

Brief Communication



Seroprevalence of Measles in Healthcare Workers in South Korea

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ABSTRACT

There are only limited data regarding the seroprevalence of measles of healthcare workers (HCWs) in Korea. We evaluated the seroprevalence of measles in HCWs in a tertiary care hospital in Korea. A total of 7,411 HCWs born from 1952 to 1995 underwent antibody test. The overall seropositivity of measles was 73% (95% confidence interval, 72 – 74). The seropositivity of measles sharply declined from 85% in the 1986 birth cohort to 42% in the 1995 birth cohort, thus signifying pockets of under-immunity. Our data warrant the need for routine antibody tests, followed by measles vaccination or routine measles vaccination in young Korean HCWs.

Keywords: Measles; Measles-Mumps-Rubella vaccine; Healthcare workers; seroprevalence

Measles is a highly contagious disease, which is transmissible by airborne particles and is vaccine-preventable. In South Korea, one dose of measles-mumps-rubella (MMR) vaccine was implemented in the national immunization program in 1983, and two doses of the same vaccine was implemented in 1997. After a large outbreak during 2000 – 2001 involving more than 55,000 cases, measles-rubella (MR) catch-up vaccination to the birth cohorts between 1985 and 1994 was performed in 2001. In addition, the birth cohorts after 1994 received routine second doses of MMR and were required to submit the certificate of vaccination before entering elementary school. As a result, South Korea has maintained a highly immunized adult population. Despite such measures, however, small local outbreaks of measles continued to occur in South Korea [1], and there have been some reports of pockets of under-immunity among the young adult population [2, 3]. We previously reported the low seropositive rate from 1994 to 1985 birth cohort in new healthcare workers (HCWs) (n = 1,130) [4]. Outbreak of measles in healthcare facilities would have a serious impact as large numbers of patients and HCWs would be exposed, and serious complications of measles may develop in immunocompromised patients as a result. As such, HCWs without evidence of immunity who have been exposed need to be relieved of direct patient contact from 5th to the 21st day after exposure, which would result in serious economic loss. Therefore, it is important to know the seroepidemiology of HCWs for policy decision making process, but there are only limited data on seroprevalence of measles of HCWs in South Korea. This study builds on our earlier publication [4] with a larger number of subjects.



Seroprevalence of measles in healthcare workers

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Conflict of Interest

No conflicts of interest.

Author Contributions

Conceptualization: JJ, SHK. Data curation: JJ. Formal analysis: JJ. Writing - original draft: JJ. Writing - review & editing: SKK, SHK, MJH.

We thus investigated the seroprevalence of HCWs at Asan Medical Center, a 2,700-bed tertiary care hospital in Seoul, South Korea with a total of 8,329 HCWs. In 2014, after an outbreak of measles occurred in a university in Seoul, Asan Medical Center performed measles IgG tests (enzyme immunoassay kit, EUROIMMUN, Lübeck, Germany) for all HCWs born in and after 1967 for point surveillance. In addition, we have routinely performed measles antibody test (enzyme immunoassay kit [Enzygnost Anti-Measles Virus/IgG, Siemens Healthcare Diagnostics Products GmbH Marburg, Germany]) for new HCWs since 2014. The sample results were classified as positive, equivocal, or negative according to the manufacturer's instructions. In 2018, antibody tests were administered in HCWs who were born before 1967 or those who had taken a leave of absence in 2014. We provided MMR vaccination to all HCWs whose antibody test yielded negative results. We did not repeat measles antibody test, and there were no healthcare workers performed duplicated antibody test. The study was approved by the Institutional Review Board of our hospital (2017-1242) with waiver of consent.

A total of 7,411 HCWs (89%) underwent measles antibody tests from 2014 to 2018. Birth years ranged from 1952 to 1995, and 5,626 (76%) were females. Seroprevalence data of measles for HCWs stratified by birth year are shown in Figure 1, and seroprevalence data stratified by new HCWs or current HCWs are shown in Supplementary Figure 1. The overall seropositivity was 73% (95% confidence interval, 72 – 74); seroprevalence was 73% in HCWs born in or after 1967, while that of HCWs born before 1967 was 98%. The seroprevalence sharply decreased from 85% in the 1986 birth cohort to 42% in the 1995 birth cohort.

Young Korean adults including the birth cohort after 1994 and the birth cohort between 1985 and 1994 are highly vaccinated populations - more than 95% of the former cohort had received routine two-dose vaccinations and more than 97% of the latter cohort received catch-up MR vaccines in 2001, which already had more than 90% 1st dose vaccination rate

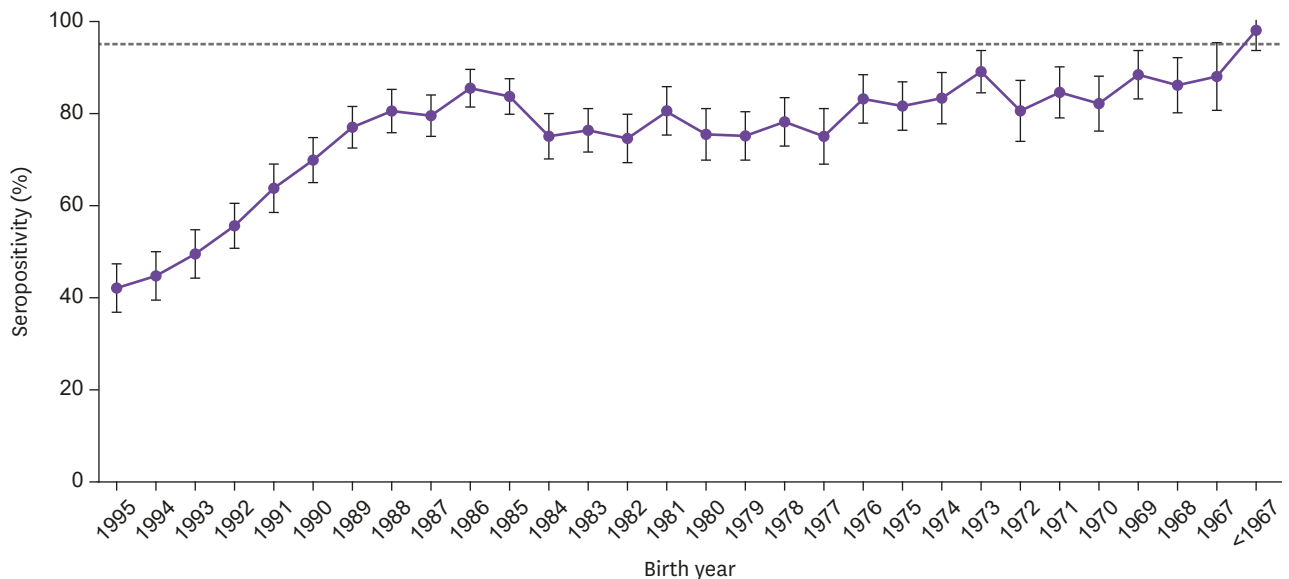


Figure 1. Seroprevalence of measles immunoglobulin G antibodies in healthcare workers between 2014 and 2018. Circles denote mean seropositivity (%) and error bars denote 95% confidence intervals. Dashed line denotes 95% seropositivity. HCWs, healthcare workers.

[5]. Therefore, the majority of the birth cohort between 1985 and 1994 received two-dose measles vaccines. Nevertheless, our data show that the birth cohort between 1994 and 1995 have substantially low seropositivity for measles, which gradually increased with age. Generally, two-dose measles vaccination history is regarded as the evidence of measles immunity [6]; however, as shown in our data, two-dose vaccination history should be cautiously interpreted, especially in young Korean HCWs.

The reasons for the low seropositive rate despite high two-dose vaccination rate are not clear. Primary vaccine failure is a possible cause, but we assume that it is a less plausible cause for our finding because most Korean young adults received two-dose vaccination and primary vaccine failure was considered to be less important in the two-dose vaccine strategy era. Secondary vaccine failure or waning immunity after two-dose vaccination is a more likely explanation. As administering first dose vaccination at the age of 12 months is a common practice in South Korea, the interfering maternal antibody and immature immune response to the first dose vaccination may facilitate waning immunity in populations who only depend on vaccine-induced immunity without natural exposure to measles. Finally, increasing seropositivity from 1995 to 1986 can be explained by the older cohorts having had a higher chance of being affected by natural infection during the nationwide outbreak in 2000 – 2001.

Young Korean HCWs should be given the highest priority for improving herd immunity in hospitals. Therefore, routine measles vaccination or serologic screening followed by measles vaccination should be considered. However, the seropositivity in HCWs born in or after 1967 was also lower than the threshold for maintaining herd immunity. Therefore, serologic screening followed by measles vaccination may be considered in order to improve herd immunity in hospitals. In contrast, HCWs born before 1967 had 98% seropositivity, and therefore may be considered as having full herd immunity against measles. Otherwise, more preferably, serologic screening followed by measles vaccination may be considered in HCWs born before 1967. Further studies are needed to decide which strategy would be most cost-effective in different age groups of HCWs in Korea.

Our study has several limitations. It was a single-center study, and the modes of serologic screening tests were different between existing HCWs and those who were employed after 2014. Also, we did not analyze the geometric mean titer or plaque reduction-neutralization tests. Despite these limitations, our study presents seroepidemiologic data from a large cohort of HCWs and thus provides vital information for making policies on hospital vaccination, in relation with the current ongoing measles outbreak in South Korea [7].

In conclusion, the proportion of measles-susceptible individuals was substantially high in HCWs, especially in young adults. As the impact of measles outbreak in healthcare facilities would be critical, a policy on routine serologic screening followed by measles vaccination or routine measles vaccination in healthcare facilities should be considered, especially in young Korean HCWs.

SUPPLEMENTARY MATERIAL

Supplementary material can be found with this article on-line <https://icjournal.org/src/sm/ic-51-58-s001.ppt>.

Supplementary Figure 1

Seroprevalence of measles immunoglobulin G antibodies in (A) new healthcare workers and (B) current healthcare workers.

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