International Journal of Advance Research in Nursing

Volume 8; Issue 1; Jan-Jun 2025; Page No. 532-538

Mental health fallout of a pandemic: A quantitative study analysis on healthcare workers during COVID-19

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Abstract
The COVID-19 pandemic has significantly impacted the mental health of healthcare workers, particularly nurses, due to prolonged exposure to infection risks, increased workloads, and emotional strain. This study assessed the psychosocial impact of the pandemic on 250 nurses across three districts in Kerala, India-Pathanamthitta, Alappuzha, and Kollam. Quantitative data were collected using validated psychometric tools. Results revealed high prevalence of stress, anxiety, depression, insomnia, and burnout, with younger nurses and females experiencing higher levels of psychological distress. Major stressors included fear of infection, inadequate training, long working hours, and lack of institutional support. Protective factors such as resilience, family support, and peer networks emerged as crucial in mitigating psychological harm. The findings underscore the urgent need for targeted mental health interventions and systemic organizational support to safeguard the well-being of healthcare workers during current and future health crises.

Keywords: COVID-19, healthcare workers, nurses, psychological impact, mental health, burnout, resilience

Introduction

The COVID-19 pandemic, first identified in late 2019, swiftly evolved into a global health emergency and has since been regarded as one of the most significant public health crises since World War II. Although initially recognized as a respiratory illness, the pandemic's impact rapidly extended far beyond physical health, with the World Health Organization (WHO) declaring it a global pandemic by March 2020. In response, governments worldwide enforced lockdowns, quarantine protocols, and social distancing measures, which, although essential for controlling virus transmission, brought about severe social, psychological, and economic consequences. Individuals and communities globally experienced disruptions in their routines and support systems, with healthcare workers being among the most deeply affected groups. Among healthcare workers (HCWs), particularly nurses and frontline staff, the pandemic created an extraordinary dual burden of physical risk and emotional strain. Numerous international studies, including those from China, Spain, and the United States, have highlighted significant psychological effects among HCWs, including heightened anxiety, depression, insomnia, and burnout (Romero *et al.*, 2022; Xiong *et al.*, 2022) [1, 2]. These emotional burdens were further intensified by long working hours, fear of infection, inadequate personal protective equipment, and the emotional trauma associated with patient loss. As the American Psychological Association observed, these workers not only battled the virus on the medical front but also struggled with profound psychological fatigue. In response to increasing mental health needs, digital mental health services such as telepsychology became vital, as noted by Saladino (2020) [15], ensuring continuity of care amidst physical distancing restrictions. However, the mental health burden was unevenly distributed, disproportionately affecting certain groups such as women, younger healthcare workers, students, and those in high-contact roles. The disruption of education, cancellation of life events, and extended exposure to illness and loss added to widespread psychological strain, making long-term psychological care a priority (Osofsky *et al.*, 2020; Serafini, 2020) [16, 17].

Romero *et al.* (2022) [1] developed the Psychological Stress and Adaptation at Work Score (PSAS), which revealed heightened stress levels in departments like geriatrics and respiratory medicine in Spain. Xiong *et al.* (2022) [2] conducted a meta-analysis across 65,706 Chinese HCWs, revealing considerable levels of PTSS, depression, and anxiety, particularly among nurses and frontline staff. Similarly, Moreno Martínez *et al.* (2022) [3] and Shi *et al.* (2022) [4] demonstrated that gender, age, and professional role significantly influenced psychological distress levels, with younger, female professionals experiencing more severe symptoms. These studies emphasize the need for tailored mental health interventions. Organizational

shortcomings also played a major role in worsening psychological distress. Dawood *et al*. (2022) [5] and Lee *et al*. (2022) [6] reported a lack of preparedness, insufficient psychological support, and poor communication as key stressors. On the other hand, studies by Zhang *et al*. (2022) [7] and Hannemann *et al*. (2022) [8] pointed out that social support and psychological resilience serve as vital buffers against stress and burnout. Interventions such as peer support programs, flexible work arrangements, and mental health counseling were identified as essential for building HCWs' resilience.Roslan *et al*. (2021) [9] and Ulfa *et al*. (2022) [10] demonstrated that the psychological effects extended to erosion in the quality of life, with high rates of burnout and emotional exhaustion. Reduced work-life balance, social isolation, and fear of transmitting the virus to family members exacerbated the mental health burden. Moreover, studies like those by Ramaci *et al*. (2020) [11] and Eddy (2021) [12] highlighted the stigma faced by HCWs, further intensifying their social challenges and feelings of alienation. This extended even to students and non-clinical staff, as Roldán-Merino *et al*. (2022) [13] and May *et al*. (2021) [14] revealed significant distress among nursing students and other essential workers. While the literature provides extensive evidence of the psychological and social impact of the pandemic on HCWs, there remains a gap in mixed-method studies that integrate both statistical data and in-depth personal narratives. Additionally, most studies lack longitudinal follow-up to understand the lasting psychological effects or evaluate the effectiveness of institutional support systems. The current study addresses these gaps through a mixed-methods approach among healthcare workers in Kerala, India, aiming to generate nuanced insights and actionable recommendations for healthcare policy and mental health interventions. This research will be vital in informing strategies for supporting healthcare professionals during future health emergencies. This study adopts a quantitative research design to examine the psychological impact of the COVID-19 pandemic on healthcare workers in Kerala, with a primary focus on nurses.

2. Materials and Methods
2.1 Research design, setting and Population
The research design follows a quantitative phase to gather broad statistical evidence to explore and interpret its findings. This design ensures that initial patterns observed in numerical data are contextualized through the voices and lived experiences of the participants.

The study is situated in Kerala, India, and spans three districts-Pathanamthitta, Alappuzha, and Kollam-covering both government and private healthcare institutions. This geographic and institutional diversity enhances the representativeness of the findings. The target population includes nurses actively employed during the COVID-19 pandemic, as they represent the frontline workforce most consistently exposed to the health crisis.

2.2 Sampling and Participant Demographics
A stratified random sampling technique was employed to ensure balanced representation across key demographic variables such as age, gender, residence, marital status, education, income, and employment status. A total sample of 250 participants was selected, ensuring statistical power

while maintaining feasibility for qualitative data collection.

Table 1: Distribution of the sample

Type	Variables	Sample Numbers
Age	Less than 25	45
	26-35	78
	36-45	90
	Above 45	37
Gender	Male	24
	Female	226
	Others	0
Area of residence	Urban	126
	Semi urban	89
	Rural	35
Martial status	Single	63
	Married	182
	Divorced	5
Dietary pattern	Vegetarian	28
	Mixed	222
Educational qualification	Diploma	92
	Degree	146
	Master degree	12
Current employing status	Employed	224
	Unemployed	3
	On leave	23
Type of family	Nuclear	60
	Joint family	190
Salary scale	Less than 20000	12
	20000-40000	176
	Above 40000	62
Contact type with covid positive patient	Direct contact	162
	Indirect contact	88

2.3 Tool Development, Validity, and Reliability
A structured tool was developed to assess both psychological and social domains. The tool underwent rigorous content validation through literature review and expert panel evaluations. Its reliability was confirmed using statistical methods: test-retest reliability (r=0.85), internal consistency (Cronbach's alpha=0.92), and inter-rater reliability (Cohen's kappa=0.71) for qualitative coding. These values confirm the tool's consistency, accuracy, and suitability for evaluating the multifaceted experiences of healthcare workers.

2.4 Quantitative and Qualitative Instruments
The quantitative questionnaire included demographic questions and structured items measuring stress, anxiety, exposure to COVID-19, morale, health perception, and institutional support.

2.5 Data Collection and Analysis
Quantitative data were collected using structured, paper-based questionnaires from 250 healthcare workers and analyzed using statistical software to assess levels of stress, anxiety, depression, and burnout. Descriptive and inferential statistics were applied to identify patterns and significant associations between psychosocial variables and demographic factors.

3. Results and discussions
3.1 Quantitative Analysis Report on safety at work
The quantitative analysis on perceptions of workplace safety

during the COVID-19 pandemic revealed significant associations with several demographic and contextual variables. Using the Chi-square test of independence, age (p=0.009), gender (p=0.000), hospital area (p=0.001), marital status (p=0.020), educational level (p=0.021), family type (p=0.001281), salary scale (p=0.000567), and contact type with COVID-19 patients (p=0.038109) were all found to significantly influence feelings of safety at work. Younger workers (especially under 25) and those aged 36-45 reported lower safety levels. Male respondents and those from nuclear families expressed greater concerns about workplace safety, while employees from joint families and rural areas felt safer than expected. Interestingly, higher salary earners and individuals with direct or indirect exposure to COVID-19 patients also reported increased feelings of insecurity, suggesting that both role-based risk and socio-economic status may influence perceived safety. Dietary patterns and employment status had no significant effect on safety perceptions, while education, marital status, and demographics played a key role. These results highlight the need for targeted workplace safety measures and psychological support for high-risk and vulnerable groups.

3.2 Quantitative analysis report on training to handle known or suspected cases of COVID-19
The quantitative analysis of training received to handle known or suspected cases of COVID-19 revealed several key demographic associations. Using the chi-square test of independence, significant relationships were observed for hospital area (p=0.0339), educational level (p=0.000037), salary scale ($p\approx$4.03E-09), and contact type with COVID-19 patients ($p\approx$6.65E-12). Urban residents were more likely to have received training than those in rural areas, indicating disparities in training accessibility. Educational qualification played a critical role, as diploma holders reported receiving less training than degree holders. Furthermore, individuals with direct contact with COVID-19 patients were more likely to have been trained, while those with indirect contact were undertrained. The salary scale also influenced training receipt, with mid-income groups receiving more training than high-income groups, suggesting that resource allocation may have favored operational-level staff. The study found no significant link between training allocation and factors such as age, gender, marital status, dietary habits, employment status, or family type, suggesting overall equity in training distribution. However, specific gaps were identified among rural workers, diploma holders, and those with indirect COVID-19 patient contact. These groups were less likely to receive adequate training. Addressing these disparities is essential to improving preparedness and response capacity among all healthcare workers.

3.3 Quantitative analysis on preparedness to care for patients with COVID-19
The quantitative analysis on healthcare workers' perceived preparedness to care for COVID-19 patients revealed that hospital area (p=0.016), employment status ($p\approx$0.000), and salary scale ($p\approx$6.55E-14) are significantly associated with perceived readiness. Workers in urban areas reported higher levels of preparedness compared to those in rural regions, who showed greater uncertainty—suggesting disparities in

training access or resource availability. Employed individuals felt more confident in handling COVID-19 patients than those on leave or unemployed, highlighting the role of continued clinical engagement in maintaining preparedness. Similarly, salary scale emerged as a key factor: workers in the middle-income group (₹20,000-₹40,000) reported greater preparedness, while lower-income groups expressed uncertainty or lack of readiness, possibly due to limited training or support infrastructure. The analysis showed no significant association between perceived preparedness and variables like age, gender, marital status, education, or contact type with COVID-19 patients. This suggests that demographic factors had little influence on readiness levels. Instead, structural factors such as employment status, income, and geographic location played a more critical role, highlighting the need for targeted training and support for underserved groups.

3.4 Quantitative analysis report on worry or anxiety about COVID-19
The quantitative analysis on worry or anxiety related to COVID-19 revealed statistically significant associations with several demographic variables, including age ($p\approx$2.23E-07), gender (p=0.0055), area of residence ($p\approx$2.32E-05), educational level (p=0.003), family type (p=0.0026), salary scale (p=0.0012), and type of contact with COVID-19 patients (p=0.0011). Younger individuals (particularly under 25) and those aged 36-45 displayed higher anxiety levels. Males reported more feelings of worry and inadequacy than expected, while females aligned more closely with average emotional responses. Urban residents expressed consistently high anxiety, possibly due to greater exposure risk, while rural residents showed an unexpected level of concern, indicating diverse environmental or information-related influences. Moreover, individuals from nuclear families reported higher anxiety than those from joint families, and lower-income groups experienced significantly more worry, likely tied to economic vulnerability. Direct contact with COVID-19 patients also correlated with elevated anxiety levels, highlighting the psychological toll on those most exposed, such as healthcare professionals. Marital status (p=0.6018) and employment status (p=0.2944) were not significantly associated with anxiety levels, indicating limited influence from these variables.

3.5 Quantitative analysis feelings of loneliness during the COVID-19
The quantitative analysis examining feelings of loneliness during the COVID-19 pandemic identified significant associations with age group (p=0.0224), educational level (p=0.0125), and type of contact with COVID-19 patients (p=0.0006). Younger adults and older adults experienced loneliness differently, with middle-aged groups (26-45 years) more frequently reporting that they never felt lonely, potentially due to being actively engaged in work or family life. Educational background also played a role—individuals holding diploma or degree qualifications were more likely to report feelings of loneliness, suggesting that academic exposure may influence social expectations or emotional resilience. Most notably, those with direct contact with COVID-19 patients reported significantly higher levels of

loneliness than their counterparts, reflecting the emotional burden carried by frontline workers and others exposed to high-risk environments, possibly due to social isolation or fear of transmitting the virus to loved ones. Demographic variables like gender, marital status, and income showed no significant link to loneliness, suggesting emotional isolation was widespread during the pandemic. Interestingly, typical well-being indicators did not affect loneliness, highlighting a universal psychological impact. Targeted support is crucial for high-contact roles, with further research needed on the role of age and education.

3.6 Quantitative analysis report on concern for self-health during COVID-19

The quantitative analysis of concern for personal health during the COVID-19 pandemic revealed statistically significant associations with age ($p=0.0206$), area of residence ($p=0.0002$), educational level ($p=0.0246$), and type of contact with COVID-19 patients ($p=0.0006$). Age-specific differences showed that individuals aged 26-35 expressed greater concern than expected, while younger (under 25) and older (above 45) participants reported comparatively lower concern. Area of residence also played a key role, with participants from semi-urban regions expressing higher levels of concern than expected, likely due to healthcare accessibility or public health infrastructure disparities. Educational level influenced how individuals perceived their health risk, with diploma holders reporting higher concern levels. Demographic factors like gender, marital status, and income showed no significant link to health concerns, suggesting varied emotional responses during the pandemic. However, location, education, and exposure level influenced perceived risk. These findings stress the need for targeted public health messaging and interventions, especially for semi-urban and high-exposure groups.

3.7 Quantitative analysis on additional compensation or benefits to employees during COVID-19

The quantitative analysis of additional compensation or benefits provided to employees during the COVID-19 pandemic revealed statistically significant associations with age group ($p=0.0048$), educational level ($p\approx7.38E-09$), salary scale ($p=0.000015$), and type of contact with COVID-19 patients ($p=0.0287$). Younger employees (especially those under 25) and those above 45 showed differing patterns in support perception and disclosure, suggesting that perceived risk and expectations of support may vary with age. Employees with diploma-level education reported significantly higher instances of receiving additional compensation, potentially due to their job roles or frontline responsibilities. Income level also played a critical role, with disparities in support likely reflecting the differing financial burdens across salary brackets. Notably, those with direct exposure to COVID-19 were more likely to report receiving compensation or benefits, highlighting institutional recognition of the elevated risk faced by frontline staff.

No statistically significant associations were observed between benefit receipt and demographic factors such as gender, residence area, marital status, dietary habits, employment status, or family type, indicating a generally uniform distribution of support. However, this uniformity does not preclude the presence of nuanced disparities, especially among age groups, income brackets, and high-exposure individuals. These results highlight the importance of maintaining equitable baseline support while implementing targeted compensatory strategies for more vulnerable healthcare segments in future public health crises.

3.8 Quantitative analysis report on study on effect of morale to deal with COVID 19 patients in following waves

The quantitative analysis on the effect of morale to deal with COVID-19 patients across successive waves reveals significant associations with several demographic factors. Notably, age ($p=0.01002$), gender ($p=0.00163$), hospital area ($p=0.00021$), marital status ($p=0.0007$), dietary pattern ($p=0.00083$), educational level ($p\approx0.000071$), employment status ($p=0.00055$), and income level ($p=0.01373$) all showed strong statistical relevance to morale levels. These results indicate that morale is shaped by a combination of personal, professional, and socioeconomic contexts. For instance, differences in morale across age and education groups may stem from varying levels of resilience, exposure to high-risk environments, or access to support and information. Urban healthcare workers reported higher morale than rural counterparts, likely reflecting better resources and organizational support. Similarly, those with direct employment were more confident, while those on leave or unemployed expressed lower morale, signalling the importance of institutional belonging and engagement.

The COVID-19 pandemic has placed extraordinary psychological and emotional demands on healthcare workers, with nurses in Kerala, India, standing at the forefront of the crisis. A comprehensive survey of 250 healthcare professionals offers a revealing glimpse into their mental well-being, workplace experiences, and emotional responses throughout the pandemic. While a commendable 84.4% of participants reported receiving training for handling COVID-19 cases, only 88.8% felt fully prepared to manage patient care, and 89.6% actively followed safety protocols. These numbers reflect a generally proactive approach toward crisis preparedness. However, concerns persist, with 51.6% of respondents having direct or indirect contact with COVID-19 patients and 33.6% reporting below-average health, suggesting that the pressures of the pandemic continue to manifest in both physical and psychological forms.

A particularly alarming finding is that 93.6% of respondents expressed concerns about workplace safety, underscoring widespread anxiety within healthcare settings. Emotional strain was evident in the data, with 66.8% of workers reporting heightened levels of worry or anxiety, and 22.4% experiencing loneliness. Only 18.4% of respondents reported feelings of happiness, reflecting the emotional toll the pandemic has exacted. Furthermore, over half of the participants (51.6%) were highly concerned about their personal health, revealing deep-rooted fears about vulnerability and the potential consequences of their exposure. Despite this, morale levels were mixed, with some workers reporting improved resilience over time, while others found their morale deteriorating as the crisis prolonged.
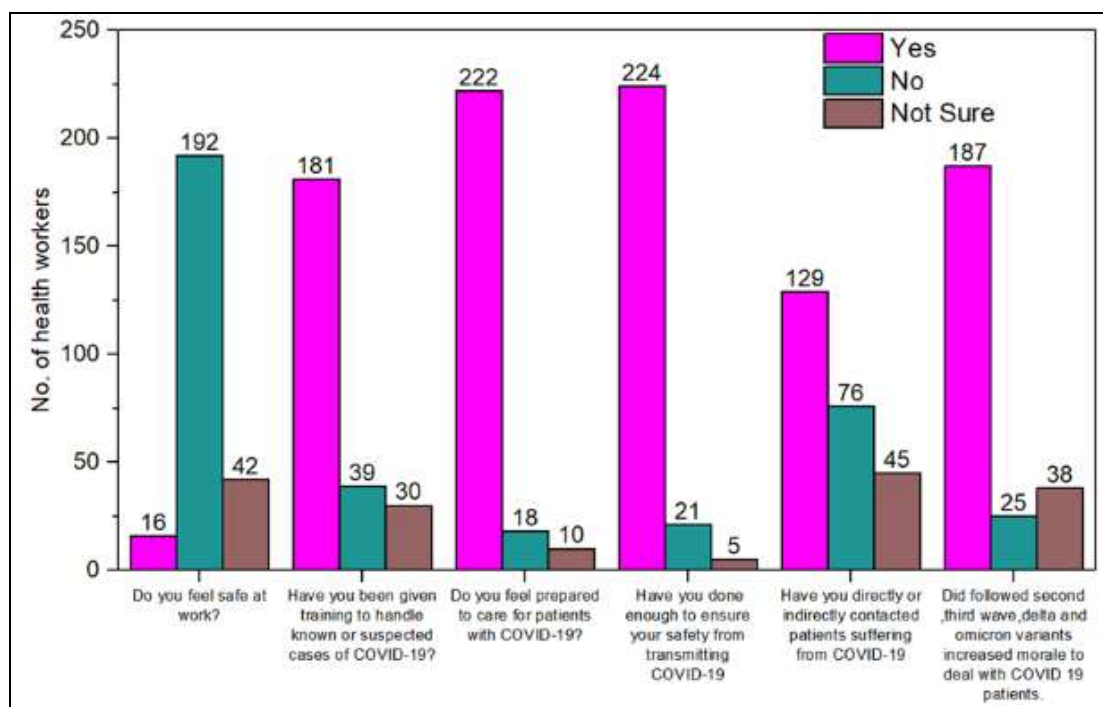
Fig 1: Responses of psychological open-ended questions by healthcare workers
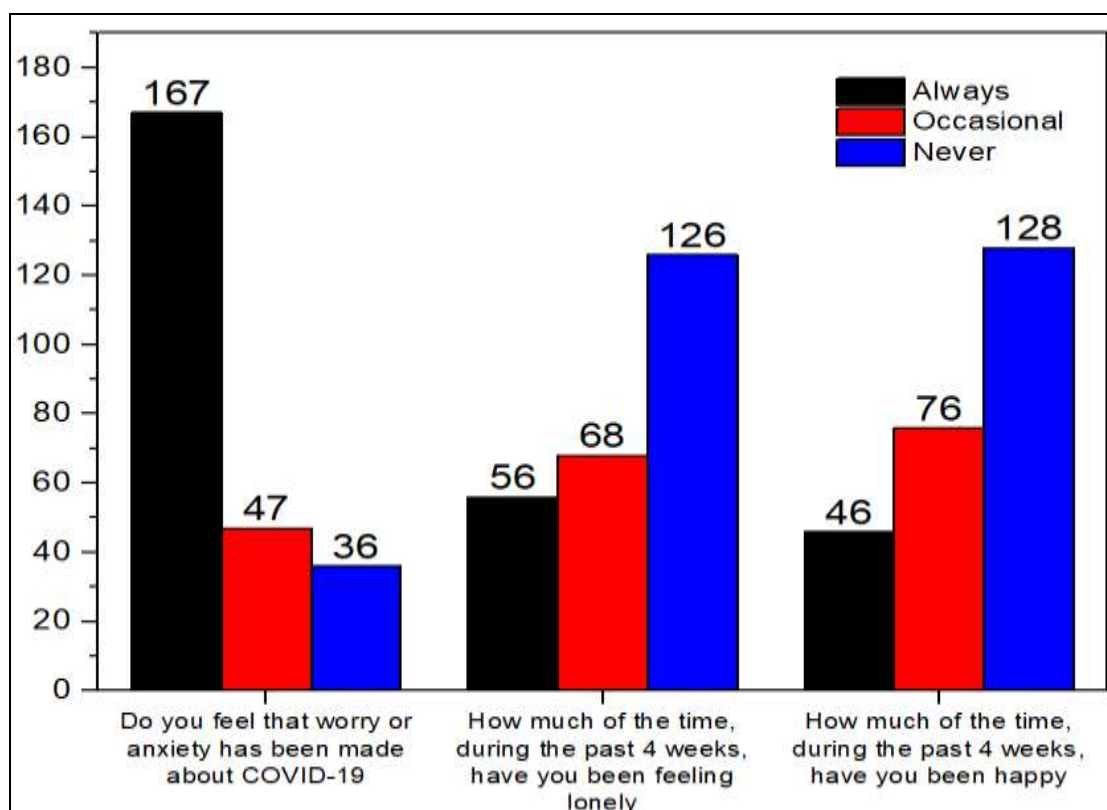

Fig 2: Responses of psychological likert scale questions by healthcare workers
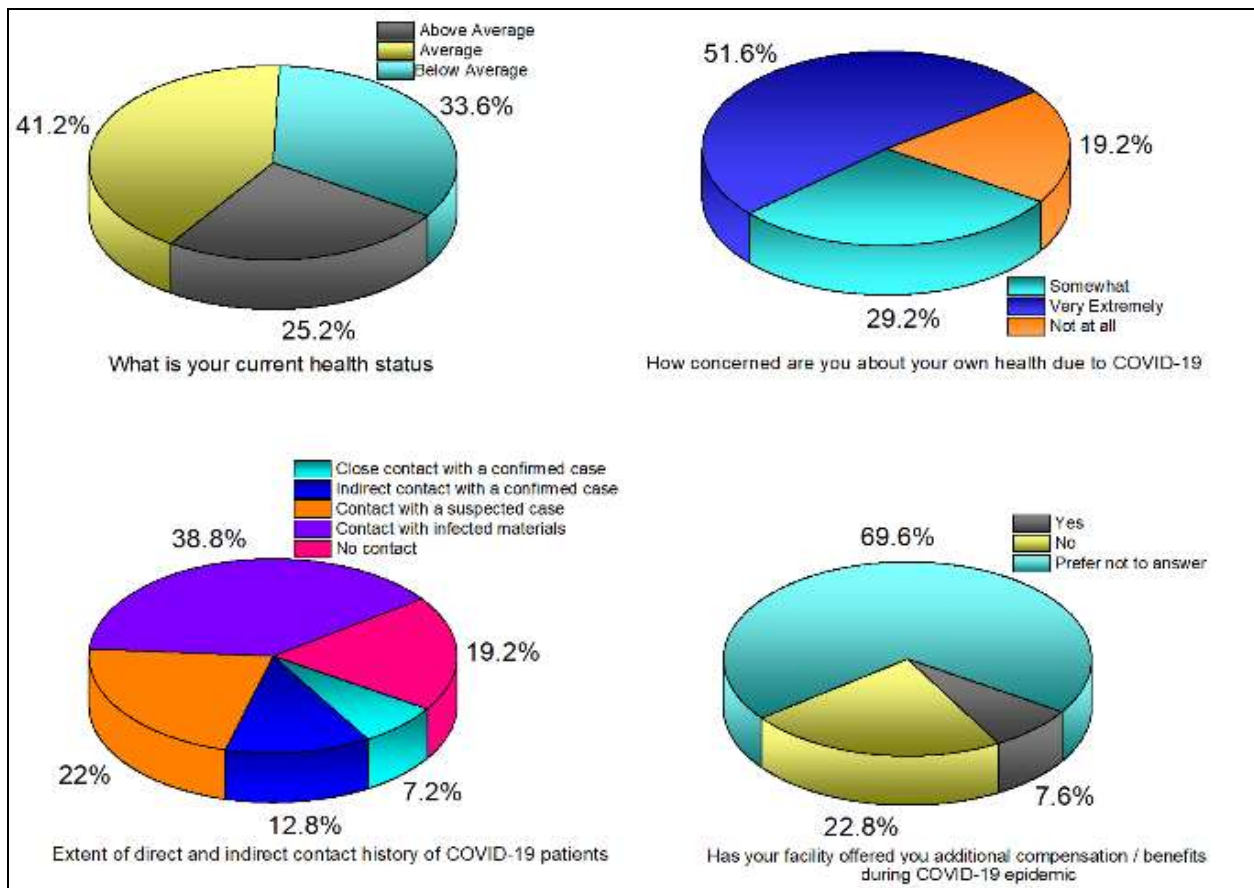
Fig 3: Responses of detailed questions by healthcare workers

Figure 1 illustrates responses to open-ended psychological questions, revealing that a majority of participants expressed concerns about their mental and emotional well-being during the pandemic. Most respondents (Above 85%) acknowledged experiencing worry, loneliness, and a lack of institutional support. These findings underscore widespread emotional distress, despite some respondents remaining unsure about the adequacy of their workplace preparation or mental health safety.

Figure 2 presents the frequency distribution of Likert scale responses, highlighting that 167 participants consistently felt anxious about COVID-19, while a significant proportion reported experiencing loneliness (126) and a lack of happiness (128) frequently. Figure 3 offers detailed insights into workplace conditions: only 22.8% received additional compensation, and 76% reported direct contact with COVID-positive patients, while 58.4% lacked awareness of institutional support services. These results reflect gaps in systemic support, indicating the need for targeted mental health and organizational interventions to bolster healthcare worker resilience. Adding to the burden, just 7.6% of healthcare professionals reported receiving any additional compensation or benefits during the pandemic. This lack of tangible support contrasts sharply with the magnitude of personal risk and psychological strain endured by these workers. The findings collectively emphasize the urgent need for systemic interventions that address not only physical safety and training but also mental health support and fair compensation. Strengthening institutional backing through psychological services, regular morale-boosting initiatives, and financial recognition can significantly enhance the resilience and well-being of healthcare workers as they continue to battle the effects of the pandemic and brace for future health emergencies.

4. Conclusion
This study provides a comprehensive assessment of the psychosocial impact of the COVID-19 pandemic on healthcare workers, with a specific focus on nurses across three districts in Kerala, India. The findings underscore that psychological distress—manifested as anxiety, stress, loneliness, and perceived health deterioration—was significantly associated with professional exposure variables such as direct patient contact, income level, and geographic location, rather than traditional demographic attributes like marital status or family type. Despite widespread training efforts, perceived preparedness remained uneven, particularly among rural and lower-income groups, indicating structural deficiencies in institutional readiness and support. The quantitative data revealed that frontline workers, particularly younger females and those in economically constrained conditions, were disproportionately affected. Compounding this, the lack of adequate compensation and psychological support further exacerbated emotional fatigue and burnout. These insights emphasize the urgent need for multidimensional interventions that address both systemic and individual-level stressors.

In view of these findings, it is imperative that healthcare institutions adopt an integrative strategy that includes robust mental health infrastructure, equitable financial recognition, and targeted training programs tailored to vulnerable

subgroups. Such measures will not only mitigate the psychological burden of current healthcare crises but also strengthen the preparedness and resilience of the workforce for future public health emergencies.

Conflict of Interest
Not available

Financial Support
Not available

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