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ORIGINAL ARTICLE

Frequency of Age-Appropriate Vaccination in Children Till 15 Months of Age Admitted at the Aga Khan Hospital, Karachi, Pakistan

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ABSTRACT

Objective: To determine the frequency of age-appropriate vaccination till 15 months of age at Aga Khan Hospital, Karachi Pakistan.

Study design: Cross-sectional study

Place and Duration: Inpatient department of the Aga Khan University Hospital from Nov 2019 to Nov 2020

Methodology: All children admitted to the pediatric ward and fulfilling the inclusion criteria were enrolled. A predesigned proforma was used to collect data on the basic demographics of children and parents, their socioeconomic status, parental education, occupation, and vaccination status. The age-appropriate vaccination was defined as children who had received the vaccination, according to their age as per the expanded program of immunization (EPI) schedule of Pakistan. All collected data were analyzed using SPSS version 23.

Results: Out of 350 admitted children, 222 (63.4%) were males and 128 (36.6%) were females. Most of the children were vaccinated (95.7%), while 4.3% were not vaccinated**.** Among vaccinated children, 63.7% had not received age-appropriate vaccination, and only 127 (36.3%) had age-appropriate vaccination**.** Statistically, the employment status of mothers (p=0.001) and educational level of mothers (p=0.001) and fathers (p=0.001) were significantly associated with age-appropriate vaccination in children of age up to 15 months.

Conclusion: Despite having a high vaccination coverage rate, the proportion of age-appropriate vaccination was lower. The factors associated with age-appropriate vaccination were the employment status of the mother and the educational status of the parents. Vaccination programmes should work on identified risk factors in order to improve age-appropriate vaccination coverage.

Keywords: Age appropriate vaccination, immunization, vaccination card

INTRODUCTION

The most effective and economical public health measures to reduce fatal illnesses and infant mortality are immunization campaigns. Smallpox, measles, and poliomyelitis have all been eradicated worldwide because of immunization programmes.[1, 2] Morbidity and mortality linked to diphtheria, tetanus, and pertussis have also decreased. However, the World Health Organization (WHO) estimates that 1.5 million children still lose their lives each year to diseases that can be prevented by vaccination. [3]

As a result, the WHO launched the Expanded Programme on Immunization (EPI) in 1974, which provided recommendations for the ages at which each vaccine should be administered, the gaps between vaccines, and the spacing between immunizations. [1, 4] Therefore, these vaccination schedules are created to safeguard children at a time when they are most susceptible to specific illnesses. [5]

EPI has been a huge success all around the world since it was implemented.[5, 6]For example, almost one billion people have been immunized in the previous ten years, and vaccination has prevented nearly 2 to 3 million deaths worldwide.[6]At the same time, 20 million people still experience vaccine inaccessibility worldwide.[2] The resurgence of diseases which can be prevented by vaccines such as measles in the USA, Mongolia and other counties has stressed that not just vaccination coverage but also the administration of vaccines on time is important in order to ensure effective immunization. [7, 8]

Currently, EPI Pakistan provides protection against nine different preventable antigens free of cost to all children from birth to 15 months of age.[9,10]The EPI coverage is 80% for BCG, 65% for DPT3 and polio3 and 67% for measles in Pakistan.[10]A significant fraction of children (45%) in Pakistan do not receive vaccinations that are age-appropriate, despite the fact that immunization rates for the entire set of basic vaccines have been rising in Pakistan as a result of the EPI. [10]

Lack of age-appropriate vaccination may cause outbreaks of infectious disease as meningitis, diarrheal disease and pneumonia among children.[9, 10]Hence, to take full advantage of the vaccination program, it is important to consider not only the coverage rate but also the timeliness of vaccination. Hence, the primary objective of this study was to determine the frequency of age-appropriate vaccination and risk factors for delay in vaccination in children till 15 months of age admitted at Aga Khan Hospital, Karachi Pakistan. The results of this study could be useful for policymakers and health authorities in Pakistan for designing and implementing policies for achieving age-appropriate vaccination coverage in children.

METHODOLOGY

From November 2019 to November 2020, a cross-sectional study was carried out at the Aga Khan University Hospital Karachi's Department of Pediatrics and Child Health.

Using WHO sample size calculator, considering 95% confidence level, with an estimated population proportion of 35% children get their all the recommended vaccination at the age of 1 year as per Sindh demographic data[11]and an absolute precision of 0.03, the anticipated sample size was 350 children. All admitted children from birth till 15 months of age of either gender were included in the study. Children who were in PICU, or ventilator support for respiratory distress, or who have arelative and absolute contraindication to live vaccines as per WHO standard vaccination guidelines were excluded from the study. Non-probability consecutive sampling method was employed.

The study was approved by an ethical review committee of Aga Khan Hospital, Karachi, Pakistan under approval no. 2019-1827-6774. Data regarding the basic demographics of children and parents, their socioeconomic status, parental education, occupation, and vaccination status were collected on a pre-designed questionnaire after taking informed consent from the mother/guardian through face to face interview. The confirmation of vaccination status was done using vaccination card or verbal communication with parents. The age-appropriate vaccination was defined as children who had received vaccination, according to their age as per EPI schedule of Pakistan displayed in Table 1.

Table 1: Pakistan's EPI Vaccination Schedule

Disease	Causative agent	Vaccine	Doses	Age of Administration
Childhood TB	Bacteria	BCG	1	Soon after birth
Poliomyelitis	Virus	OPV	4	OPV0: soon after birth OPV1: 6 weeks OPV2: 10 weeks OPV3: 14 weeks
		IPV	1	IPV-I: 14 weeks
Diphtheria	Bacteria	Pentavalent vaccine (DTP+Hep B + Hib)	3	Penta1: 6 weeks Penta2: 10 weeks Penta3: 14 weeks
Tetanus	Bacteria			
Pertussis	Bacteria			
Hepatitis B	Virus			
Hib pneumonia and meningitis	Bacteria			
Measles	Virus	Measles	2	Measles1: 9 months Measles2: 15months
Diarrhoea due to rotavirus	Virus	*Rotavirus	2	Rota 1: 6 weeks Rota 2: 10 weeks

Statistical analysis was performed on SPSS version 23. Frequency and percentage were reported for categorical variables like gender, family status, employment status of parents, educational status of parents, vaccination coverage and age-appropriate vaccination. Chi-square test/Fisher exact test was applied in order to assess theassociation between gender, family status, employment status of parents and educational status of parents. A p-value≤0.05 was considered statistically significant.

RESULTS

A total of 350 admitted children from birth till 15 months of age at Aga Khan Hospital, Karachi were enrolled in this study. Out of 350 children, 63.4% were males and 36.6% were females. About 58.9% of the children were living in joint family system, 85.4% of the mothers were house wife by occupation, and 69.1% of the fathers were employed. Furthermore, most of the mothers (57.1%) and fathers (65.7%) had higher education. (As shown inTable 2)

Majority of children were vaccinated 335 (95.7%) while 15 (4.3%) were not vaccinated**.** Among vaccinated children, 223 (63.7%) of children had not received age appropriate vaccination, only 127 (36.3%) were vaccinated age appropriately as shown in figure 1.

Statistically employment status of mothers (p=0.001) and educational level of mothers (p=0.001) and fathers(p=0.001) were significantly associated with age-appropriate vaccination in children of age up to 15 months. (As shown inTable 3)

Table 2: Baseline Characteristic of Study Participants

Gender	
Male	222 (63.4%)
Female	128 (36.6%)
Family Status	
Nuclear	144 (41.1%)
Joint	206 (58.9%)
Mother Occupation	
Working woman	51 (14.6%)
Housewife	299 (85.4%)
Father Occupation	
Employed	242 (69.1%)
Unemployed	108 (30.9%)
Father Education	
Uneducated/primary	58 (16.6%)
Secondary	62 (17.7%)
Higher	230 (65.7%)
Mother Education	
Uneducated/primary	76 (21.7%)
Secondary	74 (21.1%)
Higher	200 (57.1%)
Data presented as n (%)	

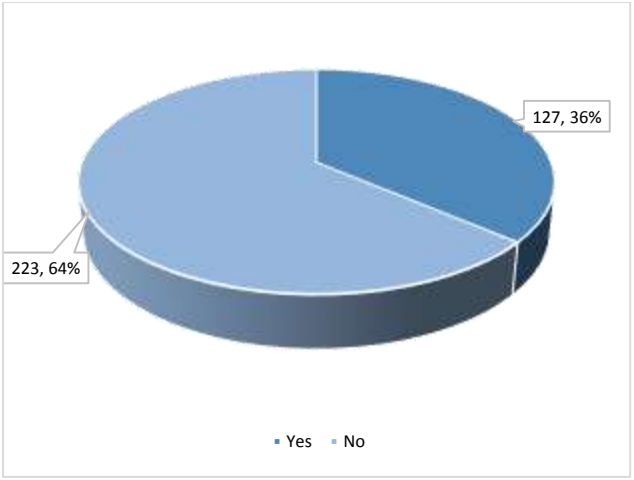

Figure 1: Frequency distribution of age-appropriate vaccination

Table 3: Factors affecting age-appropriate vaccination among children till 15 years

	Age-appropriate vaccination		p-value
	Yes (n=127)	No (n=223)	
Gender of child			
Male	84 (37.8)	138 (62.2)	
Female	43 (33.6)	85 (66.4)	0.426
Family status			
Joint	58 (40.3)	86 (59.7)	
Nuclear	69 (33.5)	137 (66.5)	0.065
Mother employment status			
Employed	32 (62.7)	19 (37.3)	
Unemployed	95 (31.8)	204 (68.2)	0.001*
Father employment status			
Employed	92 (38)	150 (62)	
Unemployed	35 (32.4)	73 (67.6)	0.313
Father education			
Uneducated/Primary	4 (6.9)	54 (93.1)	
Secondary	21 (33.9)	41 (66.1)	0.001*
Higher	102 (44.3)	128 (55.7)	
Mother education			
Uneducated/Primary	9 (11.8)	67 (88.2)	
Secondary	22 (29.7)	52 (70.3)	0.001*
Higher	96 (48)	104 (52)	
Data presented as n (%) Chi-square/Fisher exact test was applied *Significant at 0.05 level of significance			

DISCUSSION

Both vaccination coverage and administration of vaccines on time are useful to achieve full advantage of immunization program. Due to the extended program on immunization (EPI) [12], vaccination rates for the entire set of basic vaccines have been rising in Pakistan, but little is known about vaccination timeliness and the factors that determine early, timely, and delayed vaccination. The current study sought to determine how frequently children hospitalized at the Aga Khan University hospital received vaccinations that were age-appropriate.

We found a 95% vaccination coverage rate in children till 15 months in the current study. However, only 36% of the children were vaccinated at their recommended age. National figures indicate that the issue of vaccination delays persists even though the majority of kids eventually become up to date. According to additional research based on the National Immunization Survey (NIS), just 22% of children have received all three doses of the 4:3:1 series at the advised ages. [12]

Similar findings have been reported in studies from developing and developed countries that revealed a low proportion of age-appropriate vaccination, even with high vaccine coverage rate. [13-16]

This means that a sizable fraction of children are either not protected at all or are only partially protected for varying amounts of time against certain diseases that can be prevented by

vaccination. One reason for the delayed vaccination may be that the mothers were reminded of the significance of vaccinations for children due to the efforts of the EPI program and the government of Pakistan, and as a result, had their children vaccinated at birth. However, over time, due to other family/social activities, lost or misplaced vaccination cards, and a lack of an institutional vaccination monitoring program, the mothers may have had difficulty remembering and/or complying with vaccination appointments.

Since pneumonia, meningitis, and diarrhea are the three leading diseases that kill children under the age of five in Pakistan, a sizable children of kids do not obtain a timely, complete course of vaccines, putting them at risk for these diseases.

Also, catch-up vaccination should be implemented so that there is no missed vaccination among children.

We found working mothers had a significantly lower rate of age-appropriate vaccination than housewives (31.8% vs 62.7%, p=0.001). In the study conducted by Hu et al. similar findings were observed, odds of age-in-appropriate vaccination were higher among employed mothers as compared to working mothers.[17] Furthermore, we found higher education of parents was strongly associated with age-appropriate vaccination. Previous researches also observed that parents' education was significantly associated with timeliness of vaccination.[12, 17-19]

The present study has several limitations. Firstly, it was a single center study having small size, therefore, results cannot be generalized. Secondly, vaccination status was assessed by communicating with parents where vaccination cards were not available; therefore, it could lead to parents' recall bias or information bias. However, this research provided information regarding timeliness which could help in designing targeted interventions.

CONCLUSION

Despite having a high vaccination coverage rate, the proportion of age-appropriate vaccination was lower. The factors associated with age-appropriate vaccination were employment status of mother and educational status of parents. Vaccination program should work on identified risk factors in order to improve age-appropriate vaccination coverage.

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Ethical Consideration: Permission was taken from the ethical review committee of hospital

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