

Immunization While Hospitalization; Can It Be Opportunity for Childhood Immunization?

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ABSTRACT

Introduction: Vaccination is an important public health practice that protects individuals as well as the general population from infectious diseases. Publications have examined the effects of vaccination practices, on vaccination rates in children hospitalized for other reasons. The present study aimed to evaluate opportunistic vaccination rates in hospitalized children.

Methods: In the present study, children who were consulted for vaccination at the well-child clinic during hospitalization between 2015-2022, were retrospectively evaluated. Patients who could not be vaccinated because they did not comply with pre-vaccine administration checklist were excluded from the study. Patients were examined in three groups: routine, delayed, and risk groups. Patients were evaluated according to demographic, clinical, and vaccine characteristics.

Results: Of the 971 patients included in the study, 480 (49.4%) were female and the median age was 0 (range 0-18). Five hundred fifty-four (57.1%) of the patients were premature infants who were referred from the neonatal intensive care unit. A total of 1792 doses of vaccine were administered to the patients included in the study (677 routine vaccinations, 735 delayed vaccinations, and 380 risk group vaccinations). The most frequently administered vaccine was hepatitis B vaccine, with 975 (54.4%) doses. It is observed that delayed vaccination, and risk group vaccinations increased proportionally in the following years ($p<0.001$).

Conclusion: Hospitalizations can be seen as vaccination opportunities for children. Having units in hospitals that will administer vaccines to inpatients, will contribute to the vaccination rates in children.

Keywords: Child, immunization, inpatient, missed opportunity, vaccine

Introduction

The aim of vaccination is to protect individuals and societies from diseases and the risks that these diseases may cause (1). It is reported that 21% of deaths under the age of 5 are due to vaccine-preventable causes such as lower respiratory tract infections, meningitis, and measles (2). According to the World Health Organization data, 3.5-5 million deaths caused by infectious diseases such as diphtheria, tetanus, pertussis, influenza, and measles are prevented each year with vaccination. The fact that vaccination has a social protective effect on unvaccinated individuals and that this effect is correlated with the vaccination rate emphasizes the need to increase vaccination rates (3). An individual's visit to a health institution for any reason is an opportunity to complete missing vaccinations and to administer vaccines that are due. There are publications recommending that the vaccination status of all children be

evaluated at every health institution visit (4,5). In this study, we aimed to emphasize the contribution of hospitalization in evaluating missed vaccination opportunities by examining patients who were hospitalized for various reasons in our hospital and consulted for vaccination at the well child clinic.

Methods

This descriptive, cross-sectional study included patients aged 0-18, who were consulted for vaccination at the well child clinic of University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital between 2015-2022, and vaccinated while hospitalized. Consultations requested for vaccination from the well child clinic were examined retrospectively: the hospital database was used to investigate the patients' diagnoses, reasons for vaccination, vaccines administered,



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and which unit requested the consultation for vaccination. Examination of the patients' vaccination cards and vaccines registered in the Vaccine tracking system was used to access previous vaccination records. The obtained data were recorded. Vaccination status was individually evaluated according to the National Immunization Program Schedule and risk group vaccination requirements.

Patients were divided into three groups: routine vaccination, delayed vaccination, and risk group vaccination:

1- Routine vaccination group: Patients whose age-appropriate vaccination time came according to the National Immunization Program Schedule.

2- Delayed vaccination group: Patients whose routine vaccination time came according to the National Immunization Program Schedule but who were not vaccinated without being in the risk group.

3- Risk group: Those who were vaccinated in addition to the National Immunization Program Schedule due to reasons such as prematurity and/or low birth weight, chronic diseases (e.g., malignancies, transplantation, and immunosuppressive treatments), and conditions predisposing to encapsulated bacterial infections (e.g., asplenia, post-splenectomy status, immunosuppressive diseases, complement deficiencies, and antibody production disorders).

Patients who were consulted at the well-child clinic for vaccination but were not vaccinated according to the pre-vaccine administration checklist were excluded from the study (6).

The present study was conducted in accordance with the Helsinki Declaration and was approved by the University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital Clinical Research Ethics Committee (approved number: 4425, date: 11.06.2024).

Statistical Analysis

Statistical analysis were performed using SPSS version 25.0 and TURCOSA. Categorical data were expressed as numbers and percentages, while continuous data were expressed as median and range. Chi-square tests (Pearson chi-square, Fisher's exact test, etc.) were used to compare categorical data. All p-values were two-sided, and the results were evaluated using a significance level of $p < 0.05$ with a 95% confidence interval.

Results

A total of 971 patients were included in the study. Four hundred eighty (49.4%) of the patients were female and the median age was 0 (range 0-18). Seven hundred twenty nine (74.6%) of the patients were between 0-12 months old. Five hundred fifty four (57.1%) of the patients were premature infants from the neonatal intensive care unit (ICU) (Table 1).

A total of 1,792 doses of vaccine were administered to the patients included in the study between 2015 and 2022. Of these doses, 677 were routine vaccinations, 735 were delayed vaccinations, and 380 were risk group vaccinations. When the vaccination trend was evaluated between 2015-2022, delayed vaccinations and risk group vaccinations were seen to increase proportionally, while routine vaccination decreased ($p < 0.001$) (Table 2).

The most frequently administered vaccine was hepatitis B vaccine with 975 (54.4%) doses. Pneumococcal conjugate vaccine was the second most frequently administered vaccine, administered, with 319 (17.8%) doses, and pentavalent vaccine (DaBT-IPA-Hib) the third, with 302 (16.9%) doses. The number of vaccine applications by year is given in detail in Table 3.

Discussion

In our study, among the 971 patients evaluated, a total of 1,792 vaccine doses were administered, of which 677 were routine, 735 were delayed, and 380 were risk group vaccinations. It was determined that only one fifth of the vaccines administered to children during hospitalization were given because the children were in the risk group, and the vast majority were delayed and routine vaccinations. It has been reported that vaccination rates have decreased in our country and the world for

Table 1. Demographic and clinicopathologic features of the participants

Variables		n	%
All patients		971	100
Age (median 0, range 0-18)	0-12 months	729	75
	12-72 months	103	10.6
	6-13 years	91	9.3
	14-17 years	48	4.9
Gender	Female	480	49.4
	Male	491	50.6
Diagnosis	Prematurity	554	57.1
	Respiratory diseases	109	11.2
	Renal diseases	65	6.7
	Malignancy	58	6
	Gastrointestinal diseases	49	5
	Neurological diseases	47	4.8
	Metabolic diseases	30	3.1
	Endocrinological diseases	22	2.2
	Cardiovascular diseases	17	1.7
	Post-splenectomy	12	1.2
	Infectious diseases	8	1

Table 2. Yearly distribution of reasons for vaccination

Variables	Routine	Delayed	Risk group	p-value
2015	142	7	22	<0.001 ^a
2016	115	11	40	
2017	71	103	65	
2018	47	134	49	
2019	49	141	61	
2020	96	128	36	
2021	81	75	36	
2022	76	136	71	
Total (1792)	677	735	380	

^aChi-square test

Table 3. Vaccinations administered to pediatric patients during hospitalization between 2015-2022

Vaccines	2015	2016	2017	2018	2019	2020	2021	2022	Total vaccine count (n=1792)
Hepatitis B	118	113	131	102	114	116	112	169	975 54.4%
DPT	24	20	42	44	45	54	35	38	302 16.9%
CPV	24	21	46	53	52	50	31	42	319 17.8%
Hepatitis A	3	5	14	15	27	24	10	15	113 6.3%
MMR	0	2	4	4	5	8	0	7	30 1.7%
Varicella zoster	0	1	2	6	4	7	0	5	25 1.4%
Meningococcus	0	1	0	3	3	1	3	4	15 0.8%
Oral polio vaccine	0	0	0	3	1	0	1	0	5 0.3%
BCG	1	1	0	0	0	0	0	1	3 0.2%
Pneumococcus	0	2	0	0	0	0	0	2	4 0.2%
Influenza	1	0	0	0	0	0	0	0	1 0.1%

DPT: Diphtheria pertussis tetanus, CPV: Conjugated pneumococcus vaccine, MMR: Measles, mumps and rubella, BCG: Bacillus Calmette-Guérin

various reasons in recent years (7). The factors that cause the decrease in vaccination rates can be divided into two groups: health institution and personnel, and family and community-based reasons. Examples of missed vaccination opportunities originating from health institutions include lack of equipment and vaccines, lack of information about vaccination and incorrect contraindications, and avoidance of multiple vaccines at the same time. Examples of missed vaccination opportunities originating from health institutions include lack of education, misinformation, and beliefs originating from families and society (8). Hospitalization can be seen as an opportunity to reach more children and adolescents who have missed vaccinations, thereby contributing to increasing the effectiveness of vaccination programs (9).

Mihalek et al. (9)'s study showed that children who were hospitalized had low vaccination rates compared to the general population. Weddle and Jackson (10) study found that 92% of patients who were hospitalized received age-appropriate vaccines, and the most missed vaccines were influenza (67%), meningococcal (57%), hepatitis A (48%), and varicella (38%). In a recent retrospective cohort study by Bryan et al. (11), the most common vaccines administered to hospitalized patients were the hepatitis B birth dose and influenza vaccine. In our hospital, all newborns are given hepatitis B birth doses by the neonatal clinic. Therefore, we did not include routine hepatitis B doses administered in the delivery room in our study, although the most commonly administered vaccine was it.

In a study published in 2020 by Diallo et al. (12), it was reported that in 275 children aged between 6 and 18 months and affected by type 1 diabetes, human immunodeficiency virus infection, Down syndrome, cystic fibrosis, or neurological diseases, the coverage of diphtheria-tetanus-pertussis, polio, and hepatitis B vaccines approached 85% at 24 months; measles-mumps-rubella coverage was 62%, and seasonal influenza coverage was 59%. There was also heterogeneity among children with different chronic diseases. In the present study, regardless of the risk group, it was observed that the hepatitis B vaccine was the second and third most frequently administered vaccine, followed by the conjugated pneumococcal and pentavalent vaccines, in all groups.

Various invasive infectious diseases, including vaccine-preventable infectious diseases, pose a higher risk for children with chronic diseases. In a 2023 study, 14 Italian children's hospitals were evaluated concerning their vaccination practices. According to this study, the services where vaccination is offered more frequently to inpatients are general pediatrics, neonatology, pediatric hematology and oncology, pediatric endocrinology, pediatric cardiology and pediatric infectious diseases (range, 58% to 83%). While 58% of the hospitals that provide vaccination reported <500 vaccinations/year, 17% reported >2,000/year (13). In the present study, it was determined that 1792 doses of vaccine were administered to 971 children while they were hospitalized in our hospital. Again, it was determined that the unit that requested the most consultation for vaccination, was the neonatal ICU, with 59% (n=1058). The other units that requested the most consultation were neonatal intensive care, general pediatrics, pediatric hematology and oncology, and pediatric infectious diseases. This study emphasizes the benefit of adding a vaccination center to in-hospital well-child clinics. It ensures children at risk of being behind on vaccines receive proper immunization.

Study Limitations

One limitation of our study is its retrospective design. Additionally, not all hospitalized children were assessed for vaccination status, as some patients admitted during the study period were not evaluated for vaccination in the healthy child clinic.

Conclusion

It is known that vaccination rates have decreased in recent years due to several factors. In the present study, it was determined that the majority of vaccines administered to children while they were hospitalized were delayed routine vaccinations. By administering vaccines during hospitalization, children in the risk group who need vaccination, as well as those with delayed and routine vaccinations, can be covered. According to the results of the present study, hospitalization can be seen as an opportunity for vaccination, and thus, there should be units in hospitals where vaccinations can be administered.

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital Clinical Research Ethics Committee (approved number: 4425, date: 11.06.2024).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions: Surgical and Medical Practices - B.T.D., Ş.A., Z.B.B.K., A.K., H.S.U., A.B., G.K.E.; Concept - B.T.D., G.K.E.; Design - B.T.D., G.K.E.; Data Collection or Processing - B.T.D., Ş.A., Z.B.B.K., H.S.U., A.B., A.K.; Analysis or Interpretation - B.T.D., Ş.A., Z.B.B.K., A.K., H.S.U., A.B., G.K.E.; Literature Search - B.T.D.; Writing - B.T.D., G.K.E.

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