Original Article

Serostatus of IgG Antibody Against Mumps Virus in Healthcare Workers at a Tertiary Care Hospital, Nalgonda

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Abstract

Background: Mumps remains an important vaccine-preventable viral infection because outbreaks continue to occur in adult and occupational groups despite childhood vaccination. Healthcare workers require adequate immunity to prevent occupational acquisition and onward transmission within hospitals. The objective is to determine the serostatus of mumps-specific immunoglobulin G antibodies among healthcare workers in a tertiary care hospital at Nalgonda and to assess its association with measles-mumps-rubella vaccination dose and gender. **Material and Methods:** This prospective cross-sectional study was conducted over six months at Government General Hospital, Nalgonda. Healthcare workers with documented receipt of one or two doses of measles-mumps-rubella vaccine were enrolled. Participants with previous mumps infection, immunocompromising conditions, or immunosuppressive therapy were excluded. Venous blood samples were collected, serum was separated, and mumps-specific immunoglobulin G was detected using the Bio-Rad Mumps IgG enzyme-linked immunosorbent assay. Equivocal results were considered non-protective for analysis. Associations were assessed using the chi-square test. **Results:** A total of 194 healthcare workers were included; 118 (60.8%) were female and 76 (39.2%) were male. Overall, 126 participants were seropositive, giving a mumps IgG seropositivity rate of 65.0%, while 68 (35.0%) were seronegative. Seropositivity was significantly higher among double-dose recipients than single-dose recipients (82.1% versus 51.8%; chi-square = 19.24, $p < 0.001$). Double-dose recipients had 1.59 times higher seropositivity than single-dose recipients. Gender-wise seropositivity was comparable between females and males (65.2% versus 64.5%; $p = 0.911$). **Conclusion:** Mumps IgG seropositivity among healthcare workers was suboptimal, with one-third remaining susceptible. Completion of the two-dose measles-mumps-rubella schedule was strongly associated with detectable immunity, supporting institutional screening and targeted booster vaccination. **Keywords:** Mumps virus; Healthcare workers; Mumps IgG; MMR vaccine; Seroprevalence; Occupational health; ELISA.

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Introduction

Mumps is an acute communicable viral illness caused by mumps virus, an enveloped negative-sense single-stranded RNA virus belonging to the family Paramyxoviridae. The disease classically presents with fever, malaise, myalgia, and painful parotid swelling; however, its clinical spectrum extends beyond parotitis. Aseptic meningitis, encephalitis, pancreatitis, orchitis, oophoritis, mastitis, and sensorineural hearing loss have been described, particularly when infection occurs in adolescents and adults.[1,2] Although vaccination has markedly reduced the burden of mumps in several countries, the infection has not disappeared and continues to re-emerge in settings where immunity is incomplete or has declined over time.

The epidemiology of mumps has changed in the vaccine era. Outbreaks have been reported even in highly vaccinated communities, especially universities, military settings, and other closely interacting groups. These events are attributed to several interacting factors, including waning humoral immunity, intense exposure, incomplete vaccine uptake, and possible antigenic differences between vaccine strains and circulating wild-type viruses.[3-5] Two-dose measles-mumps-rubella (MMR) vaccination provides better protection than a single dose, yet measurable antibody concentrations decline in some individuals years after vaccination. Therefore, a documented vaccine history alone does not always confirm durable serological protection.

The Indian context adds further importance to this issue. Mumps remains outside the Universal Immunization Programme, where measles-rubella vaccination has received greater national priority. The Indian Academy of Pediatrics has highlighted the continuing burden of mumps and the need for stronger vaccination strategies, while recent reports have described resurgence of mumps cases across India.[6,7] Adults entering the healthcare workforce are therefore likely to represent mixed immunization backgrounds, including individuals vaccinated privately, partially vaccinated persons, and those with uncertain

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long-term antibody persistence.

Healthcare workers occupy a distinct risk category because they are repeatedly exposed to respiratory pathogens and work in close contact with infants, pregnant women, immunocompromised patients, and unvaccinated individuals. Serological studies from different countries have shown variable mumps IgG seropositivity among healthcare workers, nurses, and medical students, with some cohorts showing substantial susceptibility despite previous vaccination.[8-10] Identifying non-immune healthcare workers is clinically relevant for staff safety and for preventing nosocomial transmission during outbreaks.

The present study was undertaken to determine the serostatus of IgG antibodies against mumps virus among healthcare workers in a tertiary care hospital in Nalgonda, Telangana. The objectives were to estimate the prevalence of mumps-specific IgG antibodies, assess the association of seropositivity with MMR vaccination dose and gender, and provide evidence for targeted institutional screening and booster vaccination policies.

Materials and Methods

Study design and setting: This prospective cross-sectional study was conducted in the Department of Microbiology, Government General Hospital, Nalgonda, Telangana, India, over six months from October 2024 to May 2025. The hospital is a tertiary care teaching institution attached to Government Medical College, Nalgonda, and provides outpatient, inpatient, emergency, laboratory, and specialty clinical services to patients from Nalgonda and surrounding districts.

Study population and eligibility: Healthcare workers from different hospital departments were invited to participate. The study included doctors, nurses, and paramedical or support staff with documented receipt of either one dose or two doses of MMR vaccine. Participants were categorized as single-dose recipients or double-dose recipients based on vaccination records. Healthcare workers with a self-reported or documented previous history of mumps infection, immunocompromising illness, or current immunosuppressive therapy were excluded to avoid misclassification of naturally acquired or altered immune responses.

Sample size and sampling: A total of 194 eligible healthcare workers were enrolled during the study period. The final study population consisted of 110 single-dose recipients and 84 double-dose recipients. Participation was voluntary, and each participant provided written informed consent before sample collection.

Specimen collection and laboratory procedure: Approximately 3-5 mL of venous blood was collected from each participant using aseptic precautions. Blood samples were allowed to clot at room temperature and were centrifuged at 3000 rpm for 10 minutes. Separated serum was stored at -20°C until analysis. Mumps-specific IgG antibodies were detected using the Bio-Rad Mumps IgG enzyme-linked immunosorbent assay kit according to the manufacturer's instructions. Optical density was measured at 450 nm with a 620-630 nm reference wavelength using a calibrated ELISA reader.

Interpretation and quality control: Antibody index values below 0.8 were interpreted as negative, values from 0.8 to 1.1 as equivocal, and values above 1.1 as positive. For conservative occupational risk assessment, equivocal results were treated as non-protective and grouped with seronegative samples. Each assay run included kit-provided negative control, positive control, and calibrator. Runs were accepted only when control values met manufacturer-specified quality criteria.

Statistical analysis: Data were entered and analyzed using standard descriptive statistics. Frequencies and percentages were calculated for categorical variables. Associations between serostatus and vaccination dose or gender were tested using the chi-square test. A p value below 0.05 was considered statistically significant.

Ethical considerations: The study was approved by the Institutional Ethics Committee, Government Medical College/Government General Hospital, Nalgonda (GMC/NLG/2024/22; dated 14 February 2024).

Results

A total of 194 healthcare workers were included for analysis. The study population showed female predominance, with 118 females (60.8%) and 76 males (39.2%). The gender distribution is shown in [Table 1].

Table 1: Distribution of study subjects by gender (N = 194)

Gender	Frequency (n)	Percentage (%)
Female	118	60.8
Male	76	39.2
Total	194	100.0

Based on documented MMR vaccination status, 110 healthcare workers (56.7%) had received a single dose and 84 (43.3%) had received two doses. Thus, single-dose vaccination was more frequent than completion of the two-dose schedule in the enrolled cohort [Table 2& Figure 1].

Table 2: Distribution of MMR vaccination status among healthcare workers

Vaccination status	Frequency (n)	Percentage (%)
Single dose	110	56.7
Double dose	84	43.3
Total	194	100.0

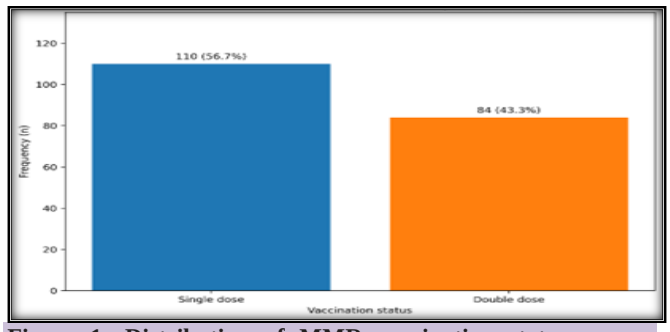

Figure 1: Distribution of MMR vaccination status among healthcare workers

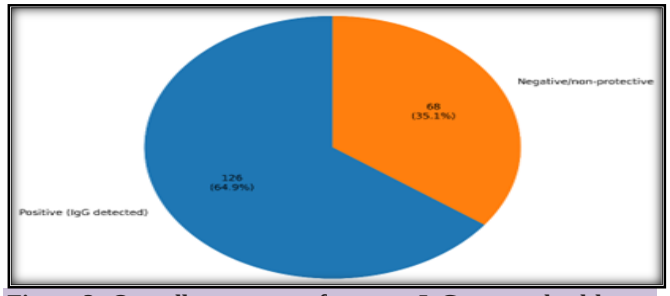

Figure 2: Overall serostatus of mumps IgG among healthcare workers (N = 194)

Mumps-specific IgG antibodies were detected in 126 of 194 participants, giving an overall seropositivity rate of 65.0%. The remaining 68 participants (35.0%) were seronegative or considered non-protective, indicating a sizeable susceptible group within the hospital workforce [Table 3 & Figure 2].

Seropositivity differed markedly by vaccination dosage. Among single-dose recipients, 57 of 110 participants (51.8%) were IgG positive and 53 (48.2%) were IgG negative. Among double-dose recipients, 69 of 84 participants (82.1%) were IgG positive and 15 (17.9%) were IgG negative. The association between vaccination dose and seropositivity was statistically significant (chi-square = 19.24, $p < 0.001$). Double-dose recipients had a relative seropositivity of 1.59 compared with single-dose recipients, and the odds of seropositivity were 4.28 times higher among double-dose recipients [Table 4].

Gender-wise analysis showed similar seropositivity among females and males. Among females, 77 of 118 participants (65.2%) were seropositive, while 49 of 76 males (64.5%) were seropositive. This difference was not statistically significant (chi-square = 0.01, $p = 0.911$), suggesting that gender was not associated with mumps IgG status in this cohort [Table 5].

Table 3: Overall serostatus of mumps IgG among healthcare workers (N = 194)

Serostatus	Frequency (n)	Percentage (%)
Positive (IgG detected)	126	65.0
Negative/non-protective	68	35.0
Total	194	100.0

Table 4: Association between MMR vaccination dosage and mumps IgG seropositivity

Vaccination status	Total (N)	IgG positive n (%)	IgG negative n (%)	Statistical test
Single dose	110	57 (51.8)	53 (48.2)	Chi-square = 19.24; p < 0.001
Double dose	84	69 (82.1)	15 (17.9)	
Total	194	126 (65.0)	68 (35.0)	

Table 5: Gender-wise distribution of mumps IgG seropositivity

Gender	Total tested	IgG positive n (%)	IgG negative n (%)	Statistical test
Female	118	77 (65.2)	41 (34.8)	Chi-square = 0.01; p = 0.911
Male	76	49 (64.5)	27 (35.5)	
Total	194	126 (65.0)	68 (35.0)	

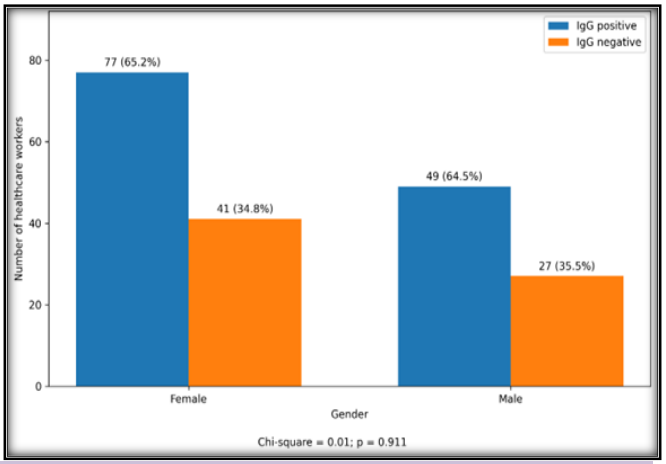

Figure 3: Gender-wise distribution of mumps IgG seropositivity

Discussion

This study demonstrated that only 65.0% of healthcare workers had detectable mumps-specific IgG antibodies, leaving 35.0% without serological evidence of protection. In a hospital workforce, this immunity gap is relevant because mumps is transmitted through respiratory droplets and close contact, both of which occur frequently in clinical areas. The finding is lower than reports from some settings with established two-dose MMR policies, including South Korea and Japan, where mumps seropositivity among healthcare workers was reported around 87-92%.[10] It is, however, close to the 60.2% seropositivity reported among newly employed female nurses in Korea and the 65.6% protection reported in hospital workers from Spain, showing that susceptible adult healthcare groups are not uncommon.[11,12]

The most important observation was the strong association

between vaccination dosage and seropositivity. Double-dose recipients showed 82.1% positivity, whereas single-dose recipients showed only 51.8% positivity. The calculated relative likelihood of seropositivity was 1.59 times higher in double-dose recipients, and the association was statistically significant. This pattern is consistent with vaccine effectiveness studies showing superior protection after two doses compared with one dose.[13] Long-term follow-up studies have also reported decline in mumps antibody levels after childhood MMR vaccination, supporting the role of secondary vaccine failure or waning immunity in adult susceptibility.

The present findings also support the practical value of serological screening. Several studies among healthcare workers, medical students, and future healthcare workers have identified mumps-susceptible subgroups despite presumed or reported vaccination.[14] In the current study, nearly half of single-dose recipients were seronegative. This indicates that relying only on history of one childhood dose is insufficient for occupational risk management. A two-step approach involving documentation of two MMR doses and IgG screening for uncertain or high-risk staff provides a more defensible institutional strategy.

Gender did not influence seropositivity in the present cohort. Female and male participants showed nearly identical rates, indicating that immunization history rather than sex-related biological variation was the main observable determinant of antibody status. The female predominance of the sample reflects the composition of many healthcare workforces, particularly nursing and laboratory support services, rather than a difference in susceptibility.

From an infection-control perspective, the data favour mandatory baseline MMR documentation for new staff, targeted IgG testing where records are incomplete, and catch-up vaccination for seronegative or single-dose workers. During outbreaks or in high-risk departments, booster strategies need institutional review. In India, where mumps vaccination is not part of the national Universal Immunization Programme, such hospital-level policies are especially important.

Limitations: This study had a single-centre design and included only healthcare workers with documented MMR vaccination, limiting wider generalization. Neutralizing antibody assays and cellular immune markers were not performed. Age-wise, cadre-wise, and duration-since-vaccination analyses were restricted by the available dataset. Self-reported past infection was excluded through history, but silent previous infection could not be completely ruled out with certainty in all participants.

Conclusion

The study identified a substantial immunity gap against mumps among healthcare workers, with only 65.0% showing detectable IgG antibodies. Seropositivity was markedly better among workers who had completed two MMR doses, while single-dose recipients showed inadequate protection. The absence of gender difference further indicates that vaccination completeness is the key measurable determinant of immunity in this cohort. In a tertiary care hospital, a 35.0% susceptible workforce creates preventable occupational and nosocomial risk. Routine documentation of MMR vaccination, baseline mumps IgG screening for new staff, and catch-up vaccination for seronegative or single-dose workers should be incorporated into institutional infection-control policy and periodic occupational health review through annual staff surveillance review cycles.

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Conflicts of interest

There are no conflicts of interest.

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