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CLINICAL RESEARCH / KLİNİK ARAŞTIRMA

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Evaluation of Measles, Mumps, Hepatitis A and Hepatitis B Seroprevalence in Health Care Providers of a Training and Research Hospital

Bir Eğitim ve Araştırma Hastanesi Çalışanlarında Kızamık, Kabakulak, Hepatit A ve Hepatit B Seroprevalansının Değerlendirilmesi

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Abstract

Objective: The study aims to evaluate the antibody levels in the blood of hospital employees against vaccine-preventable diseases and determine the immunity rates for measles, mumps, and hepatitis A and B among hospital staff.

Methods: This cross-sectional, retrospective study included hospital employees with available measles antibody data. Antibody levels for measles, mumps, hepatitis A and B were examined.

Results: Six hundred and two employees' data were obtained as part of the periodic health screening. Of the employees, 29.4% (n=177) were male and 70.6% (n=425) were female. Measles antibodies were found to be positive in 53.5% (n=322), negative in 38.2% (n=230), and in the gray zone in 8.3% (n=50) of the employees. Mumps antibodies were positive in 81% (n=265), in the gray zone in 16.2% (n=53) and 2.8% (n=9) were in the gray zone. Hepatitis B antibodies were positive in 75.6% (n=455), while hepatitis A antibody levels were positive in 72% (n=431) of the employees. Hepatitis B positivity was significantly higher in physicians. Measles and hepatitis A positivity increased with age, while hepatitis B positivity decreased with age ($p<0.05$). Employees in intensive care units had a notably lower measles positivity rate (35.8%), and pediatric department staff showed lower hepatitis B positivity than the hospital average.

Conclusion: Healthcare workers, who are at a higher risk compared to the general population, must have immunity to these diseases. Ongoing screening and vaccination are essential, as antibody levels may change. Large-scale, multicenter seroprevalence studies will help refine national immunity strategies.

Keywords: Health surveillance, occupational health and safety, health care providers, measles antibody

Öz

Amaç: Çalışmanın amacı; hastane çalışanlarının aşıyla önlenebilir hastalıklara karşı kandaki antikor düzeylerinin değerlendirilmesi ve hastane çalışanlarının kızamık, kabakulak, hepatit A ve hepatit B'ye karşı bağışıklık düzeylerinin belirlenmesidir.

Yöntem: Retrospektif kesitsel tipteki bu çalışmaya kızamık antikor verilerine sahip hastane çalışanları dahil edildi. Kızamık, kabakulak, hepatit A ve B için antikor düzeyleri incelendi.

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Öz

Bulgular: Periyodik sağlık taramaları kapsamında 602 çalışanın verisi elde edildi. Çalışanların %29,4'ü (n=177) erkek ve %70,6'sı (n=425) kadındı. Kızamık antikorlarının çalışanların %53,5'inde (n=322) pozitif, %38,2'sinde (n=230) negatif ve %8,3'ünde (n=50) gri bölgede olduğu bulundu. Kabakulak antikorları %81'inde (n=265) pozitif, %16,2'sinde (n=53) gri bölgede ve %2,8'inde (n=9) gri bölgedeydi. Hepatit B antikorları çalışanların %7,6'sında (n=455) pozitifken, hepatit A antikor seviyeleri çalışanların %72'sinde (n=431) pozitifti. Hepatit B pozitifliği hekimlerde anlamlı olarak daha yüksekti. Kızamık ve hepatit A pozitifliği yaşla birlikte artarken, hepatit B pozitifliği yaşla birlikte azaldı (p<0,05). Yoğun bakım ünitelerindeki çalışanların kızamık pozitiflik oranı belirgin şekilde daha düşüktü (%35,8) ve pediatri bölümünde çalışanların hepatit B pozitifliği hastane ortalamasından düşük bulundu.

Sonuç: Bulaşıcı hastalıklar açısından topluma kıyasla daha yüksek risk altında olan sağlık çalışanlarının bu hastalıklara karşı bağışık olmaları gerekmektedir. Zaman içerisinde antikor düzeylerinde değişim de olabileceğinden sürekli tarama ve aşılama esastır. Büyük ölçekli, çok merkezli seroprevalans çalışmaları ulusal bağışıklık stratejilerini iyileştirmeye yardımcı olacaktır.

Anahtar Kelimeler: Sağlık gözetimi, iş sağlığı ve güvenliği, sağlık hizmeti sağlayıcıları, kızamık antikoru

Introduction

Healthcare workers are at higher risk of infection than the general population because they come into contact with patients' body fluids, blood, and respiratory particles. When infected, they carry the risk of spreading the disease to other healthcare workers, patients, and the community. Therefore, being immune to diseases that can be prevented through vaccination is very important for both personal and public health[1]. One of the viruses that is increasing in frequency globally and that threatens society is the measles virus. According to the data published by the World Health Organization, 2.367 measles cases were reported in Türkiye between September 2023 and August 2024. The total number of cases reported in the European region during this period is 138.740[2].

Measles is a contagious and fatal disease that can spread through airborne particles and cause serious complications and death. It can affect individuals of all ages, especially children. When the virus is transmitted, it first infects the respiratory tract and then spreads throughout the body. Symptoms include high fever, runny nose, cough, and widespread rash on the body. The disease develops on average 10-12 days after contact with a person with measles. People with measles are considered contagious for 4 days before after the rash begins[3]. The most effective way to prevent the transmission and spread of measles is vaccination[4]. Adults without a record of vaccinated against measles or rubella, who have had the disease, or who have serologically negative antibodies, should receive at least 1 dose. Individuals working in healthcare facilities should receive two doses of the measles-mumps-rubella vaccine at least 28 days apart[5].

Mumps is a contagious disease caused by the mumps virus, which belongs to the paramyxovirus family. The disease begins with mild symptoms such as headache, fatigue, and fever. However, parotitis develops later, typically causing tenderness and swelling of the cheeks and jaw. The incubation period is 7-25 days on average. The virus is transmitted through direct contact with infected saliva or respiratory droplets from an infected person. Mumps is preventable due to the vaccine's effectiveness[6].

Viral hepatitis continues to be a major health problem worldwide as it is one of the infectious diseases with high mortality. The global hepatitis report 2024 published by the World Health Organization reported that an estimated 254 million people are living with the hepatitis B virus (HBV)[7]. Hepatitis A is a disease that can be transmitted through the fecal-oral route. Hepatitis B is a vaccine-preventable disease caused by HBV and can be transmitted to an uninfected person through the blood, semen, or body fluids of an infected person. Vaccination programs in our country are planned and implemented to protect both the community and healthcare professionals.

Our study was conducted at Buca Seyfi Demirsoy Training and Research Hospital. Our hospital was opened in 2002 as a Social Insurance Institution (SSK) Hospital, and gained the status of training and research hospital in 2020 with the joint use protocol signed between İzmir Democracy University and the Ministry of Health. It has a bed capacity of 318; 152 of which are intensive care.

According to article 15 of the Occupational Health and Safety Law No. 6331, employers take into account the health and safety risks that workers will be exposed to in the workplace and ensure that they are subject to health surveillance. Within this scope, pre-employment examinations are carried out. Serological examinations are carried out in our hospital for healthcare workers who are deemed at risk.

Our aim in the study is to determine the healthcare workers' immunity rate for measles, mumps, hepatitis A, and B by evaluating the antibody levels in the blood of hospital workers against vaccine-preventable diseases.

Materials and Methods

This study was designed as a retrospective cross-sectional study. The sample of the study consisted of all healthcare workers in Buca Seyfi Demirsoy Training and Research Hospital whose measles antibodies were checked during the annual health screening.

Ethics committee approval for the study was received from the Buca Seyfi Demirsoy Training and Research Hospital Non-Interventional Research Ethics Committee with the decision number: 2024/363 dated: 27.11.2024.

Measles, mumps, hepatitis A, and hepatitis B antibody Immunoglobulin G levels determined by enzyme-linked immunosorbent assay were evaluated. It was evaluated whether there was a difference in these values according to the age, gender, profession and unit of employment of the individuals.

Statistical Analysis

Statistical analysis of the obtained data was performed using the SPSS-29 software package. Descriptive distribution analysis was used in the evaluation of the data, and the chi-square test was used in statistical analysis. A p-value of less than $p<0.05$ was considered statistically significant.

Results

Within the scope of periodic health screening, antibody values for measles, mumps, hepatitis B, and hepatitis A were retrospectively scanned, and data from a total of 602 employees were obtained. 29.4% (n=177) of the employees were male and 70.6% (n=425) were female (Table 1).

Measles antibodies were found to be positive in 53.5% (n=322) of the workers, negative in 38.2% (n=230), and in the gray zone in 8.3% (n=50). Mumps antibodies were found to be positive in 81% (n=265), gray-zone in 16.2% (n=53), and negative in 2.8% (n=9). Hepatitis B antibodies were found to be positive in 75.6% (n=455) and negative in 24.4% (n=147); hepatitis A antibody values were reported as positive in 72% (n=431) and negative in 28% (n=168). No significant difference was found in antibody values between the gender groups. When the employees were examined according to their professions, 23.6% (n=142) were physicians, 34.1% (n=205) were nurses and midwives, 26.2% (n=158) were workers, 7.6% (n=46) were technicians, and 8.5% (n=51) were other hospital employees. Although no statistically significant difference was found, the measles antibody seropositivity rate was observed to be the lowest in physicians (43.7%) and the highest in technicians (60.9%). Hepatitis B antibody positivity was found to be significantly higher in physicians ($p<0.05$) (Table 2). It was observed that measles and hepatitis A antibody positivity of employees examined according to age groups, increased significantly with age. While the positive measles and hepatitis A antibody rates in employees aged 50 and over were 87.5-95%, these values were found to be 36.3-65% in the 19-30 age group. The hepatitis B antibody positivity rate was negatively correlated with age ($p<0.05$). The rate of mumps antibodies was found to be significantly high in the 31-49 age group (87.8%). When examined based on the departments in which they worked, measles antibody positivity among intensive care unit workers was well below average at 35.8%. No significant difference was found between units in terms of mumps and hepatitis A antibodies. Among pediatric patients, the hepatitis B antibody positivity rate was found to be below the hospital average (Table 3).

Table 1. Sociodemographic characteristics of participants

Variable	Category	n	%
Gender	Male	177	29.4
	Female	425	70.6
Age group	19-30 years	281	46.7
	31-49 years	281	46.7
	50 years and above	40	6.6
Profession	Nurse	205	34.1
	Physician	142	23.6
	Worker	158	26.2
	Technician	46	7.6
	Other staff	51	8.5
Department	Emergency service	71	11.8
	Surgical clinics	64	10.6
	Pediatrics	48	8
	Internal clinics	122	20.3
	Administrative department	103	17.1
	Gynecology	29	4.8
	Laboratory	13	2.2
	Cleaning services	71	11.8
	ICU	81	13.4

ICU: Intensive care unit

Table 2. Antibody values according to profession

Profession		Measles antibody				Mumps antibody				Hepatitis A antibody			Hepatitis B antibody		
		Negative	GZ	Positive	Total	Negative	GZ	Positive	Total	Negative	Positive	Total	Negative	Positive	Total
Nurse	n	73	13	119	205	23	3	116	142	48	155	203	46	159	205
	%	35.6%	6.3%	58.0%	100.0%	16.2%	2.1%	81.7%	100.0%	23.6%	76.4%	100.0%	22.4%	77.6%	100.0%
Physician	n	65	15	62	142	11	1	53	65	48	94	142	25	117	142
	%	45.8%	10.6%	**43.7%**	100.0%	16.9%	1.5%	81.5%	100.0%	33.8%	66.2%	100.0%	17.6%	82.4%	100.0%
Worker	n	53	16	89	158	9	1	51	61	42	116	158	52	106	158
	%	33.5%	10.1%	56.3%	100.0%	14.8%	1.6%	83.6%	100.0%	26.6%	73.4%	100.0%	32.9%	**67.1%**	100.0%
Technician	n	14	4	28	46	3	2	25	30	11	35	46	15	31	46
	%	30.4%	8.7%	60.9%	100.0%	10.0%	6.7%	83.3%	100.0%	23.9%	76.1%	100.0%	32.6%	**67.4%**	100.0%
Other staff	n	25	2	24	51	7	2	20	29	19	31	50	9	42	51
	%	49.0%	3.9%	**47.1%**	100.0%	24.1%	6.9%	69.0%	100.0%	38.0%	62.0%	100.0%	17.6%	82.4%	100.0%
Total	n	230	50	322	602	53	9	265	327	168	431	599	147	455	602
	%	38.2%	8.3%	**53.5%**	100.0%	16.2%	2.8%	**81.0%**	100.0%	28.0%	**72.0%**	100.0%	24.4%	**75.6%**	100.0%
p-value		p>0.05				p>0.05				p>0.05			**p=0.01***		

*: p<0.05, GZ: Gray zone

Discussion

The results of this study showed that the highest seropositivity rate among our hospital staff was for mumps (81%), while the lowest seropositivity rate was for measles (53.5%). Hepatitis B antibody positivity was 75.6%, and hepatitis A positivity was 72%. Many seroprevalence studies have been conducted among healthcare workers in our country and around the world, and seropositivity rates have varied from region to region.

In some studies conducted in our country, the anti-HBs positivity rate was found to be between 56.5% and 88%, similar to our study[8-14]. In a study conducted among healthcare workers in an oncology hospital, 95.7% were found to be seropositive for measles and 82.3% for mumps[15]. In a study conducted by Cılız et al. [16] in a university hospital close to our region, seropositivity was observed as 84.1% seropositivity for hepatitis B, 99.7% for measles, and 99.7% for mumps in healthcare workers. In a study conducted in Eskişehir, the seropositivity rate for hepatitis B was found to be high in nurses and doctors, and hepatitis A seropositivity was also 71.7%, similar to our study[9]. In a study conducted on 384 volunteer healthcare workers at Zonguldak Bülent Ecevit Hospital in 2019, the antibody positivity rate against measles was found to be 92.2%[17]. In a cross-sectional study conducted by Altın et al.[13] the positivity rate was reported as 74.17% for hepatitis B, 31.48% for hepatitis A, 64.36% for measles, and 72.2% for mumps; the average age of those with positive hepatitis A, measles, and mumps antibodies was found to be higher. In our study, the measles and hepatitis A antibody positivity rates were found to be similarly high, and hepatitis B antibody positivity was found to be lower in those with an older average age. We believe that the viral load an individual has been exposed to throughout life may contribute to the increasing measles antibody positivity rate with age. In another multicenter study conducted in our country, measles seropositivity was reported as 77.6% and mumps seropositivity as 81.6%[18]. In a study conducted in Korea to compare measles seroprevalence among healthcare workers in two hospitals, the general measles seropositivity rate was 93.1%. It was found that the antibody positivity rate increased as the average age increased[19]. In another study conducted in Korea, the general measles seropositivity rate was found to be 73%, and, when the workers were examined according to their birth years, the seropositivity rate of those born in earlier years was found to be higher, similar to the findings of our study. It was thought that this situation might have been due to vaccination failure, insufficient immune

Table 3. Antibody values according to department

Department		Measles antibody				Mumps antibody				Hepatitis A antibody			Hepatitis B antibody		
		Negative	GZ**	Positive	Total	Negative	GZ**	Positive	Total	Negative	Positive	Total	Negative	Positive	Total
Emergency service	n	30	7	34	71	3	0	27	30	24	45	69	13	58	71
	%	42.3%	9.9%	**47.9%**	100.0%	10%	0.0%	90.0%	100.0%	34.8%	65.2%	100.0%	18.3%	81.7%	100.0%
Surgical clinics	n	20	7	37	64	6	1	38	45	20	44	64	7	57	64
	%	31.3%	10.9%	57.8%	100.0%	13.3%	2.2%	84.4%	100.0%	31.3%	68.8%	100.0%	10.9%	89.1%	100.0%
Pediatrics	n	16	5	27	48	7	0	40	47	12	36	48	14	34	48
	%	33.3%	10.4%	56.3%	100.0%	14.9%	0.0%	85.1%	100.0%	25.0%	75.0%	100.0%	29.2%	**70.8%**	100.0%
Internal medicine	n	53	9	60	122	17	4	51	72	38	83	121	29	93	122
	%	43.4%	7.4%	**49.2%**	100.0%	23.6%	5.6%	**70.8%**	100.0%	31.4%	68.6%	100.0%	23.8%	76.2%	100.0%
Administrative department	n	35	6	62	103	5	2	34	41	34	69	103	36	67	103
	%	34.0%	5.8%	60.2%	100.0%	12.2%	4.9%	82.9%	100.0%	33.0%	67.0%	100.0%	35.0%	**65.0%**	100.0%
Gynecology	n	9	0	20	29	3	1	18	22	7	22	29	8	21	29
	%	31.0%	0.0%	69.0%	100.0%	13.6%	4.5%	81.8%	100.0%	24.1%	75.9%	100.0%	27.6%	**72.4%**	100.0%
Laboratory	n	2	1	10	13	0	0	9	9	2	11	13	2	11	13
	%	15.4%	7.7%	76.9%	100.0%	0.0%	0.0%	100.0%	100.0%	15.4%	84.6%	100.0%	15.4%	84.6%	100.0%
Cleaning service	n	19	9	43	71	5	0	24	29	12	59	71	22	49	71
	%	26.8%	12.7%	60.6%	100.0%	17.2%	0.0%	82.8%	100.0%	16.9%	83.1%	100.0%	31.0%	**69.0%**	100.0%
ICU	n	46	6	29	81	7	1	24	32	19	62	81	16	65	81
	%	56.8%	7.4%	**35.8%**	100.0%	21.9%	3.1%	**75.0%**	100.0%	23.5%	76.5%	100.0%	19.8%	80.2%	100.0%
Total	n	230	50	322	602	53	9	265	327	168	431	599	147	455	602
	%	38.2%	8.3%	**53.5%**	100.0%	16.2%	2.8%	**81.0%**	100.0%	28.0%	**72.0%**	100.0%	24.4%	**75.6%**	100.0%
p-value		**p=0.015***				p>0.05				p>0.05			**p=0.022***		

*: p<0.05, **: GZ: Gray zone, ICU: Intensive care unit

response to the vaccine, or exposure to infection during the nationwide epidemic in 2000-2001[20]. In a study conducted in Spain in 2013, measles seropositivity was found to be 98%, and in a study conducted in 2023, it 89%[21,22]. Again, in a study conducted in Spain to screen for hepatitis B seroprevalence in healthcare workers, hepatitis B antibody positivity was found to be 64.4%, and a higher positive antibody rate was reported in workers under the age of 25, similar to our results[23].

As we found in our study and the existing literature, the level of immunity against infectious diseases can vary from region to region and over the years. In recent years, there has been an increase in infectious diseases, especially measles, due to the entry of people with unknown immunity. It is thought that the interruption of vaccination during the pandemic period may also have an impact on this situation.

Study Limitations

The limitations of our study can be listed as its retrospective and single-center nature, the lack of screening for the antibody values of all employees in the hospital, and the inability to access the vaccination status of the employees.

Conclusion

Healthcare workers, who are at higher risk of infectious diseases compared to the general public, need to be immunized against these diseases. The low seropositivity rates we have detected in departments that are particularly risky, such as intensive care units and pediatrics, are of great importance.

Since antibody levels may change over time, screening and vaccination programs should be continued without slowing down as recommended by the Ministry of Health. Protecting healthcare workers from infectious diseases will also be significantly effective in protecting public health. We believe that conducting multicenter, comprehensive seroprevalence studies will contribute to the development of health strategies by determining the current immunity status in our country.

Ethics

Ethics Committee Approval: Ethics committee approval for the study was received from the Buca Seyfi Demirsoy Training and Research Hospital Non-Interventional Research Ethics Committee with the decision number: 2024/363 dated: 27.11.2024.

Informed Consent: This study was designed as a retrospective cross-sectional study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.G., K.E., Z.S., Concept: H.G., K.E., Z.S., Design: H.G., K.E., Data Collection or Processing: K.E., Analysis or Interpretation: H.G., Z.S., Literature Search: K.E., Writing: H.G., K.E., Z.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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