ORIGINAL ARTICLE

PERCEIVED BARRIERS FOR DELAY IN AGE-APPROPRIATE VACCINATION AMONG CHILDREN ATTENDING A TERTIARY CARE HOSPITAL OF RAWALPINDI

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ABSTRACT

Objective: To determine the frequency of delay in age-appropriate vaccination, association between the delay and demographic variables along with the perceived barriers associated with it.

Design: Descriptive, Cross-sectional study.

Place and Duration of Study: Department of Pediatrics, Fauji Foundation Hospital, Rawalpindi, 6 months (April to Oct 2022).

Patients and Methods: Four hundred children, up to 2 years of age, having their vaccination card were included in the study via convenience sampling. Questionnaire was used to evaluate the frequency of delay in age appropriate vaccination along with the perceived barriers for delay. Data were entered and analysed in SPSS 26. To evaluate the association between delay and sociodemographic factors, the Chi square test was performed.

Results: Overall, 21.2% of the children received at least one of the vaccines after the recommended time. Most prevalent delayed vaccine was Penta 1, OPV 1. Significant relationship between mother's age and BCG, OPV0, and Penta 1, OPV 1 with mother's age, distance from health facility, and occupation of father was observed (p-value 0.05). Statistically significant association was also found between Penta 3, OPV 3 with education of parents and occupation of father. Parents' transportation issue (29.8%) and distance from facility (25.5%) were the two most common perceived barriers.

Conclusion: Current study showed improvement in age appropriate vaccination as compared to previous studies. In order to increase age-appropriate coverage, vaccination initiatives should address the identified impediments.

Key words: : *Age-appropriate vaccination, Delay, Perceived barriers, Tertiary hospital .*

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INTRODUCTION

Childhood diseases can be effectively prevented and their impact on health and lives reduced through the cost-efficient measure of vaccination [1]. To successfully address vaccine-preventable diseases (VPDs), extensive vaccination coverage with highly efficient vaccinations is required. The World Health Organization (WHO) aims to achieve a 90% coverage rate for childhood immunization [2]. The Expanded Programme on Immunization (EPI)'s success relies not only on achieving high coverage but also on ensuring the timely administration of vaccines. In particular, age-appropriate immunization during the 1st year of life is vital as the antibodies from the mother decline fast [3]. Failure to achieve this, can lead to reduced immunity in children which result in the outbreaks of VPD [4,5].

Despite the impressive progress made in optimizing immunization coverage, the struggle for vaccinating children continues throughout parts of the world, usually in the poorest of countries [6]. The COVID-19 pandemic has had a substantial impact on healthcare systems, leading to disruptions that resulted in 25 million children missing out on immunization in 2021. This number is a 5.9 million increase from 2019 and the worst decline since 2009. About 81% (105 million) newborns received 3 doses of the Diphtheria-Tetanus-Pertussis (DTP3) vaccine in 2021, shielding them from infections that can have detrimental effects like illness, disability, or death [7].

A study conducted in sub-Saharan Africa revealed a significant proportion of children experiencing delays in vaccination by at least one month [8]. In research carried out in India, it was found that a significant percentage of children aged 10 to 23 months experienced delayed vaccination. Specifically, 23.1% of children had delayed BCG vaccination, 29.3% had delayed administration of the first dose of DPT vaccine, and 34.8% had delayed measles vaccination [9].

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EPI Pakistan currently offers all children from birth to 15 months of age free protection against nine distinct avoidable antigens. In Pakistan, the EPI coverage for BCG is 80%, for DPT3 and polio3, it is 65%, and with measles, it is 67%. Despite the fact that immunisation rates for complete fundamental vaccines have been increasing in Pakistan as a result of the EPI,a sizable portion of kids (45%) in Pakistan do not receive immunisations that are age-appropriate[10]. According to a JW Noh study in Sindh, 20.8% of children who received complete vaccination) got all doses on time [11]. According to research conducted in the peri-urban area of Karachi, a concerning 55% of infants experienced delayed age-appropriate vaccination [12].

Infectious disease outbreaks in children, such as meningitis, diarrheal disease, and pneumonia, may be caused by a lack of age-appropriate vaccinations. Therefore, it is crucial to take into account both the coverage rate and the timeliness of vaccination in order to maximise the benefits of the vaccination programme. Monitoring the status of age-appropriate vaccination and identifying the primary contributing factors is paramount to increasing vaccination coverage and ultimately reducing infant morbidity and mortality.

CAPSULE SUMMARY

The frequency of delayed age-appropriate vaccination, the relationship between the delay and demographic characteristics, and the perceived difficulties associated with it were investigated. An improvement in age- appropriate immunisation, compared to prior research was observed. Mother's age, distance from the health facility, father's work, transportation problems and facility distance were the most prevalent impediments. Vaccination campaigns should address these constraints in order to increase age-appropriate coverage.

OBJECTIVES

To determine the frequency of delay in age-appropriate vaccination and to determine association between delay and demographic variables along with perceived barriers associated with it in children visiting the Pediatrics department.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted on children/caretakers attending reporting to vaccination centre of Fauji Foundation Hospital Rawalpindi from April to Oct 2022. Convenient sampling was used to include children up to 2 years old (who had their vaccination cards) in the study, but children who were in a paediatric intensive care unit (PICU), required ventilator support for respiratory distress, or had a relative or absolute contraindication to live vaccines in accordance with WHO standard vaccination guidelines were excluded from the study. Study had the approval of the Institutional Ethical Review Committee.

The percentage of children who got immunisation for a given vaccine more than 4 weeks after the prescribed age was used to define the delay in age-appropriate vaccination [9]. Delay was observed for OPV, BCG, Penta valent and measles. Recommended as well as minimally acceptable ages for routine immunization in the EPI Pakistan is given in Table 1.

A self-administered structured pretested questionnaire translated into Urdu was used to collect data. The questionnaire consisted of four sections. Section 1 describes sociodemographic characteristics including age, gender, ethnicity, residence, type of family, distance from the health facility. Section 2 inquired about maternal factors such as maternal age, education, occupation, and vaccination during pregnancy. Section 3 consisted of paternal factors such as age, education, occupation was included. Section 4 consisted of data regarding perceived barriers for delay in vaccination.

SPSS 26 was used for data analysis, and the results were given as frequencies as well as percentages. In order to compute the association between delay and demographic variables, Chi-square test was employed.

RESULTS

Total number of participants in the study was 400. Mean age of children was found to be 9.69 with standard deviation of 8.18.

Almost half of the sample was male i.e, 205(51.2%) ,200(50%) were Punjabi and 80(20%) were Urdu speaking. Out of total sample, 289(72%) were resident of urban area,320(80.3%)

Table 1: Recommended & minimum acceptable ages for routine immunizations in the EPI in Pakistan

Vaccine	**Minimum age**	**Recommended**	**Timely** (Days)	**Early** (Days)	**Late** (Days)
OPVo, BCG	At birth	0 week/0 day	0-28	-	>23
OPV1, Penta 1	6 weeks	6 weeks/42 days	39-70	<39	>70
OPV2, Penta 2	10 weeks	10weeks/70 days	67-98	<67	>98
OPV3, Penta 3	14 weeks	14 week/98 days	95-126	<95	>126
Measles	26 weeks	39 weeks/273 days	270-301	<270	>301

children had distance of more than 2 km from medical facility,192(48%) belonged to joint family system and 263(66%) having family income of greater than 25000 rupees. Table 3 showed maternal and paternal characteristics.

Overall 84(21.2%) of the children had delayed vaccination of at least one of the studied vaccines. Most prevalent delayed vaccine was Penta 1, OPV 1 as shown in Figure 1.

Table 2: Sociodemographic characteristics of respondents

Characteristics	Frequency	Percentage
AGE OF MOTHER(Years)		
19-24	47	11.8
25-29	**213**	**53.3**
>30	140	35
EDUCATION OF MOTHER		
Illiterate	47	11.8
Equal or less than 10 years of education	129	32.3
More than 10 years	**224**	**56**
OCCUPATION OF MOTHER		
Employed	139	34.8
Unemployed	**261**	**65.3**
TETANUS VACCINATION DURING PREGNANCY		
Vaccinated	**371**	92.8
Unvaccinated	29	7.2
AGE OF FATHER(Years)		
19-24	13	3.3
25-29	105	26.3
>30	**282**	**70.5**
EDUCATION OF FATHER		
Illiterate	25	6.3
Equal or less than 10 years of education	110	27.5
More than 10 years	**265**	**66.3**
OCCUPATION OF FATHER		
Employed	**338**	**84.5**
Unemployed	62	15.5

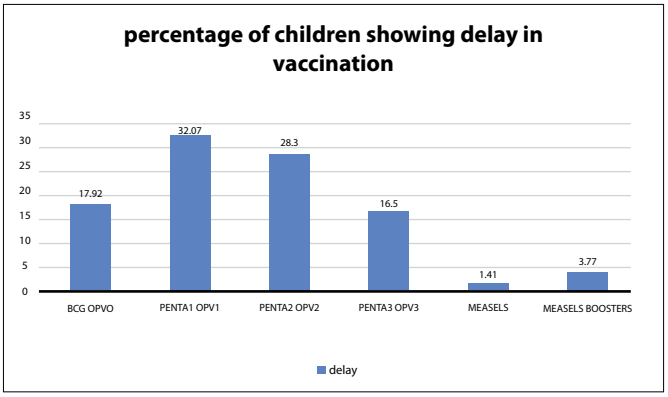

Figure 1: Children with a delayed age-appropriate vaccination according to vaccine

Significant relationship between mother's age and BCG OPV0 was observed (p-value 0.05). Statistically significant relationship was found between Penta 1, OPV 1 and mother's age, distance from health facility, and occupation of father. Statistically significant association was found between Penta 3, OPV 3 with education of parents and occupation of father. Significant association between delay in vaccine with sociodemographic, and sociodemographic factors is given in Table 3.

Table 3: Association between delay in age-appropriate vaccination with sociodemographic variables

Variables	On time	Delayed	p-value
BCG, OPV 0			
AGE OF MOTHER(Years)			
19-24	37	5	0.02
25-29	190	6	
< 30	130	4	
PENTA 1, OPV 1			
AGE OF MOTHER(Years)			
19-24	30	10	0.000
25-29	156	10	
<30	107	7	
OCCUPATION OF FATHER			
Employed	242	18	0.04
Unemployed	51	9	
DISTANCE FROM HEALTH CLINIC			
Less than 2 km	57	0	0.011
More than 2 km	236	26	
PENTA 2, OPV 2			
EDUCATION OF MOTHER			
Illiterate	28	6	0.04
Equal to or less than 10 years of schooling	90	4	
Greater than 10 years of schooling	109	14	

Table 3 continued...

Variables	On time	Delayed	p-value
PENTA 3, OPV 3			
EDUCATION OF MOTHER			
Illiterate	22	8	0.0000
Equal to or less than 10 years of schooling	82	0	
Greater than 10 years of schooling	94	6	
EDUCATION OF FATHER			
Illiterate	11	3	0.031
Equal to or less than 10 years of schooling	64	6	
Greater than 10 years of schooling	123	5	
OCCUPATION OF FATHER			
Employed	158	6	0.001
unemployed	40	8	
MEASELS			
AGE OF MOTHER (Years)			
19-24	12	1	0.003
25-29	84	0	
<30	68	0	
EDUCATION OF MOTHER			
Illiterate	21	1	0.03
Equal to or less than 10 years of schooling	65	0	
Greater than 10 years of schooling	78	0	

Education of the mother was mostly significant with all OPV and Penta vaccines, Age of mother showed association with BCG, Penta 1 OPV 1 and Measles.

According to parents' transportation issue 119(29.8%) and distance from facility 103 (25%) are the two most common perceived barriers as shown in Figure 2.

DISCUSSION

For the purpose of evaluating children's health, identifying trends, and planning intervention programmes, an accurate estimate of vaccination coverage is required. The current study evaluates the significant gaps from the most recent vaccination status while analysing risk factors for delaying age- appropriate vaccination. According to this hospital-based cross-sectional survey, 21.2% of patients in our study received delayed immunisation. Mustafa A's study in Karachi found that 36.3% (127) children were immunised at the recommended age [10]. In contrast, a study by Noronha et al. in a rural area of Goa found that 31% of vaccinations were postponed and 69% were administered on schedule [13].

According to a research done by JW Noh in Sindh, 20.8% children got all immunizations according to the recommended schedule of the children who received complete basic vaccinations[11].

In our study two main reasons for delay were transportation issues (29.2 %) and distance from health facility (25.5%). According to a study conducted in India, delayed vaccination is more common when it takes longer than 30 minutes to get from home to the immunization centre (74.5%) than when it takes less time (67.2%) [14]. According to the study, delays in immunization were most frequently caused due to parent-related factors. In our study 32.07% children reported with delays in pentavalent 1 and OPV 1 related to the age of mother (25%) and illiteracy of mother (26.6%). In our study 16.5 % children reported with delay in Penta 3/OPV3 vaccine related to illiteracy of parents and unemployment of father as the major risk factors. The findings of a study carried out in Rwanda by Nwankwo et al. revealed similar findings, which showed a significant relationship between education level and immunization status [15]. Two hundred and sixty one mothers in our study were unemployed and there was significant delay in vaccination status of their children as compared to the

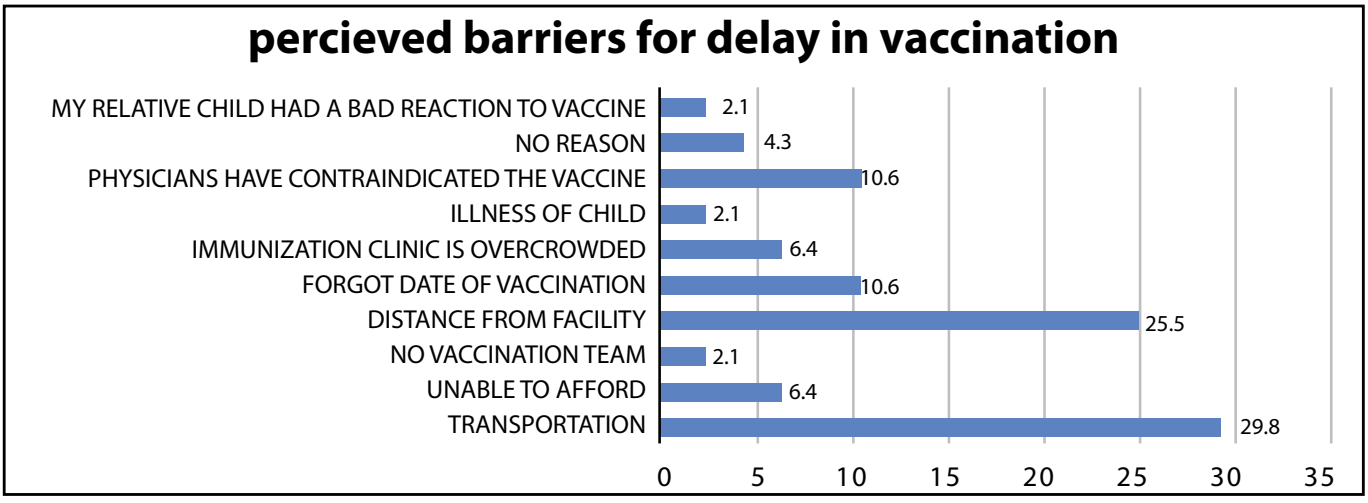

Figure 2: Perceived barriers for delay in age-appropriate vaccination

children of employed mothers [15]. These results were comparable to those of a research by Alrowaili et al. in Northern Saudi Arabia, which showed that 31.7% of children of stay-at-home mothers and 9.3% of children of working mothers had delayed immunization [16].

Delay in BCG vaccination in our study was 18% and the main factor related with delay in BCG OPV0 was also mother's age group. According to a study that has been published in the literature, delayed vaccination was more common among women under the age of 25 (72.1%) than moms over the age of 25 (67.1%) [14].

In this study, only 1.41% children had delay in measles vaccination. In our study regarding measles, the predominant factors turned out to be age and education of the mother. It is more likely that a mother or other caregiver will vaccinate the child at the prescribed interval if she attends formal education. This conclusion, which is in line with the results from Ethiopian[17] and Indian [9] studies, suggesting that the mother/caregiver participation in proper education lowers the likelihood of late immunization. It could be that, being more educated it is be easier for mothers and other caregivers to communicate with medical professionals, which affects how conscious they are of using and seeking out public health services like child vaccination [17].

Additionally, having enough understanding about vaccinations improves the likelihood that the child will receive the appropriate series of vaccinations. In a similar manner, research conducted in North East Ethiopia [18] and central Ethiopia [19] revealed that inadequate vaccination knowledge aggravated the deferral in vaccination at the advised intervals. The possibility of decreasing unpleasant thoughts (adverse reaction) about childhood vaccinations as a result of information may be one factor, which would enhance practise and timeliness. In our study one factor for delay was also after listening an adverse reaction to vaccination from someone (2.1%). Additionally, the likelihood of immunizing kids on time will increase if parents are aware of the vaccination schedule and reasons for immunization [19].

About10.6% of parents, in our study, forgot about date of vaccination in our study. Literature suggested that interventions to remember or recall patients are typically deemed to be quite helpful at increasing immunization rates, and the most successful outreach techniques are those that use telephones. In order to increase vaccination rates, other methods (such as sent letters or postcards) should be used in addition to telephone outreach[20].

CONCLUSION

Overall 21.2% of the children had delayed vaccination as per recommended time of at least one of the studied vaccines. Significant relationship between mother's age and BCG OPV0 was observed (p-value 0.05), Penta 1, OPV 1 delay was significant with mother's age, distance from health facility, and occupation of father. Statistically significant association was found between Penta 3, OPV 3 with education of parents and occupation of father. Parents' transportation issue (29.8%) and distance from facility (25%) were the two most common perceived barriers.

RECOMMENDATIONS

This study highlighted that a significant number of children received vaccinations beyond the recommended age, indicating the importance of addressing timely administration of vaccines alongside overall coverage.

Mothers/caregivers should be promptly awared on the highlighted variables through a realistic programme in order to follow the advised schedule. Policymakers should concentrate on and include the indicators of vaccine timeliness monitoring in order to improve children's immunological health.

AUTHORS' CONTRIBUTION

Mehwish Riaz	Conception and design, Acquisition of data, Analysis and interpretation of data, Critical revision
Fatima Farahi	Conception and design, Acquisition of data, Drafting the Article
Azalfa Malik	Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the Article
Sana Shaukat Siddiqui	Analysis and interpretation of data, Critical revision
Sana Matloob	Analysis and interpretation of data, Acquisition of data, Drafting the Article
Maham Israr Abbasi	Acquisition of data,Drafting the Article

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