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Suicidal ideation in Mexican chemical engineering students

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Mental health is a crucial component of overall wellbeing, as it significantly impacts the quality of life and interpersonal relationships. Suicide, one of the leading causes of death worldwide, particularly affects young people between 15 and 29 years of age. This phenomenon is linked to factors such as mental disorders, family problems, socioeconomic constraints, and substance abuse. In the university setting, students face emotional challenges stemming from academic stress, separation from the nuclear family, and social pressure. These factors increase their vulnerability to suicidal ideation. In careers such as Chemical Engineering, academic stress is exceptionally high due to the complexity of the studies; despite the above, it is not one of the professions with the highest rates of suicidal ideation, but its impact on the mental health of students requires attention. Mexican universities have implemented psychological support programs to address these problems. It is essential to continually evaluate these programs to enhance their effectiveness and respond effectively to student needs. Further research is needed on the specific factors affecting chemical engineering students to design more effective preventive strategies.

KEYWORDS

suicidal ideation, suicide, university students, chemistry, Mexico

1 Introduction

Mental health is fundamental for general wellbeing, directly influencing the quality of life and interpersonal relationships. Proper care prevents problems such as depression and anxiety, contributing to a balanced and satisfying life. Suicide is one of the leading causes of death worldwide, particularly among young people. According to the World Health Organization (World Health Organization, 2024; Valdez-Santiago and Arenas-Monreal, 2019), about seven lakhs twenty six thousand people die by suicide each year, being the third leading cause of death among young people aged 15-29 years in 2021. This problem affects all regions, with 73% of cases occurring in low- and middle-income countries. In Mexico, during 2023, 8,837 suicides were reported, equivalent to 1.1% of total deaths, with an overall rate of 6.8 per 100,000 inhabitants and marked gender disparity: 11.4 for men and 2.5 for women. The states with the highest rates were Chihuahua, Yucatan, Campeche, and Aguascalientes [Instituto Nacional de Estadística y Geografía (INEGI), 2024]. Even more worrying is the global increase in suicidal ideation, a phenomenon linked to multiple

biological, psychological, and social factors, such as depressive disorders, anxiety, family problems, socioeconomic limitations, and substance use (Benítez-Camacho, 2021).

Suicidal behavior ranges from ideation to intentional self-injury and completed suicide. Suicidal ideation is a significant risk indicator, especially in young people, as half of those who experience it plan suicide and a quarter go on to attempt it (Predescu and Sipos, 2023; Alabi et al., 2021). International studies demonstrate the influence of environmental, psychosocial, biological, and behavioral factors on the occurrence of suicidal ideation in college students (Biswas et al., 2020; Moitra et al., 2021). The Interpersonal Theory of Suicide posits that ideation arises mainly from the perception of being a burden to others and frustration due to lack of belonging, common phenomena in university environments with academic pressure and family estrangement (Van Orden et al., 2010). The interaction of emotional, social, and family factors, integrated in the biopsychosocial model, is key to analyzing the situation in the Mexican context (Martinez-Fierro et al., 2025). Based on this, this paper aims to reflect on suicidal ideation in chemical engineering students in Mexico, exploring its particularities and possible associated factors.

2 Mental health and suicidal ideation in college students

The university represents a key space for the comprehensive training, academic and professional development of young people, but it also involves new challenges that can generate emotional distress if adaptation is poor (Santos, 2019; Ariño and Bardagi, 2018; Ramos-Mejía, 2025). Understanding suicide in this population is complex and influenced by multiple factors that hinder its effective prevention, especially when there are misperceptions about this problem. Traditionally, suicide has been stigmatized as a selfish act, but recent research suggests that many suicidal individuals seek to relieve an emotional or financial burden for their loved ones (Van Orden et al., 2010; Kheibari et al., 2025).

College students are particularly vulnerable due to the stress generated by separation from their nuclear families, academic demands, economic constraints, and social pressures (Deng et al., 2022; Burke et al., 2018; Cerolini et al., 2023). Traumatic experiences such as bullying, intimate partner violence, or adverse childhood events are significantly associated with suicidal ideation (Meeker et al., 2021). Economic factors, such as low financial support, parental unemployment, and family instability, also increase this risk (Zhai et al., 2015; Cecchin et al., 2024). Sleep disturbances emerge as a critical factor affecting emotional well-being and increasing susceptibility to suicidal thoughts and behaviors (Harris et al., 2020; Fernandes et al., 2021).

The COVID-19 pandemic intensified the problem, increasing the incidence of suicide in men and affecting mental health due to social isolation, economic anxiety, and emotional stress (Zapata-Garibay et al., 2021; Hwang et al., 2020; Brandt et al., 2022). The restrictions imposed specific challenges for students whose careers require face-to-face practices, such as those in chemical engineering, generating frustration, isolation, and increased academic stress (McIntyre et al., 2023). In Mexico, an increase in requests for psychological support and reports of loneliness were observed during this period (Benítez-Camacho, 2021).

3 Suicidal ideation in chemical engineers

Chemical engineering students face particular challenges that may impact their mental health differently than those in other academic careers (Silva-Ramos et al., 2020). The simultaneous demand for theoretical mastery, constant laboratory practice, and strict safety protocols makes up an intense workload that favors the appearance of psychological distress, evidencing the need for specialized preventive strategies. Although there are no recent figures on its student population in Mexico, historical data indicate that in 2015, there were approximately one lakh seventy three thousand two hundred and seventy students pursuing this career. In a study by Rosete-Mohedano (2006), 6% of students in this discipline presented mental health problems and higher failure and dropout rates, lower figures in comparison with health careers.

According to information from the Secretaria de Economía Gobierno Federal (2024), as of the third quarter of 2024, the national workforce of chemical engineers totaled sixteen thousand seven hundred people, with an average monthly salary of 6,860 Mexican pesos and a working week of 42.4 h. Men predominate (81%), with an average wage of 6,310 Mexican pesos, in contrast to women (19%), who receive around 9,180 pesos. This disparity highlights gender wage gaps that reflect differences in professional valuation and possible female concentration in better-paid positions. However, it may also be due to experience and promotion opportunities (Secretaria de Economía Gobierno Federal, 2024). Jalisco, the State of Mexico, and Guanajuato are the states with the most significant number of chemical engineers in the country.

These economic disparities also affect the mental health of women in the academic and work environment, generating psychosocial stress, frustration, anxiety, and low self-esteem. The low representation of women and the challenges to reconcile personal and professional life increase the risk of developing problems such as impostor syndrome, chronic stress, and depressive symptoms that can lead to suicidal ideation. Addressing this gap and making its consequences visible is key to promoting more equitable and healthy environments.

Universities in Mexico have begun to implement various psychological support programs, recognizing the relevance of mental health in the academic life of their students. These initiatives seek to provide tools for young people to face the emotional and psychological challenges that may arise during their university education. Among the most common strategies is the University Counseling Service, where professionals such as psychologists and counselors offer confidential individual sessions. These sessions allow students to express their concerns and receive specialized guidance on issues ranging from academic stress to complex personal situations (Dosil-Santamaria et al., 2022).

Several institutions organize workshops and support groups focused on stress management and the development of coping skills. These spaces promote the creation of supportive

communities and provide practical tools for students (Tamminga et al., 2023). Some universities, such as the University of Guadalajara, have specific psychological care and training programs that include counseling services, workshops, and conferences to foster the integral development of the university community. Access to online resources has also grown significantly, allowing students to use educational and interactive materials anytime, anywhere, which is especially useful for those who prefer not to seek help in person (Pretorius and Coyle, 2021).

The National Autonomous University of Mexico (UNAM) has established mental health clinics that offer comprehensive care in psychiatry and psychology for both students and the general community. Programs such as the Universidad Veracruzana's Psychological Support Program provide psychological evaluation and brief psychotherapy, addressing the needs of both students and external audiences. This comprehensive approach seeks not only to help students overcome their difficulties but also to train trained professionals in the clinical area (Deroncele-Acosta and Ellis, 2024). Constant evaluation of these programs is essential to measure their effectiveness and continuously improve the services offered. Identifying successful regions and those that require attention enables institutions to allocate their resources more effectively to meet student needs, thereby contributing to overall wellbeing and a healthier academic environment.

Teachers play an essential role. Beyond transmitting technical knowledge, they are the ones in direct and frequent contact with students, allowing them to identify changes in behavior or signs of emotional distress. This requires that teachers have training, awareness, and tools to respond appropriately to these situations, fostering an empathetic and supportive environment that encourages the expression of difficulties without fear of judgment or discrimination.

Institutional policies should reflect a clear and structured commitment to mental health, integrating strategies ranging from prevention to crisis intervention. These policies should be dynamic, incorporating student participation and adjusting to the particularities of careers such as chemical engineering, which have specific demands that impact psychological wellbeing. Collaboration between faculties, health services, and student organizations strengthens support programs and generates sustainable support networks.

However, significant challenges remain: the lack of sufficient mental health professionals in universities, the limited integration of these topics in the curriculum, and the scarcity of economic resources dedicated exclusively to these areas. In the face of this, it is necessary to recognize that a comprehensive approach to mental health in undergraduate contexts, such as chemical engineering, not only improves the quality of student life but also has a positive impact on the formation of more competent, resilient chemical engineers who are aware of their well-being.

4 Conclusions

Mental health in higher education, particularly in STEM careers such as chemical engineering, is an increasingly important issue that has a direct impact on the wellbeing, academic development, and comprehensive training of students. It's adequate attention not only prevents disorders such as anxiety and depression, but also helps to avoid serious consequences. One of them is suicidal ideation, a problem that requires an immediate and structured response from institutions. Therefore, researchers and academic leaders should focus their efforts on designing and evaluating comprehensive educational interventions that incorporate emotional health content into the curriculum, create ongoing prevention programs, and implement accessible and confidential psychological services. It is also essential to promote interdisciplinary research to understand the particularities of the student context and thus adapt institutional policies more effectively. This line of action will contribute to building academic environments that are resilient, inclusive, and committed to training professionals capable of managing not only technical, but also emotional and social challenges.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/supplementary material.

Author contributions

IG-M: Formal analysis, Resources, Validation, Conceptualization, Methodology, Supervision, Writing – review & editing, Writing – original draft, Investigation. DM-P: Methodology, Supervision, Conceptualization, Investigation, Writing – original draft. EH-B: Formal analysis, Writing – original draft, Investigation, Conceptualization, Methodology. AC-M: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft. GG-M: Conceptualization, Formal analysis, Writing – original draft, Methodology. EL: Conceptualization, Resources, Writing – original draft, Methodology, Investigation, Formal analysis. MS-M: Conceptualization, Methodology, Supervision, Investigation, Writing – original draft.

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