Original Article

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Measles Seroprevalence İstanbul, Health Care Workers in a Tertiary Hospital, İstanbul, Turkey

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ABSTRACT

Objective: Measles is a vaccine-preventable disease that has a potential for outbreaks. Health care workers (HCWs) are the most vulnerable group to get infected. In this study, measles seroprevalence in HCWs and the relationship of seroprevalence with age and occupational groups was studied.

Methods: The measles serology of 422 HCWs tested between January 2010 and January 2011 was retrospectively searched from the electronic data system. The names, ages, and occupations were obtained from the personnel registration department. The blood samples were examined for measles immunoglobulin G using a micro-ELISA kit qualitative (NovaTec Immundiagnostica GmbH, Dietzenbach, Germany). The results were compared according to the occupational groups (doctors, nurses, and non-medical staff).

Results: A total of 94% HCWs were immune to measles. Employees in the non-medical staff (91%) were below this percentage while doctors (98%) and nurses (95%) were above. Although the immune status to measles was more remarkable for the doctor group, no statistical significance was found (p=0.080).

Conclusion: The measles seroprevalence is increasing with age and is particularly higher in the medical staff rather than the non-medical staff.

Keywords: Measles, seroprevalence, health care workers

Introduction

Measles is a highly infectious disease that causes mortality and morbidity in children as well as adults. It is a vaccine-preventable disease. Thus, to control measles, vaccination campaigns are conducted all around the world. The herd immunity, in the conventional sense of total protection of susceptible individuals by the immunity of persons around them, is very difficult to establish against measles because the virus is extremely contagious, and a very high level of the population immunity is required (1). The herd immunity to achieve this effect is 95% for the elimination of measles. The goal according to the global measles and rubella strategic plan is to eliminate measles in at least five regions (African, South-East Asia, Eastern Mediterranean, European, Western Pacific) of World Health Organization by 2020 (2).

Health care workers (HCWs) are particularly at risk of becoming infected with measles. The risk of acquiring the disease is 13 times higher in the HCWs than in the general population (3). The Advisory Committee of Immunization Practices strongly recommends HCWs to get vaccinated or to document their immunity status against measles, as well as hepatitis B, influenza, mumps, rubella, and varicella (4). In Turkey, vaccination against these infectious diseases in HCWs is recommended but not mandatory. Vaccination of HCWs is important because of an increased risk of becoming infected and spreading the disease to their patients, family members, and also other hospital employees. Vaccination is also part of the control program for the elimination of measles.

There are reports describing nosocomial outbreaks of measles among HCWs (4, 5). Preparedness against an outbreak by at least knowing the immune status of HCWs against measles is very helpful because limited storage of the vaccine is

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preferred and more rapid, and managing transmission control is easier as well.

Screening studies for measles seroprevalence in HCWs are limited but the immunity rates are reported to be mostly above 90% (6-20).

We aimed to determine the serological status of our hospital's HCWs (The Bakirkoy Dr. Sadi Konuk Training and Researh Hospital) for measles and gathering epidemiological data before a possible outbreak. The relationship of seroprevalence between age and occupational groups were also investigated.

Methods

The Bakirkoy Dr. Sadi Konuk Training and Research Hospital is a 611-bed tertiary referral hospital with 2100 employees. The measles serology of 422 HCWs tested between January 2010 and January 2011 were retrospectively searched in the electronic data system after the consent from hospital administration was obtained. The names, ages, and occupations were obtained from the personnel registration department. Immune-supressed HCWs were excluded from the study, whereas all immune-competent HCWs were included.

Venous blood samples (3-5 mL) were collected in sterile tubes, and serum was separated by centrifuging the clotted samples and stored at –20°C. The samples were examined for measles immunoglobulin G with the qualitative micro-ELISA kit (NovaTec Immundiagnostica GmbH, Dietzenbach, Germany). This test is routinely used in our hospital for clinical diagnosis. For calculation of measles antibodies, we expressed the results in NovaTec units (NTU) as follows: NTU=patient absorbance value 10 / the absorbance of cutoff controls. The cutoff point is 10 NTU, negative are <10, and positive are >11 NTU. Results between 9 and 11 were considered to be equivocal. Tests that were equivocal were studied for a second time. All of the repeated equivocal samples were negative.

A written consent form was signed by all employees. The ethics committee approved the study.

Statistical analysis

The statistical analysis was performed using the NCSS 2007 statistical software, and the Chi-square test was used as well.

Results

There are 2100 employees in our hospital, and they were grouped into three categories: doctors (staff physicians, residents), nurses (nurses, nurse residents, and midwives), and non-medical staff (housekeepers, secretaries, etc.), with a distribution of 481 (23%), 661 (31%), and 958 (46%), respectively. The serological results of immune-competent 422 employees were found. Forty-seven percent (n=200) were females. Nineteen percent were doctors, 26% nurses, and 55% non-medical staff. The age range was between 19 and 61, with an average age of 30.8±7.6 years.

A total of 94% employees (398) were immune to measles, non-medical staff were below this (91%), while doctors (98%) and nurses (95%) were above. Although distribution of the immune status against measles was more remarkable for the doctor group, no statistical significance was found (p=0.080). The mean age of the employees in the immune group was 30.7±7.5 years, ranging between 19 and 61 years. Moreover, there were no statistical differences between the groups for seroprevalence [doctor–nurse (p=0.411], doctor-non-medical staff (p=0.071), nurse–non-medical staff (p=0.360)].

Only 6% (25) were not immune to measles with an average age of 28±6.5 years, ranging between 20 and 45 years. The median age was 26 years, and 80% of the employees in the susceptible group were younger than 30 years. The susceptible group had 1 doctor resident, 5 nurses (20%), and 19 non-medical staff (76%), and none of them were born before 1957.

Table 1. Results compared according to the age and the occupational group

	Doctors		Nurses		Non-medical Staff	
Age (years)	Total (n)	IgG + ((n)/%)	Total (n)	IgG + ((n)/%)	Total (n)	IgG + ((n)/%)
19–24	1	0	17	(17)/100	60	(55)/91
25–29	36	(36)/100	42	(38)/90	77	(67)/87
30–34	10	(10)/100	21	(20)/95	44	(43)/97
35–39	19	(19)/100	18	(18)/100	22	(21)/95
40–44	5	(5)/100	5	(5)/100	17	(16)/94
45–49	3	(3)/100	7	(7)/100	10	(9)/90
50–54	1	(1)/100	0	0	4	(4)/100
55–59	2	(2)/100	1	(1)/100	0	0
60–64	1	(1)/100	0	0	0	0
Total	78	(77)/98	111	(106)/95	234	(215)/91

IgG: immunoglobulin G

The demographical data of HCWs and rates of measles immunoglobulin G (IgG) seropositivity are summarized in Table 1 and Table 2.

Discussion

In our study, we determined that 94% of our HCWs were immune to measles. In other studies completed in Turkey, higher rates were achieved. In Celikbas' study, including 363 HCWs, 98.6% were immune; in Hatipoglu's study, including 81 HCWs, 97.5% were immune (12, 15).

In Alp's study, including 1255 HCWs, which is the largest study conducted in Turkey, the immunity rate was 94%, similar to that observed in our study (19). In Aypak's study, including 288 HCWs, it was 90.8%, the lowest rate determined in Turkey (20).

The study conducted in Ankara, with a percentage of 98.6, had the highest rate of immunity that we reviewed in the literature (15).

A similar high rate was also observed in a study from Japan with a seroprevalence of 98.5%. This study was an age-limited study with participants below the age of 32 years, whereas other studies in Turkey and our study had no age limitations (8). In our study, we wanted to emphasize that the ages of our HCWs were mostly under 35 (72.8%), which can also be a reason for a relatively low rate of immunity compared to other Turkish studies.

Other studies, including more than 1000 HCWs, determined the seroprevalence rates as follows: Washington, 97.9%; New York, 90.6%; Italy, 92%; Switzerland, 95.5%; Utah, 89.7%; Saudi Arabia, 87%; and another multicenter study from Italy 71.4%-97.8% (6, 7, 9, 10, 13, 14, 16). The seroprevelance rate of 94% detected in our study is consistent with that in the literature. The review of these studies is presented in Table 3.

Table 2. Results of all health care workers according to ages

Age (years)	Total (n)	IgG + ((n)/%)
19–24	78	(72)/92
25–29	155	(141)/90
30–34	75	(73)/97
35–39	59	(58)/98
40–44	27	(26)/96
45–49	20	(19)/95
50–54	5	(5)/100
55–59	3	(3)/100
60–64	1	(1)/100
Total	423	(398)/94

IgG: immunoglobulin G

Table 3. Other studies summarized and compared to our study

Investigator	Reference	Year	Place	HCWs Number	Immune %
Botelho-Nevers	5	2011	France	153	93
L'Ecuyer	6	1998	USA	5.007	97.9
Sellick	7	1992	USA	1.768	90.6
Hatekayama	8	2004	Japan	877	98.5
Porru	9	2007	Italy	2.934	92
Campagna	10	2010	Italy	9.000	71.4–97.8
Dinelli	11	2009	Brazil	187	86.6
Hatipoglu	12	2010	Turkey	81	97.5
Uckay	13	2007	Switzerland	2.600	95.5
Wright	14	1994	USA	5.825	89.7
Celikbas	15	2006	Turkey	363	98.6
Almuneef	16	2006	Saudi Arabia	4.006	87
Ziegler	17	2003	England	528	96.3
Subbaro	18	1991	USA	222	86
Alp	19	2012	Turkey	1.255	94
Aypak	20	2012	Turkey	288	90.8
Abbas	21	2007	Saudi Arabia	380	95.5
Our Study		2012	Turkey	422	94

HCWs: health care workers

We found that the immunity to measles was relatively lower in non-medical staff (91%), although it is not statistically significant. This might be because of less close contact with patients infected with measles, relative older age of exposure risk than doctors and nurses, and also insufficient vaccination coverage. A study by Dinelli et al. (11) showed that the employees in the non-medical staff were significantly less immune to measles than those in other occupational groups. Similarly, a study in Saudi Arabia also found an association between less immunity against measles and housekeeping staff (21).

Doctors contributed to the highest immunity group with a percentage of 98%, which is higher than the goal for the measles herd immunity, while the nurses (95%) were at the goal level for herd immunity. There were no significant differences between the occupational groups consistent with other similar studies (5, 10).

Similar to other studies, there was no significant difference between the age groups (10, 16). Also we did not find an age threshold similar to Uckay et al.'s study (13), such as 30s, to say that it will replace serology, while in a study conducted in France, (5) it was done, but was mainly completed among medical staff. Although, according to our study, we can say that all HCWs born before 1957 are immune to measles, other studies show that it can also mean that some non-immune HCWs are missing from the results (7, 18).

As expected, the immune status against measles increased with age, 80% of employees in the non-immune group were under the age of 30 years, and no one was found non-immune after the age 45 years.

Conclusion

We want to report that the measles seroprevalence is high, particularly in medical staff, which is above the desired herd immunity. So, prevaccination screenings may also be a significant alternative choice. Also, screening newly recruited hospital staff and vaccinating them as required will also reduce incidence during an outbreak and help us contain it. We also want to emphasize that vaccination against measles must be mandatory, specifically when targeting to eliminate the disease.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital (Date: 11.04.2016; Protocol No: 2016-95).

Informed Consent: Written informed consent was obtained from all employees who participated in this study.

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