

ASSESSMENT OF UTILIZATION OF ESSENTIAL IMMUNIZATION SERVICES AMONG CHILDREN UNDER 2 YEARS IN AN URBAN SLUM OF BHUBANESWAR, ODISHAAMIT KUMAR¹, IPSA MOHAPATRA², KRISHNA MISHRA²¹Consultant, ICMR-National Institute of Epidemiology, Raipur, Chhattisgarh, India. ²Department of Community Medicine, Kalinga Institute of Medical Sciences, Odisha, India. Email: dr_ipsa@yahoo.co.in

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ABSTRACT

Objectives: The study was planned with the objectives to assess the under-two immunization coverage and to identify determinants and reasons for non-utilization.

Methodology: It was a cross-sectional study which was undertaken in urban slums under field practice area of a medical college, over a span of 4 months among 100 mothers with children 12–23 months of age. Descriptive statistics was used and Fisher's exact test as the test of association; taking $p < 0.05$ as statistically significant.

Results: Mean age of the children was 17.63 months \pm 3.43. 72% were fully immunized, 28% partially, and none in unimmunized category. Mother's literacy status ($p=0.03$) and father's literacy status ($p=0.0001$) were found to be significantly associated with the immunization status of the child. The immunization coverage based on card and history was – BCG (93%), OPV1 (88%), OPV2 (86%), OPV3 (82%), pentavalent 1 (88%), pentavalent 2 (84%), pentavalent 3 (82%), and measles (84%). Waiting time (85.71%) and lack of adequate information (67.86%) were reasons cited for partial immunization.

Conclusion: The overall immunization coverage was good with none unimmunized. The literacy status of the parents played a major role in determining the immunization status of the children. Waiting time and lack of information were some of the identified barriers.

Keywords: Immunization service, Immunization status, Urban slum, 12–23 months.

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INTRODUCTION

Immunizing children against vaccine preventable diseases (VPDs) can greatly reduce childhood morbidity and mortality [1]. Measurements of vaccination coverage levels and trends are used to monitor the performance of routine vaccination services, measure the effectiveness of interventions to increase coverage, and provide insights into areas of program weakness [2]. Variability in immunization coverage across the globe is attributed to a number of factors such as the demographic profile, socioeconomic characteristics, and political environment [3]. Studies have shown considerable inequities in full immunization by various individual (birth order, gender, birth weight), social (religion, caste), and societal (health care facility and cluster type) characteristics. 4-6 VPDs contribute to severe disease burden when coverage is low; although immunization coverage is better in urban areas than the rural ones, still wide disparities exist in urban areas, particularly, in slums [3-7]. Fully vaccinated (FV) children coverage in 12–23 months is considered a priority indicator for monitoring the coverage of vaccination [8]. The present study was planned in these vulnerable pockets of urban slums with the following objectives.

Objectives

The objectives of this study were as follows:

1. To assess the under-two immunization coverage in the urban slums
2. To identify determinants of full immunization uptake and find the reasons for non-immunization or partial immunization if any.

MATERIALS AND METHODS**Study design**

It was a community-based cross-sectional study.

Study setting

The study was conducted in the urban slums under field practice area of Urban Health and Training Center (UHTC), Department of Community Medicine. The total population of all the five slums under the field practice area of UHTC was nearly 12,500 with 3200 households.

Study period

The study was conducted over a span of 4 months, that is, from June 1, 2017, to September 30, 2017.

Study population

The study participants comprised mothers with children aged 12–23 months. A household was eligible if a child was aged between 12 and 23 months and available in the house. A child aged between 12 and 23 months was identified from the household through house-to-house visits; mother of the child was asked for the child's vaccination/mother and child protection (MCP) card. In case where there were two or more children aged between 12 and 23 months, the youngest child was selected. For the child with immunization card, the information on the doses and types of vaccines was copied from the card. In the absence of vaccination card, mothers were asked for immunization history of the child. The number of doses the child took and its route of administration was the way of collecting immunization history of the child. Information on other variables was asked directly from the child's mother.

Inclusion criteria

The following criteria were included in the study:

- All the mothers with children aged 12–23 months who consented for the study.
- Mothers who were residents of that area for a minimum period of 1 year.

Exclusion criteria

The following criteria were excluded from the study:

- Those who were not available during the period of visit.
- Mothers who were mentally incapacitated.

Sample size

A statistically significant sample size was calculated by applying the sample size formula:

$$n = z^2 p q / d^2$$

n=The sample size to be estimated

z=The standard normal deviate set as 1.96

p=The complete immunization coverage in Odisha which is 0.62*

q=1-p, which is 0.38

d=The precision error (0.10), considering a confidence interval of 95% and permissible error of 0.10

*As per the Immunization Dashboard (March 2016), Child Health and Immunization Division, Ministry of Health and Family Welfare, and Government of India, complete immunization coverage is 62% for Odisha [9].

Taking 10% non-response rate, a total of 100 children were covered in this survey.

Sampling technique

The subjects were selected using random sampling technique. In the first stage, line listing of all the eligible households was done and 421 households were identified. In the next stage, households were randomly selected until the sample size was achieved.

Study tool

Data were collected using a predesigned, semi-structured schedule under the following sections: (A) Sociodemographic profile of the respondent, (B) details of the child vaccination status – whether immunization completed according to EPI schedule, availability of immunization/mother and child protection (MCP) card, details of each vaccine taken, immunization status of child at 1 year of age, side-effects, etc., and (C) reasons cited for partial immunization/not vaccinating the child.

Filled questionnaires were checked for completeness and coded by the researcher.

Statistical analysis

Data were entered into Microsoft Excel spreadsheet and analyzed using Epi Info 7 software (version 3.5.4). Descriptive statistics were used and Fisher's exact test as the test of significance; taking $p < 0.05$ as statistically significant.

Ethical implication

Ethical clearance and approval was obtained from the Institutional Ethics Committee. The mothers were briefed about the purpose of the study. Informed written consent was obtained from the participant mothers, assuring their full confidentiality and voluntariness, that they had the right to refuse the participation at any stage of data collection.

Operational definitions

Fully vaccinated

A child aged between 12 and 23 months who received one Bacillus Calmette-Guerin (BCG), at least three doses of pentavalent, three doses of oral polio vaccine (OPV), and a measles vaccine was said to be fully vaccinated [5].

Partially vaccinated

A child who missed at least one dose of the eight vaccines was said to be partially vaccinated [5].

Unvaccinated

A child who did not receive any dose of the eight vaccines was said to be unvaccinated [5].

Table 1: Association of sociodemographic variables of the children with their immunization status (n=100)

Variables	Fully immunized (n=72)	Partially immunized (n=28)	p-value
1. Sex of the child			
Male (n=65)	51 (78.46%)	14 (21.54%)	0.08
Female (n=35)	21 (60.0%)	14 (40.0%)	
2. Birth order of child			
1 st (n=52)	42 (80.77%)	10 (19.23%)	0.10
2 nd (n=41)	25 (60.98%)	16 (39.02%)	
>3 rd (n=7)	5 (71.43%)	2 (28.57%)	
3. Religion			
Hindu (n=94)	66 (70.21%)	28 (29.79%)	0.18
Muslim (n=6)	6 (100%)	0 (0%)	
4. Socioeconomic status*			
Middle (n=19)	12 (63.16%)	7 (36.84%)	0.50
Lower (n=81)	60 (74.07%)	21 (25.93%)	
5. Mother's age			
<20 years (n=4)	4 (100.00%)	0 (0.00%)	0.29
20–34 years (n=94)	66 (70.21%)	28 (29.79%)	
> 35 years (n=2)	2 (100.00%)	0 (0.00%)	
6. Mother's literacy status			
Literate (n=68)	54 (79.41%)	14 (20.59%)	0.03
Illiterate (n=32)	18 (56.25%)	14 (43.75%)	
7. Mother's occupation			
Unskilled worker (n=7)	4 (57.14%)	3 (42.86%)	0.64
Homemaker (n=93)	68 (73.11%)	25 (26.89%)	
8. Father's age**			
20–34 years (n=82)	56 (68.29%)	26 (31.71%)	0.14
>35 years (n=18)	16 (88.89%)	2 (11.11%)	
9. Father's literacy status			
Literate (n=87)	69 (79.31%)	18 (20.69%)	0.0001
Illiterate (n=13)	3 (23.08%)	10 (76.92%)	
10. Father's occupation***			
Unskilled/semi-skilled (n=37)	22 (59.46%)	15 (40.54%)	0.14
Government job (n=31)	23 (74.19%)	8 (25.81%)	
Private job (n=12)	10 (83.33%)	2 (16.67%)	
Self-employed (n=20)	17 (85%)	3 (15%)	

*None of the respondents belonged to upper-middle socioeconomic scale according to the modified Kuppuswamy scale, so for the analysis purpose upper [n = 1], upper middle [n = 0] and lower middle [n = 18] category had been merged and named as "middle" and upper lower [n = 76] and lower [n = 5] had merged to make "lower" scale. **None of them were in the age-group of < 20 years. ***None of them were unemployed

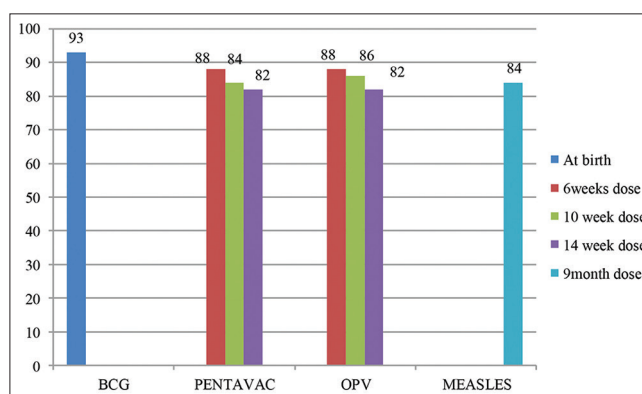


Fig. 1: Immunization coverage of the children with vaccine details (n=100)

Vaccinated

A child who took at least one dose of the eight vaccines was said to be vaccinated [5].

Coverage by card only

Coverage calculated with numerator-based only on documented dose, excluding from the numerator those vaccinated by history [5].

Coverage by card as well as history

Coverage calculated with numerator based on card and mother's report [5].

RESULTS

The mean age of the children in the present study was found to be 17.63±3.43 months. Around 65% of the children were male and 35% were female. Majority of the children (52%) were first born-child. Mean age of the respondents was 24.48 years±3.97 years and majority of them (94%) belonged to the age group 20–34 years. Thirty-two percentages of the respondents were illiterate and 93% of them were homemakers by profession; 81% belonged to the lower socioeconomic status according to the modified Kuppaswamy scale, and 94% of the

respondents were Hindus. Around 72% were fully immunized and 28 % were partially immunized according to age by card and history. None of the child belonged to unimmunized category in the present study. Among the sociodemographic variables, mother's literacy status (*p=0.03) as well as father's literacy status (**p=0.0001) were found to be significantly associated with the immunization status of the child (Table 1).

The immunization coverage based on card and history was: BCG (93%), OPV1 (88%), OPV2 (86%), OPV3 (82%), Pentavalent 1 (88%), Pentavalent 2 (84%), Pentavalent 3 (82%), and Measles (84%) (Fig. 1).

Table 2 depicts the association of immunization coverage of the selected study population with some selected sociodemographic variables.

Among the 68 women with children 12–23 months who were literate, 76.5% received pentavalent three vaccines and out of 32 illiterate women, 93.8% of children had received pentavalent 3, and

Table 2: Immunization coverage of the children with selected sociodemographic variables (n=100)

Variables	BCG taken (immunized) n=93	Pentavalent taken (immunized) No (%)			OPV taken (immunized) No (%)			Measles 1 st dose taken (immunized) n=84
	No (%)	P1 n=88	P2 n=84	P3 n=82	OPV1 n=88	OPV2 n=86	OPV3 n=82	No (%)
1. Father's literacy status								
Literate (n=87)	81 (93.10)	77 (88.51)	72 (82.76)	71 (81.61)	78 (89.66)	74 (85.06)	71 (81.61)	73 (83.91)
Illiterate (n=13)	12 (92.31)	11 (84.62)	12 (92.31)	11 (84.62)	10 (76.92)	12 (92.31)	11 (84.62)	11 (84.62)
p-value	1.00	0.65	0.69	1.00	0.18	1.00	1.00	1.00
2. Mother's literacy status								
Literate (n=68)	62 (91.18)	59 (86.76)	55 (80.88)	52 (76.47)	60 (88.24)	57 (83.82)	52 (76.47)	63 (92.65)
Illiterate (n=32)	31 (96.88)	29 (90.63)	29 (90.63)	30 (93.75)	28 (87.50)	29 (90.63)	30 (93.75)	21 (65.63)
p-value	0.42	0.74	0.34	0.04	1.00	0.54	0.04	0.001
3. Socioeconomic status*								
Middle (n=19)	17 (89.47)	19 (100.00)	15 (78.95)	15 (78.95)	19 (100.00)	16 (84.21)	15 (78.95)	16 (84.21)
Lower (n=81)	76 (93.83)	69 (85.19)	69 (85.19)	67 (82.72)	69 (85.19)	70 (86.42)	67 (82.72)	68 (83.95)
p-value	0.61	0.11	0.49	0.74	0.12	0.72	0.74	1.0
4. Birth order of child								
1 st (n=52)	49 (94.23)	47 (90.38)	40 (76.92)	43 (82.69)	46 (88.46)	43 (82.69)	43 (82.69)	43 (82.69)
2 nd (n=41)	38 (92.68)	34 (82.93)	37 (90.24)	32 (78.05)	35 (85.37)	36 (87.80)	32 (78.05)	37 (90.24)
≥3 rd (n=7)	6 (85.71)	7 (100.00)	7 (100.00)	7 (100.00)	7 (100.00)	7 (100.00)	7 (100.00)	4 (57.14)
p-value	0.54	0.48	0.16	0.46	0.71	0.59	0.46	0.07
5. Sex of the child								
Male (n=65)	60 (92.31)	59 (90.77)	56 (86.15)	53 (81.54)	59 (90.77)	59 (90.77)	53 (81.54)	54 (83.08)
Female (n=35)	33 (94.29)	29 (82.86)	28 (80.00)	29 (82.86)	29 (82.86)	27 (77.14)	29 (82.86)	30 (85.71)
p-value	1.0	0.33	0.61	0.92	0.33	0.07	0.92	1.0

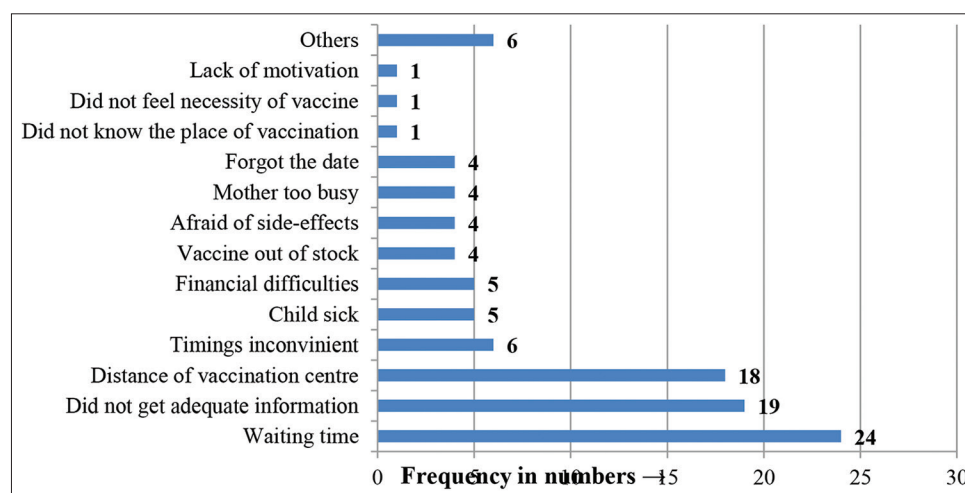


Fig. 2: Reasons for partial immunization (n=28). *Multiple responses

this difference was found to be statistically significant (** $p=0.04$). Similarly, the difference between the mother's literacy status was found to be statistically significant for OPV3 (** $p=0.04$) and highly statistically significant (**** $p=0.001$) for Measles vaccine. Rest of the sociodemographic parameters were not significantly associated with the uptake of individual vaccine as depicted in the above table.

There were multiple reasons reported by the respondents for partial immunization. Fig. 2 depicts the reasons cited by respondents for partial immunization of their children.

Long waiting time for vaccination (85.71%), lack of adequate information (67.86%), distance of vaccination center (64.28%) being far from home, etc., were some of the important reasons affecting complete immunization as stated by the respondents.

DISCUSSION

Immunization is believed to be the most cost-effective way in preventing certain vaccine-preventable diseases in the community. The results of the present study highlighted that 72% of the children were fully immunized and rest 28% were partially immunized for age. There were no unimmunized children in our study. This finding was consistent with the finding of a study done by Singhal *et al.* in Rajasthan, India, where 70.9% of the subjects had complete immunization and 23.8% had partial immunization [10], but higher than the findings of a study done by Panda *et al.* in urban slums of Odisha, where 65% of the children were fully immunized, 33% were partially immunized, and 2% were non-immunized [11]. Certain other studies have shown the percentage of fully immunized children ranging between 81.4% and 91.7% [12-14]. The present study showed that although the percentage of male children who were fully immunized were more as compared to female children, but gender did not have a statistically significant association with the immunization status of child. This is similar to the findings of Kulkarni *et al.* in an urban slum of Mumbai, India [15] and Kadarkar *et al.* in urban slum of Mumbai [16]. In this study, birth order of the child and socioeconomic status of parents were not associated with the immunization status of child, which was consistent with the findings of Verma *et al.* in slums of Lucknow [17]. The literate mothers were having more percentage of immunized children as compared to illiterate mothers and this difference was statistically significant ($p=0.03$). This finding was similar to the finding by Farzad *et al.* in Afghanistan [18], but it was in contrast with the findings of Datta *et al.* in Tripura [14] and Phadnis *et al.* [19] in an urban area in coastal Karnataka, where there was no any significant relationship between childhood immunization status and mother's education. Father's literacy status in our study was also found to be highly statistically significantly associated with the children's immunization status ($p=0.0001$), whereas Sreedevi *et al.* [20] in Kochi, Kerala showed that there was no association between father's education level and childhood immunization status. In the present study, BCG was taken by 93% of the children, followed by Pentavalent 1 and OPV1 vaccine (88% each). Pentavalent 3 vaccine was taken by 82% and Measles vaccine by 84% of the children. Thakor *et al.* [21] in his study in Ahmedabad, Gujarat showed that vaccination coverage was maximum for BCG (96.7%) followed by pentavalent first dose (95.8%), whereas Panda *et al.*, in a study done in urban slums of Odisha, found that BCG coverage was 96% followed by DTP3 (92%) [11].

Long waiting time for vaccination, lack of adequate information, distance of vaccination center being far from home, inconvenient timing of vaccination, and financial difficulties, child was sick so not brought, etc., were some of the important reasons affecting complete immunization. Kumar *et al.* reported in his study in Mangalore Taluk, India that the main reason behind partial immunization was found to be lack of information regarding when to return for 2nd and 3rd vaccination, followed by lack of motivation and inconvenient time of immunization, respectively [7]. Sanjeev *et al.* reported that lack of knowledge about routine immunization schedule and being busy with work were the major reasons [22].

CONCLUSION

In the study, the overall immunization coverage was found to be better than the state statistics. Although there was no unimmunized child in the study, still there were partially immunized children and children with delayed vaccination. The literacy status of both the parents played a major role in determining the immunization status of the children. Long waiting time for vaccination and lack of adequate information were some of the important reasons for children being partially immunized. People living in urban slums, form a vulnerable group due to compromised living conditions, poor sanitation, and overcrowding. Hence, addressing these issues by further improving female literacy and giving health education are mandate for improving the immunization coverage.

RECOMMENDATION

It is critical to identify the unvaccinated or partially vaccinated children and address these issues with focused micro-planning, provision of additional financial resources, and systematic immunization drives to reach these children with all available life-saving vaccines. A follow-up study on "Delayed vaccination" and its predictors among these children would help in bridging the gaps. Vaccination timeliness can be identified as a core indicator of the immunization program.

Limitation of the study

This study had certain limitations. The sampled population taken was from the field practice area of a medical college; hence, the performance indicators may be better due to better IEC activities, and hence, results cannot be generalized to the state as whole. In the unavailability of MCP card, data were collected based on the information provided by the mother; hence, reporting bias cannot be ruled out.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest

AUTHOR'S CONTRIBUTIONS

All the authors of the present study have participated in the planning, proposal writing, obtaining ethical clearance from the Institutional Ethical Committee, study tool designing, data collection, analysis and interpretation of the collected data, manuscript preparation, and approval of the final draft of the manuscript.

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