SYSTEMATIC APPROACHES TO MENTAL HEALTH CARE AND PROMOTION

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SYSTEMATIC APPROACHES TO MENTAL HEALTH CARE AND PROMOTION

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Globally, mental health problems remain as one of the largest contributors to the population burden of diseases. According to WHO, common mental disorders, including depression and anxiety, affect the health of about 9% of the world's population and account for over 10% of the total years lived with disability.

In many parts of the world, the number of people with mental health disorders has been increasing, fueled by a rapid population growth and aging, as well as urbanization and immigration. It is estimated that 80% of these non-fatal diseases occurred in low and middle income countries. However, in such settings, coverage of both preventive and curative services is still very limited. Diversity in socio-cultural backgrounds and limited capacity of local health care systems are emphasizing the importance of systematic approaches to understanding and intervening in the issue.

Although the social, economic and health burden of mental health issues are substantial, effectiveness of policies and interventions is varied across regions and largely driven by contextual factors. Evidence-based prevention and treatment approaches involve the synthesis of epidemiological surveys, assessment of clinical populations (e.g chronic medical diseases, chronic psychiatric illnesses) and studies exploring the role of biological markers in psychiatric illnesses.

This Research Topic aims to introduce the latest research findings on the application of system-thinking in Mental Health Care and Promotion

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Clinical Utility of Beck Anxiety Inventory in Clinical and Nonclinical Korean Samples

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Despite the prominent use of the Beck Anxiety Inventory (BAI) in primary healthcare systems, few studies have confirmed its diagnostic utility and psychometric properties in non-Western countries. This study aims to clarify the clinical utility of the BAI as a screening tool for anxiety disorders according to DSM-IV criteria, based on blind recruitment and diagnostic interviews of both clinical and non-clinical participants in the Korean population. A total of 1,157 participants were involved in the final psychometric analysis, which included correlational analysis with other anxiety and depression self-report measures and mean score comparison with the Beck Depression Inventory (BDI). ROC analysis and calculation of positive and negative predictive values were conducted to examine diagnostic utility. The BAI was found to have high correlations with depression-related self-report measures (0.747–0.796) and moderate to high correlations with anxiety-related self-report measures (0.518–0.776). The ROC analysis failed to provide cutoff scores with adequate sensitivity and specificity for identifying participants with anxiety disorders (85.0% sensitivity, 88.1% specificity, and 92.8% AUC). The comparison of BAI and BDI mean scores for different diagnostic groups revealed that BAI and BDI scores were higher in the depressive or anxiety disorders group than in the non-clinical group. However, BAI mean score was not higher for the anxiety-only group than the depression-only group. Our data supports the BAI reliability and validity as a tool to measure the severity of general anxiety in clinical and non-clinical populations; however, it fails to capture the unique characteristics of anxiety disorders that distinguish them from depressive disorders. Further clinical implications of the BAI based on these results and some limitations of the study are discussed.

Keywords: beck anxiety inventory, diagnostic utility, psychometric property, anxiety, evidence-based assessment

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INTRODUCTION

The Beck Anxiety Inventory (BAI) is a prominent screening and outcome research tool for measuring the anxiety (1), and is validated in a number of languages, including German, French, Chinese, Spanish, Persian, Nepal, Icelandic, and others (2–7). Strong psychometric evidences have been established in diverse samples, including diverse clinical samples mixed psychiatric patients (8–14), panic disorder with and without agoraphobia (15), adolescent psychiatric patients (13, 16, 17), and older adult psychiatric patients (18) to non-clinical samples (19–21). The BAI requires about 5–10 min to administer (about 10 min for oral administration), and <5 min to interpret the scores. Among counselors in primary health care settings, BAI is reported to be the ninth most commonly used tools in the United States (22), owing to the advantages in cost-effectiveness and brevity in the application procedure. According to the meta-analysis of BAI ($k = 117$), BAI was reported to manifest an excellent internal consistency in clinical (0.91) and non-clinical sample (0.91) and a good test-retest reliability in clinical (0.66) and non-clinical (0.65) (1).

This 21-item self-report questionnaire was originally developed to assess clinical anxiety (i.e., an excess of normal anxiety resulting in significant distress and impairment of functioning (23, 24), differentiated from normal anxiety (i.e., an adaptive emotional responses to danger or threat, (25, 26), as well as the unique aspects of anxiety disorders that are assumed to differ from those of depressive disorders (27). While depression is defined as the experience of being sad, gloomy, and empty which is typically associated with events experienced in the past and decreased autonomic activity, anxiety is defined as feelings of fear and tension, and apprehension which is usually related to anticipation of future events and activation of autonomic nervous system (28).

However, some issues remain regarding the BAI's discriminant validity against depressive disorders. Distinguishing anxiety and depressive disorders through self-report measures has been the subject of debate due to a high rate of comorbidity or the possibility of a single, shared underlying mechanism, such as negative affect (28). Although Beck's original studies report significantly higher BAI mean scores for patients with anxiety disorders compared to those with depressive disorders (9, 27), other studies fail to replicate the results (29). In one study conducted in Korean sample, correlation coefficients of BAI with other depression assessments such as BDI and PHQ-9 are found to be even higher than other anxiety assessment tools (30). The ambiguity found in the mean scores difference of BAI and correlation sizes with other anxiety and depression measures questions the utility of BAI as measuring the general anxiety that are distinguishable from depression as Beck et al. (27). Because various anxiety and depression tools aim to assess the same construct with heterogeneous factors, more diverse assessments must be incorporated into an analysis to provide a comprehensive outlook on the divergent and convergent validity of the BAI.

Another issue concerns the BAI's clinical utility as an anxiety screening tool and a measurement of severity in primary care settings. Although the BAI was not originally developed as a diagnostic tool, it is essential to examine the degree of its diagnostic reliability and its score distribution in a sample before it can be utilized as a tool in anxiety screening, to track symptom changes, or as an outcome measure based on severity measurements. To date, 11 studies explored the diagnostic validity of BAI, optimal cutoff scores ranging from 7 to 26 depending on the diversity of studied samples (1). As the diagnostic cutoff score can be varying across the ethnicity and cultural background behind the research setting, undertaking the diagnostic validity study in a new ethnic sample can benefit the existing literature. Negative and positive predictive powers are critical sources for determining the clinical utility of a screening tool, especially for disorders in low prevalence rate (12). Providing such information would thus help researchers to decide optimal BAI cutoff scores for their individual purposes.

The BAI is a prominent anxiety assessment tool in Korea, with uses ranging from intervention outcome measures to mechanism studies. According to the epidemiological survey of mental disorders in Korea conducted by ministry of health and welfare, the estimated lifetime prevalence rate of anxiety disorders for Korean adults was 9.3% (male 6.7%, female 11.7%) and 1-year prevalence rate of anxiety disorders for Korean adults was 5.7% (male 3.8%, female 7.5%) (31). It was suggested that a social stigma against mental illness and inability to recognize the need of treatment may contribute to lower prevalence rates in Korea than that of Western countries, and hence the need to develop screening tools to identify the targets who need treatment was emphasized. Thus, far, the factor structure of BAI has been heterogeneously reported across studies from 2 factors to 4 factors (32, 33), which are comparable to the BAI literature conducted in other languages (1). Internal consistency and test-retest reliability of the Korean BAI have been reported as 0.91–0.93 and $r = 0.84$, respectively (30, 32, 34). Before publication of the formal translated version of the BAI by Korea Psychology Co., Ltd, which underwent several back-translation processes, all previous studies except but the most recent study (30) were based on a version of the BAI independently translated by Kwon (34). The study with newly translated version reported moderate correlation of the BAI with STAI-S, STAI-T, and PHQ-9, with excellent reliability (30). However, this was based on a stratified sample of community-dwelling people; no literature is yet available to determine the clinical utility of the BAI in Korean psychiatric populations.

Using unbiased clinical and non-clinical samples, this study aims to (1) determine the divergent and convergent validity of the BAI compared to an extended set of proxy self-report questionnaires designed to measure depression and anxiety symptoms in Korean clinical and non-clinical samples; (2) provide a comparison of BAI severity scores in anxiety disorder only, depressive disorder only, and comorbid anxiety and depression populations; and (3) reconsider the clinical utility of the BAI by determining cutoff scores and calculating specificity and sensitivity as well as positive and negative predictive power using Korean anxiety disorder base rates.

MATERIALS AND METHODS

Subjects

The current study was conducted using data from the Development and Validation of the Korean Depression and Anxiety Scales Project, collected from September 2016 to July 2018. The ethical approval was made by Korea University Institutional Review Board [1040548-KU-IRB-15-92-A-1(R-A-1)(R-A-2)(R-A-2)] and Inje University Medical Institutional

Review Board (ISPAIK 2015-05-221-009). Participant sampling for the current study was undertaken at three different sites, a university-affiliated mental health institute and two general hospitals. An aggregate effect-size score for BDI-II and BAI in 109 studies published since 1993 is $r = 0.59$ [95% CI [0.58, 0.60], $n = 28{,}533$] (1). In order to get 0.95 power for this effect-size, 76 participants were required in each group for the analysis (G*Power 3.1) (35, 36). All participants were voluntarily enrolled in the study and consecutively sampled until the sample size of participants diagnosed with anxiety and depressive disorders exceed the required number. The risk of bias in sampling and assessment procedures was evaluated using the QUADAS-2 tool (**Table 1**). The one inclusion criterion was (1) age over 18 years. Exclusion criteria included individuals with (1) inappropriate responses, (2) history of surgery, and (3) presence of other major disorders. Participants were provided with a detailed account of the current study, signed an informed consent form, and then proceeded with the self-report questionnaires and diagnostic interview. Supervision of the self-report questionnaires and interviews were conducted independently by different investigators to ensure blind sampling; researchers who conducted the structured psychiatric interviews were blinded to the participants' scores on depression- or anxiety-related self-questionnaires. Psychiatric diagnosis was confirmed by the Mini-International Neuropsychiatric Interview (MINI), plus version (37, 38). A total of 1,196 participants were initially recruited. Thirty-nine participants from one of the general hospitals were excluded from the final analysis based on unfinished self-report questionnaires (26 participants), refusal to participate in the interview (11 participants), age under 18 years (1 participant), and Japanese nationality (1 participant), resulting in 1,157 participants for statistical analysis. Participant demographics are shown in **Table 2**.

TABLE 1 | Evaluation of the Current Study in QUADAS-2 Domains and Signaling Questions.

Domains of Risk of Bias	Signaling Questions	Current study performance
Patient selection Could the selection of patients have introduced bias?	Was a consecutive or random sample of patients enrolled? Was a case-control design avoided? Did the study avoid inappropriate exclusions?	Low Yes –consecutive Yes Yes
Index test Could the conduct or interpretation of the index test have introduced bias?	Were the index test results interpreted without knowledge of the reference standard? If a threshold was used, was it pre-specified?	Low Yes Not used
Reference standard Could the reference standard, its conduct, or its interpretation have introduced bias?	Is the reference standard likely to correctly classify the target condition? Were the reference standard results interpreted without knowledge of the results of the index test?	Low Yes (MINI Plus 5.0.0) Yes
Flow and timing Could the patient flow have introduced bias?	Was there an appropriate interval between the index test and the reference standard? Did all patients receive the same reference standard? Were all patients included in the analyses?	Yes (conducted on the same day) Yes No (reasons for exclusion reported)

Instruments

Mini-International Neuropsychiatric Interview Plus Version 5.0.0 (MINI)

The MINI, which was utilized as a reference standard in the present study, is a structured interview tool developed for diagnosis of major Axis I mental disorders from the tenth revision of the International Classification of Diseases (ICD-10) and the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (37). The present study adopted the Korean version of the MINI, which has a good level of diagnostic accuracy (38). Clinical psychology graduate students and psychiatry fellows conducted the interviews, and their diagnostic decisions were supervised by licensed psychologists and psychiatrists. An excellent inter-rater reliability on the MINI diagnoses was found (ICC = 0.92).

Penn State Worry Questionnaire (PSWQ)

The PSWQ is a self-report questionnaire developed to identify excessive and uncontrollable pathological worries, consisting

TABLE 2 | Participant Characteristics.

	M	*SD*
Age	37.38	14.64
Education (years)	14.63	2.98
	N[a]	%
GENDER		
Male	381	33
Female	772	67
MARITAL STATUS		
Never married	652	57.1
Married	444	38.9
Divorced	21	1.8
Widowed	24	2.1
DIAGNOSIS		
Major depressive disorder	105	9.1
Depressive disorder	191	16.5
Generalized anxiety disorder	97	8.4
Anxiety disorder	223	19.3
Bipolar disorders I & II	63	5.4
Other psychiatric disorders	193	16.7
No psychiatric disorder	712	61.5

[a] *Total may be < 1,157 due to missing data.*

of 16 items rated on a 5-point Likert scale from 1 (*not at all typical of me*) to 5 (*very typical of me*) (39). Multiple studies in both clinical and non-clinical samples have manifested high internal consistency and convergent and criterion-related validity. Although the PSWQ is not a diagnostic scale, it is highly sensitive to concerns related to generalized anxiety disorder (GAD), and the cutoff score of 65 is reported to have optimal sensitivity and specificity to distinguish patients with GAD from patients with other anxiety disorders, such as social anxiety disorder (40). The Korean version of the PSWQ demonstrates an internal consistency coefficient of 0.93 and test-retest reliability of $r = 0.90$ for a 4-week period (41).

Generalized Anxiety Disorder 7-Item Scale (GAD-7)

The GAD-7 was developed to screen and assess the severity of GAD symptoms. The tool includes 7 items rated on a 4-point Likert scale from 0 (*not at all*) to 3 (*nearly every day*) (42), and is widely used in primary healthcare settings due to its high efficiency. A Korean version of the GAD-7 was validated for patients with migraines (43) and epilepsy (44), demonstrating high internal reliability and respective cutoff scores of 5 and 6, with adequate sensitivity and specificity.

Beck Anxiety Inventory (BAI)

The BAI is a self-report assessment of anxiety symptoms, initially developed to differentiate between anxiety and depression. The BAI consists of 21 items rated on a 4-point Likert scale from 0 (*not at all*) to 3 (*severely*). The first validation study of BAI reports 0.93 for internal consistency and 0.84 for test-retest reliability (34). There is no study available reporting a cutoff score of BAI in any sample in Korea. A copyrighted version distributed by Pearson Assessments was newly translated (30) and adopted in our study.

Beck Depression Inventory-II (BDI-II)

The BDI is a self-report depression scale developed by Beck et al. to measure affective, cognitive, motivative, and physiological aspects of depression, and is widely used in both research and clinical settings (27). The BDI-II, published subsequently, introduced changes in domain and duration cues for measurement (45). The BDI-II consists of 21 items rated on a 4-point Likert scale from 0 to 3. In Korea, several independent groups undertook validation of the BDI-II (46–48). Lim et al. (47) report a cutoff score of 18 with 85.0% sensitivity, 88.1% specificity, and 92.8% AUC, which demonstrates high diagnostic utility (47). The BDI-II was used as a crucial reference in the present study to determine the diagnostic and clinical utility of the BAI.

Center for Epidemiologic Studies Depression Scale (CES-D)

The CES-D is a self-report assessment tool to accessibly measure depression in the general population using selected items from several validated depression scales such as the BDI, the Zung Self-Rating Depression Scale, and the Minnesota Multiphasic Personality Inventory Depression Scale (49). The tool consists of 20 items that measure affective, physical, and interpersonal symptoms on 4-point Likert scale from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Korean versions of the CES-D were independently adapted and validated by multiple groups, followed by the development of an integrated version, the K-CES-D (50). Cho and Kim (51) report a cutoff score of 25 points for major depressive disorder patients in Korea, 91.3% sensitivity, 78.8% specificity, and 91.4% AUC (51).

Patient Health Questionnaire 9-Item Depression Module (PHQ-9)

The PHQ-9 is a self-report questionnaire developed to screen for and measure the severity of depression in primary healthcare settings (52). It consists of 9 items required for diagnosis of major depressive disorder on a 4-point Likert scale from 0 (*not at all*) to 3 (*nearly every day*) and 1 item that measures the severity of daily life difficulty. The Korean version of the PHQ-9 was validated by various groups (53–55). The most recent study indicates a cutoff score of 9 points, 88.5% sensitivity, 94.7% specificity, and 97.6% AUC (55).

Anxiety Sensitivity Index-3 (ASI-3)

The ASI-3 is a revised version of the ASI (56), a self-report questionnaire to measure anxiety sensitivity, the degree to which physiological arousal is interpreted as a threat (57). The ASI-3 consists of 18 items rated on a 5-point Likert scale from 0 (*very little*) to 4 (*very much*). In Korea, Lim and Kim (58) have validated the tool, reporting an internal consistency of 0.87, and identified three low-order domains using factor analysis (physical, social, and cognitive concerns) (58).

Albany Panic and Phobia Questionnaire (APPQ)

The APPQ is a self-report questionnaire developed to assess and evaluate activities that elicit interoceptive fear, agoraphobia, and social phobia (59). The scale consists of 27 items rated on a 9-point Likert scale from 0 (*no fear*) to 8 (*extreme fear*). A Korean validation version of the APPQ reports an internal consistency of 0.95 and a test-retest reliability of 0.77 (60).

Procedure

This study utilized the MINI Plus version 5.0.0 as a diagnostic reference regarding participants' psychological disorders. Interviewers arrive at diagnostic conclusions by following the tool's instructions, and additional inquiries are made to clarify individuals' clinical features. In this study, the interviewers who conducted the interviews were blinded to the results of the self-report questionnaires to ensure that the diagnostic process was not influenced by the self-report results. The diagnostic interviews were conducted by trained graduate students and one certified clinical psychologist, and final diagnoses were confirmed through case conferences.

The IBM Statistics 23 software package was used for calculating Pearson's r effect-size estimates of proxy scales as well as ROC curve analysis. Positive predictive value (PPV) and negative predictive value (NPV) were calculated using the lifetime prevalence (9.3%) of anxiety disorder as assessed by the Ministry of Health and Welfare in Korea (31). BAI mean scores for depressive disorder only group, anxiety disorder only group, and comorbid group were also calculated. For the BAI and BDI mean score comparison, the sample was divided into five groups: anxiety disorder only group (i.e., disorders under anxiety disorder category under DSM-IV, with no other comorbid disorder category), depressive disorder only group (i.e., disorders under depressive disorder category under DSM-IV, with no other comorbid disorder category), comorbid group (i.e., having both categories of anxiety and depressive disorder category under DSM-IV), other psychiatric patients group (i.e., obsessive compulsive disorder, eating disorder, and other psychiatric patients without anxiety or depressive disorders) and healthy control group with no psychiatric diagnosis.

RESULTS

Participant Demographics and Diagnoses

A total of 1,157 individuals participated in this study. As confirmed by the MINI, 9.1% of participants were diagnosed with major depressive disorder, 16.5% with any type of depressive disorder, 8.4% with GAD, 19.3% with any type of anxiety disorder, and 5.4% with bipolar disorders. The number of female participants 772 (66.7%) was almost twice that of male participants. Participants ranged in age from 19 to 84.

Correlation Analysis

Our data analysis manifested a Cronbach's alpha of 0.956, which was higher than any other studies reporting internal consistency. The item-total correlations ranged from 0.358 to 0.744. Correlation analysis with proxy measures of depression and anxiety symptoms yielded heterogeneous results. The BAI showed moderate to high correlation with anxiety-related scales, and high correlation with depression-related scales (**Table 3**).

TABLE 3 | Correlation with Proxy Scales.

	BAI
ASI[a]	0.724**
APPQ[b]	0.640**
GAD-7[c]	0.776**
PSWQ[d]	0.518**
BDI-II[e]	0.796**
CES-D	0.747**
PHQ-9	0.769**

[a] *238 participants.*
[b] *239 participants.*
[c] *1147 participants.*
[d] *1091 participants.*
[e] *1147 participants.*
*** $p < 0.01$.*

Comparison of BAI and BDI Mean Scores Across Diagnoses

As expected, significant mean score differences were found between the anxiety disorder only group ($M = 11.65$, $SD = 11.24$) and the control group without any psychiatric diagnosis ($M = 4.26$, $SD = 5.18$, $p < 0.0001$). For both the anxiety disorder only and depressive disorder only group, BAI and BDI scores were higher than the non-clinical group. Interestingly, BAI scores were lower than BDI scores in the anxiety disorder only group. The comorbid group showed the highest mean scores for both BAI and BDI (**Table 4**).

Diagnostic Utility of the BAI

ROC curve analysis for the anxiety disorders only group revealed an optimal cutoff score of 8, sensitivity of 0.75, and specificity of 0.745. This means that a score of 8 or higher will identify 75% of those with an anxiety disorder and exclude 74% of those without. We additionally calculated PPV (30.8%) and NPV (69.2%) for the scale using the lifetime prevalence of 9.3% (31). This indicates that only three out of every 10 people identified by the BAI as having an anxiety disorder actually do have the disorder. The sensitivity and specificity rates for each cutoff score are presented in **Table 5**.

DISCUSSION

The present study illustrates the psychometric properties and diagnostic utility of the BAI in blind samples of clinical psychiatric and non-clinical Korean adult populations. The BAI demonstrated excellent internal reliability and significant difference in mean score between the anxiety disorder and non-clinical groups. However, the scale did not demonstrate adequate discriminant validity between anxiety and depressive disorders, nor diagnostic utility for anxiety disorders under DSM-IV.

Our correlational analyses and mean score comparisons showed that the BAI appears to possess good convergent validity with various anxiety measures such as the ASI-3, APPQ, and GAD-7, and discriminant validity for those with and without an anxiety disorder diagnosis. However, our data did not support divergent validity within samples for depressive disorders; the correlation of the BAI with depression-related scales were mostly found to be higher than with other anxiety-related scales in the Korean sample. Convergent validity with other anxiety scales was moderate to high, which is suitable considering that the various anxiety scales included in this study measure heterogeneous concepts of anxiety, such as worry, sensitivity to physiological anxiety, and fear responses to certain objects. ROC curve analysis revealed that none of the cutoff scores demonstrated adequate diagnostic sensitivity and specificity for screening participants with anxiety disorders from those without anxiety disorders, including both clinical and non-clinical participants.

The correlation of the BAI with depression scales was found to be slightly higher in our study than in previous literature (15, 61, 62). Whereas, the diagnostic criteria for depressive disorders are based on more homogenous and robust depressive symptomatology that span various depressive disorders differing in the duration, repetition, and severity of depressive episodes, anxiety disorders manifest considerable heterogeneity under DSM-5 categorization (29). For instance, severity and frequency in social anxiety disorder may be determined by the frequency of encountering threatening social contexts. Scales such as the ASI-3 isolate the social aspect of anxiety as a factor that may

TABLE 4 | BAI and BDI Mean Scores for Depression and Anxiety Disorders.

	BAI			BDI		
	N	*M*	*SD*	*N*	*M*	*SD*
Depressive disorders only	81	15.12	10.878	81	22.75	11.565
Anxiety disorders only	93	11.90	10.676	93	18.53	11.061
Comorbid depression/anxiety	102	25.64	15.761	101	31.19	13.907
Other psychiatric disorders	166	9.69	9.988	165	16.39	10.854
Nonclinical	708	4.28	5.049	707	8.82	6.953
Total	1150	8.34	10.511	1147	13.65	11.534

be more sensitive to social anxiety disorder than other disorders in the anxiety category in DSM-5. In contrast, a GAD patient with predominant and excessive worry may score high on worry-focused scales such as the PSWQ. The items in the BAI do not encapsulate these specificities, although it may successfully capture somatic or panic-related symptoms (12, 63).

Interestingly, in our Korean sample data, the depressive disorders only group showed higher BAI mean scores than the anxiety disorders only group. Previous studies have reported higher BAI mean scores for the anxiety disorders only group (27), or at least showed no significant difference between the two (29). We speculate that cross-cultural factors could have contributed to the high BAI mean score in the depressive disorder only group in our study. That is, because a majority of BAI items concern somatization (14 out of 21 items), it is possible that the Korean sample expressed more severe somatization symptoms. In fact, somaticizing depression is not a new concept in cross-cultural psychology (64). A number of Chinese studies indicate a tendency to deny depression and express it somatically, along with cultural terms such as neurasthenia and *shenjing shuairuo* (64, 65). A recent study in Korea that explores the factor structure of collapsed items of the BAI and BDI-II shows somatic anxiety and somatic depression as major factors of the two collapsed mood disorder assessments, and notes cognitive renderings of anxiety and depression as a main discriminant factor (66). Thus, the cultural prevalence of somaticized psychiatric symptoms may have obscured the discriminant validity of the BAI against the depressive disorder group.

None of the cutoff scores in our studies revealed acceptable diagnostic sensitivity and specificity. Whereas, the cutoff score of about 15 to 16 is suggested as an optimal score by the original study (27) as well as the meta-analysis of studies reporting cutoff scores (1), a cutoff score of 8 was found to be the most acceptable combination of sensitivity and specificity in our study. Considering that the maximum total BAI score is 63, this score may be too low to adequately distinguish between those with and without anxiety disorders. Positive Predictive Value (PPV) and Negative Predictive Value (NPV) illustrate the diagnostic utility of the BAI in a real setting: only two out of every 10 people identified with an anxiety disorder based on a cutoff score of 8 will actually have the disorder. However, such a low threshold may still have clinical utility in settings where detection of anxiety is of higher importance than actually having the disorder, such as in primary healthcare. Clinicians and researchers utilizing Korean samples may benefit from the cutoff score table, PPV, and NPV as references, selecting one according to their individualized settings and purpose for utilizing the tool.

An interesting speculation found in our study is that the somatization measured in BAI may contribute to the high BAI mean scores in Korean depression disorder patients. Since BAI is a criterion-based measure rather than a diagnosis-based to anxiety disorders, its utility could be highlighted in domain-based descriptions of symptomatology rather than in categorical diagnosis. We failed to find a cutoff score to distinguish anxiety disorder patients from healthy population with adequate sensitivity and specificity values. In addition, BAI is not an effective tool to discriminate patients with anxiety disorders and depressive disorders. It is therefore suggested to use a more sensitive tool in primary health care settings, due to the high possibility to incorrectly diagnose anxiety disorders.

Some limitations of the study should be noted. We aggregated the anxiety disorder group as a whole, despite the diagnostic variation across sub-categorical anxiety disorders. Future studies with larger sample sizes will allow for comparison of BAI mean scores among different types of anxiety disorders. Furthermore, considering that depression and anxiety disorders are highly comorbid, separating anxiety disorder only and depressive disorder only groups may lead to laboratory-bound results. This may have contributed to the lower BAI mean score in the anxiety disorder only group than was found in previous literature, which mainly studied anxiety disorders without separating other comorbidities. However, dividing patients into anxiety disorder only, depressive disorder only, comorbid, and general psychiatric groups may provide incremental validity by enhancing the accurate portrayal of mean score among pure anxiety and depression groups, as well as allowing important comparisons between diagnostic-based patient differences.

The main limitations of self-reported questionnaires include the risks of self-recalled bias and its inability to measure objective biological parameters. The utilization of neuropsychological tools such as the functional near-infrared spectroscopy (fNIRS), electroencephalography (EEG) or event-related potential (ERP) measures have arisen as new potentials in academic and clinical psychiatry (67–69). For instance, EEG studies focus on asymmetric hemispheric activity in depression and anxiety (68, 70), and frontal lobe abnormalities, particularly the decrease in bilateral frontotemporal oxygenation, have been found in unipolar depression using the verbal fluency test using fNIRS (71). The implementation of neurophysiological and neuropsychological instruments may shed a light on finding anxiety- or depression-specific biomarkers.

TABLE 5 | Specificity and Sensitivity for Anxiety Disorders at Selected Cutoff Scores.

BAI cutoff score	Sensitivity	Specificity
1	0.977	0.198
2	0.945	0.305
3	0.905	0.425
4	0.873	0.506
5	0.845	0.575
6	0.809	0.633
7	0.777	0.688
8	0.750	0.740
9	0.714	0.776
10	0.668	0.798
11	0.636	0.828
12	0.591	0.848
13	0.568	0.868
14	0.532	0.881
15	0.491	0.895
16	0.473	0.906
17	0.450	0.916
18	0.432	0.925
19	0.405	0.931
20	0.391	0.943
21	0.386	0.953
22	0.368	0.959
23	0.341	0.962
24	0.314	0.968
25	0.305	0.971
26	0.286	0.974
27	0.277	0.978
28	0.268	0.982
29	0.264	0.985
30	0.255	0.987
31	0.245	0.989
32	0.232	0.991
33	0.209	0.991
34	0.200	0.992
36	0.195	0.992
37	0.164	0.994
39	0.159	0.994
41	0.150	0.994
42	0.136	0.995
44	0.132	0.996
45	0.114	0.997
47	0.100	0.997
48	0.082	0.997
49	0.073	0.997
50	0.068	0.997
55	0.064	0.998
59	0.059	0.999
62	0.050	1.000
64	0.045	1.000

Another means to overcome the vulnerability to distortion or biases of retrospective retrievals of episodic memory is applying current mobile technology. It is possible to measure anxiety symptoms in a real-time using ecological momentary assessment (EMA) method, applying the measure several times a day. Moreover, to address the burden of answering 21 questions of BAI at each time point of application, computerized adaptive testing (CAT) technique could be one solution. For instance, Gibbons, Weiss (72) developed an anxiety tool "CAT-ANX" using this technique, which automatically selects and presents the most adequate questions from the item bank with 431 items. An average of 12 questions could measure the anxiety symptom that is highly correlated with the result with the entire 431 questions ($r = 0.94$). Coupled with a mobile device, CAT technique could serve as a useful means to realize real-time, longitudinal, easily distributable assessments of anxiety symptoms with relatively fewer demands on service receivers.

Since anxiety and depressive disorders are highly comorbid (73, 74), psychological or biological treatments share common targets and mechanisms such as high emotional avoidance, rumination (75), and suppression of negative emotions (76). Despite the common features, specific treatment recommendations have been made: treatments for depressive disorders include diverse psychotherapy [e.g., interpersonal psychotherapy (IPT), cognitive-behavioral therapy (CBT)], psychopharmacological treatment (e.g., SSRI, MAOIs), transcranial magnetic stimulation (77), electroconvulsive therapy (78) For treatments of anxiety disorders, exposure-based psychotherapies (79), benzodiazepine, SSRIs, and serotonin-norepinephrine reuptake inhibitors (SNRIs) are commonly used (80). In addition, in a future study, it should be investigated whether distinctive treatment recommendations after diagnosing anxiety or depressive disorders may produce differential outcomes.

Despite these limitations, the strength of this study is in its unbiased sample, which strictly followed a robust quality assessment method using the QUADAS-2 tool (81). Our study satisfied all four domains in the risk of bias criterion. In addition, this study is the first to examine the clinical utility and psychometric properties of anxiety disorders involving both clinical and non-clinical samples in Korea. The data sample we used is assumed to reflect a natural primary healthcare setting, which presents a mixture of clinical, sub-clinical and non-clinical individuals. Additionally, the results from ROC curve analysis are expected to serve as a valuable reference in selecting cutoff scores for both clinicians and researchers according to their particular research design or clinical needs. However, attentive consideration must be made before utilizing the BAI in decision-making or outcome measures, in light of its equivocal convergent and discriminant validity.

AUTHOR CONTRIBUTIONS

HO, YYC, S-HL, and K-HC contributed to the conception and design of the study. K-HC supervised the overall study process. KP and HO performed data analysis. HO wrote the first draft of the manuscript. KP, SY, YK, and HO contributed to acquisition of data. All authors contributed to manuscript revision, and have read and approved the submitted version.

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Quality of Life in Patients With a Major Mental Disorder in Singapore

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Background: There has been a paradigm shift in mental health service delivery, from a focus on reducing symptoms to a more holistic approach, which considers Quality of Life (QoL).

Method: This study aimed to explore prediction of Quality of Life (QoL) in Asian patients with a major mental disorder i.e., depression or schizophrenia in Singapore. In the current study, there were 43 patients (65.1% females) with depression. Their ages ranged from 18 to 65 ($M = 44.63$, $SD = 12.22$). The data were combined with the data on patients with schizophrenia, where there were 43 patients (65.1% females) with schizophrenia, their ages ranging from 18 to 65 ($M = 44.60$, $SD = 12.19$).

Results: The components of QoL were examined i.e., Physical Component Summary (PCS) and Mental Component Summary (MCS). For all patients, social support and age accounted for 17.3% of the variance in PCS, $F_{(2,83)} = 8.66$, $p < 0.001$. For patients with depression, disorder severity, age, and duration of treatment accounted for 48.3% of the variance in PCS, $F_{(3,39)} = 12.15$, $p < 0.001$. For patients with schizophrenia, education (Primary or Lower vs. Post-Secondary or Higher) and emotional coping accounted for 21.3% of the variance in PCS, $F_{(2,40)} = 5.40$, $p < 0.01$. For all patients, self-efficacy and age accounted for 27.0% of the variance in MCS, $F_{(2,83)} = 15.37$, $p < 0.001$. For patients with depression, disorder severity accounted for 45.6% of the variance in MCS, $F_{(1,41)} = 34.33$, $p < 0.001$. For patients with schizophrenia, number of hospitalizations accounted for 18.5% of the variance in MCS, $F_{(1,41)} = 9.29$, $p < 0.01$.

Conclusion: The findings were discussed in regards to implications in interventions to enhance QoL of patients with schizophrenia and depression in Singapore.

Keywords: schizophrenia, depression, Quality of Life, Physical Component Summary, Mental Component Summary (MCS)

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INTRODUCTION

There has been a paradigm shift in mental health service delivery, from a focus on reducing symptoms to a more holistic approach, which considers Quality of Life (QoL) and overall functioning (1). More mental health services are adopting the recovery paradigm (2), focusing on rehabilitation (3), and QoL is an increasingly critical outcome of mental healthcare (4).

Lower Quality of Life (QoL) had been associated with major mental disorders, such as depression (5, 6) and schizophrenia (4, 7). Both mental disorders are of concern (8) to clinicians working in mental health services: Schizophrenia is the most common diagnosis among hospitalized psychiatric patients, and it is a chronic mental disorder with a debilitating course (9). Functional impairment is high, leading to lost wages and work impairment, with related personal, societal, and economic burdens (10, 11). Depression is prevalent (12), a leading cause of disability worldwide (13) and highlighted as a growing public health concern in both Western (14) and Asian studies (15), with depressed patients reporting lower QoL compared to other mental disorders, including schizophrenia (16). Domestic life, work, and interpersonal activities were the most affected functional domains in depression (17), with adverse outcomes in low education, marital disruption, unstable employment, risk of secondary disorders, and early mortality due to suicide (18); while interpersonal and affective problems were found consistently across countries, cross-national variations are noted in other domains. QoL is a culturally sensitive construct (8), and it should not be assumed that conclusions from Western studies could be generalized across to Asian populations. A recent study (8) examined the QoL of Taiwanese patients with chronic mental disorders, namely schizophrenia and affective disorders. Besides disease factors, a range of psychosocial factors was found to contribute to QoL. Many of these factors were culturally sensitive; recent research done in Singapore cautioned against the generalization of research done in other countries to the Asian population in Singapore (19), without due consideration of the local sociocultural context (20). Studies related to mental disorders and QoL in Asia (21) and Singapore (22) focused mainly on patients with one mental disorder, namely schizophrenia (21) and depression (22). A study done in Taiwan (8) examined patients with schizophrenia and affective disorders, but generalizability of the results to Singapore remained unexplored. The question if there might be differences in configuration of factors contributing to QoL across the major mental disorders named above, specifically schizophrenia and depression, remains largely unexplored in Singapore. This research question is relevant and useful to clinicians working with the recovery paradigm in mental health service delivery, to facilitate the management of major mental disorders (4).

Usage of a repertoire of more than one coping strategy led to greater effectiveness in managing mental disorders (23). Individuals with schizophrenia tended to use emotion-focused and avoidant coping (24), however it is unclear if these strategies are helpful or maladaptive. Maladaptive coping strategies might adversely disturb the overall functioning of people with mental disorders (25) and add to caregiver burden (10). Individuals with mental disorders tended to report lower distress if they had greater social support (26) and employ coping strategies (23). However, the specific mechanisms and interactions of these psychosocial factors in influencing the QoL of individuals with different types of mental disorders remains largely unexplored. Coping flexibility includes a broad coping repertoire, a well-balanced coping profile, cross-situational variability in strategy deployment, and a good strategy-situation fit (27). Possible cultural influences were suggested by differences in coping flexibility and psychological adjustment in samples from countries lower or higher in individualism.

Research is needed in the local population, as it cannot be assumed that research findings conducted in other countries are also relevant to the local Asian population in Singapore. In Western samples, functional support concerning quality of relationships and perceived social support were related to QoL (28, 29) but this phenomenon was not found in Asian samples (30). In contrast, conclusions that were consistent across samples included the association between self- efficacy with lowered stress and enhanced mental health and QoL in Western samples (31, 32), as well as QoL in Asian samples (33, 34). Recent local research suggested that education level contributed to QoL (35). Other recent Asian studies suggested that duration of illness (36) and social support (37) were prominent in QoL (23), together with possible influences from demographic variables such as gender (36–38) and age (2). Many factors could contribute to QoL in mental disorders, which makes comparing results across different studies difficult, especially when the methodologies, designs and measures employed were also different.

The current study would analyze the QoL of Singaporean patients with depression, and schizophrenia. This study aimed to address the current gap in local literature by examining the ability of available variables namely demographic characteristics such as age, gender, and education, and psychosocial variables namely social support, self-efficacy, and coping styles, as well as disorder severity, and number of hospitalizations in predicting QoL for patients with depression and schizophrenia. The data sets would be combined for patients with depression and schizophrenia. Similar to a recent study in Singapore (22), QoL would be broken down into Physical Component Summary (PCS) and Mental Component Summary (MCS). It was hypothesized that self-efficacy, coping (39), social support (25), and education (35) would positively predict PCS and MCS, while number of hospitalizations and disorder severity (33, 36) would negatively predict PCS and MCS. The study would analyze the prediction of PCS and MCS in patients with a major mental disorder i.e., depression and schizophrenia as a combined sample, and also separately.

MATERIALS AND METHODS

Procedure

Ethics approval was obtained from the Domains-Specific Review Board of a large teaching hospital in Singapore. Convenience sampling was used. Forty-three patients diagnosed with depression and 43 patients diagnosed with schizophrenia were recruited from an outpatient clinic and psychiatric ward of a large teaching hospital in Singapore from January to May 2010. Eligibility criteria for the study included the following: (a) above the legal age of consent, (b) able to understand English and/or Mandarin, and (c) absence of intellectual impairment. The patients' psychiatric symptoms, subjective Quality of Life (QoL), self-efficacy, perceived social support, and coping style were investigated with the use of self-report surveys. The survey included items on: Demographic background: age, gender, and education, (2) Nature and history of presenting problems, (3) The patient's current psychiatric condition, perceived QoL, self-efficacy, social support, and coping styles.

Clinical staff conducted the recruitment. After interested individuals returned their signed consent forms, they received

TABLE 1 | Characteristics of the sample.

	All		Depression		Schizophrenia	
	n	%	*n*	%	*n*	%
GENDER						
Male	30	34.9	15	34.9	15	34.9
Female	56	65.1	28	65.1	28	65.1
EDUCATION						
Primary or Lower	15	17.4	11	25.6	4	9.3
Secondary School	41	47.7	16	37.2	25	58.1
Post-Secondary or Higher	30	34.9	16	37.2	14	32.6
MARITAL STATUS						
Single	40	46.5	14	32.6	26	60.5
Married	38	44.2	24	55.8	14	32.5
Divorced / Separated	8	9.3	5	11.6	3	7.0
EMPLOYMENT						
Employed	42	48.8	24	55.8	18	41.9
Unemployed	44	51.2	19	44.2	25	58.1
	M	***SD***	***M***	***SD***	***M***	***SD***
Age	44.62	12.13	44.63	12.22	44.60	12.19
DURATION OF (IN DAYS)						
Condition	103.91	105.30	74.47	65.09	133.35	128.18
Treatment	47.83	79.56	61.99	63.93	33.67	91.18
No. of hospitalizations (past one year)	0.36	0.57	0.16	0.43	0.56	0.63
Disorder severity	16.52	9.61	9.63	6.59	23.42	6.78

TABLE 2 | Means and standard deviations of the variables.

	All		Depression		Schizophrenia	
	M	*SD*	*M*	*SD*	*M*	*SD*
PREDICTORS						
Social Support	14.27	2.96	19.00	13.95	14.58	2.74
Self-Efficacy	21.55	3.92	28.00	20.60	22.49	3.08
Active Coping	3.65	0.90	3.47	0.96	3.84	0.81
Emotional Coping	3.47	0.95	3.47	0.88	3.47	1.03
Support Coping	3.64	1.09	3.37	1.16	3.91	0.97
Avoidant Coping	2.94	1.21	3.00	1.11	2.88	1.31
CRITERION						
PCS	44.48	10.23	42.32	10.04	46.65	10.08
MCS	41.54	12.09	36.99	11.85	46.09	10.63

the survey. After completion of the survey, participants were debriefed, and thanked for their participation.

In the current study, there were 43 patients (65.1% females) with depression, their ages ranged from 18 to 65 ($M = 44.63$, $SD = 12.22$). The data would be combined with the data on patients with schizophrenia, there were 43 patients (65.1% females) with schizophrenia, their ages ranged from 18 to 65 ($M = 44.60$, $SD = 12.19$). The characteristics of the combined sample are presented in **Table 1**.

Materials

The 4-page survey included items on demographic background and the following questionnaires. Disorder severity for depression was measured using the Depression Anxiety Stress Scale, DASS-21 (40). Items were scored on 4-point scales, whereby higher overall scores denoted poorer management of symptoms. High validity and reliability were shown in Asian samples from Singapore (22) and Malaysia (41). For individuals with schizophrenia, the psychiatric condition was assessed using the Brief Psychiatric Rating Scale, BPRS (42). The scale comprised 18 items rated on 7-point scales of severity, based on behavioral anchors. An overall measure of symptom severity was obtained by summing up the scores of all 18 items. Quality of Life (QoL) was measured using the Short Form Health Status Questionnaire (SF-12) (43). Eight domains of health which included physical functioning, role limitations due to physical and emotional problems, bodily pain, general health, vitality, social functioning, and mental health were assessed across 12 items. Appropriate items were summed to produce two factors: Physical Component Summary (PCS) and Mental Component Summary (MCS), with higher scores indicating better perceived QoL. High test/retest validity as well as good internal reliability were shown with a Chinese sample (44). Level of functional social support was assessed by a four-item measure designed to detect various archetypal functions of informational support, emotional support, positive social interaction (45), and ability to promote self-disclosure (46). This measure was scored on 5-point Likert scales, whereby higher overall scores showed perception of greater support from spouses, families, and/or friends. The internal reliability was 0.85 (22). Self-efficacy was measured using the Self-Mastery Scale SMS (47). The SMS comprised seven items scored on 5-point Likert scales, whereby higher overall scores showed greater tendency to perceive life events as under self-control rather than that of external forces. High face validity and good internal reliability were demonstrated in a Thai study (48).

RESULTS

The data were analyzed using SPSS Version 23 with the alpha level set at 0.05. The means and standard deviations of the variables are presented in **Table 2**. The categorical variables: Education and Marital Status, were re-coded with Primary or Lower and Single as the comparison group, respectively.

A series of six forward stepwise multiple regressions were used to assess the ability of the predictor variables (characteristics of the sample and the predictors, with a total of 17 predictor variables) to predict Physical Component Summary (PCS) and Mental Component Summary (MCS). The assumptions of multiple regression were examined. First, an inspection of the Durbin-Watson statistic showed that the independence of errors assumption is satisfied (i.e., the values are close to 2). Second, an inspection of the correlation matrix, Tolerance values, and Variance Inflation Factor (VIF) showed that the

TABLE 3 | Stepwise multiple regression with PCS and MCS as the dependent variables.

	Beta	*p*
DEPENDENT VARIABLE: PCS		
All Patients		
Social Support	0.30	0.004
Age	−0.27	0.008
Patients with Depression		
Disorder severity	−0.65	0.000
Age	−0.42	0.002
Duration of treatment	−0.27	0.034
Patients with Schizophrenia		
Education (Primary or Lower vs. Post-Secondary or Higher)	−0.35	0.018
Emotional Coping	0.33	0.025
DEPENDENT VARIABLE: MCS		
All Patients		
Self-Efficacy	0.46	0.000
Age	0.26	0.008
Patients with Depression		
Disorder severity	−0.68	0.000
Patients with Schizophrenia		
No. of hospitalizations (past 1 year)	−0.43	0.004

multicollinearity assumption was satisfied. Third, an inspection of the maximum Cook's Distance showed that there were no univariate outliers (i.e., the values were <1). Fourth, an inspection of the maximum Mahalanobis distance showed that there were no multivariate outliers because the values were less than the critical value of 27.59 (given $df = 17$ and alpha $= 0.05$). Fifth, an inspection of the Normal Probability Plot (P-P) showed that the normality assumption was satisfied. Lastly, the scatterplot was inspected to assess the homoscedasticity assumption. While the assumption was satisfied for the all patients, and patients with depression, it was violated for patients with schizophrenia. However, the data was not transformed since the assumption was satisfied for the other groups. Hence, the results from patients with schizophrenia should be interpreted with caution.

Physical Component Summary PCS

For all patients, social support and age accounted for 17.3% of the variance in PCS, $F_{(2,83)} = 8.66$, $p < 0.001$. For patients with depression, disorder severity, age, and duration of treatment accounted for 48.3% of the variance in PCS, $F_{(3,39)} = 12.15$, $p < 0.001$. For patients with schizophrenia, education (Primary or Lower vs. Post-Secondary or Higher) and emotional coping accounted for 21.3% of the variance in PCS, $F_{(2,40)} = 5.40$, $p < 0.01$. The results are presented in **Table 3**.

Mental Component Summary MCS

For all patients, self-efficacy and age accounted for 27.0% of the variance in MCS, $F_{(2,83)} = 15.37$, $p < 0.001$. For patients with depression, disorder severity accounted for 45.6% of the variance in MCS, $F_{(1,41)} = 34.33$, $p < 0.001$. For patients with schizophrenia, number of hospitalizations accounted for 18.5% of the variance in MCS, $F_{(1,41)} = 9.29$, $p < 0.01$. The results are presented in **Table 3**.

DISCUSSION

This study aimed to explore prediction of Quality of Life (QoL) in 86 patients with schizophrenia and depression in Singapore. As hypothesized, the models were significant in predicting Physical Component Summary (PCS) and Mental Component Summary (MCS). For all patients, social support positively and age negatively predicted PCS. For patients with depression, disorder severity, age, and duration of treatment negatively predicted PCS. For patients with schizophrenia, education (Primary or Lower vs. Post-Secondary or Higher) and emotional coping predicted PCS. For all patients, self-efficacy and age positively predicted MCS. Self-efficacy and age positively predicted MCS for all patients. Disorder severity negatively predicted MCS for patients with depression. For patients with schizophrenia, number of hospitalizations negatively predicted MCS.

The results suggested psychosocial variables, namely social support and self-efficacy, need to be considered in their contribution to QoL for patients with depression and schizophrenia. The findings are consistent with previous literature associating psychosocial variables with QoL (35, 39). As compared with results from our study on QoL of patients with schizophrenia, prediction of QoL (i.e., MCS and PCS) differed for patients with depression and schizophrenia. For patients with depression, disorder severity, age, and duration of treatment negatively predicted PCS; while disorder severity negatively predicted MCS. For patients with schizophrenia, education and emotional coping predicted PCS, while number of hospitalizations negatively predicted MCS. This is consistent with previous research (22, 24, 26).

For patients with depression, disorder severity and duration of treatment might be associated with the chronicity of the mental disorder or it could be indicative of treatment resistance, conditions that are harder to treat e.g., dysthymia or other co-morbid conditions (16) or symptoms not investigated in the current study, and detailed below. QoL could be affected by relapses caused by residual mood symptoms and insomnia, which were not explored in this study (48). Somatic symptoms were also frequent among Asian patients with depression, were associated with greater clinical severity, and lower response and remission rates (49), pain symptoms also impacted on severity of depression and QoL (50). Other psychosocial variables that might affect impact of depression include income status (38), financial and marital problems, self-esteem (14), and religiosity (51) previously investigated but not explored here.

Future studies could employ in-depth interviews to elicit detailed information, to identify different layers of factors contributing to QoL (i.e., MCS and PCS) of patients with schizophrenia and depression. Such factors to consider might include the social cultural environment, and other contextual factors that might impact on patients, e.g., socioeconomic status, ethnicity (52), and stigma, in addition to detailed features of the mental disorder, co-morbid conditions or somatic, and residual symptoms contributing to relapse.

The current findings have implications for psychosocial interventions and mental health service delivery to patients with schizophrenia and depression in Singapore, and offer preliminary evidence to support the important role that allied health professionals play in the delivery of psychosocial interventions targeted toward enhancing social support and self-efficacy. In alignment with recent paradigm changes in mental health service delivery (1), clinicians could take on a case management role, working closely with community agencies and allied health professional to provide holistic care for those with mental disorders. Such holistic interventions could include peer led groups, or social groups, where individuals with mental disorders could be encouraged to engage in leisure activities typically used for emotion-focused coping or avoidance coping. In alignment with the contemporary focus on recovery (2) and rehabilitation (3), mental health promotion could be targeted toward reducing stigma related to mental disorders, and family support could be encouraged by offering psychoeducation to family members of individuals with mental disorders, on how best they could support these individuals in the community. These recommendations are consistent with suggestions made in other recent Asian studies to promote family interventions (53) and to reduce stigma (4).

The current findings added to QoL research, providing more insight for clinicians and allied health professionals to understand how they might work in a more targeted way, with local patients with debilitating mental disorders, specifically schizophrenia and depression to enhance QoL. Patients with depression might benefit from evidence-based therapies e.g., Cognitive Behavioral Therapy, shown to be efficacious in reduction of core mood symptoms and residual symptoms, together with empowering patients with strategies for relapse prevention (54). Patients with schizophrenia and their families might benefit from psychoeducation on relapse prevention to reduce number of hospitalizations.

Limitations to the study included the following. A lack of a control group limited how the data could be interpreted. Future research could compare data collected from patients with schizophrenia or depression with matched healthy controls on key variables, for better interpretation of data. The current study used convenience sampling on two major mental disorders, however, these mental disorders are very different, with different treatments and outcomes. Future research could examine mental disorders in the same spectrum, e.g., schizophrenia spectrum and other psychotic disorders; or the spectrum of depressive disorders. Information was not available regarding the response rate, or the prescribed treatment, future research could endeavor to collect more comprehensive information, for better interpretation of the results. It is difficult to ascertain causality in cross-sectional research. Whilst our study used statistical analysis to predict MCS and PCS, a longitudinal methodology could enhance our interpretation of the contribution of key variables across time. In addition, other contextual factors might impact on patients, e.g., socioeconomic status, ethnicity (52), and stigma. However, such contextual information was not collected in this study, future research could employ in-depth interviews to elicit the intricate interplay among contextual factors, which could be confounding variables, and might limit the generalizability of our results. Other limitations of the study included the reliance on self-report, and sampling from one hospital. With the patients' consent, family members or clinical staff could be interviewed for corroboratory information. The data was collected in 2010 in one hospital, this data was the only data set with the key variable of interest, made available to the researchers, the data with the key variables was not available after the stipulated period. Future research could replicate the study with a more recent sample and a larger sample size of patients from polyclinics and both private and public hospitals in Singapore or consider combining data with similar research in other Asian countries.

CONCLUSION

The current findings added existing to QoL research and shed additional insight for clinicians to understand how they might work in a more targeted way with local patients with debilitating mental disorders, namely schizophrenia and depression, in order to enhance Quality of Life (QoL). The findings also offer preliminary evidence to support the important role that allied health professionals could play in the delivery of psychosocial interventions targeted toward enhancing social support and self-efficacy.

AUTHOR CONTRIBUTIONS

CC, RH, CH, and PC conceptualized the paper, participated in revisions, and approved the final manuscript. CH and RH designed the study and collected data. PC analyzed data. RH gave access to the data. CC compiled data, wrote the manuscript, and applied for funding.

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Trauma Exposure and Mental Health Problems Among Adults in Central Vietnam: A Randomized Cross-Sectional Survey

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Background: There is relatively little evidence about the psychological and social impacts of trauma exposure in the general population in East Asian countries. Vietnam has a long history of war and poverty, is prone to natural disasters and has high mortality related to traffic accidents. The mental health systems may be inadequate to cope with the resultant trauma.

Objectives: This research examines the lifetime prevalence of single and multiple traumas and the association between trauma exposure and depression, anxiety and post-traumatic stress disorder (PTSD) among a randomly selected sample of the adult population in Thua Thien-Hue province in central Vietnam.

Methods: Six hundred and eight Vietnamese adults aged 18 years or older participated in the survey. The main tools in the face-to-face interview included the Life Event Checklist (LEC) to measure trauma exposure, the Hospital Anxiety and Depression Scale (HADS) and the PTSD Checklist for DSM-IV (PCL-IV). Hierarchical multiple logistic regression was used to examine associations between trauma exposure and mental health.

Results: Forty seven percent of the participants experienced at least one traumatic event in their lifetime and about half of these people were exposed to multiple traumas. The prevalence of depression, anxiety, and PTSD symptoms among the total sample was 12.7, 15.5, and 6.9%, respectively. Prevalence of PTSD among those reporting trauma exposure was 14.8%. Exposure to a higher number of trauma types was associated with increased risk of having depression, anxiety, and PTSD symptoms. Interpersonal traumas were strongly associated with symptoms of all three mental disorders while non-interpersonal traumas were only associated with depressive symptoms.

Conclusion: Our findings indicate high burden of lifetime trauma and mental ill health in the adult population of central Vietnam and show a cumulative effect of multiple traumas on symptoms of the three mental disorders. Interpersonal trauma appears to have a more

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harmful effect on mental health than non-interpersonal trauma. Efforts to improve mental health in Vietnam should focus on reducing risk of preventable interpersonal trauma in every stage of life, and more broadly, ensure greater availability of trauma-sensitive mental health programs and services.

Keywords: depression, anxiety, PTSD, mental health, trauma, Vietnam

INTRODUCTION

Exposure to traumatic events in a population and the impacts on health and well-being can vary greatly depending on socio-economic, environmental, cultural, and historical factors. The recent World Mental Health Survey revealed that the estimated prevalence of lifetime trauma exposure in the general population of the 24 countries involved in the survey ranges widely, from 29 to 85% (1). Trauma exposure often occurs more frequently in countries with lower income levels (2). This is because of many factors including disparities in living conditions, unstable political situation, ongoing conflicts and lower levels of control over daily life (3). There is convincing evidence, especially from economically developed countries, of a dose-response relationship in which cumulative exposure to traumatic events is associated with progressively increasing risk of psychiatric symptoms including psychological distress, depression, anxiety and Post Traumatic Stress Disorder (PTSD) (4–7).

Over the past few decades, Vietnam has experienced dramatic economic, political and social change through the application of reform policies. This has brought about substantial economic achievements and progress in improving the material well-being of the population (8). However, the reform has also resulted in some negative consequences such as inequity in access to social and health services among groups with different income and geographical backgrounds (9). Moreover, the rapid and uncontrolled industrialization and urbanization has created a trend where people move from rural areas to cities to find better income and educational opportunities. This internal migration has led to weakening of traditional and social family structures and greater inequality in terms of living standards between rural and urban areas (10), and many other negative social phenomena including increased rates of divorce (11), drug and alcohol use (12, 13), and domestic violence (14).

In addition, a wide range of natural disasters from typhoons to floods, landslides, and drought frequently affect Vietnamese people. More than 70% of the national population is vulnerable to risks from these hazards (15). Man-made disasters, especially traffic accidents are also very common in Vietnam. The World Health Organization estimated that in 2013 for every 100,000 Vietnamese people, there were 24.5 road traffic deaths (16). These stressors along with the long history of war and poverty may have contributed to the overall trauma burden and may have substantial impact on the wellbeing in general and mental health in particular of the Vietnamese people.

Current literature documenting the population prevalence of trauma mostly comes from developed countries. The evidence of trauma exposure for less developed countries is still limited (1, 17). To our knowledge, there has not been any study that has explored the prevalence and psychological burden of lifetime trauma exposure among the Vietnamese general population. This paper reports estimates of exposure to a wide range of lifetime traumatic events and experience of multiple traumatic events, and associations with symptoms of depression, anxiety, and PTSD among a randomly selected sample of adults in Thua Thien-Hue province in central Vietnam. In addition to the effect of multiple trauma exposure, this paper examines the effect of different trauma types (interpersonal and non-interpersonal traumas) on the symptoms of mental illness.

METHODS

Design

We completed a cross-sectional randomized survey of residents in households in rural and urban areas of Thua Thien—Hue province in 2017.

Participants

Participants were eligible if they were 18 years or older and residing in Thua Thien–Hue province. Six hundred and eight participants took part in the interviews. The sample was selected through several stages. The administrative system in Thua Thien-Hue province has three levels, namely province, district and commune. Thua Thien–Hue province is comprised of nine district-level administrative units, among which three are urban, four are coastal rural and two are mountainous rural districts. At the first stage one urban district, two coastal rural districts and one mountainous rural district were randomly selected from their groups. Second, in each of the selected districts, one commune was randomly selected. Third, in each of the selected communes, 180 households were randomly selected based on the household booklets managed by the commune health center. Finally, in each of these households, a member whose age was 18 years or older was randomly selected. Altogether, there were 720 participants selected and invited to the study with 608 participating in the survey, resulting in a response rate of 84.4%.

Procedure

Village health collaborators from each of the communes went to the selected participants' houses to give them an invitation letter. Participants were invited to their closest commune health center to be involved in a face-to-face interview with trained research staff, using a structured questionnaire. An interview with each participant was conducted in a private room to ensure privacy and confidentiality. For those who could not go to the commune health center (about 3%), interviews were conducted at their homes. Interviews took an average of 60 minutes. Importantly, the interviewers were not staff of the local commune health center where interviews were done, thus minimizing risks to privacy. Written informed consent was obtained from all participants before the interview. Participation in the study was voluntary. Data were collected from April to June, 2017. Ethics approval was obtained from the Queensland University of Technology Human Research Ethics Committee (Approval No 1600000981) and the Ethical Review Board for Biomedical Research of Hanoi University of Public Health (Approval No 321/2016/YTCC-HD3).

Instruments

The study used a structured questionnaire which was originally developed in English. The questionnaire was translated into Vietnamese language following a standard back-translation procedure suggested by Brislin (18). In this procedure, forward translation from English to Vietnamese was first performed by a bilingual public health professional. Backward translation (Vietnamese to English) was then undertaken blindly by another bilingual public health professional. A native English speaker later reviewed this version to ensure equivalence to the original questionnaire. For each version of the questionnaire, revision was done when necessary to ensure eventual identical items in the English and Vietnamese versions (18). To further ensure the cultural appropriateness of the questionnaire, consultation with two Vietnamese experts in psychology and psychiatry and with local people was conducted, resulting in rewording of some questions while retaining the content and meaning of the original questionnaire. The key components of the questionnaire included the following:

Demographic Characteristics

Variables included age, sex, ethnicity, residence, education, marital status, employment, number of children, and estimated monthly household income. Perceived social status was measured using the MacArthur Scale of Subjective Social Status, which is a 10-rung ladder corresponding numbered from 1 to 10 (19). The top rung represents people who have the highest perceived social status (richest, having highest education level and most respected job) and the bottom rung represents the people who have the lowest social status (poorest, having least education and least respected job or no job) (19).

Outcome Variables

Symptoms of depression and anxiety

Depression and anxiety were measured with the Hospital Anxiety and Depression Scale (HADS), developed by Zigmond and Snaith (20). The scale is designed to distinguish between depression and anxiety symptoms, comprising seven items for depression and seven items for anxiety. For each item, a 4-point rating scale (0–3), indicating the frequency or severity of the symptoms is used, therefore each subscale can have scores ranging from 0 to 21. Scores from 0 to 7 indicate "no case," 8–10 "possible case," and 11–21 "probable case" of depression or anxiety. Although the scale was initially developed for use among patients attending general medical clinics, many studies have confirmed its reliability and validity in community and primary health care populations (21). The scale has been validated and used in surveys in South-east Asia (22, 23). In our study, those who had a total score of 8 or higher for each subscale were classified as having symptoms suggestive of depression/anxiety. This classification of cases was supported by the scale developers (20), numerous other validation studies of the HADS (24) as well as the results of our pilot study in Hue. Data from the present study showed that the two subscales had good internal consistency (Cronbach's alpha = 0.80 for the depression subscale and 0.85 for the anxiety subscale).

Post-traumatic stress disorder (PTSD)

PTSD was measured with the Post-traumatic Stress Disorder Checklist (PCL) for DSM-IV (25). This is a 17-item self-report scale designed to assess the full domain of PTSD symptoms according to DSM-IV (including intrusion, numbing/avoidance, and hyper-arousal that correspond to DSM-IV criteria B, C, and D, respectively). In this checklist, respondents are asked how much they were bothered by the symptoms during the past month. Each item has response options ranging from 1 to 5 (not at all to extremely). The PCL is one of the most widely used PTSD self-report instruments (26) and its reliability and validity have been confirmed by numerous studies in different populations around the world (27, 28). In our study, the PCL-S (specific) version was used. It includes questions referring to a specific "stressful experience." Before being asked questions to assess PTSD symptoms in the PCL-S, the participants are asked about their exposure to traumatic events. PTSD assessment was based on both the total scores of the PCL and DSM-IV symptom criteria. A person was categorized as possibly having PTSD if they had symptomatic response to at least 1 B item (questions 1–5), 3 C items (questions 6–12), and 2 D items (questions 13–17) and a PCL total scores of 30 or higher. The chosen cut point was recommended by the scale's developer—the US National Center for PTSD—for screening PTSD in a general population sample based on a series of validation studies (29). The internal consistency of the PCL in our study was high (Cronbach's alpha = 0.94).

Before the main survey, a pilot study was conducted to validate the outcome measures (the Vietnamese version of the HADS and PCL-IV). The pilot study used the same questionnaire as the main survey and had a sample of 210 adults residing in the same province. Half of these individuals were randomly selected and invited to attend a clinical diagnostic interview to assess depression, anxiety, and PTSD (in a separate interview after having completed the survey questionnaire). The pilot study showed that the HADS and PCL had acceptable reliability and validity and were feasible for screening for depression, anxiety, and PTSD symptoms in Vietnamese contexts.

Trauma Exposure

To measure exposure to traumatic events, a list of potential events adopted from the Life Events Checklist (LEC) for DSM-IV was used. The checklist was developed by the US National Center for Post-traumatic Stress Disorder (30). The Checklist includes 16 specific events and an option for other events that are not included in the checklist. For each event, the LEC inquires about multiple types of exposure (1 = happened to me, 2 = witnessed it, 3 = learned about it, 4 = not sure, and 5 = doesn't apply). Psychometric assessment of this checklist in both Western and Asian populations has confirmed that it has adequate reliability and validity (30, 31). In our study, we asked the participants to list only traumatic experiences in which they had witnessed, or were confronted with an event that involved actual or threatened death or serious injury, or a threat to their physical integrity or the physical integrity of others, and that was very frightening and upsetting. The event was considered as endorsed if the participants selected "happened to me" or "witnessed" it or "learned about it." For each participant, the total number of life-time traumatic events endorsed was calculated and categorized into 4 groups: no exposure, exposure to 1–2 events, exposure to 3–4 events, and exposure to 5 or more events.

Covariates

Positive mental health

Three positive mental health indicators were assessed: self-esteem, mastery and optimism.

Self-esteem. The Rosenberg Self-esteem Scale (RSES) was used to measure self-esteem (32). This ten-item scale asks respondent to rate their agreement with each item (e.g., "I feel I have a number of good qualities" or "At times I think I am no good at all") on a four-point Likert scale (0 = strongly agree to 3 = strongly disagree). Higher total scores reflect higher level of global self-esteem (32). The scale had been validated and used in several studies in Vietnam (33, 34). In our study, the scale had very good internal consistency (Cronbach's alpha = 0.82).

Mastery. Pearlin and Schooler's Self-Mastery Scale (35) was used to measure participants' perception about their ability to deal with life adversities. The scale has 7 items. For each item statement, the respondent is asked to rate their agreement on a 4-point Likert scale (from 1 = strongly disagree to 4 = strongly agree). The total score is obtained by adding up each item score (ranging from 7 to 28) with higher scores reflecting greater level of mastery (35). The scale has been validated and used in Vietnam (34). In our study the scale had good internal consistency (Cronbach's alpha = 0.72).

Optimism. Optimism was measured by using the Revised Life Orientation Test. This Test aims to assess generalized expectation for positive as compared to negative life outcomes. The scale includes 10 items, among which four are filler items only and are not to be scored as part of the scale. In this test, the respondent is asked to indicate their level of agreement with items such as "In uncertain times, I usually expect the best" or "I rarely count on good things happening to me" on a 4-point scale ranging from strongly disagree (0) to (1) strongly agree. Reverse coding is required for negatively worded items before adding up all items to obtain the scale's overall score, which ranges from 0 to 24. The higher the overall score, the higher the sense of optimism (36). Studies with both Western and Asian samples have reported favorable validity and reliability of the scale (37, 38). The present study is the first to use it with a Vietnamese sample. Preliminary analyses revealed that our data supported previous studies in conforming with a two-factor structure of the test (37, 38) and we found moderate internal consistency with Cronbach's alpha of 0.62.

Responsibilities to care for seriously ill or disabled person/people in the family were assessed by using a single yes/no question, "Do you have to take care of any seriously ill or disabled person in your family?"

Number of lifetime chronic diseases

A list of 19 common chronic conditions was included in the questionnaire. The respondents were asked to report all chronic conditions which had been diagnosed by health professionals in their life. The total number of life-time chronic conditions was used for the analyses.

Social support

The Multidimensional Scale of Perceived Social Support (MSPSS) was used to measure the level of social support. This scale comprises 12 items referring to social support from different sources: family, friends and significant others. For each item, the respondent was asked to rate on a seven-point scale [from strongly disagree (1) to strongly agree (7)] their level of agreement. Higher total scores represent higher level of perceived social support (39–41). This scale has been validated and used in previous research in Vietnam (34, 42). In our study the scale had excellent internal consistency (Cronbach's alpha = 0.88).

Statistical Analyses

Descriptive analyses were used to show the distribution of demographic characteristics, trauma exposure and outcome variables. Chi square tests were used to compare differences between males and females in terms of prevalence of the mental disorders and trauma exposure. Hierarchical multiple binary logistic regression was used to examine the relationship between exposure to multiple trauma categories and each of the three mental disorders. A three step process was used for each outcome variable. The first step (Model 1) involved including the demographic characteristics (including gender, age group, ethnicity, residence, marital status, employment, education, household income, number of children, and perceived social status). The second step involved adding multiple trauma categories (Model 2). In the third step, covariates (including responsibilities to care for ill or disabled people in the family, number of life time chronic diseases, self-esteem, optimism, mastery and social support) were all included in the model. Then, manual backward elimination of covariates was performed keeping demographics and multiple traumas in the model (Model 3). Backward elimination was done with those covariates that had a $p > 0.1$. To compare models when excluding covariates, likelihood ratio test was used. Those covariates that changed the coefficients for multiple trauma exposure by more than 15% or resulted in a likelihood ratio test $p < 0.05$ when removed were retained in the final model. As participants not exposed to any traumatic event were not asked for PTSD symptoms, logistic regression analysis for PTSD was restricted to those who were exposed to at least one traumatic event ($N = 285$).

All reported *p*-values are two tailed and considered statistically significant at $\alpha = 0.05$.

The same principles of modeling were applied when the independent effect of trauma types were examined. To examine the effect of trauma types, the 17 lifetime trauma categories in the LEC were grouped into interpersonal traumas and non-interpersonal traumas. Interpersonal traumas encompassed direct exposure (events happening to oneself) to physical assault; assault with a weapon; sexual assault; other unwanted sexual experience; serious injury, harm, or death caused to others; and captivity. Non-interpersonal traumas included witnessing or knowing about physical and sexual assaults and captivity; indirect or direct exposure to disasters, toxic substance, combat or exposure to war zones; life-threatening illness or injury; severe human suffering; sudden violent death; sudden unexpected death of someone close; and the events in the "other" category. This categorization of trauma was informed by previous research involving trauma conceptualization (43, 44). All analyses were performed using STATA version 13.1 (StataCorp, 2013).

RESULTS

Participant Characteristics

The mean age of the participants was 42.2 years (*SD* = 15.8 years; range 18–84). As seen in **Table 1**, twenty three percent were in the older age group (55 years or older), 61.8% were female, and 26.2% belonged to ethnic minority groups. The majority of participants lived in rural areas (74.0%) and were married or living with their partners (80.6%). About one third of the participants were illiterate, and nearly half were living in poor or near-poor households. The participants' perceived social status mean score was 4.1 (*SD* = 1.6; range 1–10). The mean number of children reported by participants was 2.6 (*SD* = 1.9; range 0–10).

Prevalence of Mental Disorders

Table 2 presents estimates of the prevalence of depression, anxiety, and PTSD in the study sample. Thirteen percent of the participants reported symptoms suggesting a possible depression diagnosis, and 15.5% reported symptoms suggesting a possible anxiety diagnosis. Of the total population, 6.9% experienced symptoms suggestive of PTSD. The prevalence of PTSD among those who were exposed to one or more traumatic events in their lifetime was 14.8%. Compared to male participants, females had higher prevalence of symptoms of all three mental disorders, though the differences between the two sexes were not statistically significant.

Exposure to Traumatic Events

Lifetime experience of trauma is detailed in **Table 3**. Of the total sample, 46.9% reported exposure to some traumatic event in their life. Respondents had experienced an average of 1.1 traumatic events (*SD* = 1.6; range 0–8). Among those who were exposed to at least one trauma type, 59.6% were exposed to multiple trauma types (two or more). Of the total sample, 11.2% reported exposure to two trauma types and 16.8% reported exposure to three or more. There was no significant difference between males and females regarding the total number of traumatic events experienced. The most prevalent trauma experiences were natural disasters (19.9%), transportation accidents (17.8%), and life-threatening illness or injury (15.8%). Males were more likely

TABLE 1 | Demographic characteristic of the participants.

Variable	***n* (%)**
Gender (*N* = 608)	
Males	232 (38.2)
Females	376 (61.8)
Age group (*N* = 598)	
18-24	75 (12.5)
25-54	385 (64.4)
>55	138 (23.1)
Ethnicity (*N* = 608)	
Kinh	449 (73.8)
Minority groups	159 (26.2)
Residence (*N* = 608)	
Urban	158 (26.0)
Rural	450 (74.0)
Marital status (*N* = 608)	
Never married	65 (10.7)
Married or living as couple	490 (80.6)
Separated/divorced/widowed	53 (8.7)
Employment (*N* = 608)	
Unemployed	152 (25.0)
Manual job	348 (57.2)
Non-manual job	108 (17.8)
Education level (*N* = 608)	
Illiterate	188 (30.9)
Primary school	176 (29.0)
Secondary School	110 (18.1)
High school or higher	134 (22.0)
Average household income (*N* = 604)	
Poor	174 (28.8)
Near-poor	104 (17.2)
None poor	326 (54.0)
	Mean (*SD*)
Perceived social status (*N* = 608)	4.1 (1.6)
Number of children (*N* = 608)	2.6 (1.9)

TABLE 2 | Prevalence of depression, anxiety, and PTSD symptoms by gender.

	***n* (%)**		
	Male	**Female**	**Total**
Depression[a] (*N* = 608)	28 (12.1)	49 (13.0)	77 (12.7)
Anxiety[b] (*N* = 608)	29 (12.5)	65 (17.3)	94 (15.5)
PTSD[c] whole sample (*N* = 608)	11 (4.8)	31 (8.3)	42 (6.9)
PTSD[c] among those reported trauma exposure (*N* = 285)	11 (10.1)	31 (17.8)	42 (14.8)

[a] *HADS depression subscale score ≥8.*

[b] *HADS anxiety subscale score ≥8.*

[c] *PCL score ≥30 and symptomatic response to at least 1 B item (questions 1–5), 3 C items (questions 6–12), and 2 D items (questions 13–17) in the PCL.*

to report exposure to traumatic events related to fire or explosion, serious accident at work, home, or during recreational activity and combat or exposure to a war-zone. Females were more likely to report events related to unwanted or uncomfortable sexual experience and events categorized in the "other" group (such as canceled wedding and work-related severe stress).

Burden of Multiple Trauma Exposure on Symptoms of Depression, Anxiety, and PTSD

Table 4 presents the multiple logistic regression analyses examining the effect of multiple lifetime traumas on depression, anxiety, and PTSD. In the second step of modeling, for all three outcome variables, when multiple trauma exposure was added to model 1 (demographic variables only), it led to a significant improvement of model fit. In **Table 4**, ORs, 95% CI and *p*-values were reported for those variables retained in the final model. Generally, after controlling for demographic characteristics and covariates, the risk of depression, anxiety, and PTSD was higher as the number of traumatic events increased. Compared to no trauma exposure, the odds of having depression increased by 2.7($OR = 2.7$; 95%CI 1.3–5.4) for exposure to 1–2 trauma types, by 5.0 ($OR = 5.0$; 95%CI 2.1–11.9) for exposure to 3–4 trauma types, and by 5.9 ($OR = 5.9$; 95%CI 1.9–17.9) for exposure to 5 trauma types or more. A similar trend was seen for anxiety with the odds associated with the trauma exposure categories increasing by 1.8 ($OR = 1.8$; 95%CI 0.9–3.3), 2.8 ($OR = 2.8$; 95%CI 1.2–6.3), and 6.8 ($OR = 6.8$; 95%CI 2.4–19.0), respectively. Compared to those who were exposed to 1–2 trauma types in their life, participants who reported exposure to 3–4 trauma types had a 2.7-fold increased odds ($OR = 2.7$, 95%CI 1.0–7.0) of having PTSD symptoms and those who experienced 5 or more trauma types had a 4.9-fold increased odds ($OR = 4.9$, 95%CI 1.5–15.5) of having PTSD symptoms.

Effect of Interpersonal and Non-interpersonal Traumas on Symptoms of Depression, Anxiety, and PTSD

Table 5 shows the independent effect of interpersonal traumas and non-interpersonal traumas on symptoms of the three mental illnesses, adjusted for demographics characteristics, the other trauma group, and the covariates retained in the final model. As shown in **Table 5**, interpersonal traumas were strongly and significantly associated with the symptoms of all three mental illnesses, while non-interpersonal traumas were only associated with an increased risk of depressive symptoms. Compared to those who reported no exposure to interpersonal trauma, those who reported interpersonal trauma had 3.14 times higher odds of having depressive symptoms ($OR = 3.14$, 95%CI: 1.28–7.23), 4.98 times higher odds of having anxiety symptoms ($OR = 4.98$, 95%CI: 2.13–11.64), and 4.43 times higher odds of having PTSD symptoms ($OR = 4.43$, 95%CI: 1.57–12.49). Exposure to non-interpersonal trauma increased the odds of having depressive symptoms by 2.86 times compared to non-exposure ($OR = 2.86$, 95%CI = 1.51–5.44).

DISCUSSION

Prevalence of Depression, Anxiety, and PTSD

Symptoms of depression, anxiety, and PTSD were found to be common among adults living in central Vietnam. The proportion of adults having symptoms suggestive of depression, anxiety was 12.7 and 15.5%, respectively. These level of psychological morbidity is comparable with normative data for the HADS obtained from studies in other populations [e.g., 8.8–11.0% depression and 15.7–20.1% anxiety in Norway (45), and 16.4% depression in the UK (46). 15.0–19.9% anxiety in the Netherlands (47), and 10.3% depression and 23.4% anxiety in Malaysia (23)]. However, our estimates are much lower when compared to HADS-derived estimates of depression and anxiety among the general population of Korea (43.3% depression and 29.0% anxiety) (48).

PTSD symptoms were identified in 6.9% of the total sample. This prevalence is higher than that reported among non-clinical populations in economically developed countries (4). For example data from the World Mental Health Surveys revealed that the 12-month PTSD symptoms were reported among 3.8% of the total sample in Ireland, 2.5% in the United States and 2.1% in New Zealand (4). The prevalence of PTSD among those who were exposed to at least one traumatic event in our study (14.8%) is within the range of estimates of PTSD among high risk groups including US veterans [between 2 and 17% in a meta-analysis (49)] and among people exposed to natural disasters [between 5.0 and 24.0% in a systematic review (50)].

Many studies find that, compared to men, women tend to report more symptoms of anxiety and depression (51, 52). In contrast, in the present study, although there was a trend for more symptoms of anxiety and PTSD among women than men, these differences were not statistically significant. Similar results in Vietnam were found in a study of post-typhoon prevalence of some psychiatric disorders among adults in Danang and Khanh Hoa provinces (53). This might be explained by culture-specific gender roles in Vietnam, where men are often the household heads and main income earners and may experience more pressure in maintaining employment in an economy that is increasingly competitive (53). It could also be due to the country's long history of war, where men were more likely to be directly exposed to war related traumatic events than were women (53), which is also indicated in the self-reported trauma exposure profile in the current study.

Similar findings of narrow gaps between males and females in some mental illnesses in a number of countries have generated special interest in gender roles (54, 55). It is possible that differences in the prevalence of mental illnesses between males and females arise from difference in the typical stressors faced by each gender, and different coping resources and role-identities between women and men at various points of time throughout history (54, 55). Data from the World Mental Health Survey in Japan revealed higher risk of lifetime mental disorders among men (56). Pooled data from 15 countries participating in the World Mental Health Survey showed that substantial inter-cohort narrowing of the gender gap in major depression was

TABLE 3 | Prevalence by gender of lifetime trauma.

Traumatic event	***n* (%)**		
	Male (*N* = 232)	**Female (*N* = 376)**	**Total (*N* = 608)**
Natural disaster (for example, flood, typhoon, whirlwind, earthquake)	45 (19.4)	76 (20.2)	121 (19.9)
Fire or explosion*	9 (3.9)	5 (1.3)	14 (2.3)
Transportation accident (for example, car accident, boat accident, bus, or motorbike accident)	41 (17.7)	67 (17.8)	108 (17.8)
Serious accident at work, home, or during recreational activity*	23 (9.9)	18 (4.8)	41 (6.7)
Exposure to toxic substance (for example, dangerous chemicals, radiation)	7 (3.0)	4 (1.1)	11 (1.8)
Physical assault (for example, being attacked, hit, slapped, kicked, beaten up)	22 (9.5)	26 (6.9)	48 (7.9)
Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb)	15 (6.5)	12 (3.2)	27 (4.4)
Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)	1 (0.4)	3 (0.8)	4 (0.7)
Other unwanted or uncomfortable sexual experience*	2 (0.9)	15 (4.0)	17 (2.8)
Combat or exposure to a war-zone (in the military or as a civilian)*	25 (10.8)	18 (4.8)	43 (7.1)
Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)	7 (3.0)	5 (1.3)	12 (2.0)
Life-threatening illness or injury	35 (15.1)	61 (16.2)	96 (15.8)
Severe human suffering	14 (6.0)	27 (7.2)	41 (6.7)
Sudden violent death (for example, homicide, suicide)	8 (3.5)	10 (2.7)	18 (3.0)
Sudden unexpected death of someone close	23 (6.1)	20 (8.6)	43 (7.8)
Serious injury, harm, or death you caused to someone else	5 (2.2)	4 (1.1)	9 (1.5)
Any other very stressful event or experience*	1 (0.4)	20 (5.3)	21 (3.5)
Experiencing any trauma	110 (47.4)	175 (46.5)	285 (46.9)
NUMBER OF TRAUMA CATEGORIES			
1	42 (18.1)	73 (19.4)	115 (18.9)
2	28 (12.1)	40 (10.6)	68 (11.2)
3	14 (6.0)	36 (9.6)	50 (8.2)
4	9 (3.9)	10 (2.7)	19 (3.1)
5	6 (2.6)	10 (2.7)	16 (2.6)
6-8	11 (4.7)	6 (1.6)	17 (2.8)

**p-value comparing males with females <0.05.*

associated with changes in the traditionality of female gender roles (54). Further studies are recommended to examine levels of mental distress and severe disorders between men and women in Vietnam and to identify the factors underlying this pattern.

Prevalence of Trauma Exposure

To the best of our knowledge, this is the first study to document the co-occurrence of lifetime traumatic events in a general adult population sample in Vietnam. Many participants (nearly 50%) had experienced at least one traumatic event in their lifetime. The World Mental Health Survey showed a wide range in estimates of exposure to traumatic events across the world (30–80%) (1). The prevalence of lifetime trauma exposure in Thua Thien-Hue province is in the same range (about 50–60%) as European countries and Japan (2).

The most prevalent traumatic events were natural disasters (19.9%), transportation accidents (17.8%), and life-threatening illness or injury (15.8%). Participants were asked to report only events that involved "actual or threatened death or serious injury, or a threat to the physical integrity of themselves or others" and which had strong emotional impact on them [as defined in criteria A for exposure to traumatic event for a DSM-IV PTSD diagnosis (57)]. Therefore, the proportion of those who reported natural disaster as a traumatic event may be less than the proportion of those who actually had been exposed to natural disasters but were not personally threatened or harmed. In fact, more than 70% of the Vietnamese population is exposed to natural disaster risks (15). Moreover, road traffic crashes occur very frequently in Vietnam, resulting in a mortality rate of 24.5/100.000 people (16). According to the WHO, injuries related to road traffic are the leading cause of death for those aged 15–29 in the country (58). The frequently reported events related to traffic accident and life-threatening illness or injury in our study reflect the context of the country and highlight their importance in the total burden of trauma among Vietnamese people.

Although our study found that females did not differ significantly from males in the overall risk of trauma exposure, the risk of certain traumas varied between the two sexes. Our results confirm the findings from previous studies that report higher risk for serious accidents and political victimization among males and higher risk for sexual victimization among females (5, 59, 60). These gender differences in trauma exposure suggest that there should be gender-specific interventions and

TABLE 4 | Summary of multivariable logistic regression for depression, anxiety, and PTSD.

Source	**Depression**		**Anxiety**		**PTSD**¶	
	Adjusted OR (95%CI)	***p*-value**	**Adjusted OR (95%CI)**	***p*-value**	**Adjusted OR (95%CI)**	***p*-value**
Multiple life time traumas		0.001#		<0.001#		0.008#
0 type	1		1		–	
1–2 types	2.7 (1.3–5.4)	**0.006**	1.8 (0.9–3.3)	0.081	1	
3–4 types	5.0 (2.1–11.9)	**<0.001**	2.8 (1.2–6.3)	**0.014**	2.7 (1.0–7.0)	**0.042**
5+ types	5.9 (1.9–17.9)	**0.002**	6.8 (2.4–19.0)	**<0.001**	4.9 (1.5–15.5)	**0.008**
DEMOGRAPHICS						
Gender						
Male	1		1		1	
Female	0.7 (0.3–1.3)	0.198	0.9 (0.5–1.6)	0.642	1.6 (0.6–3.8)	0.330
Age Group						
18–24	1		1		1	
25–54	1.0 (0.3–4.0)	0.944	0.6 (0.2–1.7)	0.353	1.1 (0.2–6.0)	0.899
55+	3.0 (0.7–13.5)	0.153	0.2 (0.1–0.9)	**0.029**	0.8 (0.1–5.8)	0.829
Ethnicity						
Kinh group	1		1		1	
Minority groups	2.4 (1.1–5.5)	**0.041**	1.4 (0.6–3.0)	0.397	0.8 (0.2–2.4)	0.641
Residence						
Urban area	1		1		1	
Rural area	0.8 (0.3–17)	0.519	0.4 (0.2–0.7)	**0.005**	0.6 (0.2–1.7)	0.310
Marital Status						
Never married	1		1		1	
Married or living as couple	3.7 (0.4–31.7)	0.238	1.2 (0.4–3.9)	0.807	4.2 (0.4–49.8)	0.253
Separate/divorced/widowed	1.7 (0.2–17.8)	0.637	1.4 (0.3–5.7)	0.668	5.0 (0.4–68.7)	0.228
Employment						
Unemployed	1		1		1	
Manual job	0.5 (0.2–1.1)	0.085	0.5 (0.3–1.0)	**0.044**	0.5 (0.2–1.4)	0.195
Non-manual job	1.9 (0.7–5.4)	0.209	1.3 (0.5–3.1)	0.593	1.1 (0.3–4.2)	0.841
Education Level						
Illiterate	1		1		1	
Primary school	0.5 (0.2–1.1)	0.094	1.1 (0.6–2.2)	0.770	0.6 (0.2–1.6)	0.288
Secondary School	0.9 (0.4–2.0)	0.761	1.3 (0.6–2.8)	0.532	0.7 (0.2–2.4)	0.580
High school or higher	0.2 (0.0–0.7)	**0.011**	0.6 (0.2–1.6)	0.297	0.4 (0.1–1.7)	0.216
Household Economic Status						
Poor	1		1		1	
Near-poor	1.6 (0.7–3.7)	0.244	0.9 (0.4–2.00)	0.791	2.6 (0.8–8.6)	0.122
None poor	0.9 (0.3–2.2)	0.784	0.7 (0.3–1.6)	0.363	1.5 (0.5–5.3)	0.487
Subjective social status	0.8 (0.6–1.0)	**0.025**	0.8 (0.6–0.9)	**0.010**	0.8 (0.6–1.2)	0.274
Number of children	1.0 (0.8–1.2)	0.831	1.2 (1.0–1.4)	0.093	1.0 (0.8–1.4)	0.843
COVARIATES						
Taking Care Of Sick Or Disabled Person In The Family						
No	1		1		1	
Yes	2.3 (1.2–4.3)	**0.011**	2.4 (1.4–4.3)	**0.002**	3.7 (1.6–8.7)	**0.002**
Mastery	0.7 (0.7–0.9)	**<0.001**	0.8 (0.7–0.9)	**0.003**	–	
Optimism	–		–		0.8 (0.7–0.9)	**<0.000**
Social support	–		1.0 (0.9–1.0)	**0.006**	–	
Number of lifetime chronic conditions	–				–	
0			1			
1–2			1.8 (0.7–4.3)	0.215		
3+			5.0 (1.8–13.7)	**0.002**		

 # p-value for trend, – blank cells: covariates not included in the final model after backward elimination, ¶ analysis for PTSD was restricted to those reporting trauma exposure (N = 285). The bold p-values represent significant associations.

TABLE 5 | Effect of interpersonal trauma and non-interpersonal trauma on mental health.

Trauma types	Depression[a]		Anxiety[b]		PTSD[c]	
	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value
INTERPERSONAL TRAUMA						
No	1		1		1	
Yes	3.14 (1.28–7.73)	**0.013**	4.98 (2.13–11.64)	**<0.001**	4.43 (1.58–12.49)	**0.005**
NON-INTERPERSONAL TRAUMA						
No	1		1		1	
Yes	2.86 (1.51–5.44)	**0.001**	1.66 (0.93–2.95)	0.088	1.30 (0.15–10.98)	0.809

[a] *Covariates retained in the final models included responsibilities of caring for a seriously ill or disabled family member and mastery, and perceived social support.*

[b] *Covariates retained in the final model included responsibilities of caring for a seriously ill or disabled family member, number of chronic diseases, mastery, and perceived social support.*

[c] *Covariates retained in the final model included responsibilities of caring for a seriously ill or disabled family member and optimism. The bold p-values represent significant associations.*

services aimed to lessen the burden of trauma among the Vietnamese population.

Burden of Trauma Exposure on Mental Health

Multiple Trauma Exposure and Symptoms of Depression, Anxiety, and PTSD

Exposure to multiple trauma types has a strong association with symptoms of depression, anxiety, and PTSD in Vietnamese adults. There was a graded association between the number of trauma types and all three measures of mental distress. Those with the highest number of trauma types (5 or more) had a 6-fold increase in the odds of having depressive symptoms and a 7-fold increase in the odds of having anxiety symptoms compared to those with no trauma, and a 5-fold increase in the odds of having PTSD symptoms compared to those exposed to one to two trauma types. Previous research has pointed out that the response of an individual to a more recent trauma may have been exacerbated by an event that happened earlier; in other words, an individual's response may be the result of successive traumatization rather than a given event (61, 62). Our findings lend support to previous studies that demonstrate a strong relationship between incremental levels of trauma and risk of mental ill health (6, 62–64), suggesting that the impact of multiple traumas on mental health is consistent across cultures.

Trauma Types and Symptoms of Depression, Anxiety, and PTSD

In addition to the total effect of multiple trauma exposure, the present study provided important evidence regarding the effect of different trauma types on mental health. The strong association between interpersonal trauma and symptoms of the mental illnesses found in this study support prior research that has consistently indicated that, compared to non-interpersonal trauma, exposure to interpersonal trauma bears heavier psychosocial consequences including depression (65–67), anxiety (68), PTSD (43, 66, 69–73), other disorders of extreme stress (DENOS) (74), suicidality (44), and psychiatric externalizing behavior disorder (75). There are several reasons that interpersonal trauma may become remarkably pathogenic. A traumatic event of this type can violate one's assumptions about the world's safety and predictability and can starkly expose the individual to others' capacity to engage in deliberately harmful actions (43). In addition, there has been evidence that traumatic events in which the perpetration involves a person or people with very close relationship, such as abuse by parents or intimate partner violence, are associated with a range of difficulties including affect and behavioral dysregulation and trouble dealing with interpersonal relationships (76). These circumstances may also affect the ability to ensure the ongoing safety of the victims (70).

These findings highlight the importance of the assessment of trauma exposure, particularly those of an interpersonal nature, for the detection and treatment of depression, anxiety, and PTSD among Vietnamese adults. Prevention and treatment of mood disorders may also benefit from assessment of exposure to non-interpersonal trauma. given the increased risk of depressive symptoms found in the present study.

Positive Beliefs and Symptoms of Depression, Anxiety, and PTSD

This study also provides insight into the association between mental health symptoms and positive beliefs including self-esteem, mastery, and optimism. These three coping resources may enhance the ability to manage stressful events, promote resilience to adversity and lead to better health outcomes (77). Among these coping resources, low mastery and low optimism were found to be significantly associated with symptoms of mental disorder. An increase in one score of the mastery scale was associated with a 30% decrease in the odds of having depressive symptoms, and a 20% decrease in the odds of having anxiety symptoms. An increase in one score of the optimism scale was associated with a 20% decrease in the odds of having PTSD symptoms.

Mastery or sense of control reflects the extent to which an individual feels able to control or influence his or her life events. It also refers to the inner feelings of strength and the ability to overcome difficulties with one's own effort (35, 78, 79). Research into the influence of coping resources has consistently indicated that mastery is strongly linked with better psychological wellbeing (77, 78, 80–85). Optimism facilitates sustained efforts to cope with problems instead of ignoring them or giving up

(78). Many studies have found a positive link between optimism and coping with stressful life events and better mental health (78). For example, Applebaum et al. (86) found that there was a negative relationship between the level of optimism and the number of anxiety and depression symptoms and quality of life among patients with advanced cancer.

The findings from this sample of Vietnamese adults support prior studies in confirming that mastery and optimism may predict mental wellbeing and highlight the importance of fostering these positive states of mind in intervention programs that aim to improve mental health.

LIMITATIONS

There were several limitations to this study. First, as the measures of trauma exposure and symptoms of depression, anxiety, and PTSD relied on self-reports, data might have been affected by recall bias. Misclassification might have occurred due to underreporting of traumatic events, mental distress, or both. Past traumas have been found to be minimized in interviews in some previous studies (87). This happens partly because of factors such as embarrassment, shame and social stigma. This key limitation of measurement is shared by most research into trauma that relies on retrospective self-reports that have uncertain validity (88). To reduce the risk to some extent, a standard anonymous questionnaire was used to collect information from all participants and interviews were conducted in private room at commune health centers by research staff who had not had any prior relationship with the participants.

A second limitation is that, due to the small number of people who experienced trauma in some of the 17 specific traumatic event categories, we decided not to examine the independent effect of each event on psychiatric symptoms. Instead, trauma was grouped into two larger groups, namely interpersonal and non-interpersonal trauma. Future studies with larger samples are recommended to examine the effect of cumulative traumas after controlling for the effect of specific trauma types, as well as the independent effect of each trauma type. Third, this is a cross-sectional study therefore, causality inferences could not be established. Finally, as our study was conducted in central Vietnam, a region very prone to natural disasters, annually subjected to heavy loss of human life and property due to floods and typhoons (15), the survey results might not be generalized to other parts of Vietnam. However, the study contributes to current knowledge on trauma exposure and its association with mental disorders in Vietnam, and may be of relevance to other developing countries.

CONCLUSIONS

This is the first study to estimate exposure to multiple traumas in a random community-based sample of adults in Vietnam. Although limited to one province, the findings indicate the strong impact that traumatic events can have on psychological well-being, and suggest the need for more extensive national research. The evidence at hand supports calls for integration of traumatology into mental health care, to thereby broaden the focus of current services that primarily are concerned with diagnosis and management of endogenous mental illnesses.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

AUTHOR CONTRIBUTIONS

TD, MD, and IC-V developed the study concept. TD collected and analyzed data. All authors were involved in manuscript preparation and approved the final version of this manuscript.

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An Integrative Program to Reduce Stigma in Primary Healthcare Workers Toward People With Diagnosis of Severe Mental Disorders: A Protocol for a Randomized Controlled Trial

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Background: People with severe mental disorders (SMDs) have higher disease and death rates than the general population. Stigma (negative attitudes and perceptions) contributes to limited access to health services and a lower quality of medical assistance in this population, and it is manifested as negative attitudes, social distance, and discrimination toward this social group. For these reasons, healthcare workers are a priority group for anti-stigma interventions. This study aims to assess the effectiveness of a program specifically designed to decrease negative attitudes and social distance and increase inclusive behaviors in healthcare workers toward people with SMD.

Methods: The study will be a randomized clinical trial. A minimum of 210 healthcare workers from 11 primary care centers in the province of Concepción, Chile, will be randomly chosen to receive the program or be part of the control group. There will be a pre-, post-, and 4-months evaluation of social distance, attitudes, and behaviors of participants toward people with SMD using standardized scales such as the social distance scale, which is a scale of clinician attitude toward mental illness adapted from attitudes of clinicians toward mental illness, and self-reports. The intervention program will consist of education strategies, direct, and indirect contact with people diagnosed with SMD, and skill development. There will be six face-to-face sessions directly with the participants and two additional sessions with the directors of each healthcare center. The program will involve a facilitator who will be a healthcare professional and a co-facilitator who will be a person diagnosed with SMD.

Discussion: This study will evaluate an intervention program especially designed to reduce stigma in healthcare workers toward people with SMD, a topic on which there is little background information, particularly in low- and middle-income countries. It is important to have interventions with proven effectiveness for this purpose to ensure equity in healthcare services.

Trial Registration: This study was registered under ISRCTN.com (ISRCTN46464036).

Keywords: stigma, severe mental disorders, clinical trial, primary care, healthcare workers

INTRODUCTION

Several studies have shown that people with severe mental disorder (SMD) have higher morbidity, lower life expectancy, and higher mortality rates than the general population (1, 2). There is no consensus on the definition for SMD and on the specific disorders it comprises. However, in general, the criteria proposed by the National Institute of Mental Health (NIMH) in 1987, which continue to be used, are as follows: diagnosis of psychosis, duration of more than 2 years, and marked interference in daily functioning (3–5). Schizophrenia is often considered the prototype of SMD (6).

Studies have shown that people with SMD have a higher prevalence of hepatitis, osteoporosis, obstetric complications, cardiovascular diseases, obesity, diabetes, dental problems, and other chronic diseases compared to the rest of the population (7, 8). Furthermore, these results have been found in countries with different cultural backgrounds, including those in Latin America, such as Brazil (9–11). It has also been shown that people with SMD are less likely to receive adequate health care (12). Indeed, there exists an inequality in health care for this population compared to the general public, both in hospital care and primary healthcare service (PHS) (13). Hence, there is an interest in developing strategies to ensure equity in health care for people with SMD (14–16). Inequity in health care is a result of multiple factors, but the more unresolved one is stigma toward people with a diagnosis of SMD (17, 18). Stigma is currently understood as a relational process that includes cognitive, affective, and behavioral components. It refers to a social process of labeling, loss of status, and discrimination toward a person who has an attribute that is considered negative by their community (19). Self-stigma is one of the main consequences of stigma and is characterized by the loss of self-esteem and self-efficacy due to the internalization of public stigma. Living in a society that ascribes negative characteristics to people with SMD can lead them to internalize these ideas and think that they are less valuable because they have a psychiatric disorder (20). Moreover, self-stigma has other harmful effects because some people will not seek professional help or follow treatment for fear of being identified as "mentally ill" (21). Furthermore, self-stigma produces feelings of shame and anxiety in people with SMD that can increase their stress and affect their risk of relapse (22).

In health care, several studies indicated that healthcare personnel have prejudices, negative attitudes, and discriminatory behavior toward people with SMD (16, 23–25). For instance, a recent study comparing professionals at both PHS and secondary healthcare centers found that physicians and nurses at PHS had more negative attitudes toward people with SMD than their colleagues at secondary healthcare centers (26). Although stigma is similar in different professional groups such as nurses (27, 28), physicians (29), pharmacists (30), and psychologists (31), there seems to be some differences between them. For example, professionals closest to the area of social sciences, such as psychologists, would have less stigma than professionals in the area of healthcare, such as physicians and nurses (32). Despite the few studies on this topic in Chile, the results are in agreement with other published studies demonstrating that there are prejudices and negative attitudes toward people who have SMD (33, 34). It has been shown that stigma affects the inequity of health care in several ways. For instance, there is abundant evidence describing the effect of barriers to access healthcare services that makes it difficult for the affected people to request help (35, 36). In Chile, the lack of knowledge about mental disorders and stigma are the main reasons Chileans do not seek treatment (37). On the other hand, healthcare personnel mistakenly attribute physical signs and symptoms to a mental disorder, which leads to sub-diagnosis and inadequate treatment of physical health problems (16). Finally, a negative attitude toward the patient is associated with a lower adherence to treatment. Therefore, healthcare personnel should be considered a priority group for anti-stigma interventions, especially those working in PHS (38).

The area of anti-stigma interventions is a relatively new field. One of the models used to reduce stigma is the social-cognitive model (39). In this model, erroneous social beliefs (i.e., stereotypes) produce a negative attitude (i.e., prejudice) that leads to discrimination. The prejudice is based on various settings and previous biases that tend to favor the perception of the ingroup over that of the outgroup. In other words, everything that seems strange or alien to one's own perception tends to be categorized in a negative way. Thus, the intervention is focused on modifying stereotypes and attitudes to influence discriminatory behavior (40). For example, stereotype perception is modified by providing information that disproves previous concepts, and prejudices are reshaped by favoring processes of re-categorization to develop new ideas and attitudes. These processes are carried out through social interaction with the affected outgroup (41, 42). However, studies in this area show that giving information by itself does not assure a behavioral change, but that modification of the emotional response (prejudice) is more effective at getting people to act differently (43). The emotional change is easier to achieve through direct interaction with stigmatized people, thus the subject or situation that is alien or foreign becomes familiar and close.

Two major types of anti-stigma campaigns have been developed: generalized and localized. The first corresponds to mass campaigns developed from different strategies aimed at the general public (44). Among the most outstanding initiative in this area is the program "Open the Doors" (World Psychiatric Association) (42). Despite the benefits of this type of campaign, several researchers maintain that it has important limitations, such as: (i) little knowledge of the population, (ii) biases in the evaluation, and (iii) low efficiency to internalize what has been learned. Hence, other types of more localized or workplace interventions have been proposed as preferable alternatives. These initiatives are aimed at selected groups such as employers, schoolchildren, and healthcare personnel, among others; they have the advantage of being more intensive, so that although they reach fewer people, more work is done with the participants. On the other hand, it has been demonstrated that information against attitudinal learning is only assimilated in the context of where it is taught; thus, it is better to acquire it in places where it will later be used (45). For example, a recent review by Hanisch et al. (46) indicated that anti-stigma interventions in the workplace are the most effective at reducing stigma in the work environment. Programs in the workplace have been fundamentally based on two major strategies or components: education and contact. Education provides information about mental disorders to modify social stereotypes. For instance, specific aspects of SMD are discussed such as causes, risk factors, symptoms, and treatments (47). This education is useful if the transmitted information is discussed and real cases are presented. It is also necessary to establish the types of beliefs to be modified according to the particular diagnosis and the characteristics of the intervention group. This type of intervention is mainly done through conferences and debates (48). Furthermore, several studies have shown that knowledge about the subject makes people less likely to stigmatize and discriminate against this population (43, 49). This strategy has been one of the most utilized with healthcare personnel, and similar to what happens in the general population, the results indicate that imparting information decreases negative attitudes toward people with SMD; however, the duration of the changes is limited (50).

The other major strategy, contact with affected people, is limited to interventions in which a person with a mental disorder tells their experience to a specific group, either directly or indirectly through audiovisual media (48, 51). The conditions under which contact occurs are important for success. For example, the interaction should be cooperative, perceiving similar status, and not competitive. Indeed, the largest meta-analysis performed on the subject, which included 515 studies, determined that the conditions of contact raised by Allport contributed to diminishing prejudice; however, even if all conditions are not met, contact has a positive effect on decreasing stigma (52). For contact to be effective, it is important that people do not have behaviors and attitudes that are stereotypical of the SMD, and that they have the support of the directors of the Center where the intervention is carried out. Contact seems to be the best strategy to reduce stigma against people with SMD. In fact, several studies indicate that subjects who interact with people who have SMD are less likely to have negative attitudes toward them (53, 54). In a study performed in Chile on the perception that the general public and healthcare workers have toward people with SMD, it was found that those who had greater contact with people with SMD had less authoritarian and restrictive attitudes (55). Indeed, studies performed with healthcare personnel demonstrate that using direct contact with people with SMD is a strategy that decreases negative attitudes and social distance and increases acceptance toward this social group (23, 56, 57). However, the main limitation to developing this strategy is that it requires that people affected by a mental disorder be willing to publicly disclose their condition and talk about it. Despite this difficulty, studies suggest that the active involvement of those affected in these interventions increases their self-esteem and empowerment, which are fundamental for their recovery (54).

Intervention programs tend to use both strategies in different formats. Although there is evidence that education and social contact reduce prejudice toward people with SMD, it is unclear under what conditions each strategy would be more effective (44). In recent years, some research has shown that healthcare personnel have more negative attitudes toward people with SMD when they feel that it is difficult to interact with them and they are unable to contribute to their treatment (58, 59), which leads to frustration and rejection. Thus, assessments of anti-stigma programs recommend including skills training (60–62). For example, teaching healthcare personnel how to welcome and resolve difficult situations with those who have SMD and their families is a central factor in reducing stigma.

Intervention programs have been evaluated mainly through tests that measure people's knowledge and attitudes toward SMD, where knowledge tests indicate the level of information acquired by people post-intervention (63). With regards to attitudes, multiple scales have been used, the most common one being the Community Attitudes to Mental Illness (CAMI) scale (63). Social distance measures are also used to assess the willingness of someone to interact with a specific person in a specific type of relationship (64). These scales evaluate behavioral intention, so they are in some way between the evaluation of attitudes and behaviors. Therefore, these are used as a proxy measure for behavioral change. This is important since studies have pointed out that in addition to considering attitudes, one must also evaluate the behavior modification of participants in an intervention. Indeed, a behavioral change toward people with SMD would ultimately improve their quality of life (47). However, the main limitation of studies on anti-stigma interventions is that they used a pre- and post-test design without a control group. It was estimated that $<30\%$ of studies used a control group, so the interpretation of their results for the intervention cannot be considered statistically valid (41, 44). In the last decade, some researchers have suggested that for an intervention to be successful, it is necessary to perform a qualitative evaluation before and after the intervention and to actively involve people diagnosed with SMD (47). This type of evaluation makes it possible to understand the nature of the stereotypes and prejudices of the group that one is going to work with. This would allow the implementation of an intervention relevant to the beliefs of the target group (40).

Regarding the participation of service users, an approach called "Research based on community participation" has been promoted for several years (65). This encourages the participation of affected people in their health care throughout the research process, both in the design of the interventions as well as in the execution and evaluation. Several studies point out that anti-stigma interventions should be performed from this perspective so that the programs respond to the needs of those affected while at the same time favor their recovery and empowerment (50, 63). Therefore, it is fundamental to reduce negative attitudes and discrimination in PHS personnel toward this social group. However, there is little international research on anti-stigma interventions with healthcare personnel, especially in developing countries (66). This is a relevant fact because context has an important role in the effectiveness of an intervention; in other words, cultural differences in attitudes toward people with SMD are crucial for the design of the intervention (47).

The present study trial seeks to evaluate a mixed intervention strategy for the reduction in stigmatization associated with SMD, particularly in people diagnosed with schizophrenia. To accomplish this, an intervention program will be designed, implemented, and evaluated. This program combines methods/techniques that have been shown to provide the best results in reducing stigmatization. The program will implement education, contact, and skills development as core strategies. We will actively work with people who have received a diagnosis of SMD. The objective is to design, implement, and evaluate an intervention program to reduce negative attitudes and social distance, and increase inclusive behaviors of healthcare workers toward people with SMD. The program will be implemented with healthcare workers from primary care centers. In Chile, the majority of the population use primary healthcare centers for medical attention in the public health system. Each center provides service to a specific number of inhabitants located in the population sector, and is equipped with a multi-professional health team, technicians, and an administrative support staff. The intervention program will be developed for all healthcare workers except the administrativ staff.

The hypotheses for this study are as follows:

> Compared to the control group, healthcare workers in the intervention group will have less negative attitudes and social distance toward people with SMD (schizophrenia) in the post-test evaluation and follow-up.
>
> Healthcare workers in the intervention group will exhibit more inclusive behaviors toward people with SMD (schizophrenia) in the post-test evaluation and follow-up compared to the control group.

METHODS

Design

The study design is a multicenter randomized clinical trial in which several primary healthcare centers in the province of Concepcion, Chile will participate. Randomization will be at the individual level (**Figure 1**). The randomization will be performed by blocks (each healthcare center will be a block) and will be performed after identification of all the people who have agreed to participate in the study. Two stratifications will be made for each block. The first stratification will be by the type of professional involved and divided into three categories: physicians, health professionals (nurse, midwife, nutritionist, physical therapist, dentist, paramedic, pharmacist, podiatrist), and psychosocial professionals (psychologists and social workers). The second stratification will be by the work sector of each healthcare center. In each stratum, a similar number of people will be randomized for the experimental and control group using the software package "blockrand," which creates randomizations for block random clinical trials.

Intervention Program

The objective of the program is to reduce negative attitudes and social distance, and increase the inclusive behavior of healthcare workers toward people with SMD.

Program Development

Focus groups were conducted with people diagnosed with SMD and primary healthcare workers to identify the views that both groups have about how stigma may be expressed in healthcare. This information was used to design the program. Once designed, a panel of experts composed of an academic specialist on the subject, a health professional from PHS, a patient from a PHS with a diagnosis of SMD, a person with SMD who participates in social organizations, an organizational psychologist who specializes in training programs, and a health professional from the secondary level were asked to review it and make suggestions. The program was subsequently implemented as a pilot trial at a healthcare center to refine it and make it more relevant. A manual was developed detailing the protocol for the intervention and explaining the specifics of each activity per session.

The intervention program was designed considering a research approach based on community participation and available background information on strategies that would be most effective. A unique aspect of this intervention is its "ecological" perspective that takes into consideration various structural levels and processes of the social environment and their effect on individual behaviors, thoughts, and emotions both during the formation and subsequent modification of the stigmatization process (67).

Characteristics and Methods of the Program

The program considers the following levels of intervention:

Organizational/structural

The intervention involves aspects of the organizational culture and the structure of the healthcare system that contributes to and influence stigmatization processes (68), such as norms, values, and attitudes (47).

Intergroup

Here, the intervention evaluates two central processes: biases derived from group identities (69), and the increase in prejudice

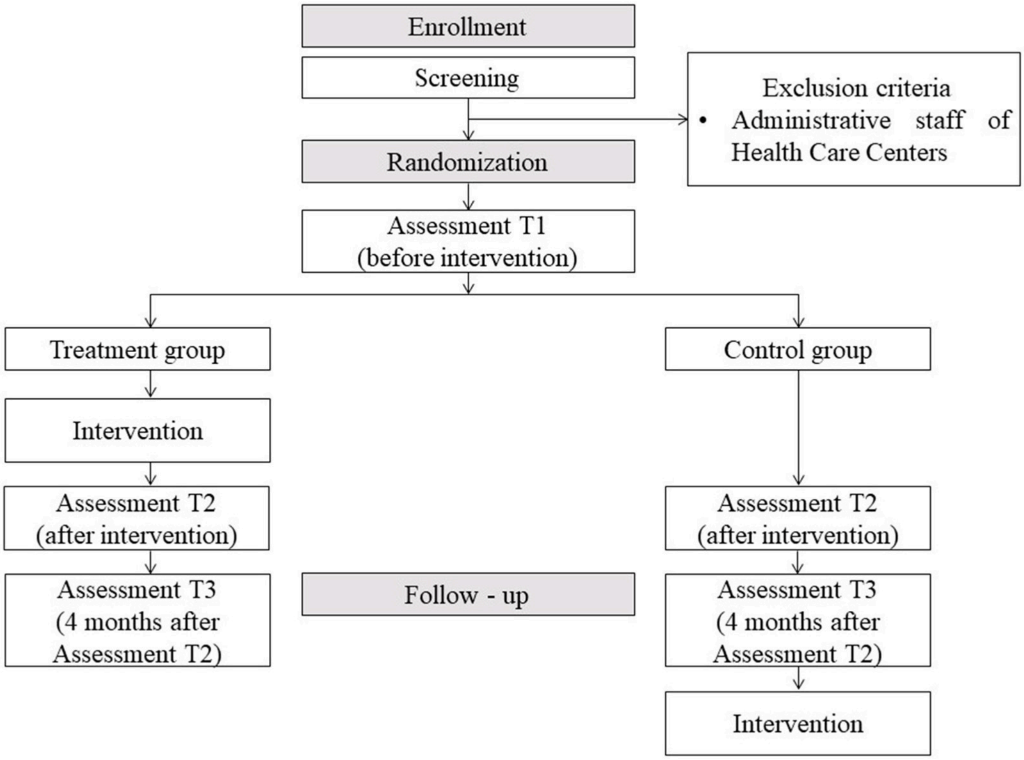

FIGURE 1 | Study flowchart.

associated with contact between social groups having conditions of inequality (70).

Individual

At this level, the intervention intends to modify beliefs and attitudes using the social cognitive theory, which is a model based on associative-propositional assessment of attitudes, and the theory of cognitive dissonance (71, 72). In an implementation of the program, a group of participants were people who were diagnosed with a SMD but who had been discharged after their rehabilitation was finished. This organization of people is involved with groups and communities with the objective to reduce stigma.

The program combines strategies for education, contact, and skills development. There will be two meetings with the directors of the healthcare centers, and there will be six sessions with health personnel done on a weekly basis for 2 h per session. The program is run by a healthcare professional and a person who has been diagnosed with SMD.

Education strategy

Information is presented about stigma and the consequences it has in several areas, especially in health care. The mistaken beliefs about SMD are disproved, specifically topics dealing with danger and violence, and the irreversibility of the disorder. The information is presented by different sources (people with and without a diagnosis of SMD) and through diverse means (orally, audiovisual, and written).

Contact strategy

Direct contact: There is direct contact throughout the program because the co-facilitator is someone who has a diagnosis of SMD. In one of the sessions, another person with a diagnosis of SMD shares their life testimony.*Indirect contact*: This is initiated through (i) *videos* in which the participants watch and analyze short videos that show different experiences of people with SMD. The videos show situations of stigma and discrimination that those affected have experienced (with health personnel present), as well as good experiences that have happened to them in the context of their health care; (ii) *written cases* that provide information about a person who has received a diagnosis of SMD for the group to discuss; and (iii) *skills strategy* that teaches skills in a practical and contextualized way on how to accept and resolve difficult situations when dealing with people with SMD. This is performed through role play with real cases that have occurred in the healthcare center. Additionally, verbal and non-verbal communication is addressed.

The sessions are designed to encourage group reflection. The information presented will be discussed and analyzed in groups in a way that favors dissonance and cognitive categorization. Furthermore, the program incorporates effective implementation of non-stigmatizing practices through the planning and execution of behaviors that increase positive attitudes and respectful and inclusive treatment toward people who have SMD (47). The program format emphasizes contact conditions that favor its effectiveness, i.e., status equality between the participants, achievement of common goals, and establishment of a cooperative relationship (52). Furthermore, the contact strategies focus on favoring empathy, which is inversely related to prejudice.

Program Implementation

Meetings will be scheduled with the directors of the healthcare centers as an encouragement to value the intervention and to facilitate and motivate workers to participate. Thus, it is mandatory that at least one of the meetings be prior to the sessions with healthcare workers. The meetings with the directors are conducted with a methodology similar to that used with the workers. Additionally, there will be a facilitator who is a health professional that has undergone a 20 h contact training process, plus several hours of study of written material regarding SMD and the characteristics and effects of stigma. In addition, all the facilitators for the intervention will be empirically trained. Co-facilitators will be people who have been diagnosed with SMD and they will receive 28 direct hours of training. Training times will be different for the facilitators who are health professionals and those who are diagnosed with SMD; however, there are training times that will be shared between the two groups. During the implementation, the facilitators, and co-facilitators will receive weekly supervision, either online or in person, to evaluate the process and correct any difficulties. The facilitators must complete a weekly checklist of activities to ensure that the program is following the established protocol. Additionally, there will be live supervision in which a member of the research team attends the session but does not participate, and then completes a standardized evaluation form on the session. Afterwards, feedback will be given to the facilitator and co-facilitator about their performance.

Measurements

Social Distance Scale (SD)

Social distance scale (SD) Link et al. (73). This scale evaluates the social distance that people have toward people with SMD. It is composed of a brief vignette where the case of a person with SMD is revealed followed by seven items in a Likert-type response with five alternative answers ranging from disagree to completely agree. The questions are related to different situations that vary in the degree of closeness to the affected person who could be a neighbor, friend, employee, or partner. This scale was adapted and validated for use in the Chilean population (74). The final questionnaire is composed of two factors: "closeness and social interaction" (three items) and "intimacy and trust" (two items). The internal consistency of each of the factors reached Cronbach's alpha values of 0.82 for factor 1, 0.75 for factor 2, and 0.78 for the total scale.

CAMI scale (75). This scale evaluates the attitudes of the general public toward people with SMD. The response is a Likert-type format that is based on five alternatives that range from totally agree to totally disagree. The original scale was adapted and validated for use in the Chilean population (76). The scale is made up of two factors, "acceptance" and "rejection of the installation of mental healthcare centers in the community," each composed of five items. The internal consistency for each of the factors reached Cronbach's alpha values of 0.61 for the first factor, 0.66 for the second factor, and 0.69 for the total scale.

"Mental Illness: Clinicians' Attitudes" (MICA) scale (77). MICA is a 16-item scale that evaluates the attitudes of professionals and students working in health toward people with SMD. The questionnaire consists of six answer options in a Likert format that ranges from strongly agree to strongly disagree. The internal consistency of the original scale was good ($\alpha = 0.72$). An adaptation of this scale is being made for validation in the Chilean population.

Self-registration of inclusive behaviors: This is an *ad hoc* scale created to assess self-perception of behaviors that one had toward the last person diagnosed with SMD with whom they had contact. There are 18 items with four response options in a Likert format.

Procedure

Primary healthcare centers from the province of Concepcion, Chile will be invited to participate. The participation of each center is approved by the Ethical-Scientific Committee of each health service and authorized by their directors. A requirement for the inclusion of a center in the study is the authorization for the participation of health workers in the program sessions during work hours. Various activities will be performed to promote the program in each selected health center and to encourage participation. The program will be implemented in health centers where there are at least 18 people enrolled to permit the randomization of control and experimental groups with at least nine people per group. Given the sizes of the centers, a maximum number of 40 participants will be considered per health center since it is unlikely that there will be more than that number of people enrolled. The randomization process will form groups with 9 to 20 people. All healthcare workers will be invited to participate through informative meetings and flyers distributed in each health center. Once the participants have agreed to take part in the program and have been evaluated, they will be randomized. The initial evaluation (T1) will take 3 weeks, and the implementation of the program will last a total of 8 weeks. The post-test evaluation (T2) will be done during the 3 weeks following the end of the program. Four months after the end of the program, the follow-up evaluation will be performed (T3) (**Table 1**).

Workers assigned to the control group will receive the program once the implementation is completed and the post and follow-up evaluations are finished. A minimum of 11 centers are needed to obtain the required sample size (**Table 1**).

Power and Data Analyses

An experimental multilevel mixed effects design with effects between groups (treatment vs. control) and within groups (time), with pre- and post-test measurements and with a

TABLE 1 | Study assessment points.

Measurement	Scale	T1	T2	T3
SOCIODEMOGRAPHIC DATA				
Sociodemographic data	Sociodemographic characterization file	✓	–	–
STIGMA IN PRIMARY HEALTHCARE WORKERS TOWARD PEOPLE WITH DIAGNOSIS OF SEVERE MENTAL DISORDERS (SMD)				
Attitudes of the general public toward people with SMD	Community Attitudes to Mental Illness (CAMI) scale	✓	✓	✓
Attitudes of professionals and students working in health toward people with SMD	Mental Illness: Clinicians' Attitudes (MICA) scale	✓	✓	✓
Social distance that people have toward people with SMD	Social distance scale (SD)	✓	✓	✓
Self-perception of behaviors that one had toward the last person diagnosed with SMD with whom they had contact	Self-registration of inclusive behaviors	✓	✓	✓

T1, assessment before intervention; T2, assessment after intervention; T3, follow-up 4 months after assessment T2.

four-month follow-up, will be used. Estimation of the effect will be by intention-to-treat. To estimate the effect of the intervention on post-test measurements, it should be taken into account that there are multiple outcomes and the results per person are not independent of each other but can have distinct distributions. Therefore, a multivariate analysis of covariance (MANCOVA) will be used where the presence of clustering per healthcare center is considered as a factor, while the pre-test measurement and previous contact with someone with SMD are considered as co-variables. Previous verification of the assumptions that the model provides, i.e., presence of normal multivariate distribution of the transformation of the measurements, as well as homogeneity of the variance/covariance matrix between the groups under study, is necessary.

Once it has been determined that the intervention is successful in general terms, specific analyses of each result will be performed using mixed ANCOVA that considers participation in the control group or experimental group as a fixed factor of interest, pre-measurement as a co-variable, and enrollment in the primary healthcare center as a random factor. To detect a moderate effect for the intervention ($d = 0.5$) with a power of 95% and a level of significance of 5%, a minimum sample of 105 participants per group is estimated (210 participants in total). This number was obtained by performing a simulation procedure using a mixed ANOVA considering the existence of a significant interaction effect between moment X group experimental/control. Considering a 10% loss in percentage, 231 is the minimum estimated number of participants.

DISCUSSION

It is expected that an intervention program that recognizes the aforementioned aspects will reduce the stigmatization that healthcare workers have toward people with SMD. Reducing stigma toward people with SMD should be one of the priorities of a policy aimed at ensuring the rights of people with psychiatric diagnoses and guaranteeing equity in health care. The results of this study could help future research to evaluate the potential of the program to be part of a global strategy geared toward improving equity in health care and the quality of life of people with SMD and their families.

One limitation of this study is the risk of contamination between the control and experimental groups within each healthcare center. However, it was estimated that this risk was lower given the characteristics of the centers and the program, which assumes that attitudinal change is not easily achieved and that direct contact with people having SMD is decisive. This experience cannot be transmitted to other people without a substantial effort. Therefore, considering the working conditions of the healthcare personnel (high demand and overload), group crosstalk is not expected to frequently occur, thereby decreasing the possibility of contamination. Furthermore, the study design of this intervention program avoids the methodological difficulties of clustered designs, which are the preferred choice to have less risk of contamination. The results of this study will be published in scientific journals and scientific meetings, and it will also be presented to the general public, especially to those involved in protecting the rights of people with SMD, and to health authorities. The data of this study will be available to those who request it.

ETHICS STATEMENT

This study was approved by the Scientific Ethics Committee of the corresponding Health Services and was designed taking into consideration the rights of the participants included in the Declaration of Helsinki and the principles of respect, autonomy, and beneficence. All participants (professionals and technicians) were invited to participate, and if they accepted, they were asked to express their agreement by signing an informed consent form. In the case of the members of the organization of people diagnosed with SMD, they are accustomed to participate in anti-stigma activities since it is one of the objectives of the organization. It is well documented that this type of activity improves the esteem and confidence of people with SMD and does not violate their integrity or rights; on the contrary, it favors the process of their recovery (50).

AUTHOR CONTRIBUTIONS

PG primary investigator. SS and FC were involved in study design. FC and PV were involved in the selection of measurements. RR-V, VV, CZ, and CO was involved in the design of the intervention.

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Depression and Anxiety as Key Factors Associated With Quality of Life Among Lung Cancer Patients in Hai Phong, Vietnam

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Background: Cancer is a leading cause of death. People living with cancer experience a variety of symptoms that might profoundly affect their quality of life (QoL).

Objective: The study aims to identify factors associated with the QoL of patients with lung cancer at the oncology department of Viet Tiep Hospital, Hai Phong city, Vietnam in 2018.

Methods: A cross-sectional study was conducted to collect data from lung cancer inpatients in Hai Phong city, Vietnam. The EQ-5D-5L and the EuroQol (EQ)-visual analogue scale (EQ VAS) were used to assess health-related quality of life (QoL). A multivariable regression analysis was performed on the EQ-5D utility score and the EQ VAS score as dependent variables, and socioeconomic, social support, and psychological factors as potential predictors.

Results: A total of 125 lung cancer patients were enrolled in this study. The highest proportion of respondents reporting any problems was in anxiety/depression (92.8%), pain/discomfort (81.2%), usual activities (75.2%), and mobility (60%) dimensions, while the lowest percentage was in self-care dimension (40.8%). The multivariate analyses showed that a low QoL score was significantly associated with depression, incapacity to pay, low response to treatment, and presence of side effects.

Conclusion: QoL of lung cancer patients is associated with anxiety/depression and other factors that can be modified by specific interventions. It is therefore possible to take care of psychological aspects to improve the QoL of Vietnamese people suffering from this condition.

Keywords: depression, anxiety, quality of life, lung cancer, social support, Hai Phong, Vietnam

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INTRODUCTION

Lung cancer is the leading cause of cancer death in men and the second leading death cause in women, with an estimated 1.6 million deaths in 2012 (1.1 million in men and 491,200 deaths in women) (1). In Vietnam, 21,667 deaths due to lung cancers representing 4.29% of total deaths were reported in 2017. The age adjusted death rate was estimated at 24.73 per 100,000 of the population, which placed Vietnam at the 37th position for lung cancer in the world (2). The survival rate of lung cancer patients remains poor with 1-year survival rate of 42% and 5-year survival rate of 16% (3). Lung cancer not only has a high mortality. It also has a high morbidity with a significant proportion of patients severely incapacitated by symptoms such as chest pain, cough, hemoptysis, and dyspnea (4). The assessment of patients with lung cancer ideally would therefore include two aspects: cancer outcomes and quality of life (QoL) outcomes. Cancer outcomes refer to the response to treatment, the duration of response and of symptom-free period, and the occurrence of relapse. QoL refers to the well-being of the patient once his or her diagnosis has been done (5–7).

Many factors might affect the QoL in cancer patients, including demographic factors (e.g., age, education, and household income) (8–10), social factors (e.g., support from family, friends, and others) (8, 10, 11), and psychological factors (such as depression and anxiety) (12–14). Specifically, based on a systematic review from 14 original studies of relationships between social support and QoL of lung cancer patients, it has been shown that social support received from family and friends affects positively the QoL particularly on its emotional and physical dimensions (11). Social support affects the QoL through two psychosocial mediating mechanisms: behavioral processes (e.g., fostering health-promoting behaviors, adherence) and psychological processes (e.g., stress appraisal) (15). Different components of the clinical process are also determinants of QoL, notably the time of cancer diagnosis, comorbidities, and the presence of side effects. Some studies have shown that the number of years since the cancer diagnosis was done is positively associated with the general QoL (16), and its role function (17) and social function dimensions (18). Poor QoL has been found to be associated with different conditions, particularly cardiovascular diseases and diabetes (19).

Among most relevant factors that affect patient's QoL, psychological factors especially depression/anxiety have been shown to be constantly associated with the QoL. Cancer patients with depression have a poorer QoL (12–14, 20, 21). Anxiety has also been shown to be negatively associated with the different QoL dimensions (22). However, in Vietnam, QoL of patients with lung cancer has been poorly studied. Little is known about this outcome and its determinants. During the daily care of lung cancer patients, we found that patients usually suffer from depression and anxiety. In order to improve care to our patients, it is important to assess the association between these psychological factors and the patients' QoL. From this perspective, we carried out this study among patients with lung cancer at the Department of Oncology of Viet Tiep Hospital, Hai Phong, Vietnam to identify factors associated with the QoL of patients.

METHODOLOGY

Study Design

A cross-sectional study was conducted to assess the QoL of lung cancer inpatients at the oncology department of Viet Tiep Hospital, Hai Phong city, Vietnam.

Study Location

The study was conducted at Viet Tiep Hospital, one of the biggest hospitals in the northeast region of Vietnam. The Oncology Center of Viet Tiep Hospital is the only cancer treatment place in Hai Phong. Thus, almost all cancer patients have received treatment in there. According to the cancer registry, the annual cancer incidence is about 4,500–5,000 new patients since 2014 (23).

Data Collection Period

Data collection was carried out between March and June 2018.

Sample Size

We interviewed all patients diagnosed with lung cancer and being under treatment at the hospital during the data collection period.

Eligibility Criteria

Inpatients were included in our study if they fulfilled the following inclusion criteria: being 18 years old or above, having a diagnosed lung cancer by biopsy and currently receiving cancer treatment in the hospital, being able to communicate, and willing to sign a written informed consent. Patients were excluded if they were unable to be interviewed, or if they refused to participate in the study.

Data Collection Process

The researcher met with the inpatients diagnosed with lung cancer by biopsy and currently receiving treatment at the hospital. All participants were informed about the purpose of the research and the data collection process. The project was clearly explained. Patients could ask any questions regarding the project before signing the written informed consent form. Data were collected by face-to-face interview. Interviews took approximately 30 min.

Instruments

Four questionnaires were used:

The EQ-5D-5L questionnaire was used to measure the QoL. The questionnaire consists of two parts: the EQ-5D-5L descriptive system and the EQ Visual Analogue scale (EQ VAS). The descriptive system contains five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression). In the current study, due to the unavailability of validated Vietnamese scores, we used the Thailand scores to calculate the utility score of the study participants (24). The EQ VAS records the respondent's self-rated health on a visual analogue scale with endpoints labeled "the best health you can imagine" and "the worst health you can imagine." The Vietnamese version of EQ-5D-5L was validated in Vietnam (25, 26).

Social support status was measured with the Perceived Social Support Scale (PSSS). The scale consists of 12 items to measure the perception of support by the family, friends, and others. The rating ranges from 1 (totally disagree) to 7 (totally agree). The mean of scales is then calculated. A mean score <2.9 was considered as low support; a score of 3 to 5 was considered as moderate support; a score from 5.1 to 7 was considered as high support (27). The questionnaire was validated in Vietnamese. Cronbach's alpha was found to be between 0.95 and 0.97 for the four subscales and 0.97 for the overall scale (28).

The Hospital Anxiety and Depression Scale (29) contains 14 items. It provides a brief measure of both anxiety (seven items) and depression (seven items) as two distinct subscales. Questions refer to the patient's feelings during the past week. The seven items in each of the anxiety and depression subscales are scored from 0 to 3, resulting in subscale scores that range from 0 to 21. Two cut-off points were suggested by the original authors: 8 is the threshold of a possible case, and 10 is the threshold of a significant distress related to anxiety or depression (29). The questionnaire has been validated in Vietnam. It showed a Cronbach's alpha of 0.79 for Hospital Anxiety and Depression Scale-Anxiety subscale (HADS-A) and 0.7 for Hospital Anxiety and Depression Scale-Depression subscale (HADS-D) (30).

A last questionnaire was used to collect basic sociodemographic information including gender, age, living milieu, capacity to pay treatments, etc.

Statistical Analyses

Data were entered in Epidata version 1, and analyses were done with STATA version 12. Descriptive statistics were used to summarize the distribution of demographic, clinical data, social support, psychological factors related to depression/anxiety, EQ-5D-5L profiles, utility score, and visual analogue scale (VAS) scores. These included frequencies, mean, median, range, and standard deviations (SDs). Total scale score and subscale scores on measures were summed. The EQ-5D utility score was calculated using the EQ-5D-5L Crosswalk Index Value Calculator.

Utility and VAS scores had a normal distribution. The comparison between independent groups was therefore assessed with a *t*-test (for gender, economic, health insurance, placement, chronic disease situation, life threatening, effectiveness of treatment, and side effect) and ANOVA tests (for age groups, marital status, education level, social support, and psychological factors).

Bivariate analyses were performed between potential independent variables and the dependent variables. Variables whose association were significant at a value of $p < 0.2$ were retained for the multivariate analyses. Multivariate linear regression analyses were performed to quantify the unique contribution of each potential predictor on utility. The considered level of statistical significance was a p-value of 0.05 or less. Data used to support the findings of this study are available from the **Supplementary Material**.

RESULTS

A total of 125 participants with lung cancer were enrolled in the study. Most of the participants were male (72.0%) and 55 years old or above (82.40%). Half of the respondents (52.80%) had achieved a secondary education level. Half (57.60%) were unemployed. More than half of the participants said they did not have enough money for their needs in life (60.80%). Approximately 50% of the respondents thought that their disease had improved since the beginning of the treatment. More than half of the participants consider having a high social support (62.40%; **Table 1**).

Table 2 illustrates that although 26.40% of participants are likely to have a depression, more than half of the participants should be evaluated for this mental disease. Two-thirds of the participants should be evaluated for an anxiety disorder.

TABLE 1 | Demographic and clinical characteristics of participants (n = 125).

Variables	*n* (%)
Age in years	
Mean (SD)	61.07 (9.09)
35–44	7 (5.60)
45–54	15 (12.0)
55–64	53 (42.40)
>64	50 (40.0)
Sex	
Male	90 (72.0)
Female	35 (28.0)
Profession	
Unemployed	75 (80.0)
Employed	25 (20.0)
Number of children	
Mean (SD)	2.75 (1.25)
Education	
Primary	21 (16.80)
Secondary	66 (52.80)
College and more	36 (30.40)
Capacity to pay treatments	
Not enough	76 (60.80)
Enough	49 (39.20)
Health insurance status	
No	4 (3.20)
Yes	121 (87.20)
Live with others	
No	5 (4.0)
Yes	120 (96.0)
Place	
Countryside	97 (77.60)
City	28 (22.40)
Months of cancer diagnosis	
Mean (SD)	15.71 (20.43)
Chronic disease	
No	99 (79.20)
Yes	26 (20.80)
Life threatening in the near future	
No	8 (6.40)
Yes	117 (93.60)
Response to treatment	
Improved	27 (21.60)
Improved a little	38 (30.40)
No change	35 (28.0)
Deteriorated	25 (20.0)
Feeling about treatment side effect	
Unbearable	18 (14.40)
Bearable	107 (85.60)
Frequency of social support	
Low support	4 (3.20)
Moderate support	43 (34.40)
High support	78 (62.40)

TABLE 2 | Prevalence of a suspicion of depression and anxiety ($n = 125$).

Scale score	Depression		Anxiety	
	N	**%**	***N***	**%**
Likely noncase	47	37.60	43	34.40
Doubtful case	45	36.0	43	34.40
Likely case	33	26.40	39	31.20

Table 3 depicts the profiles of EQ-5D-5L domains according to the frequencies of each item's response. The highest proportion of respondents reporting any problems was in the anxiety/depression dimension (92.8%), followed by pain/discomfort (81.2%), the usual activities (75.2%), and mobility (60%) dimensions, while the lowest percentage was found in the self-care dimension (40.8%).

Table 4 displays the results of the univariate analyses on the potential determinants of utility in the participants. Overall, our analysis showed that the mean scores for EQ-5D utility and EQ VAS were statistically significantly different for the various categories of the following variables: capacity to pay ($p < 0.001$ and $p = 0.0001$, respectively), perception of the disease being life threatening ($p < 0.0031$ and $p = 0.014$, respectively), response to treatment ($p < 0.0001$ and $p < 0.0001$, respectively), presence of side effects ($p < 0.0001$ and $p = 0.0015$, respectively), having social support ($p = 0.0001$ and $p < 0.0001$, respectively), having a likely depression ($p < 0.0001$ and $p < 0.0001$, respectively), and having a likely anxiety ($p < 0.0001$ and $p < 0.0001$, respectively).

The association between potential predictors of EQ-5D utility scores and EQ VAS scores were then analyzed by using a multiple linear regression. **Table 5** shows that the final model retains four predictors (capacity to pay, response to treatment, side effects, and depression) of utility score while two predictors (response to treatment, depression) are retained for the EQ VAS scores.

DISCUSSION

To our knowledge, our study is the first study on the QoL of Vietnamese patients with lung cancer. Our results show that the most frequently EQ-5D identified problems were anxiety/depression and pain/discomfort. These findings are similar to what has been found in a previous study conducted in Indonesia with the same instrument, but another type of cancer (cervical cancer) (31). One notes that a previous study in Vietnam with the same instrument, but another disease, HIV/AIDS, also found that the most affected QoL dimension was anxiety/depression (27.5%). These two studies underline the importance, when dealing with a chronic disease that affects physical health, of considering the

TABLE 3 | EQ-5D-5L: frequencies by dimension and level, as well as by sex ($n = 125$).

Variables	Total *n* (%)	Age groups				Sex	
		35–44 *n* (%)	**45–54 *n* (%)**	**55–64 *n* (%)**	**65+ *n* (%)**	**Male *n* (%)**	**Female *n* (%)**
Mobility							
Level 1	50 (40.0)	4 (57.40)	10 (66.67)	20 (37.74)	16 (32.0)	41 (45.56)	9 (25.71)
Level 2	38 (30.40)	3 (42.86)	3 (20.0)	17 (32.08)	15 (30.0)	25 (27.78)	13 (37.14)
Level 3	24 (19.20)	0 (0.0)	2 (13.33)	7 (13.21)	15 (30.0)	17 (18.89)	7 (20.0)
Level 4	9 (7.20)	0 (0.0)	0 (0.0)	5 (9.43)	4 (8.0)	4 (4.44)	5 (14.29)
Level 5	4 (3.20)	0 (0.0)	0 (0.0)	4 (7.54)	0 (0.0)	3 (3.33)	1 (2.86)
Self-care							
Level 1	74 (59.2)	7 (100.0)	12 (80.0)	30 (56.6)	25 (50.0)	56 (62.22)	18 (51.43)
Level 2	21 (16.8)	0 (0.0)	1 (6.67)	9 (19.98)	11 (22.0)	16 (17.78)	5 (14.29)
Level 3	20 (16.0)	0 (0.0)	2 (13.30)	7 (13.21)	11 (22.0)	12 (13.33)	8 (22.86)
Level 4	5 (4.0)	0 (0.0)	0 (0.0)	3 (5.66)	2 (4.0)	3 (3.33)	2 (5.71)
Level 5	5 (4.0)	0 (0.0)	0 (0.0)	4 (7.55)	1 (2.0)	3 (3.33)	2 (5.71)
Usual activity							
Level 1	31 (24.8)	2 (28.57)	8 (53.3)	11 (20.75)	10 (20.0)	23 (25.56)	8 (22.86)
Level 2	46 (36.8)	4 (57.14)	5 (33.33)	19 (35.85)	18 (36.0)	34 (37.78)	12 (34.29)
Level 3	27 (21.6)	1 (14.29)	2 (13.34)	12 (22.64)	12 (24.0)	21 (23.33)	6 (17.14)
Level 4	14 (11.2)	0 (0.0)	0 (0.0)	6 (11.32)	8 (16.0)	8 (8.89)	6 (17.14)
Level 5	7 (5.6)	0 (0.0)	0 (0.0)	5 (9.44)	2 (4.0)	4 (4.44)	3 (8.57)
Pain/discomfort							
Level 1	23 (18.80)	1 (14.29)	2 (13.33)	12 (22.64)	8 (16.0)	21 (23.33)	2 (5.71)
Level 2	60 (48.0)	5 (71.42)	10 (66.67)	21 (39.63)	24 (64.0)	40 (44.44)	20 (57.14)
Level 3	30 (24.0)	1 (14.29)	2 (13.33)	12 (22.64)	15 (30.0)	22 (24.44)	8 (22.86)
Level 4	10 (8.0)	0 (0.0)	1 (6.67)	6 (11.32)	3 (6.0)	5 (5.56)	5 (14.29)
Level 5	2 (1.60)	0 (0.0)	0 (0.0)	2 (3.77)	0 (0.0)	2 (2.22)	0 (0.0)
Anxiety/depression							
Level 1	9 (7.2)	0 (0.0)	1 (6.67)	3 (5.66)	5 (8.93)	9 (10.0)	0 (0.0)
Level 2	67 (53.6)	5 (71.43)	11 (73.33)	25 (47.17)	26 (46.63)	48 (53.33)	19 (54.29)
Level 3	39 (31.2)	2 (28.57)	2 (13.33)	20 (37.74)	20 (35.71)	29 (32.22)	10 (28.57)
Level 4	10 (8.0)	0 (0.0)	1 (6.67)	5 (9.43)	5 (8.93)	4 (4.44)	6 (17.14)

TABLE 4 | Results of univariate analyses of utility scores.

Variables	EQ-5D utility				EQ VAS			
	Mean	SD	F/*t*	*p*-value	Mean	SD	F/*t*	*p*-value
All patients (*n* = 125)	0.53	0.26			48.5	20.98		
Sociodemography								
Capacity to pay								
Not affordable	0.46	0.24			42.89	18.29		
Affordable	0.65	0.25	–4.26	<0.0001**	57.18	22.09	–3.93	0.0001**
Life threatening								
No	0.79	0.14	3.02		65.88	19.65		
Yes	0.51	0.26		0.0031**	47.31	20.62	2.47	0.0148**
Response to treatment								
No change/deterioration	0.42	0.28			39.45	18.64		
Improvement	0.63	0.20	–4.72	<0.0001**	56.85	19.63	–5.07	<0.0001**
Side effects								
Unbearable	0.27	0.3			34.17	19.50		
Bearable	0.57	0.23	–4.97	<0.0001**	50.91	20.33	–3.25	0.0015**
Social support								
Low support	0.45	0.15			48.75	13.15		
Moderate support	0.40	0.32			35.23	17.18		
High support	0.60	0.19	10.67	0.0001*	55.79	19.72	16.68	<0.0001*
Psychology factors								
Depression								
Likely noncase	0.70	0.15			65.74	14.76		
Doubtful case	0.52	0.24			45.22	16.41		
Likely case	0.31	0.24	31.16	<0.0001*	28.39	12.39	63.30	<0.0001*
Anxiety								
Likely noncase	0.72	0.15			67.09	15.77		
Doubtful case	0.52	0.20			43.84	15.92		
Likely case	0.33	0.27	31.4	<0.0001*	33.13	14.94	51.60	<0.0001*

EQ VAS, EQ-visual analog scale; EQ-5D, EuroQol-5 Dimensions.
**ANOVA test; **t-test.*

TABLE 5 | Multiple linear regression on EQ-5D utility score and EQ VAS scores.

Variables	EQ-5D utility score*			EQ VAS**		
	Coef.	95% CI	*p*-value	Coef.	95% CI	*p*-value
Capacity to pay						
Not affordable	1.00					
Affordable	0.09	0.01; 0.16	0.027	NS		
Response to treatment						
No change/deterioration	1.00			1.00		
Improvement	0.11	0.03; 0.18	0.004	9.27	3.96–14.58	0.001
Side effects						
Unbearable	1.00					
Bearable + not important	0.16	0.05; 0.27	0.012	NS		
Depression						
Likely noncase	1.00			1.00		
Doubtful case	–0.10	–0.19; –0.01	0.023	–17.73	–23.81; –11.66	<0.001
Likely case	–0.26	–0.35; –0.15	<0.001	–23.88	–40.68; –27.35	<0.001

**(Prob> F = 0.0000, R-squared = 0.45, Adj R-squared = 0.43).*
***(Prob> F = 0.0000, R-squared = 0.55, Adj R-squared = 0.54).*
NS, not significant.

mental health of the patient. Treating a physical disease should not be limited to the use of treating the etiology of the condition. It should also include the search for mental impacts of the disease. An effective management of a chronic disease requires the collaboration of physicians specialized in the disease with psychiatrists or doctors familiar with mental diseases.

The literature reveals that utility scores in lung cancer patients vary across countries. Our study found a mean (SD) utility score of 0.53 and an EQ VAS score of 48.5. A study performed in Italy found values of 0.58 (32). In France and Germany, values were 0.58 and 58.0, respectively (33). In the United States, United Kingdom, and Canada, the scores were 0.67, 0.76, and

68, respectively (34, 35). The differences of utility scores might reflect differences in weight put on the different dimensions among countries. They might also reflect differences in treatment protocol that lead to different degrees of impairment (36–38). Yet, we have to remember that our study didn't use utility values validated for the Vietnamese population. We cannot reject the possibility that the use of validated values would have changed our results (39, 40). Formally, it is desirable that further studies on QoL in Vietnam are preceded by validation studies of the utility instrument that might be used.

Another important observation from our study is that one-third of respondents with lung cancer might suffer from depression/anxiety. Of course, this suspicion should be validated with the diagnostic questionnaires used in psychiatry. Nevertheless, the high prevalence of possible depression/anxiety in cancer patients is alarming. It could be explained by the side effects of the treatment process. But other explanations should also be explored. For example, the cost of cancer treatment is expensive. Thus, patients suffer from economic pressure. This can lead to anxiety and depression. Additionally, the capacity of working is decreased in people with cancer, adding to the economic burden that patients have to face. Another factor could be the perception that the disease will lead to death in the near future. Depression and anxiety are multifactorial outcomes. This is suggested by studies that show that even in countries where physical and mental problems are usually jointly addressed, such as the Czech Republic or Japan, anxiety and depression can be found in a high proportion of patients compared to our study, in nearly half of the people with lung cancer (14, 22). This underlines the importance not only to treat medically these mental conditions but also to look for the factors that might explain anxiety and depression. The importance of depression is still apparent in the multivariate analyses. In summary, our results highlight what has been said above: management of anxiety and depression in lung cancer patients should be part of the general management of lung cancer in Vietnam.

Our study has several limitations. First, it was based on a cross-sectional design. Therefore, although our predictors are likely to be real predictors, no causal conclusion can formally be drawn. Secondly, our sample was limited to 125 patients who were currently receiving the treatment at Viet Tiep Hospital. This number of patients participating into the survey is rather small, and we cannot assure that the sample is representative of Vietnamese cancer patients. The generalizability of our finding is therefore limited. We have involved at the time of our research all the patients who are under treatment in Viet Tiep Hospital, the biggest hospital of northeast area of Vietnam. Finally, a major limitation of our study is unavailability of validated EQ-5D values of the Vietnamese population. Using Thai value might not be very adequate. In spite of these limitations, our research found the impact of treatment results, side effects, the patients' capacity to pay, and the patients' mental health problems such as depression/anxiety on the QoL of Vietnamese lung cancer patients. The most important result is that depression/anxiety can affect the patient's QoL, and this is an often neglected condition that can, nevertheless, be treated effectively and at very low costs in Vietnam.

RECOMMENDATIONS

Based on our results, we can propose that every lung cancer patient in Vietnam should be evaluated for the presence of depression and anxiety and be offered treatment for these conditions, if they occur as comorbidity.

ETHICS STATEMENT

The study protocol approval was obtained from the Institution Review Board of Haiphong University of Medicine and Pharmacy, and data collection process was approved by the Oncology Center of Viet Tiep Hospital. The objectives of the study were clearly explained to cancer patients, and informed consent was obtained. All information is confidential. All data were collected anonymously.

AUTHOR CONTRIBUTIONS

PK designed the study, supervised the data collection, led the data analysis, and drafted the manuscript. VT participated in the study design, questionnaire construction, interpretation of the results, and manuscript writing. DM participated in the coordination of the data collection, data analysis, data interpretation, and in revising the manuscript. LQ participated in the study design, interpretation of the results, and manuscript writing. NH guided the design of the study, submitted the protocol for ethical review, and chaired the manuscript writing. All authors read and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2019.00352/full#supplementary-material.

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Izmir Mental Health Cohort for Gene-Environment Interaction in Psychosis (TürkSch): Assessment of the Extended and Transdiagnostic Psychosis Phenotype and Analysis of Attrition in a 6-Year Follow-Up of a Community-Based Sample

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Objective: TürkSch is a prospective, longitudinal study in a representative community sample (İzmir, Turkey), consisting of several data collection stages, to screen and follow-up mental health outcomes, with a special focus on the extended and transdiagnostic psychosis phenotype. The aim of the present paper is to describe the research methodology, data collection results, and associations with noncontact and refusal in the longitudinal arm.

Methods: Households were contacted in a multistage clustered probability sampling frame, covering 11 districts and 302 neighborhoods at baseline (n = 4,011) and at 6-year follow-up (n = 2,185). Both at baseline and at follow-up, participants were interviewed with the Composite International Diagnostic Interview. Participants with probable psychotic disorder were reinterviewed with the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (SCID)-I either at the hospital or at the participant's residence. Relevant neighborhood-level measures were assessed in a separate sample (n = 5,124) in addition to individual-level measures. Candidate gene-by-environment interactions were investigated using two nested case-control studies.

Results: Individuals with a mental health problem had lower refusal rates. Older and lower educated individuals had a lower probability of noncontact.

Discussion: The TürkSch study has an advanced design to meet the challenges of evaluating the multidimensional etiological and phenomenological nature of the extended and transdiagnostic psychosis phenotype.

Keywords: extended psychosis phenotype, transdiagnostic psychosis phenotype, epidemiology, representative community-based sample, neighborhood-level measures, gene-environment interactions

INTRODUCTION

After nearly two decades of epidemiological studies, there is evidence suggesting that psychosis is distributed as a spectrum (1). The spectrum of psychosis extends from the clinical psychotic syndrome to nonpsychotic diagnoses with a degree of psychosis admixture and, finally, to nonclinical populations with subthreshold psychotic experiences (2–4). Thus, the *extended psychosis phenotype* is the range from psychotic experiences (PEs) gradually blending into psychotic disorders (PDs) (2).

The majority of individuals with PEs have a diagnosis of nonpsychotic disorder. Conversely, a high prevalence of PEs has been demonstrated in individuals with nonpsychotic disorders where they can be considered markers of clinical severity (5). Furthermore, PEs and nonpsychotic disorders have been shown to predict subsequent occurrences of each other, bidirectionally (6). It has been suggested that these findings point to a *transdiagnostic psychosis phenotype* in the general population (7).

To date, the definition of PEs and the type of screening instrument used have varied across studies (8), contributing to heterogeneity of results in this area. In the majority of studies, definitions of PEs were based on attenuated forms of delusional thinking and hallucinatory perceptions (1, 9, 10). However, negative, disorganization, and affective dimensions of psychosis have been identified in addition to the positive dimension. These dimensions should also be taken into account (7).

Longitudinal studies have demonstrated that PEs are mostly transitory. Persistent PEs have been associated with a greater risk of need for care (11) and prolonged exposure to environmental risks (childhood adversity, minority position, discrimination, urban upbringing and residency, stress in a wider social environment, substance misuse, etc.), possibly interacting with a genetic liability (12). Hence, a growing number of studies have tried to disentangle the components of interactions between genes and the environment underlying the *extended and transdiagnostic psychosis phenotypes* (11, 13–15). Although these studies provided new insights, further studies are required to strengthen the current evidence and generate novel findings. To date, several genes have been associated with the pathophysiology of psychosis, including neuregulin 1(NRG1), brain-derived neurotrophic factor (BDNF), and catechol-O-methyltransferase (COMT), along with the others (16–18). Furthermore, studies have shown some effect of these genes on functional brain abnormalities that may be associated with psychosis susceptibility (19–23). However, evidence on the association between these genes and schizophrenia was inconsistent (24–27), and no polymorphisms of these genes have reached genomewide significance in schizophrenia (28, 29). Nevertheless, variants of the BDNF and the NRG1 have been associated with dimensions of psychosis across diagnostic boundaries (30–33). Furthermore, gene-environment interactions involving these genes and different levels of the extended psychosis phenotype have been documented (34–36). Although the COMT was associated with a small effect on stress reactivity, no main effect was found at the level of the extended psychosis phenotype (37). Given these reports, there is a need to extend the research on gene-environment interactions to the extended and transdiagnostic psychosis phenotype.

There is strong evidence that variables that include phenomenological expression, neurocognitive functioning, socioenvironmental and genetic liabilities are shared among PEs and PDs across traditional diagnostic boundaries (7). Therefore, an approach based on searching for differences between individuals with a distinct disorder category (e.g., schizophrenia) and the healthy population (which may also include individuals with PEs) may mask some of the relevant associations with the psychosis spectrum (38). From this point of view, it is important to take the full spectrum of psychosis (including both clinical and subclinical symptoms in non-help-seeking individuals) into account.

In cross-sectional studies, a part of the associations may be missed because symptom presence and severity of psychosis are subject to fluctuations over time (39). Longitudinal studies assessing the psychosis phenotype along a severity spectrum can shed light on changes over time. This framework is also useful to detect the factors predisposing to poor outcome in the psychosis spectrum (40).There is preliminary evidence that different types of risk factors may be leading to a differential expression of symptom dimensions (41). Therefore, a multidimensional assessment of the psychosis spectrum is needed to identify nonshared factors associated with specific psychosis dimensions and shared factors underlying the transdiagnostic psychosis phenotype (7). This approach also brings the opportunity to further investigate preliminary findings suggesting an impact of environmental and genetic load on the connectivity between different dimensions of psychosis (42).

Previous studies in this area have usually defined the clinical end of the extended psychosis phenotype based on self-report or lay-interviewer assessments. Relatedly, the clinical outcomes mostly have been conceptualized as a shift on the dimensional scale of frequency/duration of an attenuated positive symptom, representing a quantitative rather than a qualitative measure. At the same time, the unitary representations of the poor outcome of the spectrum have probably caused an obstacle to identify

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Abbreviations: PE, psychotic experience; PD, psychotic disorder possible associations of the risk factors with different types of outcomes (43). Therefore, clinical reinterviews with individuals with a positive screening of psychosis are required to define more valid and efficient clinical outcomes from a multidimensional psychopathological point of view. Furthermore, most studies were not designed to specifically study the psychosis spectrum phenotype. Thus, risk factors included were not selected for their association with psychosis. In addition, factors in the wider social environment, such as neighborhood-level risk factors, were not included, and studies were not genetically sensitive, with a few notable exceptions (44–46). There is robust evidence that genetic and socioenvironmental factors, both at the individual and the neighborhood levels, interact with each other in the development and course of the psychosis spectrum (47, 48). To study gene-environment interactions when analyzing the development and course of the extended and transdiagnostic psychosis phenotype, simultaneous assessments of the genetic and the environmental factors both at the individual level and at the level of the wider social environment are required. The Izmir Mental Health Survey for Gene-Environment Interaction in Psychosis (TürkSch) was therefore conducted to provide new insights into and knowledge of the *extended and transdiagnostic psychosis phenotype*, and to identify social-environmental risks in interaction with genetic background (47, 49, 50).

The present paper describes the methods of the TürkSch follow-up. Furthermore, dynamic transitions over time in the extended psychosis phenotype are presented. Finally, the associations between various variables and noncontact/refusal in the longitudinal arm are analyzed.

METHODS

Overview of the Design of the TürkSch Cohort

TürkSch is a prospective, longitudinal study to screen and follow-up mental health outcomes in a representative general population sample of Izmir, Turkey. The TürkSch consists of two separate assessments (T_1 and T_2) and several stages of data collection. The study assessed the prevalence of the extended psychosis phenotype. In addition, associations between various individual-level variables and the extended psychosis phenotype were investigated (*stage 1, T_1*). Associations between neighborhood-level variables (e.g., socioeconomic deprivation and social capital of neighborhoods) and the extended psychosis phenotype were assessed by a separate data collection independent from the main data collection (*stage 2, T_1, $n = 5,124$*). Furthermore, a nested case-control study recruited individuals with PEs and PDs and individuals with no psychotic symptoms from stage 1 and included blood sampling for analysis of gene-environment interactions (*stage 3, T_1*).

Six years after baseline, mental health and environmental exposure were assessed (*stage 4, T_2*). Finally, a longitudinal nested case-control study recruited individuals using the results of *stages 1 and 4*, and blood samples were collected for further genetic analysis (*stage 5, T_2*). The TürkSch study was approved by the institutional ethics review board of Ege University, Turkey, and is compliant with the precepts of the Declaration of Helsinki. Each participant provided written informed consent for the examination and procedures.

Sample

At baseline, the Turkish Institute of Statistics (TurkStat) randomly selected 6,000 households representative of the Izmir metropolitan area using a multistage sampling procedure stratified by urbanicity in four categories and covering 11 districts and 302 neighborhoods. Addresses were contacted in person. One household member aged between 15 and 64 years and available to complete the interview was randomly selected using the Kish within-household sampling method (51). Out of 6,000 addresses, 5,242 households were eligible for interview. A total of 4,011 individuals were successfully interviewed, yielding a response rate of 76.5% in *stage 1*. Response was higher in older age groups and in females. Full details on the Izmir metropolitan area, sampling, representativeness, instruments, procedures of T_1, and the map of neighborhoods included can be found in a previous article (50). Participants and addresses of T_1 formed the targeted population for T_2.

Fieldwork

Follow-up assessments (T_2) were performed approximately 6 years after the baseline assessments (T_1). To optimize response, T_2 fieldwork was spread over a relatively long period (2 years) so that there was sufficient time to recontact potential respondents. At T_2, addresses of T_1 participants were visited in person by trained lay interviewers with a brochure reminding the study, providing results from baseline, seeking participation for a new interview, and explaining the study goals in detail. The brochure also referred to a website, full names of the study team, and a phone number of the research office. If the participant could not be reached at the address, the study team telephoned the participants using numbers from T_1. In these calls, the team ascertained whether the participant was reachable, and if this was the case, appointments were made for face-to-face interviews. Any contact information of the participants who could not be reached was collected by asking neighbors in the area or the neighborhood authorities. If additional information was obtained, the person was contacted at the new contact address. Any T_1 participant was defined as unreachable at T_2 after at least three consecutive visits to the address.

Interviewers, Interviewer Training, and Quality Control

At T_1, lay interviewers had at least high school education, a health-related profession, and/or were experienced in doing field surveys. At T_2, lay interviewers were psychology graduates. At T_2, both the lay interviewers and the psychiatrist who conducted the clinical reinterviews (UK) had not participated in T_1 and thus were blind to baseline results. At both assessments, lay interviewers had a 2-week formal training that included basic information on common mental disorders, symptom dimensions of psychosis, ethical aspects of the project, and practical training.

The fieldwork was closely monitored by the study team (UK, TB, HE, BK, KA). Each interview at T_1 and T_2 was conducted according to a standard procedure, with recording and quality coding. If any of the three following problems were determined: i) the quality of the interview was considered low; ii) any missing value was present; and iii) there was a doubt whether the endorsed symptom was a true symptom, as described later, a phone call or a second visit (T_1, n = 392; T_2, n = 560) was planned by the study team. The missing values still present after the second visit were assessed by the psychiatrist after the clinical reinterview.

Screening Instrument

To assess mental health outcomes, screening was based on the relevant sections of the Composite International Diagnostic Interview (CIDI) 2.1 (52). The CIDI is a fully structured interview developed by the World Health Organization (WHO) (53) and has been used in various surveys around the world, including ones in Turkey (54–56). Primarily designed for use in epidemiological studies of mental disorders, the CIDI can be used by both clinicians and trained interviewers. CIDI-based screening of symptoms provides diagnoses in accordance with the definitions and criteria of the International Classification of Diseases, 10th Revision (ICD-10), and the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV), along with information about frequency, duration, help seeking, severity of symptoms, and psychosocial impairment. CIDI 2.1 has organic exclusion rules, which are used to construct final diagnoses, for each endorsed symptom, to ascertain that symptoms were not exclusively caused by a somatic cause, an injury, or use of drugs, alcohol, or medication. Previous research reported acceptable-to-good concordance between the CIDI 2.1 diagnoses and blind clinical diagnoses (57–59). The CIDI was found to have excellent interrater reliability in almost all sections, with κ values ranging from 0.67 to 0.97 (60). In particular, κ for agreement between clinicians for delusions and hallucinations was found to be 0.85 and 0.87, respectively. Furthermore, the sensitivity of the CIDI was found to be higher than its specificity for both delusions (0.93 vs. 0.55) and hallucinations (0.86 vs. 0.50) (61). The reliability and validity functions of the Turkish version of the CIDI were studied as part of an international study (62).

Mental health screening at both T_1 and T_2 included CIDI screening sections on alcohol and substance-related disorders, depressive and dysthymic disorders, manic and bipolar affective disorders, schizophrenia and other PDs, posttraumatic stress disorder, and two final sections containing concluding questions, interviewer observations, and interviewer ratings (50). The time frame of the T_2 CIDI interview was the last 6 years.

Assessment of the Dimensions of Psychosis

Assessment of the positive dimension was based on 14 CIDI delusions items (G1, G2, G3, G4, G5, G7, G8, G9, G10, G11, G12, G13, G13b, and G14) and five CIDI hallucinations items (G17, G18, G20, G20C, and G21). All items were rated dichotomously, indicating presence or absence. Rating of the PEs can be difficult because sometimes individuals can be describing a plausible event or a religious or superstitious belief that in the CIDI may be rated as a PE. Therefore, the following procedure was followed. First, during the interview, each time a participant endorsed a CIDI PE, the participant was asked to give an example, which was written down verbatim by the interviewer for later review with the mental health clinician on the team. All CIDI interviews were reviewed by the study team. When it was not clear whether the participant had truly endorsed a positive PE, the participant was recontacted by a clinician over the telephone to confirm the PE. Thus, delusional and hallucinatory experiences were coded positive if the team clinician confirmed the PE at review. Our results showed that the interrater reliability of the CIDI psychosis section had a κ value of 0.45 at T_1 (50) and 0.67 at T_2.

Assessment of the negative and disorganization dimensions was based on the CIDI P section, which is on interviewer observations. The negative dimension was based on four symptom items (flat affect, slow speech, poverty of speech, and impaired ability to initiate activity), and the disorganization dimension was based on three symptom items (neologism, thought disorder, and hallucinatory behavior).

Assessment of the affective dimension was based on CIDI section E (depressive and dysthymic disorders) and section F (manic and bipolar affective disorders). For depression, participants were asked if they had experienced an episode lasting at least 2 weeks during which they felt depressed or had a lack of interest. If endorsed, participants were asked if, during this period, they had experienced lack of energy, appetite change, sleep problems, being slow or restless, feelings of worthlessness or guilt, decreased self-esteem, trouble thinking or indecisiveness, and thoughts of death. For manic and hypomanic episodes, participants were asked whether they had experienced elevated mood or irritability for a period of at least consecutive days either noticed by others or causing problems. If this was the case, participants were asked if, during this period, they had experienced excessive goal-directed activity, psychomotor agitation, spending sprees, sexual indiscretions, increased talkativeness, flight of ideas, loss of normal social inhibitions, increased self-esteem or grandiosity, decreased need for sleep, and distractibility. For both depressive and manic episodes, the final assessment included questions on probable association of symptoms with substance use or physical illness, help seeking due to symptoms, the route of help seeking, clinician diagnosis, and treatment history. All responses were reevaluated by a team of clinicians. Depressive episode and hypomanic/manic episode were coded positive in accordance with the definitions and criteria of DSM-IV.

Diagnostic Interviews and Construction of the Extended Psychosis Phenotype

At both T_1 and T_2, sections were devoted to define patterns of help seeking for mental health problems. Questions included any self-report mental problem, help seeking for a mental problem, the route of help seeking, the probable outcome of the help seeking (diagnosis), and prescribed medicines and any hospitalization during the time frame (lifetime and last 12 months at T_1 and last 6 years at T_2). If this was the case, the person was asked for permission to contact the clinician involved in the diagnosis or the treatment of the participant to verify the diagnosis and review case material.

A measure of impairment associated with PEs was defined using CIDI items G25 (duration of the PE: between 1 day and 6 months or more), G26, G28, G29, and G29A (level of dysfunction) and G16 and G23 (told doctor about psychotic beliefs) (47, 49). Furthermore, *a probable PD case* was defined if any of the following screening findings were endorsed:

1. Any self-reported diagnosis of psychotic or bipolar disorder.
2. Any self-reported hospitalization due to a mental health problem.
3. Any self-reported medication of any antipsychotic (typical or atypical) and/or lithium or mood-stabilizing anticonvulsant drugs.
4. In the CIDI section F for bipolar disorder: a lifetime manic episode.
5. In the CIDI section G for positive dimension: any clinically relevant positive PE (led to dysfunction or help seeking) or at least three symptoms regardless of clinical relevance. If the participant had a clinically relevant positive PE at T_1, he/she was directly defined as a *probable case* regardless of the CIDI endorsement at T_2.
6. In the CIDI section P for negative and disorganization dimensions: a rating of positive formal thought disorder, negative symptoms, behavior that suggests that the person is having hallucinations, or catatonic symptoms, or the interviewer comments were indicative of a PD.

If a participant was deemed to have a diagnosis of *probable PD* according to the algorithm mentioned, the participant was recontacted by the team psychiatrist and invited to the hospital for a clinical evaluation with the Structured Clinical Interview for DSM-IV (SCID) (63). When the participant did not attend the hospital, clinical interviews were conducted at the participant's residence by the psychiatrist. Thus, 225 participants at T_1 and 263 participants at T_2 were clinically reinterviewed to identify participants with PD.

An *extended psychosis phenotype* variable was constructed including four categories using the SCID results and *the measure of impairment associated with PEs*. *The psychotic disorder group* included all individuals diagnosed with any DSM-IV disorder with psychotic features. *The clinical PE group* included individuals who had a CIDI PE leading to any of the seven CIDI impairment items but who did not have a diagnosis of a PD. *The subclinical PE group* included individuals with a CIDI PE not leading to any distress, impairment, or help seeking. All other individuals were included in the *no psychosis* category. The flowchart of the assessment of the extended psychosis phenotype and the numbers of individuals in each group are presented in **Figure 1**.

Assessment of Environmental Exposures at the Individual Level

A sociodemographic questionnaire was included at T_2 to determine temporal changes in background characteristics (age, educational status, marital status, employment, socioeconomic status, health insurance, housing, and monthly household income). The T_1 interview also included educational and occupational status of parents, birth year of parents, migration pattern and probable reasons for migration, ethnic group, and any history of early childhood adversity (e.g., parental loss, divorce, separation). Socioeconomic status was estimated using profession and recoded into four ordinal categories (1: I and II professionals and IIIA nonmanual high employees, 2: IIIB nonmanual low employees and V and VI skilled workers and technicians, 3: IVA, IVB, and IVC owners of small businesses, and 4: VIIA and B manual workers (49, 64).

The variable *traumatic events* was obtained using the posttraumatic stress disorder section of the CIDI. The events were war experience, life-threatening accident, fire, flood or other natural disaster, witnessing someone being badly injured or killed, rape, sexual molestation, and being physically attacked or assaulted. Furthermore, the interview included the *List of Threatening Life Events* (65) so as to cover most of the stressful life events experienced by individuals. Threatening life events included a serious illness, injury, or an assault (suffering or happening to a close relative); death of a relative or a close friend, divorce, separation, serious problems with a relative/neighbor/close friend; being dismissed from a job, unemployment, major financial problems; and police/court appearance. Time frame was the last 6 years.

Alcohol, *Cannabis*, and other substance uses were assessed using screening questions on CIDI alcohol and substance-related disorders section (66). Using information from both T_1 and T_2, the continuum of alcohol, *Cannabis*, and other substance uses during the follow-up period was defined.

Assessment of Neighborhood-Level Measures

At T_1, urbanicity (birth place, places of residence at age 0–15 years, and current place of residence) was assessed. In a separate sample, socioeconomic deprivation and the social capital of the resided neighborhoods were assessed (50). T_2 assessment included questions on changes in place of residence. Furthermore, the description of the visited neighborhood and building was coded by the interviewer in five categories (village/slum/semi-urban/urban/luxury area). *Urbanicity* of the place of residence was defined using the classification of the Turkish Institute of Statistics (TurkStat). The classification depended on the level of organized features of streets and buildings (regularity of sidewalks, status of road, completeness of drainage system, and quality of outer paintings of buildings, etc.) (47). *Social capital of the neighborhood* was assessed using two assessments: informal social control and social disorganization. Questions on informal social control were derived from the Sampson collective efficacy scale (67), adapted for use in the Turkish population (47). The informal social control scale measures the willingness to intervene in hypothetical neighborhood threatening situations, for example, in the case of children misbehaving. The items were assessed using a 5-point Likert scale ranging from *strongly agree* to *strongly disagree*. Eight items assessing social

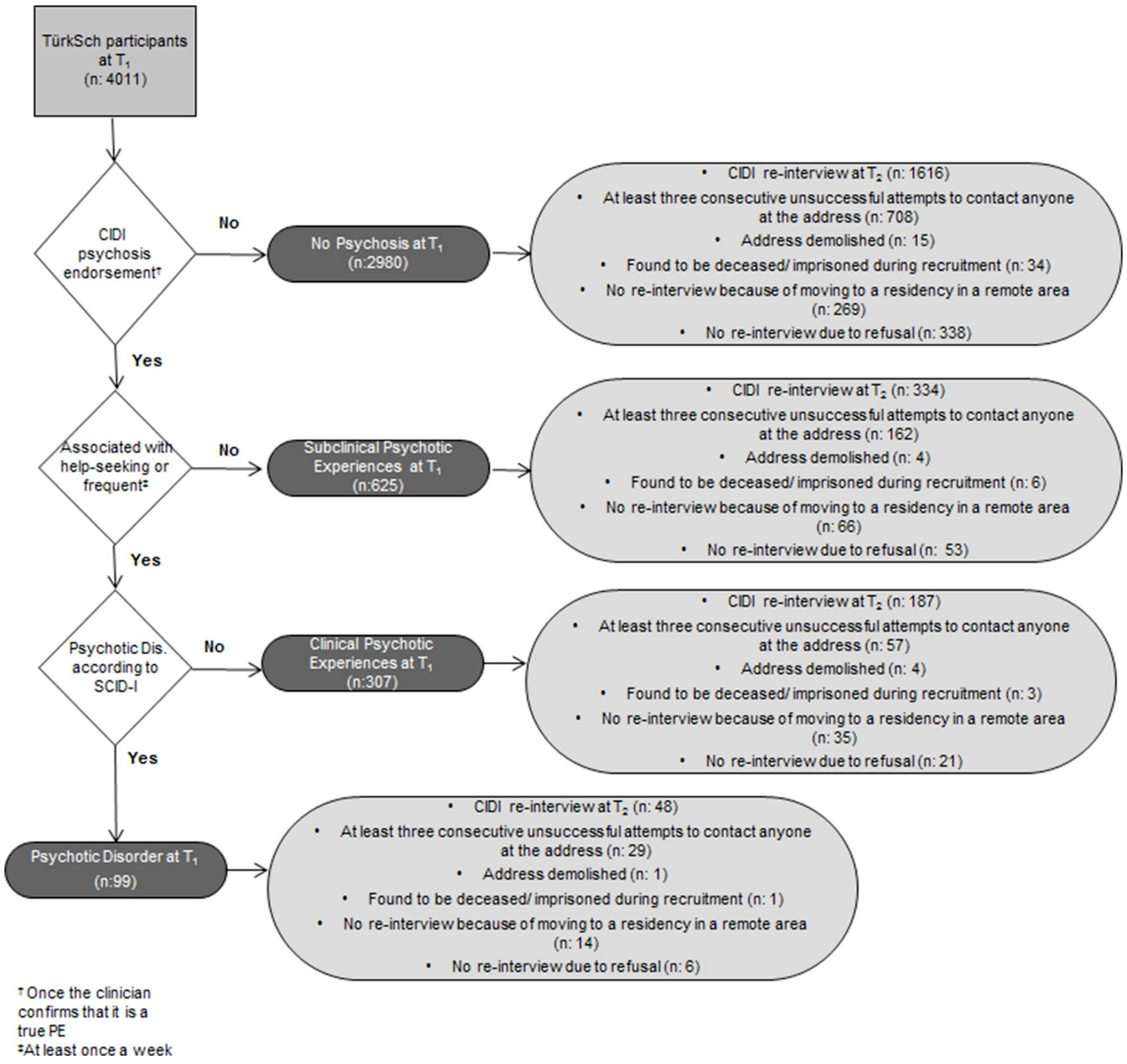

FIGURE 1 | Assessment of the extended psychosis phenotype and data collection results at follow-up.

disorganization were derived from the McCulloch instrument (68, 69). Respondents rated the frequency of certain scenarios occurring in their neighborhood (presence of graffiti, teenagers on street, vandalism, attacks due to race or skin color, other attacks, and burglary and the theft of, or from, vehicles). Each item was assessed using a 4-point Likert scale ranging from *very common* to *not at all common* (47).

Assessment of Familial Measures

Using questions derived from the Family Interview for Genetic Studies (70), history of mental disorders in the father, mother, siblings, and offspring was assessed. Thus, *a family history of mental disorders variable* was defined and coded guided by previous literature (71): 0 = No or undefined family history of mental disorders; 1 = Common mental disorder (depression/anxiety disorders/obsessive compulsive disorder/posttraumatic stress disorder/substance misuse without a history of hospitalization for the psychiatric condition, or a history of a completed suicide) in at least one family member but no severe mental illness; 2 = Severe mental illness (bipolar disorder/psychotic disorder/hospitalization/completed suicide) in at least one family member (49).

Blood Sampling and Assessment of Candidate Gene-Environment Interactions

At T_1, a nested case-control study (*stage 3*, n = 366) recruited individuals with PEs and PDs as well as individuals with no psychotic symptoms to investigate gene-environment interactions in the extended and transdiagnostic psychosis phenotypes. In this subgroup, *COMT* val158met (rs4680) and *BDNF* val66met (rs6265) polymorphisms were assessed besides the clinical reappraisals and exposures previously mentioned.

At T_2, environmental exposures for the last 6 years were assessed, followed by clinical reappraisals in eligible individuals (n = 254).

At T_2, a subsample of subjects was selected for a second nested case-control study (*stage 5*) using the results of both T_1 and T_2. First, 200 individuals with any psychotic symptoms (either PE or PD) at either T_1 or T_2 were randomly selected. Then, these individuals were matched with 200 individuals who participated in both T_1 and T_2 and had no psychotic symptoms (neither PE nor PD) during the follow-up period. Matching variables were age, gender, and neighborhood. The selected individuals were asked to provide a blood sample for further genetic analysis and clinical reappraisals. A total of 174 individuals with any psychotic symptom (61 with PD; 113 with PE) and 151 individuals with no psychotic symptoms during follow-up provided a blood sample. In light of the previous results, previously mentioned, we decided to evaluate the *BDNF* and the *NRG1* as candidate genes rather than the *COMT* gene in the whole gene sequence analysis procedure in T_2. Results were evaluated considering the environmental exposure results at both T_1 and T_2.

Statistical Analysis

To evaluate differential attrition over time, a two-step analysis was performed. First, a multinomial logistic regression model was performed (dependent variable with three categories: 0 = respondent, 1 = noncontact, 2 = refusal) to examine the role of baseline sociodemographics, psychopathology, and environmental exposure variables on the association with the two types of attrition, separately. These associations were expressed as relative risk ratios (RRR) and their 95% confidence intervals. Then, the overall effects of the previously mentioned variables on attrition were tested using chi-square tests and the relevant effect size measure (Cramer's *V*). Cramer's *V* equals 0 when there is no relationship between the two variables and has a maximum value of 1. A larger value for Cramer's *V* indicated a stronger relationship between the variables.

RESULTS

Data Collection Results

At T_2, 954 individuals from the baseline sample could not be contacted (i.e., after at least three consecutive attempts to contact anyone at the address), and 386 individuals were lost to follow-up because of moving to a residency in a remote area. Forty-four individuals were deceased or imprisoned, and 24 addresses were demolished. Furthermore, 418 individuals refused to participate in the follow-up assessment. As a result, a total of 2,185 individuals were successfully reinterviewed at T_2. **Figure 1** shows details of the data collection results at T_2 stratified by the baseline position across the extended psychosis phenotype. Dynamic transitions over time in the extended psychosis phenotype are presented in **Figure 2**.

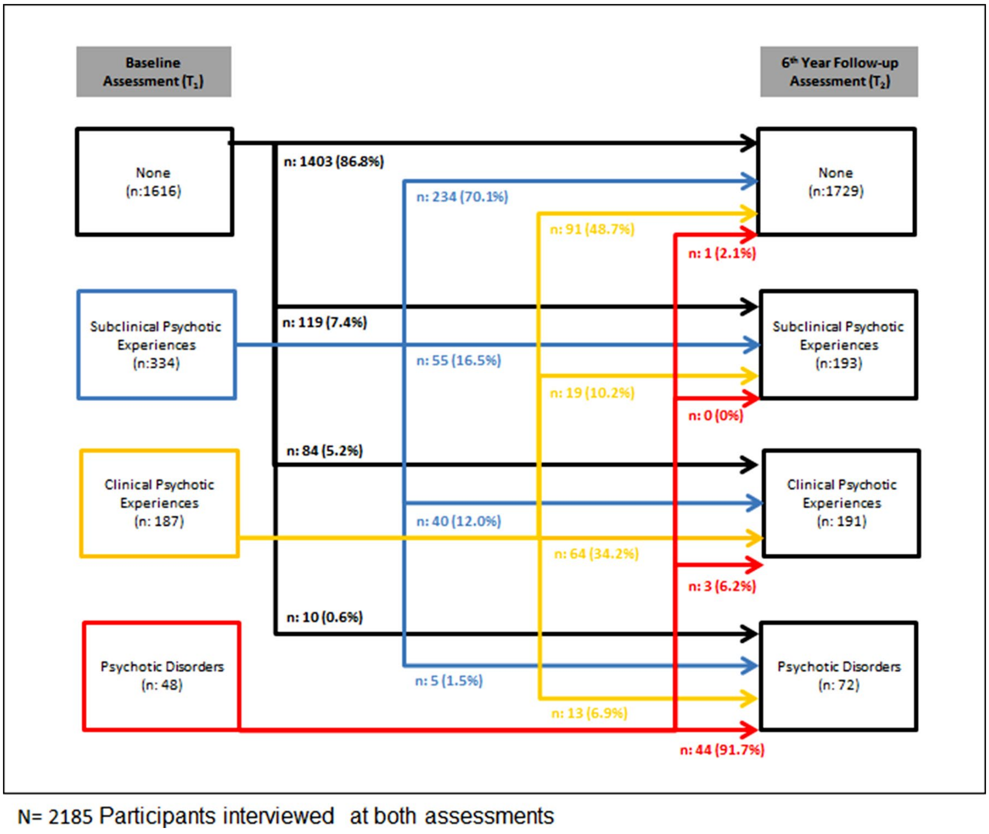

FIGURE 2 | Dynamic transitions over time in the extended psychosis phenotype.

Associations With the Two Types of Attrition (Noncontact and Refusal)

Attrition due to noncontact was significantly higher in individuals who were younger, nonmarried, more highly educated, non-help-seeking, without a valid health insurance, and using *Cannabis* and regular alcohol. The probability of refusal was significantly higher in individuals who were in paid employment, single, more educated, and with higher socioeconomic status. Furthermore, refusal was lower in individuals with a baseline mood disorder, a baseline clinical PE, a history of a traumatic event, and a family history of a severe mental illness (**Table 1**). However, analysis of overall effect on attrition showed that the associations with any independent variable had a Cramer's *V* value lower than 0.09, indicating very small effect sizes.

DISCUSSION

The TürkSch study was conducted in a general population sample, representative of the urban and rural areas of the city of Izmir, representing the third most industrialized area of Turkey. The primary focus of the study was the extended and transdiagnostic psychosis phenotypes, which were prospectively evaluated. Therefore, risk factors were chosen for their association with psychosis. Furthermore, the design of the study enabled us to assess the different symptom dimensions of psychosis (positive/negative/disorganization/affective). The sample size was relatively large and included both help-seeking and non-help-seeking individuals, so we were able to prevent help-seeking bias (43). Furthermore, diagnostic interviews were performed by psychiatrists with individuals with positive screening results. Therefore, we could assess psychotic outcomes along a spectrum, including both clinical and subclinical levels in the same sample. The assessments included family history and environmental exposures both at the individual and the neighborhood levels. The inclusion of candidate gene-based genetic analysis provided the opportunity to longitudinally evaluate specific gene-environment interactions in psychosis along a spectrum of severity.

The results from this study may have important implications. For the last decades, efforts to construct a new nosology of the psychosis spectrum, consisting of dimensional liabilities that cut across current categories, have gained interest (72) mainly because of the low validity of the current diagnostic categories and the associated stigmatization and diminished expectations from the interventions (40). This study yields high-quality data to elucidate the factors underlying specific dimensions of psychosis and the general psychosis factor, encompassing clinical and subthreshold severity levels (73). Thus, this study can contribute to efforts to better conceptualize psychosis. By investigating the complex interactions between different psychosis dimensions, genetic liability, and exposures involving the microlevel and the wider social environment, this study may provide novel information on causation and early intervention strategies (74). Finally, assessment of the factors in the wider social environment can provide a base for community-based interventions in addition to individual-level interventions.

The following limitations of the study should be noted. First, the relatively long period of time between the two data collection points (6 years) might have decreased our ability to establish the course of psychosis in detail (75). Second, as with most longitudinal studies with general population-based samples, the possibility of bias caused by differential attrition over time was a limitation. However, the dropout rate of participants in the current study is similar to that in studies using a similar methodology (11, 15). Furthermore, the comparison of baseline characteristics among respondents, refusals, and noncontacts showed no large differences. Third, the two nested case-control studies (stages 3 and 5) in which gene-environment interactions were investigated had small sample sizes and lack of genomewide genetic summary measures. Given the fact that a number of genes with small to moderate effects interact with each other in creating susceptibility to psychosis (28), a more comprehensive genetic analysis could provide a more valuable opportunity to analyze these effects. Although this information is currently not available, the DNA samples are preserved for more comprehensive genetic analyses in the future. Furthermore, genetic analyses including the entire cohort would provide more adequate statistical power. Because of limited resources, the nested case-control studies were most optimal. In addition, the broader outcome variable including the subclinical phenotypes and the longitudinal design may help to detect smaller effect sizes. Fourth, although we collected information on history of early childhood adversity, including parental loss, divorce, and separation, more detailed information on history of childhood maltreatment would have provided more comprehensive information on this exposure. False negative findings for childhood adversity thus cannot be excluded. Fifth, general population-based cohort studies represent the naturalistic course of illnesses. It cannot be ruled out that among other variables, treatment modifies the course of an illness. Although we obtained information about the treatment, we cannot rule out that this limitation impacted the results. Finally, as a consequence of the sampling method, both homeless and institutionalized persons could not be included, which may have affected the level of representativeness. However, as both groups are relatively small, effects would be negligible (50).

Analyses of attrition showed interesting results. Unlike what we expected, individuals with a mental health problem at baseline had lower refusal rates at follow-up. Furthermore, there was a difference in the sociodemographic correlates of attrition compared to studies of similar design conducted in western countries because these studies showed higher attrition rates in individuals with a lower socioeconomic status and a lower educational level (11, 76).

CONCLUSION

The TurkSch study enabled us to build a comprehensive, high-quality data set on the multidimensional etiological and phenomenological nature of the extended and transdiagnostic psychosis phenotypes. The results of this study, demonstrating associations between baseline variables and noncontact/refusal in the longitudinal arm, are of importance in planning future

TABLE 1 | Association between the two types of attrition (refusal/noncontact) and baseline characteristics.

	Respondents	Noncontact		Refusal		Overall effect on attrition	
	n (%)	**n (%)**	**RRR (95%CI)**	**n (%)**	**RRR (95%CI)**	**χ^2 (df)**	**Cramer's *V***
Sociodemographic characteristics							
Sex							
Male	890 (52.9)	612 (36.4)	1	181 (10.7)	1	3.0 (2)	0.03
Female	1,295 (55.6)	796 (34.2)	0.89 (0.78–1.02)	237 (10.2)	0.89 (0.72–1.11)		
Age							
46–65	699 (49.0)	591 (41.5)	1	135 (9.5)	1	48.9 (4)**	0.08
31–45	750 (54.7)	468 (34.1)	1.31** (1.10–1.56)	153 (11.2)	1.15 (0.89–1.49)		
15–30	736 (60.6)	349 (28.7)	1.78** (1.50–2.10)	130 (10.7)	1.09 (0.84–1.42)		
Educational level							
Basic	966 (58.2)	543 (32.7)	1	151 (9.1)	1	17.9 (4)**	0.05
High school	360 (52.0)	261 (37.7)	1.28** (1.06–1.56)	71 (10.3)	1.26 (0.92–1.71)		
University	859 (51.8)	604 (36.4)	1.25** (1.07–1.45)	196 (11.8)	1.45** (1.15–.1.83)		
Marital status							
Married	1,638 (57.7)	912 (32.1)	1	289 (10.2)	1	52.0 (4)**	0.08
Single	458 (47.0)	400 (41.0)	1.56** (1.34–1.83)	117 (12.0)	1.44** (1.14–1.83)		
Divorced	89 (45.2)	96 (48.7)	1.93** (1.43–2.61)	12 (6.1)	0.76 (0.41–1.41)		
Ethnicity							
Turkish	1,840 (54.6)	1,175 (34.8)	1	358 (10.6)	1	1.2 (2)	0.02
Non-Turkish	345 (54.1)	233 (36.5)	1.05 (0.88–1.26)	60 (9.4)	0.89 (0.66–1.20)		
Employment status							
In paid employment	1,020 (54.4)	639 (34.0)	1	218 (11.6)	1	5.9 (2)	0.04
Not in paid employment	1,165 (54.6)	769 (36.0)	1.05 (0.92–1.21)	200 (9.4)	0.80* (0.65–0.99)		
Health insurance							
Present	1,949 (55.6)	1,174 (33.5)	1	381 (10.9)	1	32.3 (2)**	0.09
Absent	236 (46.6)	234 (46.1)	1.64** (1.35–2.00)	37 (7.3)	0.80 (0.55–1.15)		
Socioeconomic status							
1	466 (54.4)	280 (32.7)	1	111 (12.9)	1	17.6 (6)**	0.05
2	585 (54.1)	382 (35.3)	1.08 (0.89–1.32)	115 (10.6)	0.82 (0.61–1.10)		
3	352 (51.9)	246 (36.3)	1.16 (0.93–1.44)	80 (11.8)	0.95 (0.69–1.10)		
4	782 (56.1)	500 (35.9)	1.06 (0.88–1.28)	112 (8.0)	0.60** (0.45–0.80)		
Baseline clinical characteristics							
Mental help seeking							
None	1,872 (53.7)	1,242 (35.7)	1	370 (10.6)	1	5.9 (2)	0.04
Yes	313 (59.4)	166 (31.5)	0.79* (0.65–0.97)	48 (9.1)	0.77 (0.56–1.07)		
Baseline mood disorder							
None	1,783 (54.2)	1,143 (34.8)	1	363 (11.0)	1	7.5 (2)*	0.04
Yes	402 (55.7)	265 (36.7)	1.02 (0.86–1.22)	55 (7.6)	0.67** (0.49–0.91)		
Baseline Cannabis							
None	2,161 (54.7)	1,377 (34.8)	1	413 (10.5)	1	7.4 (2)*	0.04
>5 times	24 (40.0)	31 (51.7)	2.02** (1.18–3.46)	5 (8.3)	1.09 (0.41–2.87)		
Baseline alcohol							
<Once a week	2,055 (55.2)	1,285 (34.5)	1	383 (10.3)	1	11.0 (2)**	0.05
At least once a week	130 (45.1)	123 (42.7)	1.51** (1.17–1.95)	35 (12.2)	1.44 (0.97–2.13)		
Traumatic event							
None	1,383 (53.5)	903 (34.9)	1	298 (11.5)	1	9.9 (2)**	0.05
At least one	802 (56.2)	505 (35.4)	0.96 (0.83–1.10)	120 (8.4)	0.69** (0.55–0.87)		
Family history							
None or unknown	1,903 (54.0)	1,245 (35.3)	1	379 (10.7)	1	9.4 (4)	0.03
Common mental disorder	222 (56.8)	132 (33.8)	0.90 (0.72–1.14)	37 (9.5)	0.83 (0.58–1.20)		
Severe mental illness	60 (64.5)	31 (33.3)	0.78 (0.50–1.22)	2 (2.2)	0.16* (0.04–0.68)		

(*Continued*)

TABLE 1 | Continued

	Respondents	Noncontact		Refusal		Overall effect on attrition	
	n (%)	n (%)	RRR (95%CI)	n (%)	RRR (95%CI)	χ^2 (df)	Cramer's *V*
Extended psychosis phenotype							
No PE	1,616 (54.2)	1,026 (34.4)	1	338 (11.4)	1	19.1 (6)**	0.05
Subclinical PE	334 (53.4)	238 (38.1)	1.12 (0.93–1.34)	53 (8.5)	0.75 (0.55–1.03)		
Clinical PE	187 (60.9)	99 (32.3)	0.83 (0.64–1.07)	21 (6.8)	0.53** (0.33–0.85)		
Psychotic disorder	48 (48.5)	45 (45.4)	1.47 (0.97–2.23)	6 (6.1)	0.59 (0.25–1.40)		

**p<0.05, **p<0.01*

Abbreviations: CI, confidence interval; RRR, relative risk ratio

representative community-based cohort studies in psychiatry. It may be important to make a special effort to include, in future studies, individuals who are younger, more educated, nonmarried, with regular alcohol and *Cannabis* use, and no history of mental health problems.

DATA AVAILABILITY

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

This study was carried out in accordance with the Declaration of Helsinki. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Institutional Ethics Review Board of Ege University.

AUTHOR CONTRIBUTIONS

UK, TB, HE, MD, BK, FÖ, HO, KA, and JO conceived and designed the study. UK, TB, HE, BK, and KA collected and collated the data, which were analyzed by UK with supervision from TB, MD, and JO. FO and HO carried out the genetic analysis. All authors were involved in the interpretation of the data. UK drafted the article, which was reviewed and revised by all authors. All authors approved the final version of the manuscript and agreed their accountability in ensuring that any questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

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Low Self-Esteem and Its Association With Anxiety, Depression, and Suicidal Ideation in Vietnamese Secondary School Students: A Cross-Sectional Study

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Background: There is a correlation between self-esteem in adolescents and risks and protective factors for their health and welfare. The study was conducted to determine the prevalence of low self-esteem and sociodemographic features related to anxiety, depression, educational stress, and suicidal ideation in secondary school students in Vietnam.

Methods: A cross-sectional design was employed for this study with participation of 1,149 students in Cantho City in Vietnam. A structured questionnaire was applied to ask about self-esteem, depression, anxiety, educational stress, and suicidal ideation.

Results: Students with low self-esteem were detected at a prevalence of 19.4%. High educational stress and physical and emotional abuse by parents or other adults in the household were major risk factors correlated to low self-esteem, while a protective factor for low self-esteem was attending supplementary classes. An association among lower self-esteem and increased anxiety, depression, and suicidal ideation was detected.

Conclusions: Self-esteem is associated with anxiety, depression, and academic stress, which significantly affect students' quality of life and links to suicidal ideation. These results therefore suggested the need for a school-based or web-based provision aimed at proactively increasing students' self-esteem and skills for dealing with academic stress.

Keywords: self-esteem, anxiety, depression, suicide, adolescents, Vietnam

INTRODUCTION

It is well recognised that adolescence is one of the most rapid phases of human development (1). It is characterised by a rapid physical, social, and cognitive growth, as well as changes in self-esteem. Self-esteem is reported to have a significant impact on important life outcomes including health and social outcomes during adolescence and adulthood. For example, there is a clear connection between higher self-esteem and positive outcomes, such as occupational success, better social relationships, a sense of well-being, and positive perceptions by peers, academic achievement, and good coping skills (2, 3). Low self-esteem is causally related to depression, substance abuse, antisocial behaviour, and suicide (4–6). The literature demonstrates that social functioning, such as acceptance by peers, is lower in children with low self-esteem (7).

Extensive research has explored risk and protective factors related to low self-esteem development during adolescence. Reported risk factors include being a girl (6, 8, 9), the family's low socioeconomic status (10), parents' education level, family eligibility for public assistance, eligibility for free or reduced-cost school meals, the parents' employment status (11), and school performance and grades (6, 12), as well as obesity (13).

Academic achievement is known to be affected by self-esteem, while self-esteem may also influence academic achievement (7). High self-esteem is reported as an important predictive factor for students' academic achievement (14). Another study found that while high self-esteem resulted in many positive outcomes and benefits, it did not necessarily lead to good school performance (15). On the other hand, adolescents with poor academic results did not always have low general self-esteem (16).

There is an association between low self-esteem and negative outcomes for young people's behavioural and mental health problems, including health-compromising behaviours such as substance abuse, early sexual activity, and eating problems (17). A longitudinal study among a large sample of young New Zealanders found, however, that while low self-esteem significantly predicted adolescent eating and other health-compromising behaviours, it was not related to substance abuse and early sexual activity (18). With regard to mental health, a correlation has been detected between low self-esteem and depression (19, 20), anxiety (10, 21), and adolescents' suicidal ideation and attempts (18, 22).

Reports during the past few years indicate that there is a strong relationship between academic pressure and stress, depression, anxiety, low self-esteem, and suicidal ideation among students in secondary or high school and in young adults (23–25). A study describing perceptions about mental illness in Hue in Vietnam noted that "studying or thinking too much" is a cause of mental health problems (26). In Vietnamese culture, the pressure from parents and schools might be expected to have an unintended effect, leading to lower self-esteem and associated outcomes seen elsewhere among high school students. There are as yet no reports of systematic studies on this issue in Vietnam, and there are few reports of descriptive or analytical research into adolescent self-esteem.

This is particularly relevant since we found high levels of depression, anxiety, and suicidal ideation among secondary school students in Vietnam [Nguyen, D. T., Dedding, C., Pham, T. T., Wright, P., & Bunders, J. (25)]. This article reports on a study that aimed to determine (1) the prevalence of low self-esteem; (2) the characteristics associated with low self-esteem; and (3) the relationships among self-esteem and anxiety, depression, educational stress, and suicidal ideation in secondary school students. We hypothesised that low self-esteem would be associated with a greater risk of poor mental health status.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional study design was used to recruit 1,260 students at three secondary schools in urban and suburban areas in Cantho City in Vietnam. All data were collected during the first academic semester, from September to December 2011. A more detailed description of the sampling and its participants can be found elsewhere (25).

Measures

All participants were invited to provide information by self-reporting using a questionnaire. This was done after class or at home anonymously to minimise potential reporting bias and to keep information confidential. The detailed components of the questionnaire have been described elsewhere (25).

The 10-item Rosenberg Self-esteem Scale (21, 27) was used to assess global self-esteem, with higher scores indicating more positive self-regard. Each item asked for response using a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree). The scale is generally reliable, with test–retest correlations value between 0.82 and 0.88 (21). The Cronbach α of the scale in the present study was 0.77. The scale ranges from 0 to 30: a score greater than 25 suggests high self-esteem; scores between 15 and 25 are considered to be within normal range, whereas scores less than 15 suggest low self-esteem (Morris Rosenberg).

A more detailed method description on employing the Center for Epidemiology Studies Depression (CES-D), the anxiety scale, and the Educational Stress Scale for Adolescents for this study is available (25).

To address the issue of suicidal ideation, additional questions on whether the student had ever seriously considered suicide or made a suicide plan used a 3-point scale (never, sometimes, and often). A yes/no question was also used to identify students who had attempted suicide.

To define risks and protective factors, we explore the variables listed in **Table 1**, including mother's education, physical and emotional abuse by parents or other adults in the household or school, academic performance in the last semester, educational stress, attendance at a supplementary class, and use of personal tutor. The data collected using the questionnaire is available in the **Supplementary Data File**.

Data Analysis

Demographic data were analysed descriptively to determine basic characteristics of the sample population and presented as means ± standard deviations (SD). The χ^2 test was used to assess the significance of differences in the distribution of participants by selected sociodemographic characteristics, risk factors, and outcome variables. Associations between low self-esteem and family characteristics, educational stress, and academic achievement were explored by logistic regression analysis. Univariate independent predictors of low self-esteem with $p < 0.10$ were entered in a multivariate logistic regression model, and the backward Wald method was applied to study their influence on the presence of low self-esteem. Univariate logistical analyses were also applied to determine the relationships among low self-esteem and

TABLE 1 | Frequencies and percentages (%) of sociodemographic variables of participants by self-esteem status.

	Total		Low self-esteem		Normal self-esteem		*p*[a]
	n	%	N	%	n	%	
Total screened	1,149	100	223	19.4	926	80.6	
Age, mean (SD)	16.05		16.01		16.05		0.290
Sex			223		926		0.085
Male	419	36.5	72	32.3	347	37.5	
Female	730	63.5	151	67.7	579	62.5	
Family economic status	1,148		222		926		<0.001
Comfortable living and wealthy	664	57.8	100	45,0	564	60,9	
Very poor/poor/earn just enough to live	484	42.2	122	55.0	362	39.1	
Academic performance in the last semester	1,130		219		911		0.003
Excellent/good	225	19.9	33	15.1	192	21.1	
Fairly good/average	854	75.6	168	76.7	686	75.3	
Below average/very poor	51	4.5	18	8.2	33	3.6	
Personal tutor	1,142		223		919		0.004
Yes	928	81.3	166	74.4	762	82.9	
No	214	18.7	57	25.6	157	17.1	
Attendance at supplementary class	1,146		223		923		0.003
None	323	28.2	81	36.3	242	26.2	
One or more	823	71.8	142	63.7	681	73.8	
Mother's education	1,143		222		921		0.001
> Primary school	1,006	88.0	181	81.5	825	89.6	
<= Primary school	137	12.0	41	18.5	96	10.4	

[a] *χ^2 was used to compare differences in percentages; t test was used to compare differences in means.*

anxiety, depression, and suicidal ideation, and Pearson correlation coefficients were used to measure the correlations among these. All analyses were carried out using a significance level of 5%, and all tests were 2-sided. The 95% confidence intervals (CIs) of odds ratios (ORs) were also calculated. All analyses were analysed by using SPSS Inc, Chicago, the United States of America version 16.0.

RESULTS

Demographics

Of the 1,260 students invited to participate, 111 (7.3%) were excluded from analysis because they did not adequately complete the questionnaire; for example, they did not provide answers to five or more items in the CES-D. The final sample comprised 1,149 senior high school students with a mean age of 16.1 years. Participating students were fairly evenly distributed in terms of sex: 36.5% males and 63.5% females (**Table 1**). This proportion also reflects the proportion of males and females enrolled in the classes studied. Students' participation from each grade (10–12) did not significantly differ, at around 33% each. Ninety-five percent of students were ethnically Kinh; other ethnic groups included Hoa and Khmer. This sample was in line with the school population in this area.

Prevalence of Low Self-Esteem and Characteristics Associated With Self-Esteem

The mean self-esteem score was 17.56 on a scale of 0 to 30. The scores for boys and girls were similar (17.83 vs. 17.40; $t = 1.720$; $p = 0.086$). Based on all scores, nearly a fifth (19.4%) of the respondents reported low self-esteem according to Rosenberg's criteria, with scores below 15 (**Table 1**). Based on univariate logistic regression analysis, among six investigated variables, two variables "having a personal tutor" and "attendance at supplementary class" were negatively associated with the risk of low self-esteem, while the other variables were positively correlated to low self-esteem (**Table 2**). Students were likely to show lower self-esteem, when their mother's education was at primary level or below, when they were often physically or emotionally abused at home or at school, when they had below average/very poor academic performance in the last semester, or when they reported experiencing high educational stress.

In the multivariate regression analysis (with the backward Wald method), not accounting for effect modification, four variables remained correlated to low self-esteem, either in a negative or positive direction. Having a personal tutor and academic performance in the last semester were no longer a significant association, but attending supplementary classes still remained a protective factor for low self-esteem (reduced OR of 43% compared with students not attending) (**Table 2**).Study results that were considerably positively associated to low self-esteem were medium and high educational stress (ORs = 2.25 and 4.02, respectively).

Relationships Between Self-Esteem and Anxiety, Depression, and Educational Stress, and Suicidal Ideation

As shown in **Table 3**, four variables—self-esteem, anxiety, depression, and educational stress—were related to each other. Self-esteem was negatively correlated to anxiety, depression, and educational stress, while educational stress was positively correlated to anxiety and depression.

One of the purposes of the study was to identify the impact of self-esteem on mental health problems. The results of univariate logistics

TABLE 2 | Factors associated with low self-esteem: multivariate logistic regression analyses.

Factors	Low self-esteem n (%)	Normal self-esteem n (%)	Univariate logistic regression		Multivariate logistic regression	
			OR (95% CI)	*p-value*	*OR (95% CI)*	*p-value*
Mother's education (n = 1,143)						
> Primary school	181 (18.0)	825 (82.0)	Reference	–	Reference	–
≤ Primary school	41 (29.9)	96 (90.1)	**1.95 (1.31–2.90)**	0.001	**1.68 (1.09–2.69)**	**0.018**
Physical and emotional abuse by parents or other adults in the household (n = 1,146)						
No	192 (18.5)	845 (81.5)	Reference	–	Reference	–
Yes	31 (28.4)	78 (71.6)	**1.75 (1.12–2.73)**	0.013	**1.76 (1.10–2.82)**	**0.018**
Academic performance in the last semester (n = 1,130)						
Excellent/good	33 (14.7)	192 (85.3)	Reference	–	Reference	–
Fairly good/average	168 (19.7)	686 (80.3)	1.43 (0.95–2.14)	0.087	–	–
Below average/very poor	18 (35.5)	33 (64.7)	**3.17 (1.60–6.28)**	0.001	–	–
Educational stress (n = 1,142)						
Low stress	31 (9.4)	300 (90.6)	Reference	–	Reference	–
Medium stress	68 (17.4)	322 (82.6)	**2.04 (1.30–3.22)**	**0.002**	**2.25 (1.41–3.58)**	**0.001**
High stress	121 (28.7)	300 (71.3)	**3.90 (2.55–5.98)**	**<0.001**	**4.02 (2.60–6.23)**	**<0.001**
Personal tutor (n = 1,142)						
Yes	166 (17.9)	762 (82.1)	Reference	–	–	–
No	57 (26.6)	157 (73.4)	**1,67 (1,18–2,36)**	**0,004**	–	–
Attendance at supplementary class (n = 1,146)						
None	81 (25.1)	242 (74.9)	Reference	–	Reference	–
One or more	142 (17.3)	681 (82.7)	**0.62 (0.46–0.85)**	**0.003**	**0.57 (0.41–0.79)**	**0.001**
Total (n = 1149)	**223 (19.4)**	**926 (80.6)**				

Significance levels were at the 0.05 level (2-tailed).

TABLE 3 | Pearson correlations between self-esteem, anxiety, depression, and educational stress.

	Self-esteem	Anxiety	Depression	Educational stress
Self-esteem	–			
Anxiety	–0.219	–		
Depression	–0.426	0.422	–	
Educational stress	–0.249	0.318	0.308	–

All correlations are significant at the 0.001 level (2-tailed).

indicate that low self-esteem contributed significantly to anxiety, depression, and suicide among adolescents. Compared to students who reported normal self-esteem, the students who reported low self-esteem had twice the odds of having anxiety symptoms [20.3% (187/921) vs. 34.2% (76/222)] (OR = 2.04; 95% CI OR = 1.48–2.82, $p < 0.001$), nearly six times the odds of being at risk of depression (CES-D score of ≥16) (74.0% vs. 33.2%), (OR = 5.72; 95% CI OR = 4.11–7.59), four times the odds of having depressive symptoms (CES-D scores of > 21) (50.7% vs. 19.8%) (OR = 4.16; 95% CI OR = 3.06–5.66), and nearly five times the odds of having depression (CES-D score of > 25) (41.7% vs. 13.0%), (OR = 4.79; 95% CI OR = 3.45 – 6.65). Students with low self-esteem also were significantly more likely to have considered or attempted suicide (**Table 4**).

DISCUSSION

We investigated the prevalence of low self-esteem among secondary school students, the characteristics associated with low self-esteem, and the relationships among self-esteem and anxiety, depression, and suicide. Nearly 20% of the students had low self-esteem, with no difference between girls and boys. These results are in line with some previous studies (12, 28), but inconsistent with others (6, 12). Cultural and social differences in the study populations could explain some of the differences.

Reasons for Having a Higher Prevalence of Low Self-Esteem Among Females

The results of this study cannot provide precise reasons for the higher prevalence of lower self-esteem among females; however, a number of possible causes for the gender differences are worth discussing. Although gender equality has improved in recent years in Vietnam and is clearly legislated, gender issues within the family and society remain a challenge for most Vietnamese, who are strongly influenced by traditional culture and custom (29). There is an association between female gender and emotionally unstable personality (30, 31). As a result, women are more prone to develop emotionally unstable personality (e.g. borderline personality) (32). Thus, females' self-esteem may be more likely to fluctuate, depending on how they themselves or others, especially their parents, evaluate their achievements.

A high prevalence of low self-esteem among the secondary school students should be considered as an important mental health problem not only by parents, school teachers, and principals but also by policy makers in the education and health sectors in Vietnam. In fact, health care related to psychological disorders has not received adequate consideration yet in Vietnam (33). Therefore, it is important to take mental health care into account when developing a policy framework to improve general school health services, such as directive no. 23/2006/CT-TTg on having well-equipped and professionally qualified health officers in schools (34), and Decision No. 401/2009/QD-TTg, which approved the

TABLE 4 | Associations between self-esteem and suicidal ideation.

	Yes n (%)	No n (%)	OR (CI 95%)	p
Seriously considered suicide	***301 (26.3)***	***844 (73.7)***		
Normal self-esteem	213 (23.1)	710 (76.9)	–	–
Low self-esteem	88 (39.6)	134 (60.4)	**2.19 (1.61–2.98)**	**<0.001**
Planning suicide	***142 (12.8)***	***965 (87.2)***		
Normal self-esteem	96 (10.8)	792 (89.2)	–	–
Low self-esteem	46 (21.0)	173 (79.0)	**2.19 (1.49–3.23)**	**<0.001**
Attempted suicide	***44 (3.9)***	***1,095 (96.1)***		
Normal self-esteem	28 (3.1)	884 (96.9)	–	–
Low self-esteem	16 (7.3)	204 (92.7)	**2.48 (1.32–4.66)**	**0.004**

Significance levels were at the 0.05 level (2-tailed).

program "Preventing and combatting diseases in educational establishments belonging to the national education system" (35).

Our results confirm the findings of previous studies (6, 10, 25, 36), namely, that family characteristics, including mother's low educational level and physical and emotional abuse by parents or other adults in the household, were associated with low levels of self-esteem. In addition, educational characteristics such as the school environment, academic performance, and high educational stress were strongly associated with self-esteem. These findings are consistent with results of other studies, for example, by Pullmann & Allik (16), which found that parents have a great deal of influence on their children's psychological development, including on the relationships outside the family environment (6, 10). Students who attended one or more supplementary classes appeared to be at lower risk of having poor self-esteem. In Vietnam, these students are usually from a family with a higher socioeconomic status. Attending supplementary class may reduce the stress of workload and academic pressure for those students. It would be useful to confirm this with further studies in the Vietnamese context, but this kind of support is unlikely to be available to families who cannot pay for it.

Low self-esteem in the adolescents in Cantho City was associated with poor academic performance. Aryana (14) reported that high self-esteem among preuniversity students was an important factor in predicting high academic achievement. Our finding also highlights that self-esteem plays an important role in predicting academic achievement, although a cross-sectional study design is unable to demonstrate causality; a prospective study to identify causality of the low self-esteem would be appropriate in future research.

With regard to mental health, the results of Pearson correlation analysis showed that self-esteem was negatively correlated to anxiety, depression, and educational stress, while the results of univariate logistic regression illustrated that low self-esteem contributed to a high risk of anxiety, depression, and suicidal ideation. These results are comparable to others showing that low self-esteem was associated with depression (19, 20, 37) and identifying a relationship between self-esteem and anxiety (10, 21), as well as a relationship between low self-esteem and suicidal ideation and suicide attempts among adolescents (18, 22). Screening for low self-esteem in adolescents is a possible strategy to help identify secondary school students at risk of anxiety, depression, and suicide. In addition, our previous study (25) showed an association between mental health problems and academic pressure, resulting from an overloaded curriculum and pressure from teachers and parents to succeed. There is clearly a need to reduce mental health problems among today's secondary school students in Vietnam. The development of a website to provide psychoeducation designed to meet the needs of young Vietnamese and of school-based counselling services for students, possibly by collaborating with volunteers from the Youth Union, the largest sociopolitical Vietnamese youth organization, at local universities, teachers, and parents, will be explored as one of the solutions (36). Around 66.3% of young Vietnamese downloaded the mobile health applications for disease prevention (38). Nevertheless, one of the challenges to using a digital health intervention is that young Vietnamese with a higher perceived stress level were significantly less likely to use such interventions (39).

Study Limitations

One limitation of this study relates to the sample and its generalizability. Although the distribution of girls and boys reflected the true/current situation in the classes selected, the sample was from only three schools in urban and suburban Cantho. Another limitation concerns the study design, which specified collection of data from adolescents by self-reporting using standardised questionnaires. The respondents' personality and identity development are still incomplete, which could result in fluctuating self-perceptions (9) and thus unreliable reporting. Also, the exploration of potential causes of low self-esteem as self-reported by subjects was not included in the survey. Another limitation is that the cross-sectional study design does not permit detection of links between covariates; longitudinal studies on this topic are still needed. Finally, the self-esteem, anxiety, and CES-D scales, like other screening instruments, cannot be viewed as diagnostic tools, but only as screening tests to identify members of groups at risk for these conditions. The results tell us how the students perceive their health but are not in themselves evidence of medical concerns. Moreover, there is no assessment of stress coping and stress levels, obesity (40), and chronic medical illness (e.g. asthma) (41), which may confound and influence anxiety, depression, and suicidal ideations. Finally, in a cross-sectional study, the cause–effect relationship cannot be measured; that requires a longitudinal cohort or a randomised controlled study.

CONCLUSIONS

Our research suggested that self-esteem is correlated to anxiety, depression, and academic stress, which significantly affects students' quality of life and is linked to suicidal ideation. The results therefore suggest the need for a school-based or web-based provision of information or services aimed at proactively increasing students' self-esteem and skills for dealing with academic stress.

ETHICS STATEMENT

The study was approved by the Scientific and Training Committees of Cantho University of Medicine and Pharmacy. Written informed consent for participation was obtained from students' parents or legal guardians before data collection.

AUTHOR CONTRIBUTIONS

A first draft of the manuscript was prepared by DN under the guidance of CD. All authors contributed to the final manuscript version. DN, JB, and CD jointly generated the research idea and the study design. DN, CD, TP, and EW contributed to the survey tools. DN and TP coordinated the surveys and data collection in the field. DN, TP, CD, and EW carried out data analysis.

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SUPPLEMENTARY MATERIAL

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What Does Personality Mean in the Context of Mental Health? A Topic Modeling Approach Based on Abstracts Published in Pubmed Over the Last 5 Years

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Personality disorders (PDs) are one of the major problems for the organization of public health systems. Deepening the link between personality traits and psychopathological drifts, it seems increasingly essential for the often dramatic repercussions that PDs have on social contexts. Some of these disorders, such as borderline PD, antisocial PD, in their most tragic expression, are the basis of problems related to crime, sexual violence, abuse, and mistreatment of minors. Many authors propose a dimensional classification of personality pathology, which has received empirical support from numerous studies over the last 20 years based on more robust theoretical principles than those applied to current nosography. The present study investigates the nature of the research carried out in the last years on the personality in the clinical field exploring the contents of current research on personality relapses, evaluating, on the one hand, the emerging areas of greatest interest and others, those that they stopped generating sufficient motivations in scholars. This study evaluates text patterns regarding how the terms "personality" and "mental health" are used in titles and abstracts published in PubMed in the last 5 years. We use a topic analysis: Latent Dirichlet Allocation that expresses every report as a probabilistic distribution of latent topics that are represented as a probabilistic distribution of words. A total of 7,572 abstracts (from 2012 to 2017) were retrieved from PubMed for the query on "mental health" and "personality." The study found 30 topics organized in eight hierarchical clusters that describe the type of current research carried out on personality and its clinical relapse. The hierarchical clusters latent themes were the

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following: social dimensions, clinical aspects, biological issues, clinical history of PD, internalization and externalization symptoms, impulsive behaviors, comorbidities, criminal behaviors. The results indicate that the concept of personality is associated with a wide range of conditions. The study of personality and mental health still proceeds, mainly, according to a practical-clinical approach; too little moves, however, according to an innovative research approach, but the work shows the common commitment of scholars to a new way of dealing with the study of personality.

Keywords: personality disorder, mental health, personality trait, topic analysis, mental health promotion

INTRODUCTION

Interactions between people are governed by patterns of bio-psycho-social processes whose purpose is the adaptation to the environment and which together describe what we define as personality. All people are characterized by their own way of relating to others and adapting to different contexts. This peculiarity can be studied by describing analytically every single function involved. As a set, these functions are routinely referred to as "personality traits." The models that describe the phenomenology and the evolution are many and often antithetical to each other. This has hitherto prevented the emergence of exhaustive theories capable of systematizing the amount of empirical data resulting from clinical observation and research (1). According to the *DSM-5* a personality disorder (PD) is a constant pattern of inner experience and behavior that deviates markedly from the expectations of the culture to which the individual belongs. These behavioral patterns are substantiated in interpersonal conflicts, difficulties in creating and maintaining intimate relationships, and establishing and achieving reasonable existential goals (2, 3).

In the current state of knowledge, the relationship between personality constructs and PD is a crucial point for understanding the topic. In the international scientific community, a general agreement has been reached in terms of the definition. WHO defines personality as a structured mode of thought, feeling, and behavior—expression of constitutional factors, development, and social experience (*ICD-10*)—which characterizes the type of adaptation and lifestyle of a subject (4). Personality traits describe adaptive behaviors that in their most extreme expressions configure the substrate on which a PD is grafted. For example, low levels of a personality trait defined as "amiability" represent the condition for the development of hostile behavior in social relationships, which is a real symptom of a PD. This does not mean that the presence of idiosyncratic and dysfunctional personality traits is always the cause of clinical problems. Additionally, these traits are present in every person and it is not easy to recognize the point in which they evolve in a PD, generating suffering in the subject and in the people with whom they come into contact. In fact, the transition of personality traits from healthy to dysfunctional and, finally, to pathological is partly determined by context variables and by the demands that the subjects receive in the environments in which they move. These variables are difficult to identify and to correlate with the individual's answers (5–7). Although clinicians and most scholars currently believe that PD symptoms are the product of extreme expression of healthy personality traits (both in the sense of deficiency and excessive manifestation), there is still no satisfactory theoretical model that can support this point of view. The classification of PDs is still based, with small variations, on the categorical model proposed in 1980 by the *DSM-IIIR*.

The categorical classification currently officially included in the *DSM-5* present 10 PDs divided into three clusters. It presents three (among others) repeatedly emphasized limits in the scientific literature: (a) the considerable internal heterogeneity of each disorder, (b) the arbitrariness of the diagnostic threshold chosen for each disorder, (c) the overlap between the different diagnostic categories. These limits make the categorical model of PDs scarcely credible and lead us to believe that they represent artificial constructs with a limited scientific support (8).

This has led many authors to propose a dimensional classification of personality pathology, which has received empirical support from numerous studies over the last 20 years based on more robust theoretical principles than those applied to current nosography. During the development of the fifth edition of the DSM, an attempt was made to find a new classification of mixed (dimensional and categorical) PDs based on the five-factor personality model. This attempt was accepted only by a minority of the authors and is today relegated to the appendix of the manual. However, it clearly expresses the emerging position that could solve many current nosographic and conceptual problems concerning PDs: the pathology of personality consists on the presence of extreme manifestations of the traits of the normal personality (9). In the categorical formulation (i.e. with arbitrary threshold criteria), PDs are diagnosed in 30% of those affected by a psychiatric disorder of which they significantly influence both the course and the prognosis. In the light of current literature, dysfunctional personality traits that do not exceed the categorical diagnostic threshold are likely to be present in all subjects with a psychiatric disorder and may be considered as risk or protection factors for the onset and course of mental illness and suicide (10). The presence of dysfunctional personality traits can both act as a trigger for the development of anxiety, depressive, or psychotic symptoms and make it difficult to manage the symptoms of psychiatric disorders. Moreover, because PDs are strongly sensitive to environmental and relational contexts, it could be easier to insert the dimensions of the personality within relational dynamics and to recognize the environmental variables at the origin of the pathological processes (11).

If this new concept of PD was able to overcome the tests of reliability and validity, it would have enormous clinical repercussions and could represent a real revolution for treatment protocols and prevention. In fact currently the therapeutic approach to PDs fails to take into adequate consideration the environmental and relational dimensions in which the individual is immersed and which have a heavy effect on the development and progression of character pathologies. This lack reduces the efficiency of therapeutic programs. The more flexible and focused nature of the dimensional concepts of the personality, in their extreme expressions, can be effectively related, more than categorical disorders, to the specific environmental conditions and relational dynamics of the patients.

The present study investigates the nature of research conducted in recent years regarding personality in the clinical field and is inscribed in a crucial season of the flowering of new approaches to the study of personality, which appear increasingly indispensable for the often dramatic repercussions that the PD have on public mental health and social welfare. In their most tragic expression, such disorders are, in fact, the basis of problems related to crime, sexual violence, abuse, and mistreatment of minors. It is now well established that a PD frequently causes serious relational and family problems, dependence on alcohol or drugs, situations of social withdrawal, loneliness, and depression (12).

In recent years, scientific production on the clinical relapses of personality traits have produced datasets of extreme interest and has expanded the semantic field of personality-related concepts. Both on the theoretical and the empirical elaboration side, it is increasingly necessary to recognize the new emerging connections (13).

A useful approach to achieve this goal is to evaluate the frequency of scientific terms used and the way in which the same terms are aggregated in research on personality and its disorders. The statistical technique used in the present study Latent Dirichlet Allocation allows to grasp and explain, through a hierarchical system of aggregation of words, the latent conceptual connections between the terms that occur with greater frequency in the most recent scientific productions (14).

In the study carried out, the scientific terms present in the abstracts published on Medline in the last 5 years were analyzed, with the aim of exploring the contents of current research on the personality relapses, assessing on the one hand the emerging areas of greatest interest and other, those that have stopped generating sufficient motivations in scholars. The study also intends to highlight the presence of new concepts or new connections between the concepts that can bring greater descriptive abilities, thus overcoming the classical definitions of the relationships between personality and mental disorders, finally entering the decisive field of action for the themes in the object.

METHODS

Study Design

This study evaluates text patterns regarding how the terms “personality” and “mental health” are used in titles and abstracts published in PubMed. These patterns were also investigated in relation to their trends over time analysis, as well as in a hierarchical cluster analysis to examine how they were related to each other. This study is described in accordance with the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines STROBE statement includes a checklist of 32 items recommended for inclusion in the reporting of observational studies. These items are related to aspects of study design, sample selection, data collection, analysis, and potential bias (15).

Dataset

We explored and recovered title and abstracts from publications regarding personality and mental health using the PubMed bibliographic database (https://www.ncbi.nlm.nih.gov/pubmed/). PubMed research (PubMed is a medical database) was carried out with the aim of limiting the sample to studies related to the use of the concept of PDs in the medical field.

Our search involved the following approach: (mental disorders[MH] OR mental health[MH]) AND personality [Title/Abstract] AND (“2012/12/31”[Date - Entrez]: “2017/12/31”[Date - Entrez]) AND has abstract [text]. The textual content was then pre-processed *via* the elimination of frequently- used words (for example, background, aim, method, result, conclusion, information, frequent, context, among, suggest, although, possible, include, article, however, also, shown, later, main, view, within, and find), numerical digits, stop- words, and punctuations. Pre-processing was conducted through the tm (textual content mining) package used in the statistical language R (16).

Topic Modeling

We made use of a topic model, aimed at determining the main principal subjects from the group of texts for this analysis. Put simply, probabilistic topic models summarize an abstract. A key aspect of developing a topic model is determining the degree of similarity among concepts, defined as a connection between different words that goes beyond its usage and meaning (17). Previous publications have investigated its use in a variety of scenarios, for example in a bibliographic analysis to explore FDA priorities or to evaluate the association between concept in medical notes and genetic information (18). A topic is operationally defined as the likelihood of a group of words being aggregated over a set of phrases. Specifically, we used the Latent Dirichlet Allocation (LDA), a hierarchical Bayesian method where every report may be expressed as a probabilistic distribution of latent topics, and also where a latent topic is represented as a probabilistic distribution of words (14, 19). Topic-file distributions, word-topic distributions, and hidden parameters are then estimated by the model through the observed words and documents. The LDA (Latent Dirichlet Allocation) model is a generative model, used in the study of natural language, which allows to extract topics from a set of source documents and to provide a logical explanation on the similarity of single parts of the documents. The generative process of Latent Dirichlet Allocation is based on the analysis of data contained in the text (text mining). Word combinations are considered to be random variables.

As a first step, we defined the number of topics through a cross-validation method. Briefly, our dataset was split into five randomly selected subsets, where the first subset is used for model training, while the remaining four are used for validation, i.e. using a holdout mechanism. Different numbers of topics extracted from the dataset are extracted and then tested in relation to the perplexity statistical parameter comparing the training value against the holdout samples (20–23). In information theory, perplexity is a measurement of how well a probability distribution or probability model predicts a sample. It may be used to compare probability models. A low perplexity indicates the probability distribution is good at predicting the sample (24).

Topic Visualization

We recorded the most frequent words in each topic as a representation of subject matter underlying that topic. Word clouds were then included to represent the central concepts for each topic, with font sizes being proportional to the frequency of a word being inside a topic.

Dynamics and Hierarchical Clustering of Topics

We conducted a trend analysis of each topic's proportion from 2012 to 2017, also implementing a hierarchical clustering analysis based on a topic-word matrix to explore the association among topics.

Hierarchical clustering is a clustering approach that aims to build a hierarchy of clusters. it can be used to examine data distributions and to observe the characteristics of each distribution The matrix content was transformed into a binary format denoting the presence or absence of a word in a given topic. The average linkage method was applied to generate the cluster dendrogram (25), an Euclidean distance being the basis for assessing the range of topics.

RESULTS

A total of 7,572 abstracts published from 2012 to 2017 were retrieved from PubMed for the query on “mental health” and “personality.”

Figure 1 displays the range of the number of topics that can identify the theme comprising a document. The different metrics used in topic estimation agree that a minimum of 20 topics is optimal to discover relevant information from the mental health and personality dataset.

5-fold cross-validation of topic models was performed to choose the optimal number of topics that can describe latent themes in the corpus. The cross-validation was carried out for multiple values (10 to 100) of k = number of topics. These results are largely consistent with measures of topic- estimation in **Figure 1**, with a distinct flattening of the cross- validated perplexity metric somewhere between 30 and 60 topics. A lower number of topics results in lumping of distinct themes into a single topic, whereas, increasing the number of topics beyond the 60- topic threshold would result in a recurrence of similar themes distributed across multiple topics. Therefore, we selected an LDA with 30 topics to discover relevant issues in our document corpus.

The topics extracted from LDA with k = 30 topics were named T1-T30. Distribution of assigned topics for the documents is demonstrated in **Figure 2**.

The 10 most probable words for each topic are listed in **Table 1** and the corresponding word cloud for each topic is shown in **Figure 3**. A larger size and a more intense color of a particular word implies that it was used more frequently in the corpus of the document being

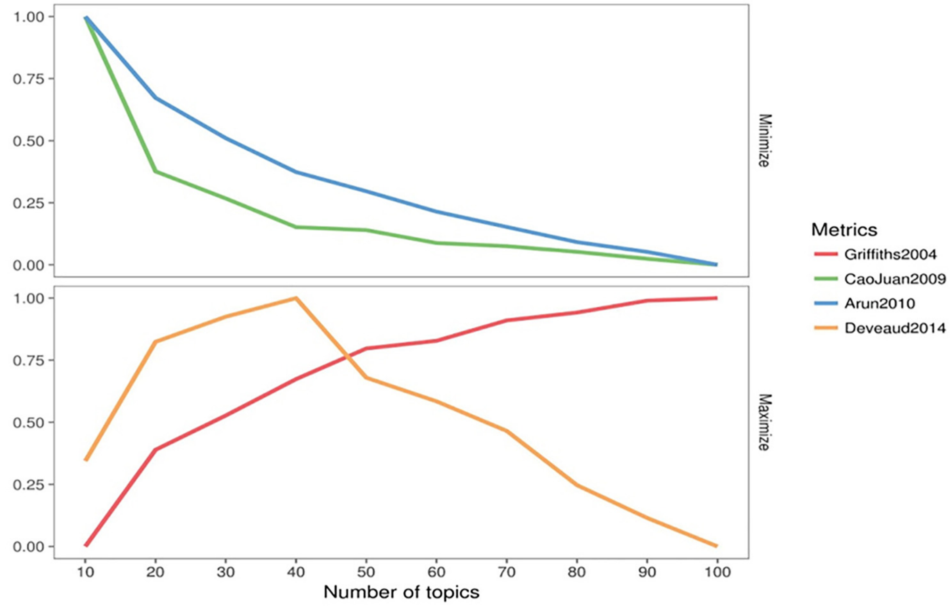

FIGURE 1 | Fit calculation plot of 4 measures/metrics for a range of topics.

analyzed. For example, in topic T1, the word "schizophrenia" presented the largest frequency and can thus be prominently visualized in the word cloud for T1. These words are represented by their roots. For example, depress can represent instances of words such as depression, depressed, or depressing. Words with high probabilities in each LDA-derived topic were selected to express the dataset.

The results indicate that the concept of personality is associated with a wide range of conditions. For example, Topic 1 associated personality with schizophrenia-related conditions, involving issues related to the personality of these patients, how psychotherapy might be related to personality, schizotypical personality and its relation to personality, and the relationship between personality and schizophrenia.

Figure 2 demonstrates the five most popular topics among the corpus dataset where T16 pertains to "interventional therapy," T14 to "substance abuse," T28 to "research instrument," T6 to "antisocial personality disorder," and T25 to "psychiatric assessment." Along with themes above, the LDA algorithm with 30 topics also uncovered issues such as eating disorder, suicidal behavior, and emotional behavior (26, 27). Finally, our results indicate that many studies focus on assessment, symptoms, and treatment of mental health along with factors including physical, mental, social, genetic, and behavioral aspects, all of which can be influenced by an individual's personality.

Word clouds are a visual representation displaying the content of topics, also demonstrating term frequency count of

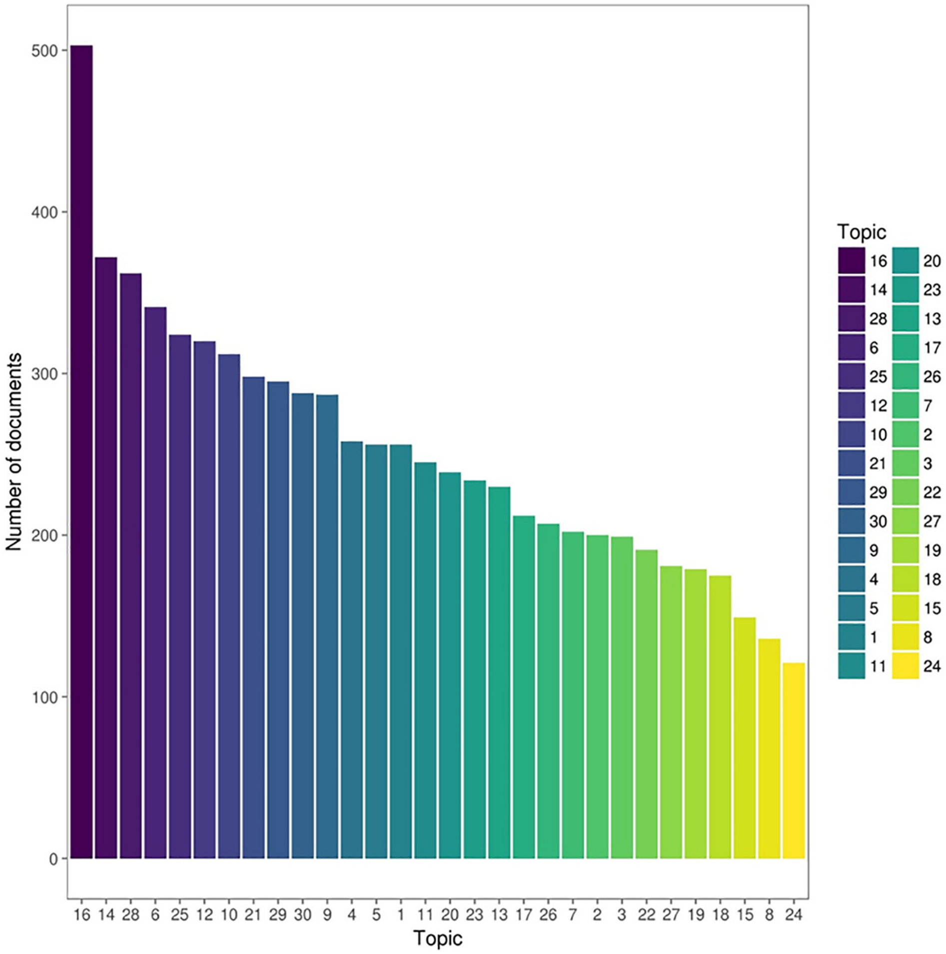

FIGURE 2 | Distributions of assigned top topics with the highest probability for documents abstracts. **1** schizophrenia, obsessions and personality - **2** anxious-depressive disease and personality - **3** qualitative assessment of personality pathology - **4** personality and quality of life - **5** eating behavior disorders and personality - **6** personality and violent behavior - **7** personality impacts on the evolution of psychiatric pathology - **8** gender differences in personality – **9** socialand health needs of psychiatricpatients - **10** impact of genetic factors on temperament and character - **11** suicidal behaviors and personality pathologies - **12** personality and chronic or degenerative pathologies - **13** personality functioning and post-traumatic disorder, dissociative states - **14** personality functioning and substance use disorders - **15** relevance of measurement systems - **16** effectiveness of clinical treatments and psychotherapy - **17** cognitive functions and personality pathologies - **18** therapeutic change and psychotherapy - **19** research methods - **20** categorical classification of psychiatric disorders -**21** biological mechanisms of personality pathologies - **22** relational dimension of the personality - **23** psychological invariants common to the population - **24** scientific evidence in personality theories - **25** categorical psychiatric evaluation model - **26** personality-related concepts and psychic distress - **27** borderline personality disorder - **28** quantitative evaluation tools of personality - **29** personality structure and individual development - **30** emotional affective dimension in personality structure.

TABLE 1 | The most probable words in the topics of lda with k topics.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6	Term 7	Term 8	Term 9	Term 10
Topic 1	schizophrenia	symptom	psychot	schizotyp	relat	compuls	Psychosi	schizotypi	spectrum	obsess
Topic 2	depress	anxieti	symptom	sever	major	mood	Associ	episod	mdd	scale
Topic 3	person	psychopatholog	type	Cluster	differ	gambl	Profil	use	analysi	extern
Topic 4	mental	health	life	qualiti	care	ill	Popul	physic	age	general
Topic 5	impuls	eat	associ	sleep	student	behavior	Bodi	relat	bing	negat
Topic 6	aggress	antisoci	psychopathi	sexual	behavior	offend	Psychopath	violenc	male	aspd
Topic 7	patient	psychiatr	adhd	clinic	hospit	medic	inpati	outpati	treatment	admiss
Topic 8	group	differ	signific	score	control	higher	compar	subject	women	person
Topic 9	peopl	work	person	servic	need	experi	Help	practic	clinician	manag
Topic 10	associ	genet	tempera	gene	factor	influenc	person	dimens	charact	traitf
Topic 11	risk	suicid	factor	associ	attempt	increas	High	adjust	regress	ratio
Topic 12	diseas	dementia	chang	case	syndrom	present	patient	clinic	caus	diagnosi
Topic 13	stress	psycholog	ptsd	Symptom	trauma	distress	traumat	clinic	caus	diagnosi
Topic 14	use	alcohol	substanc	Depend	drug	addict	associ	abus	drink	seek
Topic 15	self	report	behavior	Measur	particip	rate	Individu	harm	assess	level
Topic 16	treatment	effect	therapi	Outcom	improv	intervent	psychotherapi	trial	random	base
Topic 17	function	cognit	impair	Perform	test	deficit	Dysfunct	memori	attent	control
Topic 18	year	predict	follow	time	predictor	outcom	chang	term	baselin	long
Topic 19	person	model	approach	Develop	theori	integr	Understand	ident	concept	system
Topic 20	disord	psychiatr	comorbid	Person	bipolar	preval	diagnos	interview	axi	diagnosi
Topic 21	activ	brain	region	correl	healthi	function	imag	connect	control	network
Topic 22	social	relationship	person	interperson	mediat	role	relat	problem	effect	attach
Topic 23	trait	person	neurotic	associ	factor	model	Extravers	measur	Conscien	inventori
Topic 24	evid	recent	systemat	relev	specif	current	need	futur	identifi	limit
Topic 25	person	dsm	disord	Diagnost	patholog	model	clinic	pds	criteria	assess
Topic 26	quot	pain	case	often	belief	suffer	mani	describ	aspect	consid
Topic 27	bpd	borderlin	disord	erson	emot	symptom	affect	regul	dysregul	anger
Topic 28	scale	valid	measur	assess	use	score	Invention	factor	item	correl
Topic 29	adolesc	childhood	parent	age	earli	children	adult	famili	develop	young
Topic 30	emot	negat	respons	affect	posit	process	relat	express	sensit	reactiv

words in each topic. **Figure 3** demonstrates word clouds for all 30 topics. A larger size of a particular word implies that it was used more frequently in the corpus of the document being analyzed. For example, in topic T1, the word "schizophrenia" presented the largest frequency and can thus be prominently visualized in the word cloud for T1. Similarly, the latent theme for topic 27 is "personality disorder" which can be inferred based on its word cloud with word the "bpd (borderline personality disorder)" having the largest frequency.

The cluster dendrogram of all 30 topics is demonstrated in **Figure 4**. The topics referring to related themes are clustered together since they are represented by similar words. The similarity of two topics is indicated by the point on the vertical axis where their lines are joined; the lower that point is, the more similar the topics are. For example, two of the topics suggested by the dendrogram to be relatively similar are T4 and T11, T4 focusing on "mental health care" and T11 relates to "suicidal behavior." Even though these topics do not share any common words among their top 10 most probable words (**Table 1**) the connection between them is immediately evident since suicidal behavior and mental health are intimately connected. Similarly, T23 and T28 are closely connected as they pertain to personality assessment" and "research instrument," respectively.

Analysis of the Emerged Clusters

In the dendrogram based on the hierarchical analysis of the clusters, eight topic groups are identified. Analyzing it from a psychopathological and clinical point of view, we have identified a latent theme for each of these groups. Below we will discuss the meaning of the latent themes of the eight clusters and the internal articulation of the topics that belong to them.

The first group of topics brings together the social dimensions of personality pathology and the suffering associated with this type of pathology with theoretical models, methods of scientific investigation and psychiatric diagnostic methods. The latent tract to these topics appears to be the "conceptual revision of the personality in its pathological expressions" with the need to review the current nosography and base it on a solid empirical basis, drawing on the theoretical models of personality (28). In detail:

- Topic 9 focuses on the social and health needs of psychiatric patients and it is present in almost 300 different research works.
- In topic 19 the central concept concerns research methods; this topic is present in little more than 180 studies.
- Topic 24 is present in little more than 120 studies and expresses the need for solid scientific evidence in personality theories.
- Topic 25 is present in more than 300 studies and expresses interest in redefining and overcoming the categorical psychiatric evaluation model.
- Topic 26 is present in approximately 220 studies and clarify how personality- related concepts are present in many studies of psychic distress.

The second group deals with research on mainly clinical aspects such as hospitalization, history of illness, outpatient

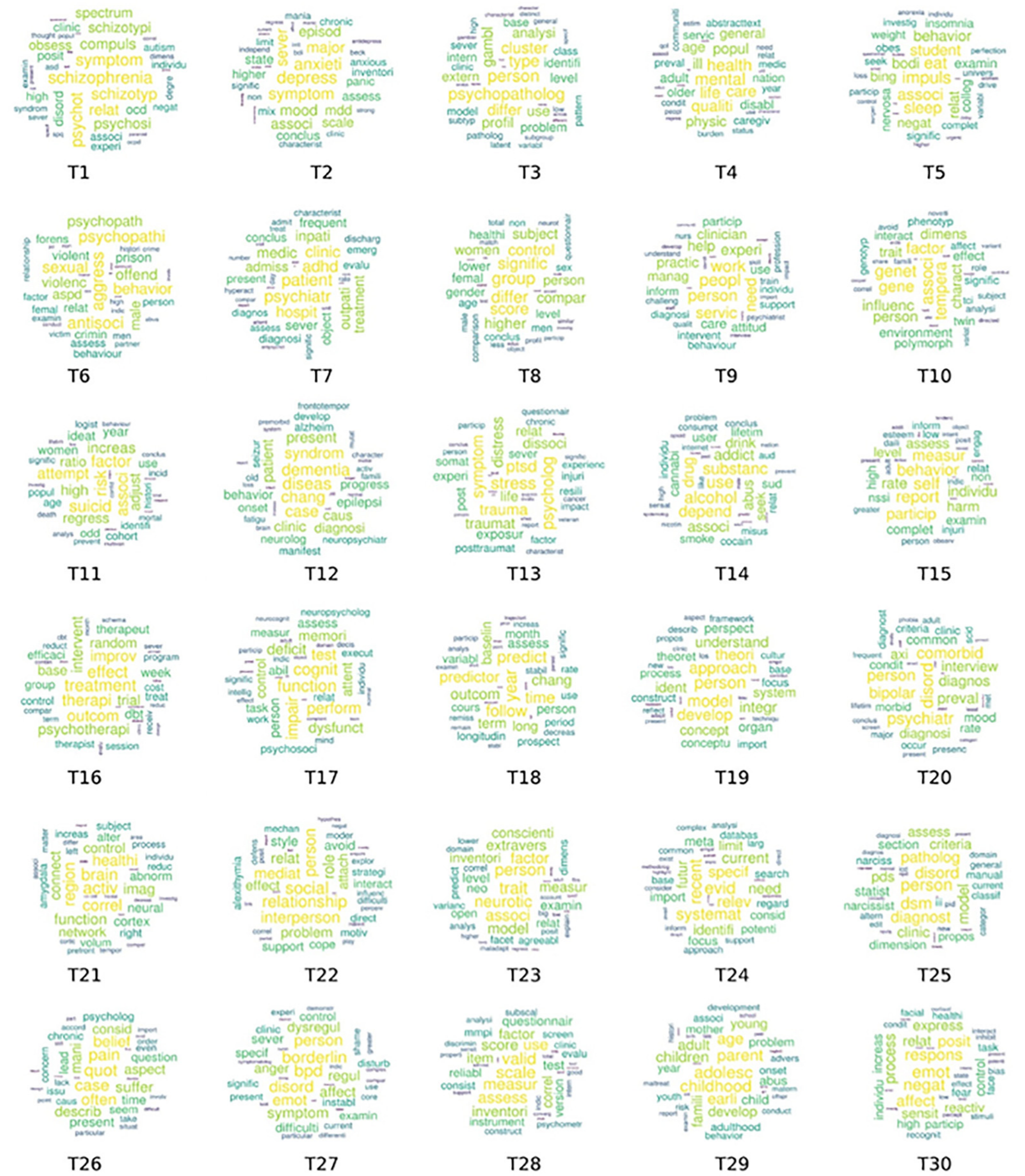

FIGURE 3 | Word clouds for all topics, where asterisk represents any combination. **1** schizophrenia, obsessions and personality - **2** anxious-depressive disease and personality - **3** qualitative assessment of personality pathology - **4** personality and quality of life - **5** eating behavior disorders and personality - **6** personality and violent behavior - **7** personality impacts on the evolution of psychiatric pathology - **8** gender differences in personality - **9** social and health needs of psychiatric patients - **10** impact of genetic factors on temperament and character - **11** suicidal behaviors and personality pathologies - **12** personality and chronic or degenerative pathologies - **13** personality functioning and post-traumatic disorder, dissociative states - **14** personality functioning and substance use disorders - **15** relevance of measurement systems - **16** effectiveness of clinical treatments and psychotherapy - **17** cognitive functions and personality pathologies - **18** therapeutic change and psychotherapy - **19** research methods - **20** categorical classification of psychiatric disorders -**21** biological mechanisms of personality pathologies - **22** relational dimension of the personality - **23** psychological invariants common to the population - **24** scientific evidence in personality theories - **25** categorical psychiatric evaluation model - **26** personality-related concepts and psychic distress - **27** borderline personality disorder - **28** quantitative evaluation tools of personality - **29** personality structure and individual development - **30** emotional affective dimension in personality structure.

treatment, health care, type of therapeutic interventions, efficacy of treatments, co-morbidities, and diagnostic methods. The latent trait underlying these topics is the "clinical practice" that has a profound need to clarify effective methods of intervention, to provide itself with consistently organized health structures and effective and valid diagnostic methods (29). In detail:

- Topic 7 clarify the existence of an area of research that points out the need to investigate how the personality impacts on the evolution of psychiatric pathology in general and on health care. This topic is present in about 200 studies.
- Topic 16 is present in more than 500 studies and expresses the interest of the scientific community on the effectiveness of

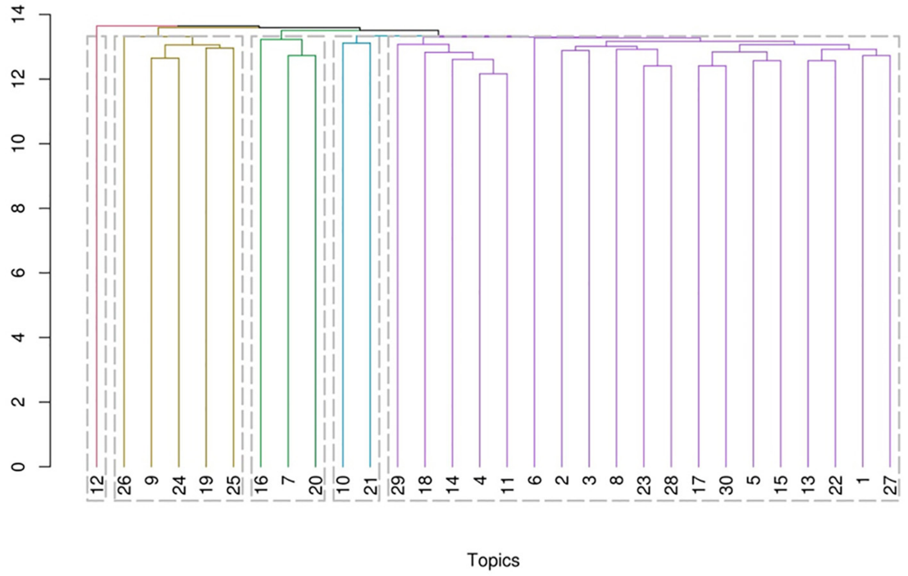

FIGURE 4 | The cluster dendrogram of topics based on hierarchical cluster analysis. **1** schizophrenia, obsessions and personality - **2** anxious-depressive disease and personality - **3** qualitative assessment of personality pathology - **4** personality and quality of life - **5** eating behavior disorders and personality - **6** personality and violent behavior - **7** personality impacts on the evolution of psychiatric pathology - **8** gender differences in personality – **9** socialand health needs of psychiatricpatients - **10** impact of genetic factors on temperament and character - **11** suicidal behaviors and personality pathologies - **12** personality and chronic or degenerative pathologies - **13** personality functioning and post-traumatic disorder, dissociative states - **14** personality functioning and substance use disorders - **15** relevance of measurement systems - **16** effectiveness of clinical treatments and psychotherapy - **17** cognitive functions and personality pathologies - **18** therapeutic change and psychotherapy - **19** research methods - **20** categorical classification of psychiatric disorders -**21** biological mechanisms of personality pathologies - **22** relational dimension of the personality - **23** psychological invariants common to the population - **24** scientific evidence in personality theories - **25** categorical psychiatric evaluation model - **26** personality-related concepts and psychic distress - **27** borderline personality disorder - **28** quantitative evaluation tools of personality - **29** personality structure and individual development - **30** emotional affective dimension in personality structure.

clinical treatments and in particular on the effectiveness of psychotherapy.
- Topic 20 is present in approximately 250 studies and expresses interest in the study of categorical classification of psychiatric disorders.

The third group is composed of about 600 studies containing biological investigation topics on the personality in both the genetic and neurobiological sense. "The biological cause of personality disorders" is the latent concept of these two topics. This is a field of preferential investigation for diseases such as antisocial disorder (due to heredity), borderline disorder (due to its relation with impulse control), and schizoid, schizotypal, and paranoid disorders (due to the relation with psychosis that scholars implicitly attribute to these disorders) (30). In detail:

- The topic 10 describes the researchers' interest regarding the impact of genetic factors on temperament and character, in dimensional terms, and in personality traits. The relevance of this topic is shown by fact that it is present in more than 300 studies.
- Topic 21 is present in less than 300 studies and expresses interest in the biological mechanisms of personality pathologies (26).

In the fourth group of topics the study of the evolution of personality development, the analysis of the clinical history of PD and the response to psychotherapeutic treatments are linked to investigations on the management systems of mental health of the territory, on suicidal risk and on the use of drugs. The latent concept that holds these topics together is the knowledge of the process of development and of the "natural history of the pathology of personality." For this purpose it is necessary to activate follow-up studies to evaluate the autobiographical antecedents and proximal causes of PD, to know clearly the relationship between PD and substance abuse disorders, the risk of suicide, and the quality of life of the subjects (31). In detail:

- Topic 4 refers to the importance of personality as a key element for the quality of life of patients. It is present of this in over 250 studies in the last 5 years.
- Topic 11 focuses on the importance of research on suicidal behaviors as consequences of personality pathologies. This topic is present in approximately 300 studies.
- The topic 14 expresses the high degree of co-morbidity between personality functioning and substance use disorders. This theme is found in over 350 works.
- Topic 18 is present in approximately 180 studies and expresses interest in longitudinal follow-up studies useful for evaluating change following psychotherapy.

- Topic 29 is present in about 300 studies and expresses the interest for the definition of the emergence of the personality structure, in the course of individual development.

The fifth group of topics relates the pathological personality and individual and gender differences with the manifestation of pathologies from internalization and externalization. This personality approach is a factorial type and uses quantitative and semi-quantitative evaluation tools. The latent concept underlying this group of topics is the attempt to distinguish typical symptoms from "manifestations associated with personality pathologies." In this way, the interrelationship between psychometric studies that produce tools in order to assess the factorial structure of the personality and studies that investigate the relationship between pathological personality and disorders that frequently associate with it without constituting the skeleton, is clarified (32). In detail:

- Topic 2 is present in about 200 studies and highlights the interest of research for the connection between anxious-depressive disease and personality.
- Topic 3 expresses the interest both for the qualitative assessment of personality pathology and for categorical nosography. This topic is present in more than 250 works.
- Topic 8 express the interest in the effects of gender differences on personality. this topic is found in just over 100 studies.
- Topic 23 is present in approximately 220 studies and expresses interest for psychological invariants common to a large portion of the population.
- In the topic 28 is present in about 350 studies and expresses the interest for the study of personality through the use of quantitative evaluation tools.

The sixth group of topics describes personality in relation to impulsive issues, eating disorders, neuropsychological functions, and affective aspects. Also in this case the investigations are accompanied by the critical analysis of the psychological reagents. The latent concept to this group is the "neuropsychological dimension of the pathology of personality" that seems to explain the impulsive pathology and the control of emotions and of the alimentary behavior as a consequence of the deficit of the executive functions (33–35). The neuropsychological dimension also links to this group of topics the studies that describe the tools for assessing frontal functions (36, 37). In detail:

- Topic 5 highlights the interest for eating behavior disorders and other forms of impulsive behaviors that mainly involve young people and find their valid explanation in the concept of personality. Attention to the afore mentioned topic produced about 250 studies.
- Topic 15 identifies the relevance, in the context of the study of personality, of the subject of measurement systems. This topic has involved over 150 research studies in the last 5 years.
- Topic 17 topic is present in more than 200 studies and expresses interest in the efficiency of higher cognitive functions in personality pathologies.
- Topic 30 is present in approximately 290 studies and expresses its interest in the emotional affective dimension in the individual's personality structure.

In the seventh group of topics, the personality is investigated in association with psychosis and post-traumatic disorders. This association stems from the implicit assumption that personality determines the terrain on which the traumatic and relational events are grafted that are capable of producing the pathology insofar as they encounter a scarcely resilient constitutional terrain. The latent concept of this group is the vision of the psychic disorder in which the personality structure and a traumatic event (usually relational) interact in generating the pathology. In this sense post- traumatic disorders, psychotic conditions and PDs are united in a single vision of the genesis of mental illness (38). In detail:

- Topic 1 is present in more than 200 studies and expresses a line of research that connects schizophrenia and obsessions to personality.
- The topic 13 expresses the link between personality functioning and stress, trauma, post-traumatic disorder, and dissociative states. Interest in this theme can be found in over 200 works.
- Topic 22 is present in more than 180 studies and expresses the interest for the study of the relational dimension of the personality.
- Topic 27 is present in little more than 180 studies and expresses the interest for borderline PD aimed at establishing characteristics and symptomatology. In the eighth group we introduced two non-related topics that concern violent criminal behaviors and chronic and degenerative organic diseases and their evolution; these are strong themes for their social and health burden for which personality is considered a determining element (39). In detail:
- Topic 6 describes the different forms of manifestation of the aggression and the close relationship between the personality and violent antisocial behavior, gender violence and sexual violence. Interest in this topic became evident in about 350 studies
- Topic 12 focuses on role of personality in the socio-health management subjects suffering from chronic or degenerative pathologies. Over 300 studies in the last 5 years have dealt with this topic.

DISCUSSION AND CONCLUSION

The scientific panorama concerning the study of the impact of personality on mental health is clearly described in the eight clusters identified by their latent themes. We report them below: the conceptual revision of the personality (more or less 1,120 studies); clinical practice (more or less 950 studies); the biological cause of PDs (more or less 600 studies); development process and natural history of personality pathology (more or less 1,380 studies); typical symptoms and clinical manifestations associated with personality pathologies (more or less 1,120 studies); neuropsychological dimension of personality pathology (more or less 840 studies); diathesis-stress theory as an etiopathogenetic model of psychic disorders (more or less 760 studies); social and health impact of personality pathology (more or less 650 studies). The central element from the current scientific discussion is the evolution of the concept of PD from a categorical construct to a dimensional construct that identifies the personality structure not as a disease but as a psychic phenotype produced by the interaction between organism and environment (40). From the analysis of the data it is clear that the interest and the concrete commitment in the scientific community have been more focused, in the last five years, on the concrete aspects related to personality and mental health, in adherence with the recommendations of the international organization, with the most urgent needs expressed by patients, their families, and society as a whole (41).

Below we highlight the shortcomings that emerged in our review, indicating the desirable future directions.

In the studies that focus on the relationship between personality and mental health, the dimensional theme is still scarcely present, while the exhortation of the clinical weight of the categorical nosography prevails. The evidence-based approach, built on randomized double-blind trials, was unsatisfactory for many of the most widespread psychotherapeutic approaches and did not compensate for the expectations that had been invested in it (42). In our opinion, this area of investigation requires a commitment much greater than that described by our study, which has identified, in topic 24, just over 120 studies in this regard.

Research on the biological and genetic dimensions of personality pathologies is currently restricted to two major themes, impulsive and violent behavior, and PDs of the psychotic spectrum. The analysis of the relationship between temperament, neurobiology, and genetics in its widest sense would fill a scientifically unacceptable vacuum in the knowledge of this central aspect of human beings (37, 43, 44).

Although attention to PDs has been important for at least 50 years, there are very few follow-up studies regarding the development and evolution of PDs.

Essential questions about the differences in the pathology of personality related to gender, age, ethnic origin, relational antecedents (excluding childhood traumas that explain only part of the phenomenon), and prognosis remain unanswered (45).

The typical clinical manifestations of personality pathology, unlike what we can imagine, are not yet well defined and are often confused with some associated manifestations such as the use of drugs. For example, we still have little data on the sexual functioning or on the basic biological rhythms of individuals with PD and we do not know how to enter this information in the clinical picture and in the treatment plan (46).

A more innovative stimulus is given by research concerning neuropsychological functions and personality pathology, currently related to borderline, antisocial, and schizoid disorders. Although the link between the activity of the frontal lobes and the social functioning of the subjects has always been known, a systematic interest in this study has only been displayed in the last ten years. There is a risk in this research approach that sometimes seems to give in to the reductionist temptation to place the personality in the frontal lobes (47).

The etiology of PD is perhaps the least known element of the subject in question. The study of the interactive dynamics between body, cultural, and relational dimension is in an embryonic phase. This area of investigation needs a powerful effort to get out of the narrow scope of the stress-diathesis model and open up to circular and complex etiopathogenetic models (48).

It highlights, again, an approach to the study of personality that makes extensive use of the categorical nosography of *DSM-5* (49). The study of personality and mental health still proceeds, prevalently, according to a practical- clinical approach; too little is still moving, instead, according to an innovative research approach, but the topics analyzed to bring to light the common commitment of scholars to a new way of approaching the study of personality that can clarify a theme so complex and still lacking substantial scientific evidence.

Finally, it is necessary to recognize how the personality or some specific pathological traits underlie phenomena of social relevance (such as intra- family violence or juvenile crime), health (such as the surge of chronic cardio and cerebrovascular diseases), and dysregulation (such as affect and behavioral and interpersonal dysregulation) and at the time complicate the management of these same phenomena (50, 51). In this area, scientific research requires multidisciplinary models that integrate sociology, sports medicine, nutritional medicine, and AI technology tools (52, 53).

To implement the change in the scientific paradigm of reference, the only viable path seems to be that of a widespread and serious commitment in scientific research, as a strategy for achieving greater knowledge that can also be translated into plans for preventive interventions for personal wellbeing and public mental health.

It is hoped that the study approach presented in this review will be reflected in the academic as well as clinical, to spread a different way of conceptualizing and treating the personality according to the already existing dimensional method.

This study has the following limitations. This study did not include exploratory factor analysis (54), global network analysis (55), and number of papers by countries (56–60) as reported in other studies of LDA (61–64).

AUTHOR CONTRIBUTIONS

RS, GM, and NM conceived and designed the investigation. RS, DI, LuM, EM, FS, and VR conceived, designed, and performed analysis and interpretation of data. RP, VM, AM, LaM, SD'O, EG, AC, and CS worked on analysis and interpretation of the data. RS, GM, and MC drafted the manuscript. NM and MM reviewed the manuscript. All authors approved the final manuscript.

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Suicide, Stigma, and Utilizing Social Media Platforms to Gauge Public Perceptions

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Introduction: Suicide, a multifaceted complex outcome that arises from numerous biopsychosocial factors, is a public health concern which is growing in numbers despite valiant prevention efforts. There is still a lot of stigma surrounding suicide that needs to be addressed. Social media is growing exponentially and there are many forums where suicidality is being discussed. As a result, we conducted a brief survey on the perception of suicide on social media platforms of Facebook and Reddit in order to gather more information.

Results: Of the 152 respondents, 86% believed that suicide is preventable, and 72.85% believed that it is a person's right to die by suicide. About a third (31.79%) had lost someone close to them to suicide. Respondents who did not think suicide was preventable also viewed suicide as either a sign of strength (42.86%) or a revenge act (33.3%). Those who responded that someone close to them died by suicide believed that the media glorified suicide (56.25%) while those who did not lose someone, did not believe that (66.99%). Women (61%) found social media to be a good platform for people to ask for help while men did not (60.61%).

Conclusions: We utilized the social media platforms to gauge the perception of suicide and found among the sample of mostly young white respondents, suicide is not stigmatized, most believed it is preventable and it is a person's right to die by suicide. While women found social media to be a good platform to ask for support, men did not, which is in keeping with the trend that women tend to be more willing to seek help. A third of the group had lost someone close to them to suicide which was the national average, who tended to believe that media glorified suicide. Limitations of this study include the fact that those who respond voluntarily to a survey likely have an interest in the topic, and this might not accurately reflect the public opinion and attitude.

Keywords: suicide, stigma, social media, perceptions, attitudes, survey

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INTRODUCTION

Suicide is a global phenomenon, with nearly 800,000 people dying each year and 79% occurring in low- and middle-income countries (1). In 2017, it is estimated that 47,173 Americans died by suicide, and around 1.4 million attempted suicide; men died by suicide 3.54 times more often than women and firearms accounted for 50.57% of all suicide deaths (2).

Society has viewed suicide through the lens of religion and politics, and this has historically undergone dramatic changes over time and has shifted public opinion in myriad ways. In the ancient Roman times, self-killing was recognized with the Epicureans acknowledging man's fundamental right to dispose of his own life (3). In 1897, Durkheim published "Suicide: a study in Sociology" (4), which highlighted social conditions that were identified to be the root cause and shifted the focus away from suicide being considered an irredeemable sin or moral crime. Durkheim proposed four different types of suicide based on social integration and regulation: egoistic suicide, altruistic suicide, anomic suicide, and fatalistic suicide (5–7). In the past several decades, the pendulum has swung in the direction of a psychological model, with the assumption that nearly all suicides result from mental illness, although this is often diagnosed after the fact from psychological autopsies (8). Joiner's interpersonal theory of suicide has received widespread recognition (9, 10), but has faced some criticism (11). Across different cultures, suicide has also been perceived to result from overwork or occupational burnout (12, 13), serious financial problems (14), lack of support (15), problems with mandatory military service (16), interpersonal relationship problems (17), and marital problems (18). Suicide has been associated with the stress of dealing with chronic medical conditions such as epilepsy and stroke (19, 20). It is helpful to gauge the attitude of the public towards suicide, its acceptance, condemnation, and preventability, and whether it can be encompassed in the argument for a person's right to die.

Suicide has been steeped in stigma for centuries, and there are vestigial remnants of it to this day, mostly perceived by suicide loss survivors and suicide attempt survivors. Stigma is an overarching term that contains three elements: problems of knowledge (ignorance), attitudes (prejudice), and behavior (discrimination) (21). Public stigma is a social phenomenon that refers to the negative attitudes held by members of the public about people with devalued characteristics, while self-stigma is the internalization of these public attitudes which leads to numerous negative consequences (22). Stigma and discrimination in relation to diseases such as HIV can be measured through many dimensions such as blame/judgment (23), shame (24), discrimination in different settings, and disclosure of disease status (25). Common stereotypes about suicide are emotional weakness, attention-seeking, selfishness, malingering, and immorality. Those who attempt or die by suicide are perceived to be impious (not praying enough, believing enough), or as betraying family and others through cowardly or selfish acts (26). In addition to stigma, survivors' guilt often compounds and reinforces the stigma either imagined or accurately perceived by bereaved friends, family, and therapists (27).

With the rapid technological advances, the use of social media platforms has grown exponentially, with Facebook, one of the platforms used for the study, having 2.41 billion active users per month (28). Social media platforms can offer several potential benefits in suicide prevention, which include reach, accessibility, nonjudgmental, and anonymous nature of such platforms. However, these platforms have also been used to spread information about how to die by suicide, help make cyber-suicide pacts with strangers, and access unregulated online pharmacies. There is the increased risk of media contagion effect, with peer pressure from online forums that are pro-suicide, swaying those who are ambivalent (29). Accessing and utilizing social media platforms can be a huge boon in prevention of suicide, but there are numerous ethical and methodological challenges surrounding privacy in the digital age for clinicians and researchers (30, 31).

Our study aims to understand the attitudes of social media platform users towards suicide, whether there are correlations with demographics and other factors such as having lost someone close to suicide, and whether these platforms for help.

MATERIALS AND METHODS

Questionnaire Development

To better understand how the public views suicide in this current era, we developed a short survey to gauge the perception of suicide in social media. While at least 14 suicidal attitude scales have been identified, there is no gold standard due to the implicit instability of attitudes, the varied dimensions of attitudes, and a lack of consensus (32). The Attitudes Towards Suicide (ATTS) questionnaire has 34 items which include 10 dimensions (suicide as a right – justifiability, incomprehensibility, noncommunication, preventability, tabooing, normal-common, suicide as a process, relation caused, preparedness to prevent, and resignation) (32). The Suicide Opinion Questionnaire (SOQ) has 100 items assessing different domains, with a 5-factor structure: 1) Acceptability (AC): "People with incurable diseases should be allowed to commit suicide in a dignified manner."; 2) Perceived Factual Knowledge (PFK): "Most suicides are triggered by arguments with a spouse.", willingness to accept as fact inaccurate statements related to suicide; 3) Social Disintegration (SD): "The higher incidence of suicide is because of the lesser influence of religion."; 4) Personal Defect (PD): "I would feel ashamed if a member of my family committed suicide."; and 5) Emotional Perturbation (EP): "Most persons who attempt suicide are lonely or depressed.", that those who attempt or die by suicide are emotionally distraught or mentally ill (33). The Cognition Concerning Suicide Scale (CCSS) has three factors, the first is "right to commit suicide" (CCSS-S 8 items: "Everyone has the right to commit suicide", "When life consists of intolerable pain, suicide is an acceptable alternative"); the second factor is "interpersonal gesture" (CCSS-I 5 items: "I sometimes think suicide would be a good way to pay back people who have hurt me deeply", "Taking my own life would be a good way to make sure I would always be remembered"); the third factor is "resiliency" (CCSS-R 4 items: "Even if I got tired of living, I would not seriously consider suicide as a way out", "Even if I could not be with the person I love, I would not consider suicide") (34).

The brief questionnaire we developed had items under these main themes: 1. Demographic characteristics (age, gender, ethnicity, level of education) 2. Had someone close to you died of suicide 3. Whether media glorifies suicide 4. Whether social media is viewed as a platform where people could get help and support 5. Whether suicide is preventable 6. Does one have the right to die by suicide 6. Attitudes about suicide that explore themes of acceptability, interpersonal gesture, stigma (it is a way to escape, a selfish act, a selfless act, an impulsive act, a sign of weakness of cowardice, a sign of strength or courage, a revenge act). In an effort to keep the survey short, we did not request open and qualitative comments (35).

Administration

The survey was posted on social media forums of Facebook and Reddit, explaining the purpose of the survey and requesting voluntary and anonymous participation. There was no advertisement and no incentive for participation. Participants were advised to not take the survey if it in anyway was a trigger or caused discomfort. The survey included information about The National Suicide Prevention Lifeline which offers great resources, and can be reached by calling 1-800-273-TALK(8255) or chat online at https://suicidepreventionlifeline.org/. No personal data, such as name or other identifying information, were collected in the survey as a measure to protect personal information. The data was stored in a database accessed through surveymonkey, which was continuously updated during the survey period. Ethical approval was sought from the Institutional Review Board (IRB) of Stanford University School of Medicine, and all procedures were in compliance with the Helsinki Declaration. The first page of the survey asked for participants' consent, and if the person consented, they were taken to a second page with 10 questions with the focus on perceptions regarding suicide. It was posted on social media for one week and we had a total of 152 respondents.

Data Analysis

Descriptive statistics of the characteristics of respondents and responses to each question are presented. Analyses are based on the respondents' age, ethnicity, level of education, and their perception of suicide. Normally distributed data were presented as a mean and 95% confidence interval (95% CI) or standard deviation (SD), whereas data that were not normally distributed were presented as a median and 95% CI. Analysis of Variance (ANOVA) was conducted separately to assess the individual associations of demographics, with attitudes towards suicide. Variables that were found to be significantly associated in the univariate ANOVA ($p < 0.05$) were highlighted.

RESULTS

The respondents were predominantly white (59.33%) and in the age group 18–29 (63.09%). The majority had attended college: 23.84% had some college, 27.15% had a bachelor's degree, and 25.17% had a graduate degree. 31.79% reported that someone close to them had died of suicide. Most (59.60%) did not believe that the media glorifies death by suicide and 52.03% of the respondents believed that social media is a good platform for people to ask for help. Of the respondents, 86% believed that suicide is preventable, and 72.85% believed that it a person's right to die by suicide. Most of the responders (87%) viewed suicide as "an escape", 47.6% as an impulsive act, 27.89% as a selfish act, 18.37% as a sign of strength, 14.97% as a revenge act, 13.61% as a selfless act, and 12.93% as a sign of weakness. Please see **Figures 1–5**.

Significant findings ($p \leq 0.05$) included the following: those who identified as female found social media to be a good platform for people to ask for help (61%) while males did not (60.61%). Both whites (79.78%) and Asians (61.29%) believed it was a person's right to die by suicide. Whites and Asians also viewed suicide to be a sign of weakness. Regarding education, those who had some college (83.33%) and those with a bachelor's degree (78.05%) both believed that it was a person's right to die by suicide. Interestingly, the opinion was split 50-50 among those with a graduate degree. Those who believed it was a person's right to die to die by suicide viewed suicide as a sign of strength (23.36%) as opposed to those who did not (5%). Those who responded that someone close to them died by suicide believed that the media glorified suicide (56.25%) while those who did not lose someone close to suicide did not believe that (66.99%). Those who believed that media glorified suicide, also has a more stigmatizing view of suicide as a selfish act (41.67%) as opposed to those who did not (18.39%). Respondents who did not think suicide was preventable also viewed suicide as either a sign of strength (42.86%) or a revenge act (33.3%).

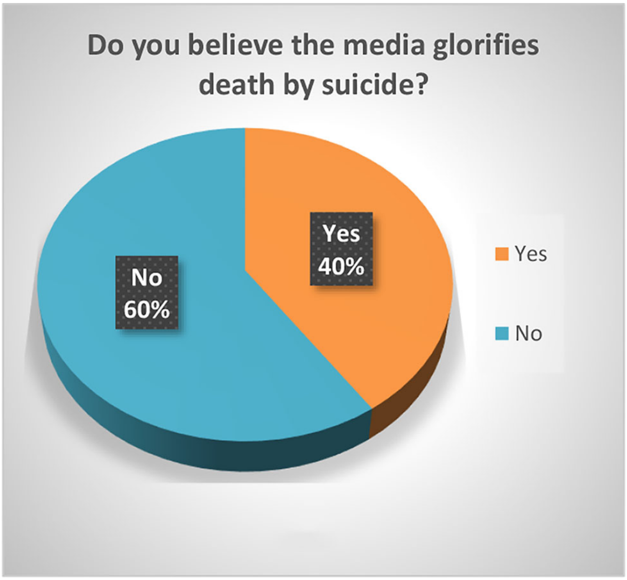

FIGURE 1 | Do you believe the media glorifies death by suicide?

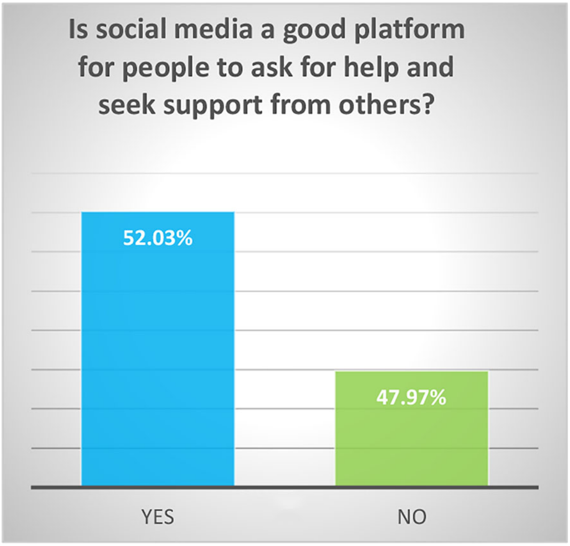

FIGURE 2 | Is social media a good platform for people to ask for help and seek support from others?

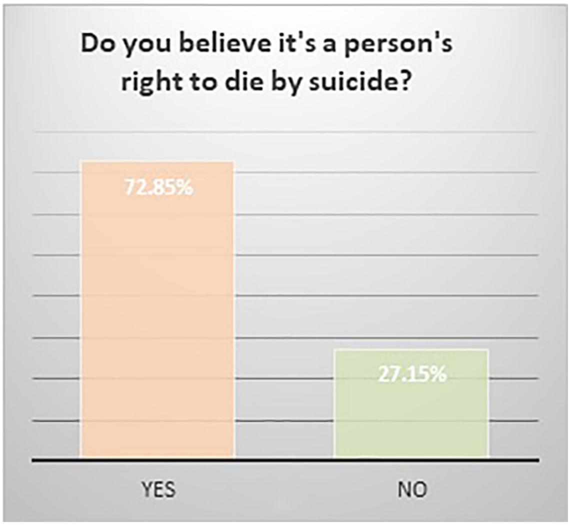

FIGURE 4 | Do believe it's a person's right to die by suicide?

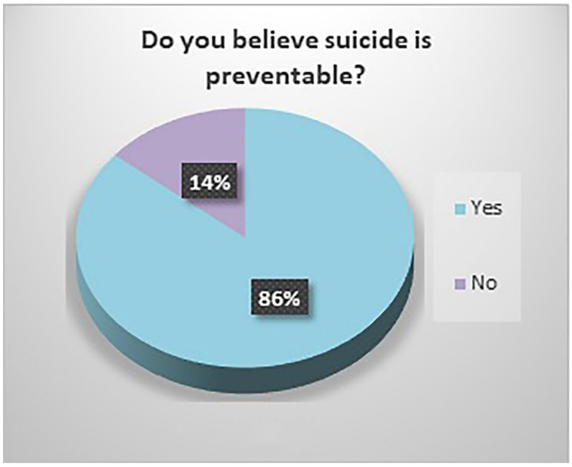

FIGURE 3 | Do you believe suicide is preventable?

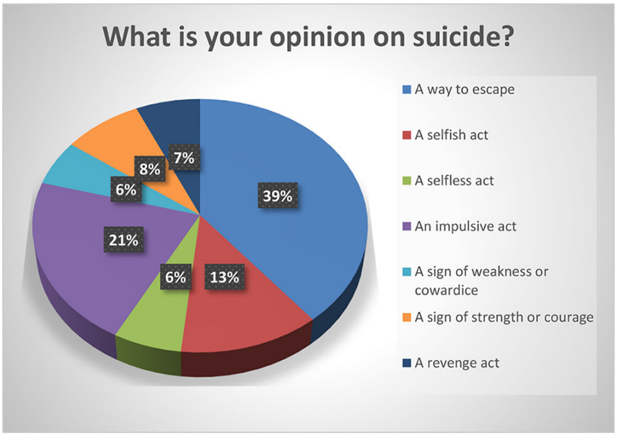

FIGURE 5 | What is your opinion on suicide?

DISCUSSION

The study respondents were predominantly young and educated, and their view of suicide was overwhelmingly non-stigmatizing, with majority choosing responses such as “escape” (87%) or an impulsive act (47.6%). Overall, there were less of stigmatizing views of suicide, such as a selfish act (27.89%), revenge (13.61%), and a sign of weakness (12.93%); and less of glorifying, with only 14.97% viewing it as a sign of strength and 13.61% as a selfless act. The view of suicide as being an “escape” is somewhat neutral, a theory which can be ascribed to Shneidman (36) who described the “psychache” that one wants to escape from, and Baumeister (37). This approach does not blame the individual or others/society who supposedly failed the individual, rather the concept of “escape” is one that frees everyone to accept the inevitable. Survivors' guilt can also compound and reinforce the stigma either imagined or accurately perceived by bereaved friends, family, and therapists (38). We did not find any correlation in our study that those who had lost someone close to suicide had greater stigmatizing attitudes. Those who did not think suicide was preventable viewed suicide as either a sign of strength or as a revenge act.

Our study found that 31.79% had lost someone close to them to suicide, and this is in keeping with the data that a third of

Americans know someone who has died of suicide (39). We did not explore how the closeness impacted them. It has been shown that younger age at time of exposure to the suicide, time since the event, female sex, relationship with the deceased, and multiple exposures had greater personal impact (40). Those who had lost someone close to them to suicide believed that the media glorified suicide (56.25%) while those who did not lose someone close to suicide did not believe that (66.99%). Exposure to the suicide of a close friend or relative can influence attitudes to suicide which can impact own risk of suicide attempt; four key themes have emerged with a sense of gaining or losing control: 1) Suicide as a more tangible option; 2) Identification with the deceased and awareness of shared vulnerabilities to suicide; 3) Personal determination to avoid suicide; and 4) Beliefs regarding safeguards against suicide. Those who are determined to avoid suicide seek to exercise control over a perceived risk, aware of the devastating grief caused by suicide; others who perceived their own susceptibility to suicide described a sense of inevitability, which they either battled against or submitted to (38). Positive attitudes towards suicide, the "right to commit suicide" subscale can be predictive of suicide risk (41).

Of the respondents 40.4% believe that the media glorifies death by suicide. The "Werther Effect" or copycat phenomenon refers to the media reporting of suicides by celebrities and well-known figures which leads to an increase in suicide deaths in the general population (42). The exact mechanism of how celebrity suicides act to increase suicidal risk in the wider public is unknown, but emotional reactions may play a part (43). After the release of the Netflix series, "13 reasons why" about the aftermath of a 17-year-old's suicide, there was an increase in suicide rate about 10–19-year-olds which appeared to be consistent with a contagion by media (44). It is important to train journalists in responsible professional media coverage: avoiding sensationalism and glorification, martyrification, and mystification of suicide; avoiding detailed descriptions of suicide methods used (45).

Women (61%) found social media to be a good platform for people to ask for help while only 39.39% of men did; on the other hand, 38.96% of the women did not find social media to be good platform to seek help, compared to 60.61% of men. Part of dispelling the stigma surrounding suicide is to get more people to talk about it. Our societies have perpetuated longstanding gender roles which are changing, however dominant masculine norms still exist which had led to men to avoid being emotional, and likely linked to lower likelihood of seeking help. The Australian "Man Up" Twitter campaign successfully influenced the social media conversation about masculinity and suicide, was game-changing in shifting attitudes toward expressing emotions and reaching out to others for help (46).

It is encouraging that 86% of the respondents believe suicide is preventable. We need to continue to raise awareness of it being a public health concern and to promote prevention efforts. A major intervention that needs ongoing support is restricting public access to lethal means of suicide: including firearm control legislation, restrictions on pesticides, detoxification of domestic gas, restrictions on prescription and sale of barbiturates, packaging analgesics in blister packets only and reducing number of tablets per package, mandatory use of catalytic converters in motor vehicles, construction of barriers at jumping sites (47).

More than half of the respondents (52%) feel that social media platforms are a good place to ask for help and seek support from others. Because of this, we need to harness technological advances such as machine learning to create safer spaces on social media platforms for those at risk for suicidality. Linguistic pattern recognition of stigma expressions around suicide attempts in Weibo (social media in China) posts have confirmed that social media mining can help improve stigma reduction programs (48). Machine learning is currently used to automatically identify and score helpful comments in a subreddit suicide watch forum to assist moderators with immediate feedback for help with online suicide prevention (49). Suicide happens because of numerous factors coming together, and it is hard to precisely pin down ways it can be prevented. Rather than to focus on risk factors, we need to shift emphasis on risk algorithms by employing machine learning algorithms to form complex, albeit robust and replicable combinations of many potential risk factors within large data sets (50).

Limitations of this study include the fact that those who respond to a survey voluntarily might have an interest in the topic, and this might not accurately reflect the public attitude. Because it is an anonymous online survey, there is no way to verify data. We did not perform further analysis of the data. In addition, we only surveyed those who are Facebook and Reddit users, and did not post on the numerous social media platforms available

CONCLUSIONS

The social media is a medium with boundless possibilities, which melds together an individual's biological and psychological uniqueness in the collective wisdom of a group that reflects the sociocultural mores of the time— we need to better understand the views held within such forums before we can tap in to bring about meaningful changes in how we approach public health concerns such as suicide.

We gauged the perception of suicide on social media platforms and found among the sample of mostly young white respondents, suicide is not as stigmatized, most believed it is preventable, while also supporting the right to die by suicide. While women found social media a good platform to ask for support, men did not, which reflects data that women tend to be more willing to seek help. A third of the group had lost someone close to them to suicide which was the national average and they tended to believe that media glorified suicide.

More research is needed to better understand how the social media influences its users, and whether it could be utilized as a forum to reduce stigma, promote open and nuanced discussions that promote wellness. Social media platforms need to use machine learning algorithms more for intervention purposes.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

ETHICS STATEMENT

The study involving human participants was reviewed and approved by Stanford University Institutional Review Board. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

NN designed the study, implemented it and collected data. Both authors, NN and KN, collaborated on the data analysis and wrote the paper together.

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Occupational Stress Among Health Worker in a National Dermatology Hospital in Vietnam, 2018

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A cross-sectional study was conducted among 171 doctors and nurses in a National Dermatology hospital using the Karasek's Job Content Questionnaire which has been validated in Vietnamese (JCQ-V), to assess the prevalence of occupational stress and to explore the association with some associated factors among them. The result showed that doctors and nurses with occupational stress accounted for 6.4%. This proportion was higher among nurse compared to doctor (8.0% vs. 2.2%); among those with diploma literacy compared to bachelor and above (10.6% and 2.3%). This rate was also higher in health workers under 30 years old (12.9%), health workers under 5 years at work (12.1%), working night shift from 3–4 nights (33.3%), temporary employment (12.8%), heavy workload occasionally (12.5%), and working hard occasionally (17.2%) compared to those in the comparison groups with p value <0,05. This prevalence concentrated in some departments such as surgery (11.9%), internal medicine (6.7%), dermatology, and others (1.5%). The study has not found the significant association between the prevalence of occupational stress and heavy workload and skill level. Therefore, it is essential for hospital should conduct screening all doctors, nurses, and medical staffs to identify subjects having occupational stress and give appropriate intervention.

Keywords: occupational stress, JCQ-V, healthcare worker, hospital, Vietnam

INTRODUCTION

Occupational stress is an imbalance between requirements and ability to work (1). In the context of globalization and changing factors of the nature of work, the environment is increasingly pressured and unstable, people are at risk of facing increasing work stress (2).

Burnout, a form of occupational stress was found to be common among junior doctors. In a recent global meta-analysis, more than half, 51.89% of dermatology residents suffered from burnout (3). Therefore, we carried out this project with the objective to identify the percentage of occupational stress using the Job Content Questionnaire in Vietnamese (JCQ-V) scale in doctors and clinical nurses at the national dermatology hospital.

In Vietnam, the issue of occupational stress among health workers has also been of great interest in recent years (4). Specifically, in 2016, a study conducted on eight central hospitals in Hanoi showed that 48.6% of health workers showed stress (5). A number of studies have focused on stress in clinical nurses and show that the incidence of occupational stress in this group was also relatively high (6–8).

In Vietnam, patients with skin diseases have low health related quality of life (9), low family quality of life (10), and poor sleep (11). More severe skin disease correlated to greater psychological burden (12) and such burden may be displaced to health professionals.

So far there has been no research on occupational stress among health staff in the Leprosy Hospital. Therefore, we carried out this project with the objective to identify the percentage of occupational stress using the JCQ-V scale in doctors and clinical nurses at Quy Hoa Central Leprosy-Dermatology Hospital in 2018 and to analyze some associated factors of occupational stress among health care work. The findings would help policy makers better understanding the situation and may develop appropriate intervention for reducing the occupational stress for good human resource in health facility in developing countries like Vietnam.

MATERIALS AND METHODS

Research Subjects

Doctors and clinical nurses, with a labor contract of at least 1 year at the time of data collection and agree to participate in the study.

Location and Study Time

The study was conducted at Quy Hoa Central Leprosy Dermatology Hospital from May 2018 to October 2018. The Hospital of Leprosy—Dermatology Central Quy Hoa is a class-1 hospital in dermatology that approved by Ministry of Health. The hazardous working condition of the hospital was ranked IV level by Vietnamese labor classification.

Research Design

A cross-sectional research with quantitative method was applied in our study.

Sample Size and Sample Selection

In our study, we found that 203 physicians and clinical nurses met the selection criteria. We interviewed 171/203 doctors and nurses working in the department of internal medicine, surgery, dermatology, and others (76.7%).

Variable

In our study, we used dependent variable and independent variables. The dependent variable was occupational stress status (yes/no). The independent variables were some personal factors (included professional level, age, job age, gender, education level, …) and some elements of job characteristics (included department of work, average number of nights per week, workload, intense work, type of labor contract, …)

Tools and Criteria for Assessing Stress

In our study, we used Karasek's model for assessing occupational stress. This model included 33 questions and assessed three aspects which were psychological stress (from 1 to 8), decision-making or self-control at work (from verses 9 to 25), and support through evaluating worker relationships with colleagues and superiors (from 26 to 33) (13). According to Karasek model, we classified stress into four group: high pressure jobs, passive work, active work, and comfortable work. High pressure jobs were calculated by total score psychological pressure over 16 and decision power ≤ 34 (threshold of occupational stress). Passive works were calculated by total score psychological pressure ≤ 16 and decision right ≤ 34. Active works were calculated by total score psychological pressure> 16 + decision right > 34. Comfortable works were calculated by total score psychological pressure ≤ 16 + decision right > 34. Stress status is "yes" when the assessment in the Karasek model is "high pressure work" (13). The questionnaire was tested on 02 subjects, including 01 doctor and 01 nurse, then completed before the official investigation.

Data Processing

Data was entered, cleaned with Epidata 3.1 software and processing data using SPSS18 software. Test for the difference between the two proportions with the Chi square test or the Fisher exact test was used. Logistic regression was applied to measure association between occupational stress and some demographic characteristics. P value at 0.05 was significant level.

Research Ethics

The study was completely approved by the leadership of Quy Hoa Leprosy Dermatology Hospital and was conducted after being approved by the council through the research protocol of the Institute of Preventive Medicine and Public Health, School. Ha Noi Medical University dated on April 2018. Collected information from people who agreed verbally to participate in research and information of research subjects was kept confidential.

RESULTS

General Characteristics of the Object

We interviewed 171/203 doctors and nurses of hospitals, including 46 doctors and 125 nurses. Women accounted for a higher proportion than men (72.5% compared to 27.5%). Researchers group aged 30 and above accounted for 63.7%. More than half of research participants work for 5 years or more, at a rate of 61.4%. Half of research respondents have university and postgraduate educational level with the rate of 50.3% (**Table 1**).

Occupational Stress Status

Comment: According to Karasek model, the research participants with the most active jobs accounted for the highest proportion with 62%, followed by the group with comfortable work with 31.6%, the group feeling stressful work [love demand for psychology was high and decision-making power was low (6.4%)] and the group of research respondents who have to do passive jobs accounts for the lowest rate of 1.8% (**Table 2**).

TABLE 1 | General characteristics of the sample group.

Variables	Characteristics	Frequency (n)	Rate (%)
Age group	< 30 years old	62	36.3
	≥ 30 years old	109	63.7
		$\bar{x}$ ± SD $_{(\text{min–max})}$: 34.64 ± 8.709$_{(23–65)}$	
Gender	Male	47	27.5
	Female	124	72.5
Occupational age group	1–5 years	66	38.6
	From 6 to 10 years	42	24.6
	Over 10 years	63	36.8
		$\bar{x}$± SD $_{(\text{min–max})}$: 9.52 ± 6.757$_{(1–30)}$	
Educational level	Intermediate	85	49.7
	University	86	50.3
	Post graduated		
Specialist	Doctor	46	26.9
	Nurse	125	73.1
Total		171	100

TABLE 2 | Occupational stress status of health workers accorsing to Karasek model.

Psychological stress	Decision right			
	Low		***High***	
Low	***Passive work***		***Comfortable work***	
	n	%	n	%
	3	1.8	54	31.6
High	***Stressful work***		***Active work***	
	n	%	n	%
	11	**6.4**	103	60.2

Bolded text denote for occupational stress among study participants.

The results in the **Table 3** show that there was a statistically significant relationship between stress rate and some personal factors (age group, education level), occupation factor (age group, ministry work division, number of nights, labor type, and intensity of work) with p < 0.05. Specifically, the rate of occupational stress in the research participants under 30 years old was 5.24 times higher than the participants over 30 years old (95% CI: 1.33–20.53, p value = 0.019 < 0.05). The rate of work-related stresses among researched junior and senior research participants was 4.97 times higher than that of university and post-graduate participants (95% CI: 1.04–23.75, p value = 0.036 < 0.05). The rate of occupational stress in the research participants under 5 years of age was 4.69 times higher than that in the participants working over 5 years (95% CI: 1.2–18.37, p value = 0.024 < 0.05). The rate of work-related stresses of surgeon staff was 8.8 times higher than that staff working in dermatology and other specialties (95% CI: 1.33–20.53, p value = 0.019 < 0.05). The rate of work stress of the research participants signing a contract was 5.1 times higher than that of the indefinite term (95% CI: 1.3–19.96, p value = 0.02 < 0.05). The rate of occupational stress in the research participants on duty three to four sessions a week was 12.4 times higher than that on the staff on duty two nights or less a week (95% CI: 3.3–46.7, p value = 0.00 < 0.05). The rate of occupational stress in the research group doing high intensity work with frequency (often or more) was 4.72 times higher than the group with the frequency of never or occasional (95% CI: 1, 34–16.7, p value = 0.02 < 0.05).

In addition, the results in the table above also show that there was no statistically significant relationship between the occupational stress rate and some factors such as qualification and workload status (p value > 0.05).

DISCUSSION

Occupational Stress Status

In this study, we used the JCQ-V scale to determine the occupational stress ratio of research respondents through three issues: psychological pressure, decision making power, and support from the working environment. This scale, developed by Karasek in 1998, has been assessed to be of good value and reliability and has been used in a number of previous studies in Vietnam. After investigating 171 subjects using a toolkit using the JCQ-V scale, based on Karasek's occupational stress model, we found that up to 62% of subjects were actively employed (pressure high psychological power, high decision-making power); 31.6% of the subjects were able to do a comfortable job (high decision-making power, low psychological pressure); 6.4% perceived to be high-pressure work (high psychological pressure and low decision-making power) and only 1.8% felt passive work (low psychological pressure, low decision-making power). This could be explained by the industry-specific nature, which requires a high degree of initiative, a high degree of decisive expertise in the professional activities of health workers, and less boring and simple work. More diversification so the work will also be more proactive and comfortable.

Thus, the results show that the occupational stress rate was 6.4%, which is similar to that of Pham et al. in 2011 in Hai Phong city using the JCQ-V scale (6.39%) (14). This rate is lower than that of Nguyen et al. in 2015 at Binh Dinh General Hospital (18%) (7), lower than that of Dang et al. in 2017 at Hanoi Medical University Hospital (6). This is lower than study in England (39%) (15), Portugal (11%) (16), Thailand (17,5%) (17), Taiwan (27%) (18), Germany (52%) (19), and India (63%) (20). This difference may be due to different research subjects. Our study selected all the doctors, clinical nurses in the hospital, the sample size was small (171), while the study of Nguyen et al. and Dang et al.

TABLE 3 | Association between occupational stress and some characteristics.

Characteristics		**Stress status**				**OR (95% CI)**	**p**
		Yes		**No**			
		n	**%**	**n**	**%**		
Specialist	**Nurse**	10	8.0	115	92.0	3.91 (0.48–31.4)	0.292
	Doctor	1	2.2	45	97.8	1	
Age group	**< 30**	8	12.9	54	87.1	5.24 (1.33–20.53)	**0.019**
	≥30	3	2.8	106	97.2	1	
Occupational age group	**< 5 years**	8	12.1	58	87.9	4.69 (1.2–18.37)	**0.024**
	≥ 5 years	3	2.9	102	97.1	1	
Educational level	**Intermediate**	9	10.6	76	89.4	4.97 (1.04–23.75)	**0.036**
	University **Post graduated**	2	2.3	84	97.7	1	
Medical specialties	**Surgeon**	7	11.9	52	88.1	8.8 (1.05–74.5)	**0.018**
	Internal medicine	3	6.7	42	93.3	4.71 (0.45–48.37)	0.15
	Dermatology and others*	1	1.5	66	98.5	1	1
Number of nights on the week	**3–4 nights per week**	6	33.3	12	66.7	14.8 (3.9–55.6)	0.00
	under 2 nights/week	5	3.3	148	96.7	1	
Type of labor	**Limited contract**	8	12.7	55	87.3	5.1 (1.3–19.96)	**0.02**
	Unlimited contract	3	2.8	105	97.2	1	
Large workload that exceeds the ability to work	**Usually**	1	12.5	7	87.5	2.1 (0.2–19.5)	0.4
	Never/sometimes	10	6.1	153	93.9	1	
Work with high intensity	**Frequent/very often/Continuous**	5	17.2	24	82.8	4.72 (1.34–16.7)	**0.02**
	Never/sometimes	6	4.2	136	95.8	1	

Bolded and underlined texts denote for statistically significant.

selected only the subjects that were nurses and left across the rest of the subjects, large sample sizes (483). Due to the nature of work, nurses may be at higher risk of occupational stress than other subjects. Therefore, the assessment of stress in the population of only nurses would be higher than assessing the stress situation in the population including both doctors and nurses.

Another explanation is the difference in tools. The stress measurement tool of these two authors is DASS21. DASS21 is a validated scale to assess depression, anxiety, and stress in Asians (21, 22) and Vietnamese (23). The DASS21 tool uses seven questions, focusing on screening orientation to find cases of psychological stress in general, whether or not work-related. And the JCQ-V is a tool that explores the individual characteristics and description of the job (psychological pressure, decision making power, support in the workplace), using more questions (33 questions) to assessing workplace stress, an evaluation model that produces stress results will be tighter and may result in a lower rate. Therefore the difference in results is expected in advance. The different findings on the rate of occupational stress among studies would suggest that policy makers should develop a standardization tool to measure occupational stress among medical staff.

The Relationship Between Stress Status According to Some Characteristics

In our study, we found that some characteristics related to stress status such as: age group and occupational age group; academic level; medical specialties; average number of nights per week; and labor contract. The number of people under 30 years old with work stress is 12.9%, while this figure in the remaining group is 2.8%, p = 0.019 < 0.05. This finding corresponds to findings of a recent meta-analysis which found that more than half, 51.89% of dermatology residents suffered from burnout (3). The occupational stress of young doctors and nurses could originate from depression, anxiety, and mental health issues encountered in medical and nursing schools (24–27).

The study has shown that the rate of occupational stress in the group with intermediate level and college is 4.97 times higher than in the research group with university and post university degrees (10.6% compared to 2, 3%, p = 0.036 < 0.05). The reason may be that the less educated people are, the more they are mentally pressured to become more professional, to improve their skills in order to keep up with the job, and to decide the job at work. They are lower than subjects with a university or higher degree, leading to a higher risk of stress.

Quy Hoa Leprosy Dermatology Hospital currently has 20 clinical departments divided into many divisions to manage, including: surgery, internal surgery, dermatology, and other specialties such as rehabilitation, traditional medicine, and department of examination. Each department in the hospital has different functions and tasks, specific characteristics of each department, so the assessment of the stress situation in each department is necessary to make appropriate judgments and interventions, suitable for medical staff in the department. Through univariate analysis, we found that, compared to the group working in the dermatology group, those working in the surgeon sector suffered from occupational stress with the rate of 8.8 times higher (11.9% compared to 1.5%). This result similar to research in China in 2017 and India in 2018 (20, 28). This is consistent with the reality at the hospital. The surgeon division is a new specialized division invested in recent years, which is being developed in the hospital. Due to the characteristics of the surgeon division, most of the employees have to work with sick people who are quick to respond, highly responsible, time is not proactive, pressure from family members, often in contact with their lips. The risk of infection is caused by exposure to bodily fluids, which makes the occupational stress higher. While those who work in the dermatology division, there are fewer endangered diseases and this is also a specialized branch of the hospital so the highly qualified human resources will be less stressed at work. Because no studies classify this as ours, comparisons for this result are not possible.

Night duty is a specific task for health workers and has a significant impact on health due to changes in the normal circadian rhythm of humans. The majority of shift work affects sleep after the night shift and the quality of sleep before the morning shift. The combination of sleep deprivation and working at a time when bodily functions are restricted can cause severe fatigue and insomnia, difficulty in performing good jobs and increase the risk of accidents, and stress (29). The study results showed that, occupational stress in the on-call group for 3–4 nights/was 33.3%, 14.8 times higher than the lower group less than or equal to two sessions a week (33.3% vs 3.3%, $p = 0.000 < 0.05$). This result is similar to the result of Nguyen Van Tuyen on nursing at Binh Dinh General Hospital in 2015, those who are on duty more than two nights a week are 1.9 times more likely to stress than those who only directly from two nights/week or less with $p = 0.02$ (7). Another study at the Hanoi Oncology Hospital also showed that clinicians who were on duty four times a month were 6.8 times more likely to be stressed than those under four sessions per month (8).

Our results show that those with a fixed term contract had a Gaaos stress rate of 5.1 times that of an indefinite or permanent contract (12.7% compared to 2.8% $p = 0.02 < 0.05$). Perhaps with the mentality of wanting a stable career, those who sign indefinite contracts—usually young people—are just out of school, are in the process of demonstrating competence before being put on an indefinite preparations. Therefore, they will have more psychological effort and higher pressure to show their position at work, leading to a higher risk of occupational stress than the other group.

Because of time and manpower limitations, our study was conducted on only doctors and nurses in a hospital, so it was not possible to represent the entire healthcare workers. This is a cross-sectional descriptive study that investigates the status and factors that affect the stress of medical staff, so it is not possible to confirm what is the main cause of the stress. This suggests more in-depth, complete, and multi-dimensional studies are needed to make clearer and more accurate judgments.

CONCLUSIONS

Findings indicated that the research group with the most active jobs accounted for the highest proportion (62%). The job stressors affecting the healthcare workers included some personal factors (age group, education level), occupation factor (age group, ministry work division, number of nights, labor type, and intensity of work). Hospital should conduct screening all doctors, nurses, and medical staffs to identify subjects having occupational stress and give appropriate intervention. For doctors and clinical nurses, the hospital needs to enhance the exchange of sharing experiences, sharing the work volume. Next studies should use a standardized tool to assess occupational stress and follow-up data to evaluate the effectiveness of interventions.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Hanoi Medical University Committee dated in April 2018. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization: XL, AN, HL, AV, and TN. Data curration: AN, and XL. Formal analysis: AN, and XL. Investigation: HL, and AV. Methodology: AN, and XL. Project administration and supervision: XL, AN, and AV. Visualization: AN, and XL. Writing-original draft: AN, XL, TN, HL, and AV. Writing review and editing: AN, and XL.

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BRIEF RESEARCH REPORT
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The Influence of Disabilities in Activities of Daily Living on Successful Aging: The Role of Well-Being and Residence Location

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This study aimed to investigate the effect of disability in activities of daily living (ADLs) on successful aging, and the possible moderators between them. Based on data from the Chinese Longitudinal Healthy Longevity Surveys (CLHLS), we used the Cox proportional hazards model of survival analysis and multivariate regression analysis (SPSS 16.0) to test our hypotheses. Mortality or cognition impairment were the dependents variables, and disability in ADLs was the independent variable. Well-being and residence location were the moderators. The results showed that in survey 2005, the Chinese elders with disability in ADLs, after controlling elder's gender, age, residence place, and marital status, often experienced more mortality and cognition impairment risk in the next 3 years. Our findings also showed that the increased mortality risk among elders with disability in ADLs was lower in those with higher well-being or younger age. The increased cognitive impairment risk among elders with disability in ADLs was lower in those living in the city than those living in a rural area or small towns. These findings contribute to a better understanding of the relationship between disability in ADLs and successful aging among Chinese elders. Our findings also expose other elements to consider such as psychological factors (e.g., well-being) and residence location in the relationships between the disability in ADLs and mortality (or cognition impairment), which have a psychological impact in successful aging of the Chinese elders.

Keywords: mortality, cognition impairment, disability in activities of daily living (ADLs), well-being, residence place

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INTRODUCTION

An aging population is a significant challenge for most countries in the world, including China (1). Attention should be paid on aging population due to their physical decline, high mortality, possible depression symptom, and cognition impairment, which are regarded as important obstacles in reaching the goals of successful aging (2–5). The activity center was proved as an effective model for health support and health-related quality of life improvements for older people (6, 7). However, the direct impact of disability in activities of daily living (ADLs) on longevity and cognitive impairment and how the relationship varies with other variables are still unclear.

Disability in ADLs is defined as individuals who are partly or entirely unable to perform basic ADLs (e.g., dressing) (1, 8). Elders with disability in ADLs often need help from their family members or caregivers (9). Due to the declining ability in making their own choice and shrinking social network (2, 5), elders often experience low self-control and a strong sense of loneliness or meaninglessness, which are risk factors that increase elder's cognition impairment, suicide, and mortality risk (10–14). So disability in ADLs might have a direct effect on the elder's mortality and cognitive function. Besides, the association between disability in ADLs and mortality (or cognitive impairment) can vary due to individual mental status (e.g., well-being) and living environment (e.g., residence place). Comparing with low well-being elders or those living in Chinese rural area, elders with high well-being or those living in Chinese urban area might have high internal (e.g., positive attitude to life) or external resources (e.g., social or medical support) against adversity (e.g., disability in ADLs) (1, 10, 12, 15), which could reduce the increased risk of disability in ADLs on elder's mortality or cognitive impairment. Thus, residence place and well-being could moderate the relationship between the disability in ADLs and cognitive impairment (or mortality). Therefore, two hypotheses were proposed as follows.

Hypothesis 1: The disability in ADLs was positively related to mortality and cognitive impairment.

Hypothesis 2: The relation between the disability in ADLs and mortality or cognitive impairment might be moderated by well-being or residence place.

MATERIALS AND METHODS

Participants

This study used data from the 2005 and 2008 Chinese Longitudinal Healthy Longevity Surveys (CLHLS). CLHLS is a national survey which adopted a targeted random-sample design to ensure the representativeness of the Chinese aging population considering the gender, age, and other factors. In survey 2005, 15,638 elders participated, of those participants, 2,938 were lost in the following 3 years (2008 survey) and were excluded. Therefore, we only used data from 12,700 participants in the analysis. The age of participants (42.7% men, $n = 5,430$) ranged from 60 to 112 years (M = 86.1, SD 11.7), 3,871 participants (30.5%) were married and living with their spouses, 2,461 participants (19.4%) received pension as retired workers or government officers (economic status), 2,168 participants (21%) experienced serious physical or mental illness (e.g., cancer, dementia) in the previous years before survey 2008, and 2,795 participants' (23%) had their residence in cities. The Research Ethics Committees of Peking University and Jiangxi Normal University reviewed the study protocol and granted approval for the Protection of Human Subjects for CLHLS, including the collection of data used in the study.

Measurements

Cognition impairment was measured with the mini-MMSE (16), which is proved as an excellent assessment tool for Chinese elders (17). The mini-MMSE includes 24 items regarding attention, calculation, recall, and language, with a total score ranging from 0 to 30, with higher scores indicating less cognitive impairment. For mortality, a score of 0 indicates that the participants were still alive in survey 2008, while a score of 1 indicates that the participant was dead. Well-being was measured using a psychological well-being scale (12), which includes seven items covering positive effects (e.g., optimism) and adverse effects (e.g., loss of self-worth) with a five-point Likert scale. A psychological well-being index was conducted using the total scores of these seven items, with higher scores indicating better well-being. Disability in ADLs was measured using a brief scale of disability in ADLs, which includes six items (e.g., eating) and proved to be a proper measurement for Chinese elder's functional capacity (1). A score of 1 indicates that the participants need assistance with the daily activities, while a score of 0 indicates that participants are self-sufficient and do not need any assistance.

Gender, martial status, economic status (e.g., received pension as retired workers or government officers), and serious illness were proved to have an impact on elder's mortality and cognition impairment (1, 13, 18) and were used as control variables.

Procedure Process and Analytical Strategies

All the variables in the present study were collected in survey 2005, except the data of cognitive impairment and mortality, which was collected in survey 2008. To examine the relationship between disability in ADLs and mortality, we used two Cox proportional hazards model of survival analysis (19). Model 1 included the independent variable (e.g., disability in ADLs), moderators (e.g., residence place, well-being), and the control variables (e.g., economic status, serious illness, marital status, and gender). Model 2 added a two-way interaction between disability in ADLs and residence place, disability in ADLs and well-being. In the survival analysis, survival time for survivors (or decreased respondents) was the number of days between the date of survey 2005 and the date of survey 2008 (or death). Two multiple variables regression models were used to measure the relationship between disability in ADLs and cognitive impairment. Model 3 included the independent variable, moderator, and control variables, as showed in model 1. Model 4 added a two-way interaction between the independent variables and moderators, as showed in model 3. In model 2 and 4, we did not include the two-way or three-way interaction between disability in ADLs and other control variables (except age in model 2 of **Table 1**) because they were not significant. All models above were analyzed using the SPSS software (version 16.0).

RESULTS

Mortality

Table 1 shows the relative risk factors of mortality. Model 1 shows that one-point increase in disability in the ADLs index was associated with an increased hazard ratio (HR) of 35% (HR = 1.35, 95% CI: 1.32–1.39), after controlling for elder's gender, age, residence place, and well-being. Model 2 shows that the HR of the interaction between disability in ADLs and well-being was more than 1 (HR = 1.02, 95% CI: 1.01–1.03), while the HR of the interaction between disability in ADLs and age was <1 (HR = 0.08, 95% CI: 0.07–0.08). This indicates that the increased mortality risk among elders with disability in ADLs was lower in those with higher well-being (or younger age) than in those with lower well-being (or older age).

Cognition Impairment

Table 2 shows the relative risk factors of cognitive impairment. Model 3 shows that elders with disability in ADLs had a worse

TABLE 1 | The relative risk factors of mortality among Chinese elders ($N = 12,700$).

Variables	Mortality			
	Model 1		Model 2	
	HR (CI)	*P*-value	HR (CI)	*P*-value
MAIN TERMS				
Disability in ADLs (No)	1.35 (1.32, 1.39)	<0.001	1.04 (0.89, 1.20)	0.64
TWO-WAY INTERACTIONS				
Disability in ADLs*Residence place			1.01 (0.96, 1.07)	0.70
Disability in ADLs*well-being			1.02 (1.01, 1.03)	<0.001
Disability in ADLs*age			0.08 (0.07, 0.08)	<0.001
CONTROLS				
Didn't receive pension (receive)	1.34 (1.27, 1.42)	<0.001	1.34 (1.26, 1.42)	<0.001
Current married (No)	0.36 (0.34, 0.37)	<0.001	0.36 (0.34, 0.37)	<0.001
Serious illness (No)	1.08 (1.02, 1.13)	<0.01	1.07 (1.02, 1.13)	<0.01
Age in survey 2005	1.31 (1.24, 1.39)	<0.001	1.30 (1.24, 1.38)	<0.001
Men (Women)	1.02 (0.99, 1.04)	0.10	1.02 (0.99, 1.04)	0.09
Low well-being (high)	1.02 (1.01, 1.03)	<0.001	0.99 (0.97, 1.01)	0.26
Rural (city)	1.07 (1.04, 1.10)	<0.001	1.06 (1.01, 1.11)	<0.05

HR, relative risk; CI, confidence interval.

TABLE 2 | The relative risk factors of cognitive impairment among Chinese elders ($N = 12,700$).

Variables	Cognitive function			
	Model 3		Model 4	
	β	*P*-value	β	*P*-value
CONTROL				
Economic status	0.08	<0.001	0.1	<0.001
Marital status	−0.02	0.40	−0.01	0.45
Serious illness	−0.02	0.17	−0.02	0.18
Age in survey 2005	−0.30	<0.001	−0.32	<0.001
Gender	−0.14	<0.001	−0.13	<0.001
Well-being	0.02	0.22	−0.02	0.61
Residence place	−0.05	<0.01	−0.25	<0.001
MAIN TERMS				
Disability in ADLs	−0.06	<0.001	−0.14	0.09
TWO-WAY INTERACTIONS				
Disability in ADLs*Residence place			−0.24	0.001
Disability in ADLs*well-being			0.09	0.26
Disability in ADLs*age			0.02	64
ΔR^2	0.15		0.02	

For cognitive function: high score means better cognitive function; disability in ADLs: 0 = No, 1 = Yes; economic status: 0 = didn't receive pension, 1 = receive; marital status: 0 = current married, 1 = widows; serious illness: 0 = No, 1 = Yes; Gender: 0 = men, 1 = women; well-being: high score means higher well-being; residence place: 0 = city, 1 = rural area or town.

cognitive function ($\beta = -0.06$, $P < 0.001$), after controlling for elder's gender, age, residence place, and well-being. There is a significant interaction effect between disability in ADLs and residence place in predicting elder's cognitive function ($\beta = -0.24$, $P < 0.001$). Simple slope analysis shows the increased cognitive impairment risk among elders with disability in ADLs was lower for those living in the city than in those living in rural areas or small towns (city: $\beta = -0.04$, $P = 0.24$; rural or small towns: $\beta = -0.084$, $P < 0.001$).

DISCUSSION

The study findings show that in 2005, Chinese elders with disability in ADLs often experienced more mortality and cognition impairment in the following 3 years, after controlling for age, residence place, etc. (supported hypothesis 1). It indicates that disability in ADLs is a risk factor for elder's successful aging due to the shrinking social network and the declining ability in making their own choice. Our finding also found that the increased mortality risk among elders with disability in ADLs was lower in those with higher well-being (or younger age). A possible reason might be that high well-being (or younger age) act as protective factors and could provide enough mental (or physical) energy to reduce the risk of disability in ADLs. Moreover, we found that the increased cognitive impairment risk among elders with disability in ADLs was lower in those living in cities than in those living in rural areas or small towns. The possible explanation is that living in cities could provide better medical or educational resource, which could reduce the risk of disability in ADLs on cognitive impairment while living in rural areas or small towns could not. These findings suggest that government officers should pay more attention to Chinese elders with disability in ADLs, especially for those who lived in town or village in policy-making for successful aging. And these findings also suggest that psychological factor (e.g., well-being) can be used as a psychological intervention for successful aging among Chinese elders.

Although survival time could reflect the longevity, the valid age of death might be a better index for measuring longevity. Future research could use the valid age of death as the index of longevity to provide a robust evidence for the relation between disability in ADLs and successful aging. In addition, Brain derived neurotrophic factors (BDNF) and pro-inflammatory cytokines (e.g., Interleukin-1 beta) are implicated in cognitive impairment and dementia (7, 20). And medical conditions or comorbidities, and education also play important role in the process of the successful aging (5, 19). Further research should focus on other factors which were not explored in this study, such as the direct effect of BDNF, medical conditions or comorbidities, and interaction effect of BDNF, medical conditions or comorbidities, education, and disability in ADLs.

CONCLUSION

Our findings showed that disability in ADLs is a risk factor of mortality and cognition impairment among Chinese elders, and the increased mortality or cognitive impairment risk of disability in ADLs could be moderated by the variables of well-being, age, or residence place.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: http://opendata.pku.edu.cn/dataverse/CHADS.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the Research Ethics Committees of Peking University with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Research Ethics Committees of Peking University.

AUTHOR CONTRIBUTIONS

XL, JF, and JL participated in the design of this study, carried out the data acquisition, analysis, manuscript editing, critical revision of the manuscript for important intellectual content, and final approval of the version to be published. JW and SD carried out the literature search, contributed to data acquisition, and manuscript editing. XL provided the largest contribution to the manuscript. All authors approved the final version of this manuscript and agree to be accountable for all aspects of the work.

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