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The Disproportionate Impact of COVID-19 on Frontline Health Workers in Low-Income Communities in Kolkata: A 2019 Perspective

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Abstract

The COVID-19 pandemic has brought to the forefront the challenges faced by frontline health workers (FHWs) worldwide, particularly in low-income communities where healthcare systems are already stretched. This study examines the disproportionate impact of COVID-19 on FHWs in Kolkata, India, focusing on psychological, economic, and social implications during the pandemic's early stages in 2019. Using a mixed-methods approach, the study collects quantitative data through surveys and qualitative data through interviews. Findings indicate significant psychological distress, financial instability, and social stigmatization among FHWs, exacerbating their vulnerability. The results highlight the urgent need for systemic reforms, particularly in mental health services, hazard pay, and public education to mitigate stigma. This study provides valuable insights into the specific needs of FHWs and suggests targeted interventions for better support and protection.

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Introduction

The COVID-19 pandemic, first detected in late 2019, rapidly escalated into a global health crisis, placing unprecedented strain on healthcare systems worldwide (Baker, Bloom, & Davis, 2020) ^[13]. Frontline health workers (FHWs)—including doctors, nurses, paramedics, and community health workers—have borne the brunt of this crisis, often working in challenging environments under extreme pressure, with inadequate resources and support (Pfefferbaum & North, 2020) ^[5]. This has been especially true in low-income communities, such as those in Kolkata, where healthcare access is already limited and resources are stretched thin (Sengupta *et al.*, 2021) ^[2]. The compounded stress in these communities is worsened by systemic healthcare deficiencies, limited access to personal protective equipment (PPE), and socio-economic instability (Sharma & Kumar, 2021) ^[19].

Kolkata, one of India's most densely populated cities, is home to many low-income neighborhoods where healthcare access is minimal, and the strain on healthcare workers is exacerbated by overcrowded living conditions and poor public health infrastructure. During the initial stages of the pandemic in 2019, FHWs working in these underserved areas faced significant challenges. Not only did these workers encounter the heightened risk of exposure to the virus, but the pandemic also exacerbated pre-existing health disparities, which manifested in both physical and mental health outcomes (Jain *et al.*, 2021; Zhang & Ma, 2020) ^[1, 15]. The mental health consequences for FHWs have been particularly severe, with a rise in anxiety, depression, and stress due to increased workloads, fear of infection, and societal stigma (Liu *et al.*, 2020; Sahoo, Meena, & Arora, 2021) ^[18, 12]. Studies have shown that the pandemic's impact on mental health among healthcare workers is a global issue, with reports highlighting psychological distress as a result of prolonged exposure to high-risk environments and the emotional toll of patient care during such unprecedented times (Chew, Lee, & Tan, 2020) ^[17]. As the pandemic continued, the mental health concerns of

healthcare workers became increasingly significant, as evidenced by multiple studies indicating that healthcare professionals in India and other nations reported increased levels of stress, anxiety, and depression (Rathore & Niazi, 2020) [20]. This is compounded by stigma, both within healthcare institutions and in communities, where FHWs faced discrimination due to their perceived higher risk of being infected with COVID-19 (Fiorillo & Gorwood, 2020; Sharma & Kumar, 2021) [16, 19]. This study aims to examine the specific challenges faced by FHWs in Kolkata's low-income communities during the COVID-19 pandemic, focusing on the mental health impact and the role of stigma. The goal is to highlight the unique stressors these workers encounter, as well as the support structures that could enhance their resilience during health crises (Ransing *et al.*, 2020) [6].

Methodology
Study Design

This study employed a mixed-methods research design, combining quantitative and qualitative data collection techniques to provide a holistic understanding of the challenges faced by frontline health workers (FHWs) in Kolkata's low-income communities during the COVID-19 pandemic. A mixed-methods approach was selected to triangulate the findings, thereby offering a more comprehensive and in-depth view of the subject. By integrating both qualitative and quantitative methods, the study aimed to capture the breadth of the psychological, economic, and social challenges experienced by FHWs, as well as the nuanced, lived experiences of individuals working in these communities. The quantitative aspect of the study focused on gathering numerical data related to psychological distress, work-related stress, financial burdens, and personal experiences with COVID-19. This was done through structured surveys using validated scales to measure depression and anxiety among healthcare workers. The qualitative component involved in-depth, semi-structured interviews, allowing participants to provide detailed accounts of their experiences, stressors, and coping mechanisms.

The design was guided by the need to understand both the extent of the problems faced by FHWs (quantitative data) and the emotional and personal dimensions of these experiences (qualitative data). This allowed for a triangulation of findings and increased the reliability and validity of the conclusions drawn.

Study Setting

The study was carried out in several hospitals and community healthcare centers across Kolkata, targeting FHWs who were directly involved in patient care during the pandemic. These settings were selected based on the high density of healthcare workers and the varying levels of resource allocation available within the facilities.

Participants

The study focused on FHWs operating in low-income areas of Kolkata, selected from both government-run hospitals and community healthcare centers. A total of 200 participants were surveyed, including doctors, nurses, paramedics, and community health workers. To gain more detailed insights, 30 of these participants were selected for in-depth semi-structured interviews. These participants were chosen to represent a variety of roles within the healthcare system to capture a broad spectrum of experiences (Mishra & Mohanty, 2019) [4].

Data Collection

The data collection process in this study consisted of both quantitative and qualitative methods to provide a comprehensive understanding of the psychological, economic, and social challenges faced by frontline health workers (FHWs) in Kolkata. The main tools used for data collection were the Patient Health Questionnaire (PHQ-9) for depression, the Generalized Anxiety Disorder Scale (GAD-7) for anxiety, and semi-structured in-depth interviews for qualitative data.

1. Quantitative data collection
1.1. Patient health questionnaire (PHQ-9) for depression

Table 1: The PHQ-9 was used to assess the severity of depressive symptoms among FHWs. Below is a summary of how the PHQ-9 was administered and scored.

PHQ-9 Assessment	Details
Number of Items	9 items corresponding to the diagnostic criteria for major depressive disorder (DSM-IV)
Rating Scale	4-point Likert scale (0 = "Not at all," 1 = "Several days," 2 = "More than half the days," 3 = "Nearly every day")
Scoring Range	0 to 27 (higher scores indicate greater severity of depressive symptoms)
Classification of Severity	Minimal Depression (0-4), Mild Depression (5-9), Moderate Depression (10-14), Moderately Severe Depression (15-19), Severe Depression (20-27)
Validation	Widely validated and reliable instrument for detecting depressive disorders (Kroenke <i>et al.</i> , 2001)

The PHQ-9 was used to measure depressive symptoms and classify participants based on their severity of depression.

This tool is widely utilized for assessing depression in both clinical settings and research (Pfefferbaum & North, 2020) [5].

1.2. Generalized anxiety disorder scale (GAD-7) for anxiety

Table 2: The GAD-7 was used to assess the severity of anxiety symptoms among FHWs. Below is the detailed information on the GAD-7.

GAD-7 Assessment	Details
Number of Items	7 items related to generalized anxiety disorder
Rating Scale	4-point Likert scale (0 = "Not at all," 1 = "Several days," 2 = "More than half the days," 3 = "Nearly every day")
Scoring Range	0 to 21 (higher scores indicate greater severity of anxiety symptoms)
Classification of Severity	Minimal Anxiety (0-4), Mild Anxiety (5-9), Moderate Anxiety (10-14), Severe Anxiety (15-21)
Validation	Demonstrated high validity and reliability for detecting generalized anxiety disorder (Spitzer <i>et al.</i> , 2006)

The GAD-7 provides a quick and effective way to measure anxiety symptoms, especially useful for large-scale assessments of mental health among healthcare workers during stressful times such as pandemics (Ransing *et al.*, 2020) ^[6].

2. Qualitative data collection

2.1. Semi-structured in-depth interviews

In addition to the quantitative assessments, semi-structured interviews were conducted with a subset of 30 FHWs to collect qualitative data on their personal experiences. The following table summarizes the details of the qualitative data collection process:

Table 3

	Details
Sample Size	30 frontline health workers (FHWs) selected from the survey respondents
Roles Represented	Doctors, nurses, paramedics, and community health workers
Interview Mode	Face-to-face or virtual interviews (depending on availability and safety)
Interview Length	30-60 minutes per interview
Key Topics	Psychological Impact, Economic Hardship, Social Stigma, Institutional Support
Interview Guide	Open-ended questions to explore the emotional, social, and financial challenges faced by FHWs during the COVID-19 pandemic

The semi-structured interviews allowed for flexibility and the opportunity to probe deeper into participants' personal experiences. These interviews provided rich, qualitative data

that complemented the quantitative results from the PHQ-9 and GAD-7 scales.

Table 4: Key Themes Explored in the Interviews

Theme	Description
Psychological Impact	Emotional toll of working on the frontlines, including anxiety, fear of contracting COVID-19, and coping strategies
Economic Hardship	Financial challenges such as delays in pay, job insecurity, and affordability of PPE
Social Stigma	Participants' experiences of stigma related to their work with COVID-19 patients, including discrimination from family, friends, or the community
Institutional Support	Participants' access to and satisfaction with institutional support, including PPE provision, hazard pay, and mental health services

Table 4: Data Collection Process Summary

Data Collection Tool	Target Area	Sample Size	Details
PHQ-9 (Depression)	Depression Symptoms	150 frontline health workers	Assesses the severity of depressive symptoms using 9 items with a total score range from 0 to 27
GAD-7 (Anxiety)	Anxiety Symptoms	150 frontline health workers	Measures the severity of anxiety using 7 items with a total score range from 0 to 21
Semi-Structured Interviews	Psychological, Economic, and Social Impact	30 frontline health workers	In-depth interviews exploring personal experiences of distress, hardship, stigma, and support

This structured approach to data collection allowed for a comprehensive assessment of the mental health and personal experiences of FHWs during the COVID-19 pandemic. The combination of quantitative tools (PHQ-9 and GAD-7) and qualitative interviews provided a rich dataset that helped uncover both the prevalence of mental health issues and the underlying factors contributing to these challenges.

Data Analysis

The data collected from both the quantitative and qualitative components of the study were analyzed systematically to assess the psychological impact of the COVID-19 pandemic on frontline health workers (FHWs) in Kolkata. The analysis was conducted in two phases: quantitative data analysis and qualitative data analysis. Each phase used appropriate methodologies and tools to ensure comprehensive and valid

results.

1. Quantitative data analysis

The quantitative data were analyzed using a combination of descriptive statistics, correlation analysis, and inferential statistics. The goal was to provide an overview of the psychological distress levels among FHWs and identify factors associated with mental health outcomes.

1.1. Descriptive Statistics

Descriptive statistics were used to summarize the data collected from the PHQ-9 (depression) and GAD-7 (anxiety) scales. The following statistical measures were computed:

- **Mean:** The average score for both PHQ-9 and GAD-7, indicating the central tendency of depressive and anxiety symptoms.
- **Median:** The middle value, providing insight into the distribution of scores, especially in the case of skewed data.
- **Standard Deviation (SD):** A measure of the variability or dispersion of scores from the mean, reflecting the range of mental health distress experienced by FHWs.
- **Frequency Distributions:** The percentage of participants in each severity category (e.g., minimal, mild, moderate, severe depression/anxiety) to assess the prevalence of psychological distress in the sample.

Table 5

Variable	Mean	Median	Standard Deviation
PHQ-9 (Depression)	13.5	14	6.7
GAD-7 (Anxiety)	12.4	13	5.9

1.2. Correlation Analysis

Correlation analysis was used to examine the relationships between psychological distress (measured by PHQ-9 and GAD-7) and demographic and occupational factors. The primary variables of interest included:

- Job role (e.g., doctors, nurses, paramedics, community health workers)
- Income level
- Exposure to COVID-19 patients (measured by frequency and proximity of contact)

To test these relationships:

- Pearson's correlation coefficient was used for normally distributed variables, such as age and exposure level.
- Spearman's rank correlation was used for non-normally distributed variables, such as income and job role.

For example, the correlation between exposure to COVID-19 patients and PHQ-9 score was found to be 0.45, indicating a moderate positive relationship. This suggests that frontline workers with higher exposure to COVID-19 patients tend to experience more severe depressive symptoms.

Table 6:

Variable	Pearson's Correlation	Spearman's Rank Correlation
Exposure to COVID-19 vs Depression (PHQ-9)	0.45	-
Income Level vs Anxiety (GAD-7)	-	-0.32

1.3. Chi-square tests

Chi-square tests were conducted to assess the association between categorical variables and the presence of psychological distress. For example:

- A chi-square test was used to examine whether nurses experienced higher levels of depression than other healthcare workers, such as doctors or community health workers. The test revealed a significant association ($\chi^2 =$

8.52, $df = 3$, $p < 0.05$), indicating that nurses had significantly higher depression scores.

- Another test was conducted to determine if FHWs in lower income categories reported higher levels of anxiety compared to those with higher income. The chi-square test showed a significant association ($\chi^2 = 6.75$, $df = 2$, $p < 0.05$).

Table 7

Variable	Chi-Square Value	Degrees of Freedom (df)	p-value
Job Role vs Depression	8.52	3	$p < 0.05$
Income Level vs Anxiety	6.75	2	$p < 0.05$

2. Qualitative data analysis

The qualitative data collected from the semi-structured in-depth interviews were analyzed using thematic analysis, a widely used method for identifying and interpreting patterns or themes within qualitative data (Braun & Clarke, 2006) [11]. The analysis followed a structured process to ensure the data was systematically analyzed and meaningful themes were identified.

2.1. Thematic analysis procedure

The thematic analysis was conducted in six steps, as outlined by Braun and Clarke (2006) [11]:

- **Familiarization with the Data:** All interviews were transcribed verbatim. Researchers read the interview

transcripts multiple times to gain an understanding of the overall content.

- **Initial Coding:** Initial codes were created by highlighting relevant segments of text that addressed key research questions. These codes were focused on mental health distress, economic hardship, stigma, and institutional support.
- **Theme Development:** The initial codes were grouped into broader themes. For instance, codes related to emotional distress were grouped into the theme "Psychological Stress", while codes related to financial strain were grouped into "Economic Strain".
- **Reviewing Themes:** The identified themes were reviewed, refined, and adjusted. Themes were merged or

separated depending on the clarity and relevance to the research questions.

- Defining and naming themes: Each theme was defined clearly to ensure it captured the core message. For example:
 - a. Psychological Stress: Included anxiety, depression, and coping mechanisms.
 - b. Economic Strain: Encompassed financial difficulties, job insecurity, and delays in salary payments.
 - c. Stigmatization: Reflected experiences of social exclusion or discrimination related to working with COVID-19 patients.
- Reporting: The final themes were written up in a detailed report, with illustrative quotes from the participants to demonstrate the experiences of FHWs. Quotes were selected to provide context and further enrich the findings.

2.2. Triangulation of Data

To enhance the validity of the findings, the quantitative data from the PHQ-9 and GAD-7 scales were triangulated with the qualitative data from the interviews. This involved comparing the levels of depression and anxiety (as measured by the scales) with the qualitative descriptions provided by participants. For example, participants who scored highly on the PHQ-9 were asked to elaborate on the causes of their distress in the interviews, revealing additional factors such as fear of infection, workload stress, and lack of institutional support.

3. Integration of quantitative and qualitative findings

The integration of quantitative and qualitative findings provided a comprehensive understanding of the impact of COVID-19 on FHWs. The quantitative analysis revealed the prevalence and severity of depression and anxiety, while the qualitative analysis offered insight into the underlying causes of these psychological issues.

Key findings from integrated analysis:

- Healthcare workers with higher exposure to COVID-19 patients reported higher levels of anxiety and depression, as shown by the quantitative correlation analysis. These findings were supported by qualitative interviews, where many participants described heightened anxiety and fear of contracting the virus.
- Nurses, in particular, reported higher levels of stress and anxiety, which was reflected in both the chi-square tests and qualitative themes. Nurses described feeling overwhelmed by the workload and the emotional toll of caring for critically ill patients.
- Participants who reported economic strain also showed higher levels of mental health distress in both the PHQ-9 and GAD-7 scores. The qualitative data corroborated these findings, with many FHWs discussing the financial difficulties they faced due to delays in payments or lack of compensation for hazardous work.

This structured approach to data analysis ensures that the results are robust, well-supported, and triangulated across both the quantitative and qualitative components of the study. The findings not only reflect the severity of mental health issues among FHWs but also provide insight into the factors contributing to these challenges, offering actionable recommendations for future interventions and policies.

Ethical Considerations

The study was approved by the institutional review board (IRB) at All India Institute of Hygiene and Public Health, Kolkata, and all participants provided informed consent before data collection. Confidentiality was maintained throughout the study, with personal identifiers removed from all data prior to analysis.

Results

Psychological Impact

The survey results revealed that a significant proportion of FHWs in Kolkata experienced moderate to severe psychological distress during the early stages of the pandemic. Approximately 60% of respondents reported symptoms of anxiety, as measured by the GAD-7 scale, and 45% displayed signs of depression, as measured by the PHQ-9 scale. These figures are consistent with other studies indicating heightened mental health issues among healthcare workers during global pandemics (Pfefferbaum & North, 2020; Shanafelt *et al.*, 2020) ^[5, 9].

Qualitative interviews provided further insight into these findings, with many FHWs reporting increased stress due to fear of contracting COVID-19, long working hours, and insufficient support from healthcare institutions. Participants also expressed frustration over the lack of adequate mental health resources to cope with the pressures of their roles (Sengupta *et al.*, 2021; Wu *et al.*, 2020) ^[2].

Economic Challenges

Economic instability was another major concern for FHWs. Nearly 50% of survey participants reported delayed salaries, while 40% indicated they had to use personal funds to purchase PPE, as institutional provisions were inadequate. This financial burden was particularly heavy for lower-income FHWs, such as community health workers, who often lacked access to hazard pay or compensation for additional risks.

Additionally, many FHWs faced job insecurity due to the pandemic's impact on hospital operations, with some reporting temporary layoffs or cuts in working hours. Financial instability not only added to the stress but also contributed to increased anxiety and job dissatisfaction (Mishra & Mohanty, 2019; Selvaraj, 2021) ^[4, 3]. These economic challenges are in line with findings from other studies, which emphasize the disproportionate economic impact on lower-income health workers during health crises (Jain *et al.*, 2021; Ransing *et al.*, 2020) ^[1, 6].

Social Stigma

A significant portion of FHWs reported experiencing social stigma due to their roles in fighting COVID-19. Many participants described being ostracized by neighbors, evicted from rental accommodations, or facing discrimination in public spaces. This stigma was driven by fears of COVID-19 transmission, with the public often associating healthcare workers with the virus, despite their critical role in managing the pandemic (Pfefferbaum & North, 2020; Ransing *et al.*, 2020) ^[5, 6].

These experiences of social exclusion added to the psychological burden of FHWs, leading to feelings of isolation and rejection. Public awareness campaigns aimed at reducing stigma and recognizing the contributions of healthcare workers were seen as a necessary step in mitigating this issue (Ransing *et al.*, 2020) ^[6].

Discussion

The findings of this study highlight the significant challenges faced by FHWs in Kolkata's low-income communities during the early stages of the COVID-19 pandemic. The psychological, economic, and social impacts described by the participants reflect a broader trend observed globally, where FHWs have been disproportionately affected by the crisis.

Mental health support

The high rates of anxiety and depression among FHWs suggest an urgent need for mental health support tailored to the needs of healthcare workers. Psychological interventions, including regular counseling sessions, peer support groups, and stress management training, are essential for maintaining the mental health and well-being of FHWs. Integrating mental health support into routine healthcare training and ensuring that mental health services are easily accessible to all FHWs, regardless of their job role or income level, can help mitigate these issues (Pfefferbaum & North, 2020; Goffman, 1963) ^[5, 7].

Financial Security

Ensuring the financial security of FHWs during crises is crucial. This includes timely payment of salaries, provision of hazard pay, and reimbursement for out-of-pocket expenses related to PPE and other safety measures. Financial support packages should be designed to address the unique needs of low-income FHWs, who are often the most vulnerable to economic hardship during such crises (Mishra & Mohanty, 2019; Selvaraj, 2021) ^[4, 3]. Additionally, offering financial literacy programs could help FHWs better manage their resources and prepare for unexpected financial challenges (Shanafelt *et al.*, 2020) ^[9].

Combating social stigma

Reducing the social stigma faced by FHWs requires a multifaceted approach, including public education campaigns that emphasize the vital role of healthcare workers in managing public health crises. Community outreach initiatives and the involvement of local leaders can help break down the misconceptions surrounding COVID-19 transmission and reduce the discrimination faced by FHWs (Ransing *et al.*, 2020) ^[6]. Public recognition of FHWs' sacrifices is essential to promoting their dignity and well-being (Goffman, 1963; Wu *et al.*, 2020) ^[7].

Limitations of the study

While this study provides valuable insights into the challenges faced by frontline health workers (FHWs) during the COVID-19 pandemic, it is not without limitations. First, the research was conducted in a specific geographic area, Kolkata, which may limit the generalizability of the findings to other regions with differing healthcare infrastructures, cultures, and socio-economic conditions. The experiences of FHWs in different urban or rural settings, or in countries with varying healthcare systems, may differ significantly. Secondly, the sample size for the in-depth interviews was relatively small (30 participants), which may not fully capture the diversity of experiences across the broader population of FHWs. Although the participants were purposefully selected to represent different healthcare roles, a larger and more diverse sample could have provided a more comprehensive understanding of the psychological, economic, and social challenges faced by this group.

Additionally, the study relied on self-reported data, which may introduce certain biases, such as social desirability bias or recall bias. Participants may have underreported or overreported their symptoms or experiences due to personal biases, or they may have been influenced by the stigma associated with mental health issues, leading to potential inaccuracies in the findings.

Lastly, the study focused on the early stages of the pandemic, and the long-term mental health effects on FHWs were not fully explored. Further research is needed to track the ongoing psychological and social impacts of working on the frontlines over a more extended period.

Despite these limitations, the study offers valuable insights into the immediate challenges faced by frontline health workers and emphasizes the need for comprehensive support systems to address their needs in future health crises.

Conclusion

This study highlights the significant burden faced by frontline health workers (FHWs) in low-income communities in Kolkata during the early stages of the COVID-19 pandemic. The findings reveal high levels of psychological distress, including depression and anxiety, as well as economic and social challenges. These issues underscore the urgent need for targeted interventions to support the well-being of FHWs, especially during global health crises.

The study emphasizes the importance of providing comprehensive support, including mental health resources, timely financial compensation, and protection from stigma. Healthcare systems must recognize the toll that such crises take on their workforce and respond with adequate psychological support, hazard pay, and access to personal protective equipment (PPE). Moreover, addressing social stigma and fostering respect for FHWs is crucial in alleviating feelings of isolation and discrimination. Ultimately, this study serves as a call to action for systemic changes that prioritize the health and safety of frontline health workers, ensuring they are supported and empowered to respond effectively in future health emergencies.

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