

# Comprehensive Analysis of COVID-19 Symptomatology among Healthcare Workers: Insights from a Tertiary Hospital

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## ABSTRACT

*This paper presents a thorough examination of COVID-19 symptomatology among healthcare workers from All India Institute of Medical Sciences (AIIMS), Nagpur, India. Through meticulous analysis spanning from May 2020 to October 2020, we enrolled 73 healthcare workers engaged in COVID-19 screening, care and testing. Our study aimed to elucidate the spectrum of symptoms, adherence to protective measures and implications for early detection and intervention. Key findings revealed a diverse range of symptoms, including body ache, fatigue, headache, sore throat, fever, cough and loss of taste, among others. Notably, 21% of all positive cases were asymptomatic, underscoring the variability in clinical presentation. Adherence to personal protective measures varied across work areas, highlighting the importance of stringent compliance. Our discussion emphasizes the significance of early identification and tailored monitoring systems for mitigating transmission risks and ensuring healthcare worker safety. Additionally, addressing the mental health needs of healthcare workers is crucial for comprehensive pandemic management. Overall, this study contributes essential insights into COVID-19 symptomatology among healthcare workers, offering valuable guidance for infection control and prevention strategies in the pandemic.*

**Keywords:** COVID-19, health personnel, symptomatology, pandemic preparedness, occupational health.

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Article received on the 11<sup>th</sup> of June 2024 and accepted for publication on the 26<sup>th</sup> of July 2024

## INTRODUCTION

In December 2019, a cluster of acute respiratory illness, now known as novel corona virus–infected pneumonia (NCIP), occurred in Wuhan, China. This new outbreak, defined as novel corona virus disease 2019 (COVID-19) by the International Committee on Taxonomy of Viruses (1), is sustained by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The World Health Organization (WHO) declared it as a pandemic on the 11<sup>th</sup> of March 2020. As of 4:08 PM Central European Summer Time (CEST) on April 8, 2021, WHO received reports of 132,730,691 confirmed cases of COVID-19 worldwide, including 2,880,726 deaths (2). In India, from 3 January 2020 to 4:08 PM CEST, 8 April 2021, there have been 12,928,574 confirmed cases of COVID-19 with 166,862 deaths reported to WHO (3).

The causative pathogen was subsequently identified as SARS-CoV-2. Patients' clinical features included fever, dyspnoea, nonproductive cough, fatigue, myalgia. Severe cases may result in organ dysfunction – such as shock, acute cardiac injury, acute respiratory distress syndrome (ARDS) and acute renal injury – and even death (4).

Evidence from published epidemiology and virologic research indicates that COVID-19 primarily spreads from symptomatic individuals to close contacts through respiratory droplets, direct contact with infected individuals or contact with contaminated surfaces. Studies collecting biological samples from confirmed patients suggest that viral shedding is most pronounced in the upper respiratory tract during the initial stages of the disease, typically within the first three days of symptom onset. The average incubation period for COVID-19 is 5-6 days, but may extend up to 14 days. Importantly, during the presymptomatic phase, infected individuals can transmit the virus before displaying symptoms. While asymptomatic cases are rare, they still contribute to transmission, underscoring the complexity of COVID-19 spread (5).

A healthcare worker is one who delivers care and services to the sick and ailing, either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, attendants, multi-purpose workers, house-keepers or even medical waste handlers (6).

Amid the worldwide COVID-19 pandemic, there was a notable scarcity of healthcare person-

nel. Due to concerns about the effects of the shortage, additional actions that would normally be deemed drastic have been taken: staff yearly leave has been postponed; junior doctor rotations have been temporarily stopped during the outbreak; and physicians who are engaged in research have been reassigned (7).

Safeguarding the well-being of healthcare workers (HCWs) becomes imperative amid staffing constraints. In addition to supplying sufficient personal protective equipment (PPE), prioritizing the health of HCWs involves promptly testing and isolating infected colleagues. The magnitude of this challenge remains incompletely grasped, alongside the potential for asymptomatic and pre-symptomatic HCWs to spread infection to non-COVID-19 patients, fellow HCWs or the wider community. Nonetheless, with documented instances of asymptomatic transmission, exercising utmost caution is strongly advised. Against this backdrop, HCWs assume a pivotal role in combating the pandemic, serving on the front lines to deliver essential care and services to the sick and ailing. However, the global healthcare infrastructure faces unprecedented challenges, exacerbated by staff shortages, surging patient volumes, and heightened transmission risks among HCWs. Amidst these exigencies, ensuring the health and safety of HCWs emerges as a paramount concern, necessitating stringent infection control measures and robust protective strategies (8-11).

Notably, limited studies have investigated the symptomatology of COVID-19 among HCWs engaged in the screening and care of infected patients, warranting focused inquiry into this crucial domain. Therefore, this study aims to elucidate the spectrum of COVID-19 symptoms experienced by HCWs at All India Institute of Medical Sciences (AIIMS), Nagpur, India. By comprehensively analyzing symptom profiles, adherence to protective measures, and outcomes of COVID-19 testing, this research endeavors to enhance understanding of the pandemic's impact on frontline healthcare personnel. Moreover, insights garnered from this study hold profound implications for infection control protocols, early detection strategies and tailored interventions to safeguard HCWs and mitigate transmission risks.

### Objectives of the study

1. To assess the spectrum and severity of COVID-19 symptoms experienced by HCWs in

AIIMS, Nagpur, India, who were engaged in screening of and caring for infected patients.

2. To evaluate HCWs' adherence to infection control measures and protective protocols in the context of COVID-19, including the utilization of PPE and compliance with hygiene practices.

3. To analyze the outcomes of COVID-19 testing among HCWs, including rates of infection, seroprevalence and the presence of asymptomatic carriers, in order to inform strategies for early detection and containment of viral transmission within healthcare settings. ▣

## METHODOLOGY

**T**his study adopted a comprehensive approach to explore the symptomatology of COVID-19 among HCWs who were actively involved in screening and managing COVID-19 cases in AIIMS, Nagpur, India. We employed a descriptive observational study methodology, incorporating both qualitative and quantitative data collection techniques to ensure robustness and depth in our investigation.

### Study setting and participants

The present study was conducted in AIIMS Nagpur, an Indian tertiary care hospital designated for managing COVID-19 cases. Participants included HCWs from diverse roles, encompassing doctors, nurses, laboratory technicians, attendants and multi-task workers. Eligible participants were actively engaged in COVID-19 screening, investigations and care for at least seven days in AIIMS, Nagpur, India. Exclusion criteria encompassed HCWs with less than seven days of active duty, those not involved in COVID-19 screening and care, and non-healthcare workers.

### Data collection

Data collection commenced after obtaining approval from the Institute Ethics Committee, ensuring adherence to ethical guidelines and participant confidentiality. Informed consent was obtained from all participants prior to their inclusion. The study spanned from May 2020 to October 2020, allowing for a comprehensive assessment over a significant timeframe.

### Symptom assessment

To capture the spectrum of COVID-19 symptoms experienced by HCWs, a structured question-

naire was utilized during face-to-face interviews conducted by trained research personnel. The questionnaire was designed based on the symptoms outlined by the Indian Council of Medical Research (ICMR) for COVID-19. Participants were queried about the presence of symptoms such as fever, cough, fatigue, sore throat, headache, loss of taste or smell, among others. Additionally, they were asked about their adherence to personal protective measures while on duty, including the utilization of PPE.

### Work environment and exposure assessment

Detailed information regarding participants' work environments and exposure patterns was collected to contextualize symptomatology. This included categorization of work areas (e.g., screening area, isolation ward, quarantine centers, laboratory settings) and adherence to specific infection control measures corresponding to each setting. The utilization of PPE was ascertained based on participants' descriptions of their duty stations and protocols observed during patient interaction. ▣

## RESULTS

### Demographic characteristics

**D**The present study encompassed a diverse cohort of HCWs from AIIMS, Nagpur, India. Of all 73 participants, 65 (89%) were within the age range of 20 to 39 years, while the remaining eight (11%) subjects were aged 40 years and above. Gender distribution included 39 females (53.4%) and 34 males (46.6%). Employment-wise, the sample comprised 29 doctors (39.7%), 20 nursing officers (27.4%), 18 multi-task workers (24.7%), four laboratory technicians (5.5%) and two laboratory attendants (2.7%).

### Work environment and duties

Thirty-six subjects (49.3%) were working in a screening area, 18 (24.7%) in an isolation ward (COVID-positive area), 15 (20.5%) in quarantine centres for sample collection, 14 (19.2%) in a quarantine ward (suspect area), six (8.2%) in a COVID laboratory (other than RNA extraction area) and three subjects (4.1%) were working in a COVID laboratory RNA extraction room. Some participants were working in more than one place as per their duty schedule.

Subjects working at the screening area were using N95 mask and gloves while on duty. Sub-

jects working in a quarantine ward (suspect) area and an isolation ward (positive area), those working in quarantine centres for sample collection and participants working in an RNA extraction area of COVID lab were all using full PPE while on duty. Subjects working in other areas of COVID lab were using N95 mask and gloves while on duty.

### Symptomatology and testing

Twenty-seven (37%) subjects developed body ache, 27 (37%) fatigue, 26 (35.6%) headache, 19 (26%) sore throat, 17 (23.3%) fever; nine subjects (12.3%) had fever associated with chills, 16 (21.9%) cough and eight (11%) productive cough, with none of them having blood stained sputum. Fourteen (19.2%) subjects developed loss of taste, 11 (15.1%) loss of smell sensation, 11 (15.1%) runny nose, 10 (13.7%) nausea, six (8.2%) stomach pain, six (8.2%) shortness of breath, six (8.2%) diarrhea, six (8.2%) other symptoms like back pain, five (6.8%) chest pain, three (4.1%) vomiting and three (5.9%) skin rash. Thus, in our study, the seven most common symptoms developed by HCWs included body ache, fatigue, headache, sore throat, fever, cough and loss of taste, while the less common symptoms were loss of smell sensation, runny nose, nausea, stomach ache, shortness of breath, diarrhea, back pain, chest pain, vomiting and skin rash.

### Testing and diagnosis

Forty-four (60.2%) subjects got tested themselves after developing symptoms, with 25 (34.2%) of them testing negative and 19 (26%) testing positive at the RT-PCR test. Twenty-nine subjects (39.7%) did not test themselves even after developing symptoms as their symptoms resolved after some days of preliminary treatment. Among the 19 subjects who tested positive, eight (42.1%) were multitask servants, six (31.6%) nursing officers and five (26.3%) doctors. Among the eight positive multitask servants, five were working in a screening area, one each was working in a quarantine (suspect) ward, isolation ward and COVID lab other than RNA extraction area. Among the six positive nursing officers, three were working in a screening area and three in an isolation ward. Among the five positive doctors, two were working in a screening area, two in an isolation ward and one in a COVID lab other than RNA extraction site. On enquiry with the positive tested subjects,

we found out that they were non-compliant with masking, especially in break rooms and also during meals, when face masks had to be removed but social distancing was not maintained. However, all study participants were strictly following the personal protection guidelines while on their respective duty stations.

Among the 19 subjects who tested positive at the RT-PCR test, the most common symptoms included fatigue [11 (57.9%)], body ache [11 (57.9%)], headache [10 (52.6%)], fever [nine (47.4%)], loss of taste sensation [eight (42.1%)], sore throat [eight (42.1%)], loss of smell sensation [seven (36.8%)], cough [seven (36.8%)] and runny nose [five (26.3%)]. The less common symptoms were diarrhea [three (15.8%)], stomach ache [two (10.5%)], nausea [two (10.5%)] and vomiting [one (5.3%)]. Four positive tested subjects in our study were asymptomatic. □

## DISCUSSION

Corona virus disease is caused by SARS-CoV-2, a newly described beta-coronavirus. While the majority of persons with mild to moderate respiratory illnesses recover without the need for special care, those who are older or have underlying medical conditions such as diabetes, cancer or cardiovascular disease are more susceptible to developing serious illnesses (13). Infection primarily disseminates via droplets of saliva or nasal discharge expelled when an infected individual coughs or sneezes.

The impact of COVID-19 varies among individuals, manifesting with diverse symptoms. Predominant symptoms include fever, dry cough and fatigue, while less frequent manifestations encompass bodily aches, sore throat, diarrhea, conjunctivitis, headaches, alterations in taste or smell perception, skin rashes and discoloration of extremities. Serious symptoms include difficulty breathing or shortness of breath, chest pain or pressure and loss of speech or movement (14).

In our study, the seven most common symptoms developed by HCWs were body ache, fatigue, headache, sore throat, fever, cough and loss of taste. The less common symptoms were loss of smell sensation, runny nose, nausea, stomach ache, shortness of breath, diarrhea, back pain, chest pain, vomiting and skin rash. In a study by Xiaoquan Lai *et al*, the most common symptoms were fever [67 (60.9%)], myalgia or fatigue [66

(60.0%)], cough [62 (56.4%)], sore throat [55 (50.0%)] and muscle ache [50 (45.5%)] (15).

Long H Nguyen *et al* reported that loss of smell or taste, fatigue, persistent cough and loss of appetite predicted COVID-19 positivity with high specificity using logistic regression and symptoms preceding testing (16). Similar to their study, we found that, among the 19 subjects who tested positive at the RT-PCR test, the most common symptoms were fatigue [11 cases (57.9%)], body ache [11 (57.9%)], headache [10 (52.6%)], fever [nine (47.4%)], loss of taste sensation [eight (42.1%)], sore throat [eight (42.1%)], loss of smell sensation [seven (36.8%)], cough [seven (36.8%)] and runny nose [five (26.3%)], while the less common symptoms included diarrhea [three cases (15.8%)], stomach ache [two cases (10.5%)], nausea [two subjects (10.5%)] and vomiting [one subject (5.3%)].

Four (21%) positive tested subjects in our study were asymptomatic. Few cases with test confirmation that are genuinely asymptomatic have been reported (5). However, extreme caution is advised because asymptomatic transmission has been reported (8-11).

Health care workers are at risk for nosocomial acquisition of COVID-19. The risk increases due to lapse in compliance with personal protective care (17). One of the main objectives of infection control initiatives amid the COVID-19 pandemic is to reduce the likelihood of healthcare personnel contracting the virus. Healthcare workers are at risk for infection due to a number of factors, including exposure to infected patients, inadequate diagnostic tests, job overload and inadequate PPE (18-22). Healthcare workers may nosocomially contract SARS-CoV-2 from co-workers who are infected with COVID-19 (17). Being infected raises the possibility of spreading the sickness to family members and causes missing workdays owing to quarantine (23). Severe symptoms may require hospitalization or admission to an intensive care unit for the health worker. The physical and mental health of healthcare professionals is adversely impacted by the combination of increased strain, shortage of personnel, risk of transmission and lack of resources, which also causes a great burden on healthcare systems (23).

In our study, on enquiry with the positive tested subjects, we found out that there was non-compliance with masking in these staff, especially in break rooms and also during meals, when

face masks had to be removed but social distancing was not maintained. Sharing a meal entails not just the act of removing masks, but also engaging in conversation, which can result in the dispersion of aerosols and spending an extended period of time in close proximity while seated at a table. However, all participants to our study were strictly following the personal protection guidelines while on their respective duty stations.

In a study conducted by Zabarsky *et al* (17), instances of heightened exposure risk were exclusively identified in non-clinical areas like nursing stations and communal staff areas. These occurrences stemmed from a lack of adherence to mask-wearing protocols in these spaces, or during meal times when masks were temporarily removed without proper social distancing measures in place. No personnel working in the COVID-19 ward or intensive care unit got infected in their study. However, Zabarsky *et al*'s study was conducted in the United States, which is different from Indian facilities like ours, where hospitals are more crowded and social structure is different. Whenever we become complacent, we expose ourselves to risk. Essentially, despite our belief in taking precautions, there are routine circumstances where our vigilance lapses. We need to keep in mind that our colleagues should also be considered as potential virus carriers, and not only the patients. Especially, pre-symptomatic and asymptomatic colleagues spread infection. Engaging with coworkers without wearing masks poses potential risks. Areas such as break rooms, nursing stations and coffee lounges, which are not directly involved in patient care, present risk zones. Furthermore, HCWs may contract infections beyond their workplace, such as from their families or communities. They have to be oriented about this risk as well (16). It is also important to have a customized monitoring system of exposed HCWs to facilitate early detection, appropriate triage and prompt isolation (23).

Multidisciplinary psychiatric support, the distribution of current information to reduce fear, psychological support through electronic devices and mental health screening are all necessary for the COVID-19 warriors' mental health (23). According to Anelli *et al*, rapid antigen tests should be given to health care workers as they provide results within 15-45 minutes, even if they are experiencing only mild symptoms (24). This approach will significantly reduce the stress of

HCWs. The institutional agencies should also take note of the fact that HCWs' mental health can be boosted by implementing flexible scheduling, and cutting back on working hours (25, 26). Long work shifts may have an adverse effect on general health (22, 27). Healthcare administrators should encourage proper sleep, hygiene and nutrition of their staff (28). It is the responsibility of the government to follow-up, support and appropriately treat the long-term consequences after the pandemic is over (29).

The findings of our study underscore the heightened risk of COVID-19 transmission faced by HCWs engaged in frontline duties within healthcare settings. Despite adherence to personal protective measures, a significant proportion of HCWs tested positive for the virus, suggesting potential lapses in infection control protocols or community exposure. The presence of asymptomatic carriers further complicates containment efforts, emphasizing the need for robust surveillance and early detection strategies to mitigate viral spread. Additionally, the study sheds light on the occupational challenges and mental health implications faced by HCWs amidst the pandemic, underscoring the importance of comprehensive support systems and risk mitigation measures within healthcare institutions.

Overall, the results provide valuable insights into the symptomatology, testing outcomes and occupational risks encountered by HCWs in the battle against COVID-19, informing targeted interventions to safeguard frontline personnel and enhance pandemic response efforts.

This study sheds light on the multifaceted challenges faced by HCWs in the relentless battle against COVID-19. The findings underscore the pervasive risk of viral transmission within healthcare settings, despite stringent adherence to infection control measures. Notably, a substantial proportion of HCWs tested positive for COVID-19, underscoring the urgent need for enhanced surveillance and containment strategies to safeguard frontline personnel and prevent nosocomial spread.

The identification of asymptomatic carriers among HCWs further accentuates the complexity of viral containment efforts, emphasizing the importance of robust testing protocols and early detection initiatives. Moreover, the di-

verse symptomatology reported by HCWs highlights the heterogeneous nature of COVID-19 presentation, necessitating comprehensive screening measures to identify potential cases promptly.

Beyond the clinical implications, the present study highlights the profound psychological and occupational toll of the pandemic on HCWs, underscoring the importance of tailored support systems and mental health interventions to mitigate burnout and enhance resilience. Addressing the myriad challenges faced by frontline personnel requires a multifaceted approach, encompassing not only medical interventions but also socio-economic support and institutional reforms.

Moving forward, concerted efforts are warranted to bolster healthcare infrastructure, enhance resource allocation, and prioritize the well-being of HCWs. By leveraging the insights gleaned from this study, policymakers, healthcare administrators and stakeholders can collaboratively devise evidence-based strategies to fortify pandemic preparedness and safeguard frontline heroes in the ongoing fight against COVID-19. ■

## CONCLUSIONS

Our study reveals the critical challenges confronting HCWs amidst the COVID-19 pandemic. Despite adherence to stringent protocols, a notable proportion of HCWs tested positive, emphasizing the need for enhanced surveillance and containment strategies. The identification of asymptomatic carriers underscores the importance of robust testing initiatives. Moreover, diverse symptomatology highlights the need for comprehensive screening. Beyond clinical implications, the present study underscores the psychological toll on HCWs, necessitating tailored support. Moving forward, concerted efforts are essential to bolster healthcare infrastructure, prioritize HCWs' well-being and devise evidence-based strategies for pandemic resilience. ■

*Conflicts of interest: none declared.*

*Financial support: none declared.*

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