frontiers | Frontiers in Environmental Science

TYPE Original Research
PUBLISHED 08 September 2022
DOI 10.3389/fenvs.2022.954584

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Environmental Economics and Management, a section of the journal Frontiers in Environmental Science

RECEIVED 27 May 2022
ACCEPTED 08 July 2022
PUBLISHED 08 September 2022

CITATION
Lu S, Dai J, Ali A, Al-Faryan MAS and Iqbal N (2022), Sustainable financial dimensions of managing poverty in the era of the COVID-19 pandemic: A developing country perspective. *Front. Environ. Sci.* 10:954584. doi: 10.3389/fenvs.2022.954584

RETRACTED: Sustainable financial dimensions of managing poverty in the era of the COVID-19 pandemic: A developing country perspective

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The COVID-19 pandemic is dangerous to people's lives and livelihoods, creating immediate obstacles for organizations that support impacted populations. This research concentrates on the consequences for local microfinance institutions in Pakistan, which is a well-developed sector that has pulled many households out of the poverty trap. Microfinance programs in Pakistan provide financial resources to vulnerable and deprived people to engage in income-generating practices on more favorable terms. As a result, this study addressed and assessed the financial dimensions of managing poverty reduction in rural Pakistan through the microfinance segment and its effectiveness on poverty-reduction programs in Pakistan during the COVID-19 pandemic. The primary data were collected through a questionnaire survey to determine the views of the households, beneficiaries, and non-beneficiaries on the outcome and efficacy of poverty-reduction programs during the pandemic to meet the study objectives. The Mann-Whitney U test of the non-parametric method and Cronbach's alpha of the data reliability test have been applied for the empirical analysis. According to the non-parametric findings, programs, marital status, working women members, and resources such as land, livestock, business assets, shares, and loans have all been affected during the COVID-19 pandemic. Education, wages, gender, size, child dependency, and district variables are significant factors related to poverty, but they fell into second position during COVID-19. These findings suggests that the small loan system must be improved and made efficient during the pandemic. This could be a practical tool to maintain poor people's current economic and poverty position.

KEYWORDS

COVID-19, poverty, developing economy, non-parametric, financial dimensions

10.3389/fenvs.2022.954584

Introduction

The COVID-19 pandemic has infected people in over 210 countries, resulting in over 154.81 million incidents and 3.23 million deaths worldwide (WHO update, 6th May 2021). Due to population density, healthcare capacity, existing poverty, and environmental causes, community dissemination of the coronavirus occurred rapidly in Pakistan, with over 0.841 million people infected and over 18429 deaths (WHO update, 6th May 2021). According to forecasts, in fiscal year 2021 (from 1st July to 30th June) Pakistan will have a 10% economic deficit or 1.1 trillion PKR (local currency) (1$ = 161.83 rupee) loss because of COVID-19's many adverse effects on the primary, secondary, and tertiary sectors of the economy (e.g., agriculture, schooling, and health care). The short and long-term effects of the COVID-19 peak on Pakistan's socio-economic and societal dimensions are a significant source of information for future policymaking (Yasmin et al., 2020). This study's detailed review of the COVID-19 situation, administration, and control measures may help governments and policymakers in countries with identical social and cultural systems (Honda, 2020).

It is crucial to consider Pakistan's poverty issues. It can be remembered that Pakistan has a high poverty rate; nonetheless, Pakistan has made significant progress in reducing poverty levels since the 1970s. In particular, Pakistan made substantial gains in alleviating poverty in the 1980s, only to encounter a growth in poverty in the 1990s. Although the situation was reversed in the middle of the last decade, it remained the same at the end of the decade (Iqbal and Akhtar, 2015). As a result, cycles of poverty-reduction efforts have significantly impacted genuine and perceived poverty in the modern world. According to Azmi and Thaker (2020), poverty in Pakistan is a rustic trend, which is supported by all other surveys. In 2008, the Pakistani Planning Commission discovered that 40% of the country lived in poverty. According to a survey undertaken by the UNDP (2010), Pakistan has a 54% multidimensional poverty rate. A World Bank study recently found that hunger in Pakistan increased irrationally from 2008 to 2010 (Iqbal et al., 2014).

Poverty in Pakistan is unique because it is distributed asymmetrically around regions and within provinces. In Punjab, the province's southern and western regions have been hit hard. There are significant differences in indicators of healthcare in Punjab's different regions (Iqbal and Akhtar, 2015). Punjab's rural areas are in poorer shape than the city. Furthermore, Punjab's southern and western areas have smaller households with lower human development indices. This area also lacks educational and public-service distribution results (Burki et al., 2019). The DG Khan District, which is located in southern Punjab, is the province's most deficient region. According to Iqbal and Akhtar (2015), the poor in DG Khan Division make up 82% of the population.

The Pakistani government has introduced numerous schemes and policies to fund poverty reduction, either expressly or implicitly, for a long time. However, the government's direct policies to alleviate poverty are initiatives that prioritize the distribution of additional financial services to underprivileged communities to enhance their access to physical inputs required for higher production and improved human capital (Shen et al., 2021).

The COVID-19 pandemic has threatened the livelihood of many microenterprises, which are critical sources of income for poor households in low-income communities. Pakistan's microfinance sector helps 7.3 million low-income families living on the edge of poverty (Li et al., 2020). Half of the credit facilities are availed by women because they have little access to structured credit. If the microfinance sector does not survive COVID-19, then millions of Pakistanis will be cut off from capital and other formal financial services when they are most in need (Khan et al., 2020). It was expected that Pakistan's microfinance programs may be irreparably damaged unless regulators, investors, and other private and public actors took decisive action during the pandemic. Therefore, the microfinance industry in Pakistan faces a crisis like any other (Iqbal and Mohsin, 2019).

Microfinance is a crucial instrument for handling liquidity for many customers. It enables households and small businesses to manage their cash flow and expenditure needs, despite their often uncertain and volatile incomes of the poor in Pakistan (Iqbal et al., 2014). The World Health Organization recently advised Pakistan to reintroduce lockdowns to stop the virus's spread. Consequently, microfinance borrowers' worries have shifted to holding food on the table in the face of national lockdowns. Early data indicate that borrowers struggle to meet existing debt payments (Lenzen et al., 2020). The country's poverty situation is challenging and poverty determinants are significantly affected during the pandemic COVID-19.

This study aims to examine the efficacy of financing for poverty-reduction programs in Pakistan's Southern Punjab, especially in the Tribal areas, and whether they lead to long-term and consistent poverty reduction during the period of the COVID-19 pandemic. In addition, this research aims to evaluate the effects of microfinancing poverty mitigation initiatives in Pakistan by concentrating on the socio-economic characteristics of those who profit from them during the pandemic.

The Pakistani government has tried several strategies to combat poverty over the years. Although the Pakistani government invests a large amount of money per year in numerous poverty-reduction projects to provide physical resources and develop human ability, the success of these programs in mitigating poverty is uncertain. Therefore, this research could close the knowledge gap by evaluating the economic consequences at the household level of these programs and focusing on the determinant of poverty reduction (Abbas et al., 2020b). This study's primary objective

is to assess the efficacy of established microfinance schemes in reducing poverty during the pandemic and create a model poverty-reduction policy in developing economies like Pakistan. This study also attempted to look for the causes of poverty—it is reported that two-thirds of the country's population resides in rural areas [12], meaning that the supply of the requisite conditions for them to escape poverty is restricted. As a result, poverty in Pakistan is predominantly a rural problem, with about 80% of the poor population residing in rural areas. Poverty in these areas has several causes, including fiscal, political, and cultural factors. By adding to the existing body of knowledge and laying the groundwork for observational studies on the COVID-19 pandemic scenario, this study is expected to have practical consequences for policy formulation and decision-making in poverty-reduction strategy.

Literature review

Despite bad government, poor infrastructure, mediocre income development, and low social parameters, Pakistan diminished its poverty headcount by almost 66 percent between 2002 and 2016, and MFI is vital to this process (Afzal et al., 2020). COVID-19 poses a significant danger to poorer borrowers, who depend on labor savings to repay their debts (Khan et al., 2020). The pandemic is wreaking havoc on global textile supply chains, which is a required field for the country's economy and the livelihoods of those who depend on it (Iqbal S. et al., 2020). Several studies have attempted to view the impact of the pandemic on economic conditions. For example, Abu et al. (2021) investigated stock market problems due to infection and deaths of COVID-19 in Nigeria. Meanwhile, Marks-Bielska et al. (2020) highlighted the role of institutional efficiency during the pandemic. COVID-19 has reshaped the socio-economic conditions and the role of public-private responsibilities. For example, Aksman (2020) emphasized that pro-government efforts are a prerequisite to reducing the relative poverty gap and risk of poverty, and enhancing social benefits. Soava et al. (2020) suggested that we should evaluate the threshold point of poverty risk based on the net income median equalization method. According to Laskiene et al. (2020), there exists a causality between population and poverty in many regions.

MFIs are typically assessed in terms of social effect and profit consequences according to their dual objectives (Sumner et al., 2020). Although there is a large body of literature on the main determinants of MFI success, empirical evidence on the effect of macroeconomic conditions on MFI results has been mixed and inconclusive. According to previous research, a pandemic-induced economic slowdown would pressure banks' loan portfolios and result in significant deposit withdrawals, particularly in poor and developing countries (Fernandes, 2020). In line with this viewpoint, we anticipate that COVID-19's socio-economic harm would negatively impact MFI's financial results. First, MFIs' output may deteriorate as small and medium-sized businesses (SMEs), and households struggle to fulfill their debt obligations, who are among those most vulnerable to COVID-19. Due to plant shutdowns, supply chain disruptions, and a sharp drop in demand for products and services during the pandemic, businesses are expected to produce inadequate cash flow to repay their debt (Skvarciany et al., 2021).

Furthermore, a significant drop in economic growth typically results in a rise in the unemployment rate (Effendi, 2017). First, mass cuts and closures harm MFI's profitability because the laid-off staff is financially vulnerable. For example, they will not afford mortgage payments on time due to revenue shortfalls, raising the risk of non-performing loans. Second, COVID-19's shock would lead to an unsustainable build-up of non-performing loans and this would have a detrimental impact on sentiment, resulting in a broader drop in bank depositor interest, which could lead to large-scale withdrawals of deposits (Khan et al., 2020; Sun et al., 2020).

Another research line has shown that MFI output is likely to increase in difficult economic times (Yasmin et al., 2020). Following this reasoning, we believe the COVID-19-induced economic downturn would positively impact MFI social success for two causes. To begin, MFIs with a deep internalized social mission can be rewarded for reaching out to the disadvantaged and low-income families, and microenterprises operating in the informal economy. According to Niaz and Iqbal (2019), a drop in economic growth could increase demand for microenterprise products as customers shift away from imports or higher-quality goods. As a result, these micro-businesses would be desperate for credit to increase their manufacturing potential. Tiny and informal enterprises will not be able to deal with any new lending after the pandemic, so commercial banks cannot lend to them in periods of economic decline (Sułkowski et al., 2020). Meanwhile, MFIs express a dedication to providing financial resources to frail and needy customers. As a result, MFIs can prioritize their social purpose during recessions, causing loans to default and incur losses (Widiarto and Emrouznejad, 2015). Second, microfinance's distinct business models, such as community financing, render MFIs less vulnerable to economic fluctuations and are more cost-effective than conventional banks (Khan et al., 2020). During a slowdown, MFIs are projected to be willing to offer smaller loans to more underserved micro-entrepreneurs. In other words, MFIs' outreach is likely to broaden (in terms of the number of committed borrowers) and deepen (in terms of the provision of small loans).

In contrast to those mentioned earlier, some studies have used different evaluation methods. For example, Chai-Arayalert and Suttapong (2020) utilized the qualitative analysis case study method. Anwar et al. (2020) used a primary questionnaire-based survey of 263 non-profit organizations in Pakistan.

Marks-Bielska et al. (2020) adopted both methods (public statistics and primary survey) to evaluate the role of local government in the efficiency and development of financial institutions. However, this study preferred the primary data collection process with the non-parametric evaluation method.

Considering this, we investigate the impact of the COVID-19-induced economic recession on MFI social and financial results in emerging Asian countries such as Pakistan, as calculated by GDP and job declines. We formulate two contrasting hypotheses on the impact of the macroeconomic climate on MFI results, given the contradictory priorities published in the literature (Sumner et al., 2020); that is, there might be a trade-off between servicing the poorest segments and staying financially viable. Therefore, this research will analyze microfinancing institutes' role in poverty reduction with a notable correlation to the current COIVD-19 pandemic situations.

The rest of the work is organized as follows: the next section explains the data and methodological process. Section three presents the results and discussion. The final part of this study presents a conclusion based on empirical investigation. The policy suggestions and study limitations have also been presented in this section.

Data and methodology

Given that this study aims to respond to the research objectives through the participants' perceptions, experiences, and viewpoints, its analysis is based on the experiences of microfinance beneficiaries before and after the COIVD-19 pandemic. For this purpose, the study collected primary data from Tribal areas in South Punjab in DG Khan and Rajanpur districts using questionnaires. In total, 300 questionnaires were collected from the beneficiaries of MFIs. Although this study only focused on the beneficiaries of MFIs, we still attempted to make gender equalization to enhance the visibility and accuracy of the results. Furthermore, the data were submitted for statistical analysis to make sense of it and to draw results.

After analyzing the dataset of questionnaires in the software, we have different options regarding the model specification; for example, the logit model (also known as Logistic Regression) and the probit model (Sahban and Abbas, 2018). However, due to the nature of the data, non-parametric techniques have been used to derive reliable results from this dataset.

Furthermore, it was discovered that data distribution is not consistent because it was collected by non-random sampling. As part of the inference test, this analysis involved statistical analyses: determining or evaluating the disparity between classes (using the Mann-Whitney U or Kruskal-Wallis tests), and establishing the significance and associations between parameters (Hardle and Mammen, 2007).

The Mann-Whitney U test is a non-parametric test that is used to search for essential discrepancies between two groups' variables. If a significant gap is detected, then the mean rank is used to assess which group has the unique path (Pallant and Tennant, 2007). Larger samples can be submitted to:

1) Assign decimal rankings to all the observations (combine the observations from all classes into a single set), starting with 1 for the lowest value. Assign a rank equivalent to the midpoint of unadjusted ranks where there are classes of tied values.
2) Now apply the ranks of the findings from sample 1 together. Because the sum of all the ranks equals, the sum of ranks in sample 2 is determined. Because the total number of observations is N (N + 1)/2, the sum of all ranks equals N (N + 1)/2.
    1) Then, where N1 is the sample size for sample 1, and R1 is the total of the ranks in sample 1, U is determined.
    2) It is important to note that sample 1 may be one of the two tests. A formula for U that is similarly true is

$$U_1 = R_1 - n_1 (n + 1)/2 \quad (1)$$

R_1 is the number of the ranks in sample 1, and n_1 is the sample size for sample 1.

Remembering that the test specimen can represent one of the two tests is critical. A standard method for U is

$$U_2 = R_2 - n_2 (n + 1)/2 \quad (2)$$

The smaller value of U_1 and U_2 is used when consulting significance tables. The sum of the two values is given by

$$U + U = U_1 = R_1 - n_1 (n + 1)/2 + U_2 = R_2 - n_2 (n + 1)/2 \quad (3)$$

Knowing that $R_1 + R_2 = N (N+ 1)/2$ and $N = n_1 + n_2$, and doing some algebra, we find that the sum is $U_1 + U_2 = n_1 n_2$.

The Kruskal-Wallis test, a non-parametric test like the Mann-Whitney U test, is often used to assess relationships (significant differences) between groups. This test can be applied to every continuous variable of more than two classes.

The Kruskal-Wallis test is similar to Wilcoxon's Rank Sum test in that we are comparing the sum of ranks applied to the data. All of the selected data sets are sorted and ranked in order. The sum of the ranks of each data set is calculated ($R_{1...k}$)

$$H = \frac{\sum_{1=j}^{c} n_j \left(M_j - M_{all}\right)^2}{\frac{n_{all}(n_{all}+1)}{12}} \quad (4)$$

With tie correction

Tie is a data point with the same value.

$$H_{corrected} = \frac{H}{1 - \frac{\sum(t_1^3 - t_1)}{n_{all}^3 - n_{all}}} \quad (5)$$

With the H and the amount of df-1 value, the p can be calculated X^2 distribution.

Validity and reliability test

Cronbach's alpha is a metric that is used to determine the internal accuracy, or durability, of a group of scale or test objects. In other words, a measurement's reliability relates to how reliable it is in calculating a definition, and Cronbach's alpha is one way of evaluating how good the accuracy is.

Cronbach's alpha is calculated by adding the variance of all individual item scores to each observation's overall score (typically individual sample respondents or test-takers).

$$\alpha = (k/k - 1)\left(1 - \sum ki = 1\sigma 2yi/\sigma 2x\right) \quad (6)$$

Here k refers to the number of scale items σ2yi refers to the variance associated with the item i

σ2/x refers to the variance associated with the observed total scores.

Alternatively, Cronbach's alpha can also be defined as:

$$\alpha = (k/k - 1)\left(1 - \sum ki = 1\sigma 2yi/\sigma 2x\right) \quad (7)$$

where: k refers to the number of scale items.$\bar{c}$ refers to the average of all covariances between items.$\bar{v}$ refers to the average variance of each item.Cronbach's alpha is a function of the overall score variation, the number of items in a survey, and the average covariance between pairs of items.

Results estimation

Measuring the efficiency of poverty-reduction programs during COVID-19

This section aims to draw an inference from the details provided in the previous section. The normality measure, which contributes to inferential study, is included in this portion. The data are subjected to a non-parametric test, and the findings are summarized and analyzed in the following portion. The normality measure, non-parametric test assessment, and the conclusion are all included in this portion.

Verifying the data's non-normality

The object of this segment is to present the findings of an inferential statistical study. However, before beginning any statistical research, we should first ensure the data is in natural form. Then, we decide what quantitative statistical techniques should be used to analyze the information—the data description with normality test is reported in Table 1.

To test the normality of the underline dataset, we chose the null hypothesis that it is normally distributed while the alternative hypothesis opposed it.

As shown in Table 1, either parameter provided p-values within the Kolmogorov Smirnova and Shapiro-Wilk experiments, meaning that the variance is not average. Therefore, all of the parameters are presumed to be non-normal. To achieve effective research and performance, non-parametric tests must be used.

The S-W test produced the same findings as to the K-S test because the significance values (Sig-values) of variables are 0.000 for both variables. Therefore, we can ignore the null hypothesis and assume that the data are not usually distributed based on the S-W test because the significance value is less than 5% of the test's significance. The results of these tests show that the data is not usually transmitted. As a result, we used the Mann-Whitney non-parametric test for more data processing.

The results of the questionnaire's reliability tested based on Cronbach's alpha are presented in Table 2. In addition, the internal accuracy technique is used to see how consistently the instrument measures the variables.

The Cronbach's alpha and overall item reliability are measured. As seen in Table 2, Cronbach's alpha value of an individual item is between 0.70 and 0.90. The alpha value should be greater than 70, according to study analysts, although there are different ranges. This ensures that the device accurately analyses the variables under investigation.

Non-parametric analysis

When the data have a regular distribution, indicating no positive or negative skewness, a parametric test is sufficient (Ali et al., 2020; Iqbal N. et al., 2020). However, a non-parametric test can be used where the necessary assumptions are not met. Furthermore, non-parametric experiments are frequently more appropriate for surveys of limited groups and ordinal scales. As a result, a non-parametric evaluation is considered to be less rigorous than a parametric test (Effendi, 2017; Abbas et al., 2020a). Due to the scope of the analysis, which is called an exploration, non-parametric testing was used (Anser et al., 2020a). Furthermore, as previously mentioned, data distribution is not standard due to non-random sampling.

This study used two forms of statistical experiments of non-parametric techniques as part of the inference test (Field, 2005). First, the Mann-Whitney U and Kruskal-Wallis rank tests are used to assess and evaluate the disparity between groups

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TABLE 1 Normality test results.

	Kolmogorov Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig	Statistic	df	Sig
Old-age Dependency	0.411	1000	0.000	0.328	1000	0.000
Working Members Women	0.757	1000	0.000	0.411	1000	0.000
Working Members Men	0.544	1000	0.000	0.356	1000	0.000
Value of Animals	0.438	1000	0.000	0.300	1000	0.000
Land Ownership	0.230	1000	0.000	0.151	1000	0.000
Cultivated Land	0.231	1000	0.000	0.454	1000	0.000
Business Assets	0.342	1000	0.000	0.151	1000	0.000
Water Management	0.528	1000	0.000	0.559	1000	0.000
Change in Income	0.235	1000	0.000	0.272	1000	0.000
Source of Change	0.231	1000	0.000	0.515	1000	0.000
Change Amount	0.233	1000	0.000	0.222	1000	0.000
Saving for Emergency	0.353	1000	0.000	0.407	1000	0.000
Loan Availability	0.255	1000	0.000	0.234	1000	0.000
Loan Status	0.403	1000	0.000	0.545	1000	0.000
Per Capital Income	0.232	1000	0.000	0.353	1000	0.000
Total Income of Household	0.442	1000	0.000	0.106	1000	0.000

Author's calculation using STATA 14.
[a]Lilliefors Significance Correction.

TABLE 2 Cronbach's alpha value of an individual item.

Item	Factor loading
Land ownership	0.77
Value of livestock	0.71
Value of business assets	0.81
Loan availability	0.82
Savings	0.80
Increase in income	0.73
Decrease in income	0.78
Increase in per capita income	0.81
Decrease in per capita income	0.80

concerning provided statements. These experiments are designed to see whether the control variables impact the participants' reactions to their income activities.

Table 3 contains more comprehensive explanations of each control variable group sub-variables to summarize the data provided in non-parametric methodology during COVID-19. The purpose is to determine a vital sub-variable in each control variable by referring the score for a statement related to the earnings to the highest median intensity. This aids in establishing a pattern in terms of control variables. Control variables play the most critical role in controlling poverty reduction during COVID-19 in the study region in rural Pakistan.

Table 3 demonstrates the effect of control variables on income adjustment from the previous year, emphasizing training during COVID-19 because skilled hands can earn money. The education part includes whether or not the participants had received academic training. This is statistically essential as a control variable at a 6 percent significance level with an average p-value of 0.001 and a greater mean of 667.37. A non-parametric measurement was employed. This analysis contrasts the statistical significance and the graded means to the statement. Note that this table includes only variables with a significance level of 5% or less than 10%.

The control variable of education/literacy divided into alphabet subgroups was also measured, up to and above HSSC and SSC. The findings from K-W in Table 2 indicate a statistically significant difference in place against this assertion at the 10 percent critical stage because the p-value estimate of 0.071 is below 10 p-values. In contrast to the other subgroups, HSSC has a significant mean rank of 641.10, giving this group greater weight. Therefore, HSSC is an essential point of income enhancement training.

For the organizational control variable, various program types express a broad range of mean for the statement from the table. This is shown by an estimated p-value of less than 5%, which is 0.000. The average score supports this point because companies such as the MFI benefit from the highest average score of 776.60 during COVID-19.

The results on the importance of working women employees in household control variables on the declaration of a shift in

TABLE 3 Significance of training, literacy, program, and gender on the shift of income from the previous year.

Statement	Group	Group categories	Mean rank	Test	Asymp. Sig. (p)
Change in income	Trained	No	477.47	MWU Test	0.0.001
		Yes	**667.37**		
	Literacy	0	470.49	K-W Test	0.0.071
		1–8	496.66		
		9–10	619.06		
		11–12	641.10		
		>12	611.76		
	Program	Not benefited	491.00	K-W Test	0.000
		ZI benefited	477.77		
		BISP benefited	176.60		
		PBM benefited	674.66		
		MFI benefited	**776.60**		
		NGO benefited	467.10		
	Gender	Men	614.13	MWU Test	0.003
		Women	467.03		

Author's own calculation using STATA 14.

TABLE 4 Significance of employment, marriage workers, and livestock on the shift of income from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
Change in income	Employed	NO	460.10	MWU Test	0.000
		Yes	684.48		
	Married	No	638.66	K-W Test	0.016
		Yes	480.11		
		Other	186.60		
	Female Employed	0	481.41	K-W Test	0.000
		1 female	618.36		
		2 females	618.60		
	Male Employed	0	486.86	K-W Test	0.016
		1 male	660.30		
		2 males	631.81		
		3 males	448.48		
		4 males	686.60		
	Livestock worth	0	601.48	K-W Test	0.000
		1–9999	380.81		
		10000–19999	438.04		
		20000–29999	466.36		
		30000–39999	386.66		
		More than 40000	661.44		

Author's calculation using STATA 14.

income are summarized in the chart of COVID-19 in Table 4. This is determined by observing women employees daily. The importance of the "women working part controlling variable" at 5 percent with a p-value of 0.000 reflects the wide range of views on the factor. Furthermore, with a mean rank of 618.36.0, "group 1" received the maximum mean rank in this control variable during COVID-19.

The "men working participant" component, which involves those women in households with permanent employment, is significant at 5% with a p-value of 0.016, suggesting that there is

TABLE 5 Significance of land, business resources, water, saving, and loan on the income shift from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
Change in Income	Land ownership	0	485.18	K-W Test	0.000
		1–10	505.14		
		11–20	600.15		
		21–30	836.66		
		31–40	661.50		
		>40	366.68		
	Land area for cultivation	0	481.01	K-W Test	0.000
		1–10	501.81		
		11–20	656.31		
		21–30	815.50		
		31–40	661.50		
		>40	363.51		
Change in income	Value of Business Resources	0	483.51	K-W Test	0.001
		1–9999	883.00		
		10000–29999	883.00		
		30000–39999	668.00		
		40000–4999	0		
		More than 50000	581.48		
	Water Management	1	486.83	K-W Test	0.000
		2	601.81		
		3	586.61		
		4	406.66		
	Savings	0	485.68	MU Test	0.000
		1	808.50		
	Loan	0	468.81	K-W Test	0.000
		1–9999	481.65		
		10000–19999	686.66		
		20000–29999	686.18		
		30000–39999	883.00		
		More than 40000	883.00		

Author's calculation using STATA 14.

more effect on income adjustment. With a mean rank of 686.60, subgroup four linked to this statistic obtained the maximum mean rank during the COVID-19 pandemic.

According to the records, many people in Pakistan's rural areas hold livestock for food and emergencies. Therefore, the "value of animal" component is essential at 5% with a p-value of 0.000, suggesting that it has an additional effect on income adjustment. With a value of 661.44, subgroup six linked to this variable obtained the highest mean rank.

The importance of control variables on the income statement is examined in Table 5. Most Pakistanis live in rural areas and depend on agriculture as a source of jobs and income. At a 5% significance range, the own-land control variable was statistically significant, with an average p-value of 0.000 and a higher mean rank of 836.66 for category three during the pandemic. Held property and leased land cultivated for agricultural purposes are called cultivated land. With a 5 percent significance and a p-value of 0.000, the cultivated land control indicator is statistically essential, with a higher mean rank of category 3 of the value of 815.50 during the COVID-19 pandemic.

The control variable work status refers to whether the respondent has a permanent job. Working people had a higher mean rank of 584.48 during the COVID-19 pandemic.

The marital status attribute was divided into three categories: single, married, and other. A statistically significant marital status with a 5 percent significance value and 0.015 p-values (below the critical mark), meaning that there was a wide variety of survey answers. The single variable had a robust average rank of 538.65.

This variable is evaluated on a routine basis by evaluating women employees. The results on the importance of the "working women in household" control variables on the assertion are presented in this table. The "women working

member control variable" with a p-value of 5 percent is significant and shows this parameter's broad spectrum of views. Furthermore, with a mean rank of 618.36.0, "group 1" received the maximum mean rank in this control variable.

Rain, canals, and tube wells are all choices for providing water to the cultivated fields. This is calculated by evaluating a water facility used for irrigation. The effect on income adjustment is reflected by the "water management indicator," which is significant at 5% with a p-value of 0.000. Furthermore, with a mean rank of 601.81, 'group tube well' received the maximum mean rank in this control variable.

Respondents were questioned if they had any emergency funds or not. The saving control variable is statistically significant, with a sense of 5% and a value of 0.000 (below this critical threshold), suggesting a broad range of questionnaire surveys. Yes and no were used to categorize this variable. 'Yes' had a high average rank of 808.50.

The vector was classified into many groups, varying from no loan to more than PKR 40,000 in multiple categories. The loan control variable was statistically crucial at 5 percent, with a p-value of 0.000 on average and 883.00 on loans above PKR 30000 on aggregate.

The non-parametric methodology analysis results showing the frequency of the control variables' meaning on poverty status calculated by the financial poverty line were inferred. Poverty is a complex problem with many causes. Certain variables are the most successful in mitigating poverty, although others impact but are rated lower. The program, jobs, marital status, working men and women, land, livestock, business properties, saving, and credit capital are essential and efficient factors in income generation and eradicating poverty. Training, incomes, gender, size, reliance on children, and local variables contribute significantly to poverty but fall second. This table shows that the old-age dependence and household size affect poverty in the study field but are not high. Before developing and implementing strategies to combat and finance poverty reduction in the region, significant poverty determinants must be examined.

To increase their earnings prospects, the rural poor in the sample area obtain free training from Zakat Programs and Pakistan Bait ul Mal. At a 5% significance stage, training as a control variable is statistically significant because the estimated p-value is 0.000, and the yes subgroup has a higher mean value of 617.16 during COVID-19.

As the approximate p-value of 0 000 shows, which is less than 5%, different groups have an extensive range of views for the table argument. The mean ranking supports this claim, with those that benefit from organizations such as the MFI having the highest mean ranks (683.08) during the pandemic (see Table 6).

A working person earns revenue, increasing the household's per capita income. At a 5% significance range, the career status control variable was statistically meaningful, with an overall p-value of 0.000, and employed workers had a higher mean rank of 676.48.

The marital status control variable with a significance value of 5 percent and p-value of 0.000 (under this significant mark) is statistically relevant, which indicates a broad range of survey answers. This element was divided into three main sections: single, married, and others. The average rank of single was 640.84.

At a 5% significance range, gender is statistically significant as a control variable, with an overall p-value of 0.000 and a higher mean value of 616.67 for men.

For illiterates, the education control variable was separated into subgroups. The above claim was tested up to middle school, SSC, HSSC, and above HSSC; the K-W Test outcome in the table indicates a statistically significant gap in the position taken against this argument at the 6% vital level around the education classes because the average p-value of 0.000 is smaller than the 5% confidence level. Compared to other subgroups, HSSC has a high mean rank of 818.36, which supports this argument. As a result, the level of education above the HSSC is significant for per capita income.

There are five different types of this attribute. The estimated p-value for the control variable of child dependency, which is 0.088, which is less than a 10% significance value, shows this. The division has a high mean score of 641.18, confirming this argument.

For Table 7, many subgroups are segregated from the control variable age by various age ranges, showing an estimated p-value of 0.000, less than 5 percent meaning value. The mean rating supports this distribution, with a robust mean score of 613.47 for ages equivalent to or shorter than 10 years during the COVID-19 pandemic. This variable covers all family members, including men, women, infants, and the elderly. This measure's approximate p-value is 0.000, suggesting a significant amount of less than 5%. The mean ranking supports this distribution; the category for 1–1 has a sizeable mean rating of 703.10 during the pandemic.

Concerning the control variable of infant dependence, multiple child dependency classes separate a wide variety of subgroups for the table's argument; this is shown by the approximate p-value here, 0.000, less than a 5% significance value. Furthermore, the average rating backs up this claim; the category for 0 has a robust mean value of 601.67.

A senior citizen could be thought of as a child of the family, and therefore people over the age of 60 are included in this variable. The approximate p-value for the control variable of old-age dependence is 0.000, which is less than a 6% significance value. The mean rating backs up this claim; category 3–4 has a mean solid score of 671.88.

When women work and benefit, the household per capita income rises. Therefore, with a p-value of 0.000, the "women working member control variable" is important at 5%. Furthermore, with a mean rank of 730.40, "group 1" received the maximum mean rank in this control variable during the COVID-19 pandemic.

TABLE 6 Significance of domicile district, literacy, program gender, and training on the per capita income from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
Per capita income	Domicile	DG khan	468.78	MWU Test	0.000
		Rajanpur	648.07		
	Trained	No	476.16	MWU Test	0.010
		Yes	617.16		
	Literacy	0	610.87	K-W Test	0.000
		1–8	486.31		
		9–10	338.43		
		11–12	618.78		
		>12	683.08		
			641.14		
	Program	Not benefited	466.61	MWU Test	0.000
		ZI benefited	676.48		
		BISP benefited			
		PBM benefited			
		MFI benefited			
		NGO benefited			
	Gender	Men	640.84	K-W Test	0.000
		Women	461.64		
			183.00		
	Trained	No	417.61	MWU Test	0.000
		Yes	616.67		
	Literacy	0	416.66	K-W Test	0.0.000
		1–8	461.31		
		9–10	617.07		
		11–12	613.87		
		>12	818.36		

Authors own calculation using STATA 14.

The "men working participant" component is significant at 5% with a p-value of 0.000, which suggests that it has an additional effect on income adjustment. With a mean rank of 783.40, subgroup four, connected to this statistic, received the maximum mean rank during COVID-19.

Table 8 shows that the "animal value" parameter at 5 percent with a p-value of 0.000 is significant, suggesting that per capita incomes are more influenced. With a mean rank of 608.71, the subgroup no animal connected to this attribute achieved the maximum mean rank during the COVID-19 pandemic.

In rural Pakistan, property is considered to be the primary source of revenue for landlords. At a 5% significance amount, the own-land control variable was statistically significant, with an average p-value of 0.000 and a higher mean rank of 811.40 for categories 16–10 acres.

Business operation is carried out to generate benefits, which increases household income. Table 9 shows that the "market asset vector" at 5 percent has a p-value of 0.001 and affects the revenue change flow. Furthermore, with a mean rank of 867.00, the control variable 'group up to 10000 PKR' received the maximum mean rank during COVID-19.

A water facility was used to determine irrigation. The impact on income change is reflected by the Water Management Parameter, which is meaningful at 6% and with a p-value of 0.000. In addition, with a mean rank of 618.06, "group tube well and channel" in this control variable were given the highest mean rank during the disease outbreak.

The saving control variable, with a significance of 5% and a p-value of 0.006 (below this critical mark) is statistically essential and means that there were many survey answers.

Discussion

This study is based on the non-parametric method to evaluate the role of MFIs in the poverty-reduction process during the COVID-19 pandemic in Pakistan. The previous section contains more comprehensive explanations of each control variable group's sub-variables to summarize the non-parametric methodology's data.

TABLE 7 Significance of age, household size, children, old age, and workers on the per capita income from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
Per capita income	Age of household head	1–25	613.47	K-W Test	0.000
		26–40	486.07		
		41–60	461.83		
		60–80	461.04		
	Household Size	1–2	703.10	K-W Test	0.000
		3–5	660.71		
		6–8	461.81		
		9–11	411.67		
		12–15	418.78		
	No of Children	0	601.67	K-W Test	0.000
		1–2	613.48		
		3–4	414.84		
		6–6	340.67		
		7–8	163.88		
	Old dependency	0	488.46	K-W Test	0.000
		1–1	413.88		
		3–4	671.88		
	Female employed	0	481.46	K-W Test	0.000
		1	716.86		
		2	730.40		
		3	730.40		
	Male employed	0	466.87	K-W Test	0.000
		1–2	688.16		
		3–4	786.81		
		5–6	780.46		
		>6	783.40		

Author's calculation using STATA 14.

It aims to find the essential sub-variable in each control variable by referring to the highest mean frequency each time that the sub-variable scored for a statement relevant to income. This aids in establishing a pattern in terms of control variables. Control variables play the most crucial role in poverty reduction in the study region and in rural Pakistan.

Residing in the Rajanpur district has a more significant impact on the questionnaires-based income factors. Education is a fundamental method for human resource growth and educated students are more critical than untrained people (Shah et al., 2020). In terms of schooling, jobs, and earnings, single people are more critical than married people. This finding has been supported in Li and Sheng (2018). Due to cultural and religious practices, women are not permitted to function and work beyond the boundary wall in rural Pakistan. Therefore, they are not counted in the income statement during COVID-19. Consequently, education is a critical component of poverty reduction. Degrees and HSSC are the most efficient means to earn money, but HSSC and SSC are also significant. Only literate persons are entitled to handle poverty reduction, as seen in the graph. Therefore, to manage poverty reduction, SSC is critical and relevant. It should also be noted that microfinance programs ranked first with four frequencies during the COVID-19 pandemic.

The 20-age group scored the highest mean value for the age control variable, which, as seen, proved to be meaningful. This indicates the most relevant determinant sub-variable for income-related claims that assess poverty levels, as concluded by Olopade et al. (2019) and Anser et al. (2020b). The controls for women and men employed are significant—one female worker and four working men scored the highest mean value. This means that they are the most relevant determinants of poverty status. This notion is also supported by Cuéllar-Fernández et al. (2016), Iqbal W. et al. (2020), and Iram et al. (2020).

Compared to household size, old age, and child dependence, household properties, which involve property, cattle, and company assets, proved to be the more productive variable, ranking first during the COVID-19 pandemic. Although the outcome of the table shows that the animal control variable is essential and obtained the highest average ranking with

TABLE 8 Significance of livestock and land on the per capita income from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
	Worth of livestock	0	608.71	K-W Test	0.000
		1–9999	364.60		
		10000–19999	360.08		
		20000–29999	387.30		
		30000–39999	330.16		
		More than 40000	661.34		
Per capita income	Land ownership	0	637.61	K-W Test	0.000
		1–10	466.68		
		11–20	671.63		
		21–30	736.64		
		31–40	811.40		
		>40	164.38		
	Land area for cultivation	0	644.36	K-W Test	0.000
		1–10	464.66		
		11–20	731.78		
		21–30	773.18		
		31–40	811.40		
		>40	138.46		

Author's calculation using STATA 14.

TABLE 9 Significance of business resources, water savings, and loans on the per capita income from the previous year.

Statement	Group (control variables)	Group categories	Mean rank	Test	Asymp. Sig. (p)
Per capita income	Value of Business Resources	0	481.61	K-W Test	0.001
		1–9999	874.16		
		10000–29999	867.00		
		30000–39999	166.00		
		40000–4999	0		
		More than 50000	607.81		
	Water Management	1	641.68	K-W Test	0.000
		2	444.16		
		3	618.06		
		4	411.71		
	Savings	0	487.41	MU Test	0.006
		1	701.43		
	Loan	0	481.31	K-W Test	0.003
		1–9999	168.60		
		10000–19999	660.78		
		20000–29999	606.43		
		30000–39999 more than 40000	836.16		
			816.60		

Author's calculation using STATA 14.

subgroups for up to 40,000 PKR of animals within categories, the findings of this table also reveal that it is insignificant for the animal control parameter. For subgroups up to 30000 PKR, business properties have the most considerable mean worth. Therefore, owning and farming land is essential, and the community with 10–16 acres of land scored the highest mean

value during the pandemic. The water source for agriculture is also significant, with the subgroup tube well/canal source scoring the highest mean value. Savings and loans are also essential to control variables, with a loan having the maximum mean score for subgroup loans up to 40,000 PKR.

The outcomes of the non-parametric techniques show the importance of the frequency of the control variables on poverty level during the pandemic (Qayyum et al., 2019). Poverty is a multifaceted issue with many determinants. Some specific causes have the largest influence on poverty, although others have an influence but are ranked lower. Programs, employment, marital status, working women members, working men members, and properties such as property, farmland, company assets, deposits, and loans are essential and productive factors in producing revenue and reducing poverty. Training, income, age, child dependence, and district variables are all important factors that contribute to poverty, but are ranked second. According to this table, old-age dependence and household size influence poverty status in the sample region, but they are not as significant during the COVID-19 pandemic. High-ranking parameters are important factors determining poverty and need to be explored before designing and implementing strategies to manage and finance poverty reduction in the area.

Conclusion and policy implications

This study determines the role of a microfinance institution in the poverty-reduction process in the era of pandemic-19. For this purpose, the study distributed questionnaires among the beneficiaries of the MFIs. These questionnaires have been evaluated with a well-reputed non-parametric technique. We found that MFIs are still helping to manage poverty reduction, especially in remote areas. Gender, marital status, household size, schooling, training, working status, and age were also found to be significant determinants for managing and funding poverty reduction during the COVID-19 pandemic. Via various initiatives, this program seeks to improve financial resources and intellectual capital, resulting in increased jobs and poverty reduction.

According to this investigation's findings, programs can collaborate to achieve poverty reduction's primary goal through their regional programs and activities. Programs can work together to recognize positive and unproductive candidates in society, and then assist them to use their capacity for handling and funding poverty reduction in the nation after screening the disadvantaged to avoid the destructive impact of the COVID-19 pandemic.

Recommendations and policy implications

- As the world prepares to tackle the second phase of the COVID-19 pandemic, the main aim is to enhance decision-makers' access to knowledge and financial and economic resources, which were inaccessible to them during the first wave. Unlike in the first wave, where welfare programs, including microfinance inclusion, were not prepared ahead of time, the country's virus situation is currently at a point where sequenced steps will significantly help manage the spread.
- The goals of the microfinance reform package that have been released so far vary from country to country. Some have also made their well-being sector a priority to alleviate the pressure, while still coping with their economies' adverse effects. It is essential to develop economic growth strategies based on medium and small enterprises that are focused on inclusivity and long-term sustainability in these unprecedented times. It is also too early to assess these measures' feasibility while the threat of another COVID-19 wave(s) looms. Nevertheless, proactive efforts and prompt decisions seem to have aided in the suppression of the virus, and in the support of small and medium-scale enterprises financed by MFIs and families to preserve their lives and livelihoods.

Study limitations and future directions

During COVID-19, the researcher had difficulty concerning the responders' costs, time, and participation. This was an independently conducted field study that had no external sources of funding. Because reaching many respondents across Pakistan was impractical, the number of respondents could be limited. The researcher had approximately 2 months to collect data through questionnaires and interviews in the researcher's home country of Pakistan's DG Khan Division. This can be seen as a constraint because it was impossible to increase the respondents' number within the time frame during the COVID-19 pandemic. It should also be remembered that both beneficiaries and non-beneficiaries of the research region responded to the questionnaires. Therefore, it took a long time to get their consent to perform interviews and analyses on their property, and to obtain access to beneficiaries, especially in the pandemic era.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material; further inquiries can be directed to the corresponding author.

Ethics statement

Ethics review and approval/written informed consent was not required as per local legislation and institutional requirements.

Author contributions

SL and NI did the "conceptualization"; methodology was formed by SL, JD, and AA; software and validation performed by JD, MS, and NI; formal analysis was conducted by SL, AA, and MS; investigation, resources, data curation, performed by SL and NI; writing—original draft preparation carried out by JD, AA, MS, and NI; writing—review and editing by SL, JD, AA, MS, and NI; visualization and supervision by SL.

Funding

The 13th five year plan of Chongqing educational science "research and Practice on the training mode of Applied Undergraduate e-commerce talents from the perspective of new economy" (Subject No.:2018-GX-375).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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