

Original Research Article

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Determinants of factors affecting vaccination status of under-five children attending immunoprophylaxis clinic in a tertiary care hospital in central India

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ABSTRACT

Background: Immunization is a key to child survival. Immunization is one of the foremost effective and cost-effective ways to protect children's lives and futures. Despite clear evidence that vaccines save lives and control disease, millions of young children around the world are missing out, putting them and their communities at risk of disease and deadly outbreaks. This is unacceptable in the present era, where affordable, lifesaving vaccines exist. This study aims to study factors influencing timeliness of vaccination and to assess reasons for delay in immunization.

Methods: A Cross-sectional study was conducted among mother/caretaker and children (under five years age) attending immunoprophylaxis clinic at a tertiary health care hospital in central India. Total 171 study subjects accompanied by mother/caretaker are included in the study. Analysis was done using SPSS version 20.0. Chi square test and Fischer's exact test were used to find the association between characteristics of study subjects and obstetric variables with delayed vaccination.

Results: Delayed Vaccination is present in 119 (69.6%) of study subjects. Among the reasons for delayed vaccination, majority were parent related reasons which was present among 84 (70.6%) of study subjects. The association of higher birth order with delayed vaccination was found to be statistically significant.

Conclusions: The overall delayed vaccination was present in 69.6% of children and high birth order (3 or more) has a significant association with delayed immunization.

Keywords: Vaccination status, Under five children, Delayed immunization

INTRODUCTION

Immunization may be a process during which an individual is protected from communicable diseases by administering vaccines which stimulate body's own system and protect person against infection or disease. It's a tool for controlling and eliminating life threatening communicable diseases.¹ India has introduced expanded immunization programme in 1978 and universal immunization programme (UIP) in 1985-1986.² UIP targets to vaccinate nearly 2.7 crore new born annually with all primary doses and an additional approximately 10 crore children of 1-5 years age with booster doses².

National technical advisory group of immunizations (NTAGI) in 2002-2003 recommended introducing Hepatitis B at birth, second dose of measles at 15-18 months.³ Immunization is the foremost cost-effective health investments which is accessible even for hard to achieve and vulnerable population.¹ These programmes mainly targeted for timely, safe and effective delivery of recommended vaccines with recommended number of doses to children and antenatal women. Furthermore, to reinforce immunization coverage mission Indradhanush was launched by GOI in 2014 following which Intensified mission Indradhanush was launched to reinforce coverage by quite 90% by December 2018.²

Alongside improvement in health immunization even have a social and economic impact at both community and national level.⁴ It's also a positive impact on related programmes like Maternal and child health and birth control programmes.⁵

Timely vaccination is defined as administration of vaccine doses at a schedule which is suggested by India's National Immunization schedule.⁶ The timeliness of vaccination is important to produce appropriate levels of antibody at right time to prevent vaccine preventable diseases (VPD's).⁷ Ex: Some diseases like pertussis, hemophilus influenza infections occur with increased frequency if immunization is delayed.⁸ Timely vaccination also causes a big reduction in childhood mortality and morbidity and also a crucial indicator of Immunization programme performance.^{2,6} Although vaccines are provided free of cost in the Government health centres in India, the immunization coverage in India with children age 12-23 months fully immunized (BCG, measles, and three doses each of polio and DPT) is 62.0% consistent with NFHS-4 data.^{4,9} There are number of reasons for delayed vaccination like unawareness, fear of side-effects, education of caregivers and recently COVID-19 pandemic etc. Understanding the multidimensional determinants of delays in vaccination is crucial in improving routine immunization.⁶ Considering this fact, this study was undertaken at an Immunoprophylaxis clinic (IPC) with objective of to review factors influencing timeliness of vaccination and to assess reasons for its delay if any.^{4,8}

METHODS

Study design, settings and participants

Current study was a cross-sectional study conducted at the Immunoprophylaxis clinic (IPC) of a tertiary health care centre in Central India. The study period was from 1st December 2020 to 31st January 2021. Children (under five years age) accompanied by their mothers/caretakers attending immunoprophylaxis clinic were included in the study.

Sample size

Based on 87.3% of 'on time vaccination', 95% confidence interval, 5% allowable error, the sample size was estimated to be 171.¹⁰

Inclusion criteria

The respondents (mother/caretakers) who brought immunization card given to them and who gave written informed consent were included in the study.

Exclusion criteria

The respondents who lost immunization cards or who are not willing to give consent were excluded from the study.

Data collection

The IPC provides immunization services as per UIP adopted by Government of Maharashtra and is open from Monday to Saturday except on public holidays. After taking informed consent from respondents, they were interviewed using a pretested questionnaire for sociodemographic details, obstetric history and other details like Baby accompanied by, time taken to reach immunization centre, mode of transport. Mother and child protection card (MCPC card) was screened for date of birth of baby, dates of previous immunizations. Expected date for a particular dose of vaccine was calculated from date of birth recorded in immunization cards and timeliness of vaccination is assessed for specific vaccines. For those children with delayed immunization the respondents were interviewed for reasons of delay. The reasons were categorised as child related, parent related, facility related reasons. The timeliness of vaccination is determined based on immunization schedule for specific vaccines (Table 1).

Table 1: Immunization schedule.

When to give	Vaccine	On time	Delayed
At birth	BCG	Within 24 hrs of birth	After 24hrs of birth
	OPV 0 dose	Within 24hrs of birth	After 24hrs of birth
	Hepatitis B	Within 24hrs of birth	After 24hrs of birth
At 6 weeks	OPV1, Rota1, IPV1, Penta1		
At 10 weeks	OPV2, Rota2, Penta2	On or within 15 days of scheduled date	More than 15 days of scheduled date
At 14 weeks	OPV3, Rota3, IPV2, Penta3		
At 9 months	Measles Rubella1, Vitamin A 1 lakh IU		

Statistical analysis

The data was entered in Microsoft excel and analysis was done using SPSS version 20.0. Chi square test and Fischer's exact test was applied to determine the association between characteristics of study subjects and obstetric variables with delayed vaccination.

RESULTS

The study was conducted at an IPC of a tertiary health care centre in central India. Total 171 study subjects accompanied by mothers/caretakers after taking informed

consent were enrolled in the study. Sociodemographic characteristics of study subjects is shown in (Table 2). There was 91 (53.2%) males and 80 (46.8%) females. Mothers who were ≤ 25 years and >25 years were almost same in number and majority of mothers have education Secondary and above 86 (50.2%). Most of the mothers

were homemakers 162 (94.7%). Majority of children were accompanied by mothers 165 (96.4%). Majority of caregivers use own vehicle or walking as a mode of transport 91 (53.2%) and majority of them take ≤ 30 min. to reach immunization centre from home 116 (67.8%).

Table 2: Characteristics of study participants (n=171).

Sociodemographic variables		Frequency	%
Age of mother (years)	≤ 25	86	50.3
	>25	85	49.7
Gender of child	Male	91	53.2
	Female	80	46.8
Education of mother	Illiterate	03	1.8
	Upto 10 th std.	82	48.0
	More than 10 th std.	86	50.2
Occupation of mother	Homemaker	162	94.7
	Working	09	5.3
Total monthly family income (Rs.)	$\leq 14,000$	102	59.6
	$>14,000$	69	40.4
Baby accompanied by	Mother	165	96.4
	Father	03	1.8
	Grandmother	03	1.8
Time taken to reach immunization centre (minutes)	≤ 30	116	67.8
	>30	55	32.2
Mode of transport	Own vehicle or walking	91	53.2
	Public transport	80	46.8

Table 3: Distribution of mothers of study subjects as per obstetric variables (n=171).

Obstetric variables		Frequency	Percentage
Number of ANC visits	Less than 4	26	15.2
	4 or more	145	84.8
Place of delivery	Government hospital	168	98.2
	Private hospital	02	1.2
	Home	01	0.6
Mode of delivery	Normal vaginal delivery	105	61.4
	Lower segment	66	38.6
	Caesarean section		
Birth order	One	87	50.9
	Two	71	41.5
	Three or more	13	7.6

Distribution of study subjects as per obstetric variables is shown in (Table 3). Most of the mothers had ANC visits 4 or more 145 (84.8%). Majority of mothers were delivered in a health institution 170 (99.4%). Out of total 171 children, majority of them were delivered by normal vaginal delivery 105 (61.4%) and most of them belong to birth order one 87 (50.9%).

Table 4: Distribution of Study Subjects as per timeliness of vaccination and reasons for delay in study population (n=171).

Timeliness of vaccination	Frequency	Percentage
On time	52	30.4
Delayed	119	69.6
Reasons for delayed vaccination (n=119)		
Child related reasons	29	24.4
Parent related reasons	84	70.6
Facility related issues	06	5.0

Distribution of study subjects as per timeliness of vaccination and reasons for delay in study subjects is shown in (Table 4-5). Out of total 171 study subjects, 52(30.4%) took vaccination on time and 119 (69.6%) were having delayed vaccination. Most of the reasons for delayed vaccination were parent related reasons 84 (70.4%). The child related reasons were illness like fever, low birth weight, any other major illness requiring hospitalisation etc. The parent related reasons were unawareness, illness, forgetfulness, migration, travel and loss of wages, refusal by family, death in family, fear of adverse events, lost immunisation card, vaccination delayed on medical advice, COVID-19 pandemic, other reasons if any. The facility related reasons were appointment issues, non-availability of vaccines.

Table 5: Reasons for delayed vaccination (n=119).

Reasons	N (%)
Child related reasons (Illness)	
Fever	8 (6.7)
Gastroenteritis	4 (3.4)
Pneumonia	4 (3.4)
Typhoid	2 (1.7)
Low birth weight	6 (5.0)
Preterm birth	5 (4.2)
Meconium-stained liquor	1 (0.84)
Parent related reasons	
Unawareness	22 (18.5)
COVID-19 pandemic	19 (16.0)
Vaccination delayed on medical advice	10 (8.4)
Forgetfulness	7 (5.9)
Fear of adverse events	5 (4.2)
Loss of wages	5 (4.2)
Migration	5 (4.2)
Refusal by family	5 (4.2)
Illness	3 (2.5)
Other reasons (Mother is COVID positive, Father is COVID positive, Working mother)	3 (2.5)
Death in family	2 (1.7)
Lost immunization card	1 (0.84)
Facility related reasons	
Appointment issues	6 (5.0)

Delayed vaccination was more among mothers ≤ 25 years, illiterate mothers, homemakers and if time taken to reach immunization centre >30 min as shown in (Table 6) but it was not statistically significant. Among the obstetric variables, delayed vaccination was more if no. of ANC visits 4 or more, home delivery subjects and if birth order three or more. The association of birth order with delayed vaccination was statistically significant.

DISCUSSION

This hospital-based cross-sectional study found that 30.4% of study subjects were vaccinated on time and 69.6% got delayed vaccination. On the Contrary a study by Holambe et al in Maharashtra showed that 34% had delayed immunization.⁵ In another study by Noronha et al in a rural area of Goa, 31% had delayed vaccination and 69% were vaccinated on time.¹¹ The increased delay in our study may be due to COVID-19 pandemic, lockdown making caregivers come late for immunization.

The study showed that delayed vaccination was almost similar in both male and female children. On the contrary, study by Chakraborty et al in Kolkata showed that female children were having more delayed vaccination 34.9% compared to male children 32.8%.² In a study by Glory et al percentage of timely vaccination was higher in females

than males but this difference was not statistically significant.¹²

Delayed vaccination was seen among mothers of age ≤ 25 years (72.1%) compared to mothers of age >25 years (67.1%). Similar findings were found in a study by Ibnouf et al in Sudan which showed children of older mothers (30-45 years) have correct vaccination for specific age (82.6%) than children of younger mothers (15-29 years) (68.6%).¹³ The study findings indicate that education level of mother is positively related to timeliness of vaccination i.e. a declining trend in delay of immunization from illiterate (100.0%) to more than secondary education (68.6%). Similar findings were found in a study by Nwankwo et al in Rwanda showing a significant association between education level and incomplete immunization with $p=0.0402$ ¹⁴. In a study by Devasenapathy et al, the odds of complete vaccination were higher if mother was literate OR 1.6 (95% CI:1.15-2.16).¹⁵ This might be due to educated mothers understand the timeliness of vaccination and interact freely with health care workers.

The study showed that delay in vaccination was more in homemakers (71%) than working women (44.4%). These findings were similar to study done by Alrowaili et al in Northern Saudi Arabia showing delayed vaccination in 31.7% of children of homemakers and 9.3% of children of working mothers.⁸ The reasons may be multiple like problems due to transportation, better knowledge about vaccination etc. Children who were born at home were more likely to have a delayed vaccination compared to those who were born at a health facility. These findings were similar to study done by Odutola et al in Gambia with OR 1.66 (95% CI: 1.16-2.37).¹⁶ This may be due to poor health seeking behaviour of mother and social determinants which limit the decision making of pregnant women in our patriarchal society. The study showed delayed vaccination is more if time taken to reach immunization centre from home is >30 min. (74.5%) than time taken is ≤ 30 min. (67.2%). In a study by Poorolajal et al, delayed vaccination had no correlation with distance from nearest health centre ($p=0.577$).¹⁷ The study showed a significant difference in delay in vaccination for children with higher Birth order. These findings were similar to a study Odutola et al in Gambia which found that children with increasing birth order had 30% odds of delay in receipt of any of the vaccines compared to children with birth order <2 OR 1.27 (95% CI: 0.99-1.64).¹⁶ The study showed that parent-related reasons were most common for delayed vaccination. Among parent-related reasons, unawareness was seen in 22 (18.5%) caregivers. These findings were almost similar to a study done by Dasgupta et al in Siliguri showing unawareness among 33 (20.5%) study subjects.¹⁸ In a study by Patel and Pandit, 26.6% infants missed vaccination because of mother's forgetfulness.¹⁹ In another study by Naaraayan et al, 34.1% of the participants cited minor illness as a reason for delayed vaccination.²⁰

Table 6: Factors associated with delay in vaccination among study subjects (n=171).

Variables	Group		P value
	On time (%), n=52	Delayed (%), n=119	
Age of mother (years)			
≤25	24(27.9)	62(72.1)	0.4
>25	28(32.9)	57(67.1)	
Gender of baby			
Male	28(30.8)	63(69.2)	0.9
Female	24(30.0)	56(70.0)	
Education of mother			
Illiterate	0 (0.0)	3(100.0)	
Upto 10 th std.	25(30.5)	57(69.5)	0.7 #
More than 10 th std.	27(31.4)	59(68.6)	
Occupation of mother			
Homemaker	47(29.0)	115(71.0)	0.09 #
Working	5(55.6)	4(44.4)	
Total monthly family income (Rs.)			
≤14,000	31(30.4)	71(69.6)	0.9
>14,000	21(30.4)	48(69.6)	
Time taken to reach immunization centre (minutes)			
≤30	38(32.8)	78(67.2)	0.3
>30	14(25.5)	41(74.5)	
Mode of transport			
Own vehicle or walking	28(30.8)	63(69.2)	0.9
Public transport	24(30.0)	56(70.0)	
Number of ANC visits			
Less than 4	10(38.5)	16(61.5)	0.3
4 or more	42(29.0)	103(71.0)	
Place of delivery			
Hospital	52(30.6)	118(69.4)	0.6
Home	0(0.0)	1(100.0)	
Birth order			
One	26(29.9)	61(70.1)	
Two	26(36.6)	45(63.4)	0.01 #*
Three or more	0(0.0)	13(100.0)	

*p<0.05, considered to be significant, # - Fischer exact test

CONCLUSION

In this study, the overall delayed vaccination was present in 69.6% of children and high birth order (3 or more) has a significant association with delayed immunization. Strategies must be evolved to educate parents in study area to have greater awareness regarding timeliness of vaccination.

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