SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Pedapalli *et al*., 2026
doi: 10.21276/SSR-IIJLS.2026.12.3.15

Original Article

open access

Study of Reinfection of COVID-19 in Health Care Workers in and around Northeast Coastal Area of Andhra Pradesh

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Received: 17 Jan 2026/ Revised: 20 Mar 2026/ Accepted: 22 Apr 2026

ABSTRACT

Background: Coronavirus disease (COVID-19), caused by SARS-CoV-2, has posed a major global health challenge since its emergence in 2019. Although primary infection induces an immune response, the duration and effectiveness of immunity remain uncertain, raising concerns about reinfection, particularly among healthcare workers (HCWs) at higher occupational risk. To assess the incidence and characteristics of COVID-19 reinfection among healthcare workers.

Methods: A follow-up observational study was conducted among 500 healthcare workers aged 25–60 years with prior RT-PCR-confirmed COVID-19 infection at a tertiary care hospital in northeast coastal Andhra Pradesh. Reinfection was defined as RT-PCR positivity occurring at least 3 months after the initial infection, with two documented negative tests in between. Data on demographics, vaccination status, and reinfection were collected telephonically using a structured questionnaire.

Results: Out of 500 participants, 18 (3.5%) were found to be reinfected. Among these, 61.1% were males and 38.9% were females. A higher proportion of reinfected individuals were below 25 years of age. Vaccination status showed that 44.4% of reinfected individuals were vaccinated, while 55.5% were unvaccinated.

Conclusion: COVID-19 reinfection occurs among healthcare workers, likely due to repeated exposure and waning immunity. Continuous adherence to preventive measures is essential regardless of prior infection or vaccination status.

Key-words: COVID-19, Health care workers, Reinfection, RT-PCR, Novel coronavirus

INTRODUCTION

In December 2019, a novel coronavirus emerged in Wuhan, China, causing pneumonia of unknown origin. The virus was subsequently named SARS-CoV-2 due to its genetic similarity to SARS-CoV [1,2]. The disease, COVID-19, spread rapidly worldwide and was declared a pandemic by the World Health Organization.

How to cite this article
Pedapalli M, Padmaja N, Rekha JS, Manjula B. Study of Reinfection of COVID-19 in Health Care Workers in and around Northeast Coastal Area of Andhra Pradesh. SSR Inst Int J Life Sci., 2026; 12(3): 9798-9802.

Access this article online
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The degree of protective immunity conferred by SARS-CoV-2 infection remains uncertain. Although infection elicits a detectable immune response, the susceptibility of recovered individuals to reinfection remains poorly understood. SARS-CoV-2 reinfections are defined as infections caused by a genetically distinct strain occurring ≥90 days after the primary infection [1,2]. These reinfections became a matter of concern early in the pandemic, as human coronaviruses are known to cause reinfection despite pre-existing humoral immunity.

The risk of reinfection is influenced by multiple factors, including vaccination status [3,4], the emergence of new variants such as Omicron, the severity of the initial infection [3,5], the presence of comorbidities [3,4], and age [3–5]. Nevertheless, even after accounting for these variables, frontline healthcare workers (HCWs) exhibit a

doi: 10.21276/SSR-IIJLS.2026.12.3.15

COVID-19 infection rate significantly higher than that of the general population [3,6]. The susceptibility of HCWs to reinfection varies by age, comorbidities, occupational exposure, workplace environment, and vaccination status.

Healthcare workers play a crucial role in patient care, disease control, and public health promotion. Due to their direct and continuous exposure to infected individuals, HCWs are at an increased risk of SARS-CoV-2 infection [6–8]. Cases of reinfection among HCWs have been reported since mid-2020 [7-10].

Several factors have been proposed to explain reinfection among HCWs, including persistent occupational exposure, waning natural immunity over time, inadequate immune response following mild initial infection, behavioral fatigue leading to reduced adherence to preventive measures, and immune escape by emerging viral variants [7,11].

Reinfection poses a significant challenge to current strategies for controlling the COVID-19 pandemic. Understanding the level of protection conferred by prior infection against reinfection, disease severity, and outcomes is essential for predicting disease trends and guiding vaccination policies [12,13]. Early identification and proper management of reinfected cases are critical, as reinfection may be associated with increased severity in certain individuals [11].

MATERIALS AND METHODS

Study Design and Setting- This follow-up observational study was conducted in a tertiary care hospital located in the northeast coastal region of Andhra Pradesh.

Study Population- The study included 500 healthcare workers (doctors and nurses) aged between 25 and 60 years who had previously tested positive for COVID-19 by RT-PCR.

Inclusion Criteria- Healthcare workers aged 25–60 years with documented prior RT-PCR-confirmed COVID-19 infection were included in the study.

Exclusion Criteria- Individuals below 25 years, above 60 years, and non-healthcare workers were excluded from the study.

Definition of Reinfection- Reinfection was defined as a confirmed SARS-CoV-2 RT-PCR test result occurring at least 3 months after the initial infection, with documentation of 2 negative RT-PCR tests in the intervening period.

Sample Collection and Diagnostic Method- Nasopharyngeal or oropharyngeal swab samples were collected from symptomatic individuals and tested using standard RT-PCR techniques for the detection of SARS-CoV-2.

Data Collection- Data were collected telephonically by trained personnel using a structured questionnaire. Demographic details, symptoms, COVID-19 testing history, and vaccination status were recorded.

Statistical Analysis- Data were compiled and analyzed using descriptive statistical methods. Categorical variables were expressed as frequencies and percentages.

RESULTS

Out of 500 healthcare workers included in the study, 18 (3.5%) were found to have COVID-19 reinfection (Fig. 1).

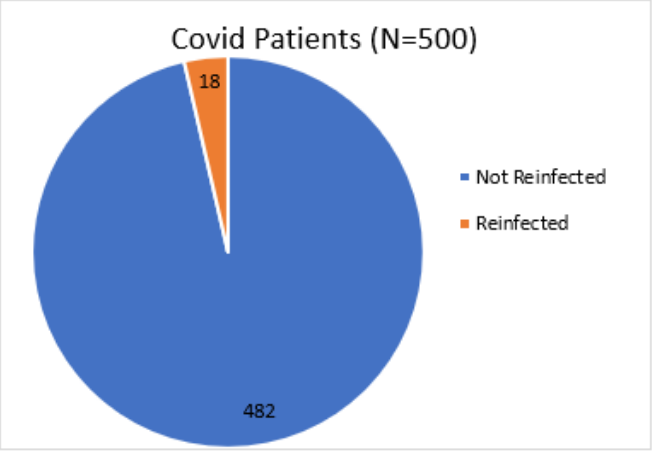

Fig. 1: Number of patients reinfected

Among the reinfected individuals, males constituted 61.1% (n=11), while females accounted for 38.9% (n=7), as shown in Fig. 2.

Age-wise distribution revealed that the majority of reinfected males (63.6%) and females (57.1%) were below 25 years of age (Figs. 3 and 4).

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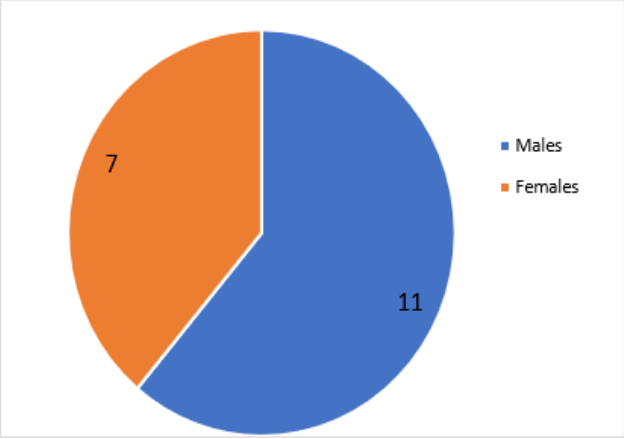

Fig. 2: Gender wise distribution among the reinfected patients

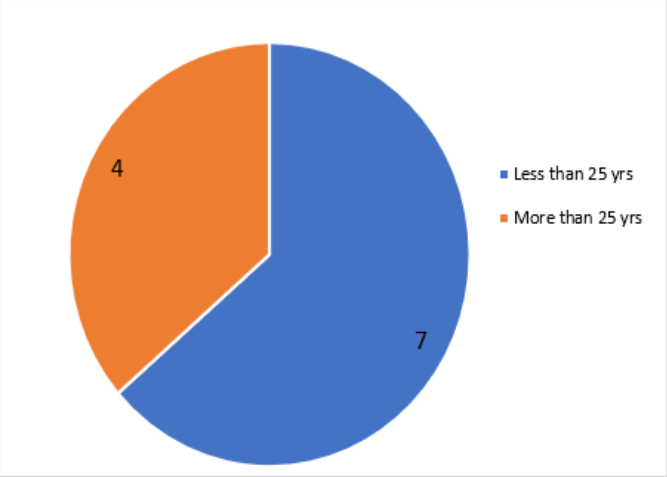

Fig. 3: Age distribution among the reinfected males

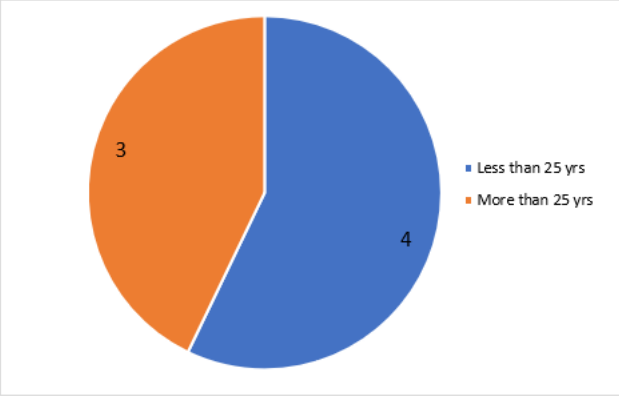

Fig. 4: Age distribution among the reinfected females

With respect to vaccination status, 44.4% (n=8) of reinfected individuals were vaccinated, whereas 55.5% (n=10) were unvaccinated, as illustrated in Fig. 5.

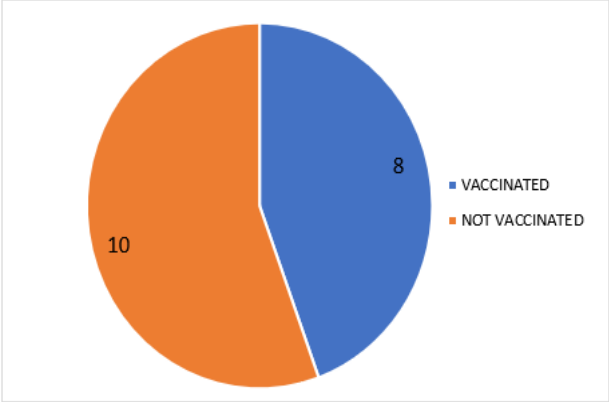

Fig. 5: Vaccination status among the reinfected

DISCUSSION

The present study was conducted among 500 healthcare workers to evaluate the incidence of SARS-CoV-2 reinfection. The reinfection rate observed in this study was 3.5%, indicating that, although relatively low, reinfection remains a significant concern among healthcare workers.

Healthcare workers are at an increased risk of COVID-19 infection due to continuous occupational exposure and frequent contact with infected individuals [10]. Persistent exposure, along with waning immunity and behavioral fatigue, may contribute to reinfection [11]. Understanding reinfection patterns is crucial, as it has important implications for infection control strategies and public health planning [12].

Vaccination has been shown to protect against severe disease; however, reinfection can still occur, particularly with emerging variants [13]. The reinfection rate observed in the present study is comparable with findings reported by Mukherjee et al., who documented a reinfection rate of 4.5% [14]. Similarly, retrospective cohort studies by Sheehan et al. and Akinbami et al. reported reinfection rates of 4.8% and 2.5%, respectively [15,16].

In the present study, a higher reinfection rate was observed among younger individuals, which may be attributed to increased mobility and occupational exposure. Additionally, a considerable proportion of reinfected individuals were unvaccinated, suggesting that vaccination plays a protective role.

However, this study has certain limitations. Being a hospital-based observational study, the findings cannot be generalized to the wider population. Furthermore, the absence of serological testing and genomic sequencing limits the confirmation of true reinfection.

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Overall, the study highlights that SARS-CoV-2 reinfection is a reality among healthcare workers and underscores the importance of continued adherence to infection prevention measures.

CONCLUSIONS

The present study demonstrates that COVID-19 reinfection can occur among healthcare workers, even after recovery from a prior infection. Although the overall reinfection rate observed was relatively low, the risk remains significant due to continuous occupational exposure and possible waning of immunity over time. The findings also suggest that younger healthcare workers may be more prone to reinfection, possibly due to greater exposure and activity. Vaccination appears to offer some level of protection; however, it does not eliminate the risk of reinfection, especially in the presence of emerging variants. Therefore, reliance solely on prior infection or vaccination status is insufficient for prevention.

Strict adherence to infection control practices, including the use of personal protective equipment, hand hygiene, and appropriate behavioral measures, remains essential. Continuous monitoring and further research are necessary to better understand the dynamics of reinfection and guide effective public health strategies.

CONTRIBUTION OF AUTHORS

Research concept- Nama Padmaja, Jangam Sushma Rekha
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Supervision- B Manjula
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Data analysis and interpretation- B Manjula
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Article editing- Nama Padmaja, Mounica Pedapalli
Final approval- B Manjula

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