

Study of determinants of immunization status among under-five children attending OPD in a rural health center of the tertiary health care institute

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ABSTRACT

Context: The risk of morbidities from vaccine-preventable diseases is highest in those who experience barriers in accessing immunization services. This spectrum could be affordability, accessibility, lack of awareness about immunization services and their health benefits or other limiting factors. The present study aimed to identify maternal and other determinants of immunization status. **Aim:** To identify maternal and other determinants of immunization status of under-five children. **Settings and Design:** An OPD based cross sectional survey. **Methods and Materials:** Non-randomized sample of 194 children (1-5 years) and mothers attending OPD in study duration were examined and interviewed. **Statistical Analysis:** Data was analysed with SPSS version 20 applying appropriate tests. **Results:** Out of 194 children, 128 (65.98%) were completely immunized, 45 (23.2%) were partially immunized and 21 (10.82%) were not immunized. Study showed significant association between immunization status and sex of children ($P 0.0004$), permanent residence ($P 0.00001$), birth order ($P 0.0007$), institutional births ($P 0.00001$), presence of the immunization card ($P 0.00001$), distance from centre ($P 0.0002$), age ($P 0.00001$) and education of mothers ($P 0.0001$). Association with Religion was statistically non-significant ($P 0.0071$). Nearness of immunization centre was the main motivating factor for full immunization, whereas unawareness about the need of immunization was prime cause of partial and non-immunization. **Conclusion:** Present study depicts low immunization completion rate and highlights determinants associated with it. This could be addressed through strong political commitment, infrastructure development and community outreach to achieve the goal of universal immunization.

Keywords: Immunization, Rural area, Determinants of Immunization

Introduction

Immunization is regarded as one of the most successful and cost-effective public health interventions which averts about 3 million deaths annually and has the potential, if coverage

improves, of saving the lives of an additional 1.5 million children annually.^[1]

The current scenario depicts that immunization coverage has been steadily increasing but the average level remains far less than the desired. Still only 62% (National Family Health Survey – 4) of the infants in India are fully immunized which is much less than the desired goal of achieving 90% coverage.^[2] Between 2009 and 2013, immunization coverage has increased from 61% to 65%, indicating meagre increase in coverage per annum. Childhood vaccines save an estimated 2–3 million lives worldwide every year,

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which has contributed substantially to the reduction in global infant mortality rate from 65 deaths per 1000 live births in 1990 to 29 deaths per 1000 live births in 2018.^[3]

The fundamental question always haunts policymakers whether or not to invest resources in improving parents' knowledge of and attitudes toward vaccination. It is commonly believed that strengthening advocacy, communication, and social mobilization will enhance informed and willing participation in vaccination program and that vaccination strategies are likely to be more successful if they are based on an understanding of sociocultural behavior.^[4] Surveying the knowledge and attitudes toward childhood immunizations is an important first step toward understanding the factors that influence vaccine acceptance and hesitancy in particular settings. Thus, simple operational research into local knowledge and attitudes should become an essential part of every vaccination campaign.^[1,4] Therefore, this study aimed to identify maternal and other determinants of immunization status of study population.

Materials and Methods

A cross-sectional survey of non-randomized sample of mothers of under-five children attending outpatient department (OPD) was conducted at rural health center from March 1 to May 31, 2012. A total of 194 children were selected by universal sampling.

Selection criteria

Mothers having children in the age group 1–5 years and children youngest among the siblings were included in the study.

Exclusion criteria

Children who were seriously ill and those whose parents were not consenting for study were excluded from the study. Children who had been previously or whose siblings were included previously were also excluded.

Data collection

Institutional Ethical Committee approval was obtained before initiating the study. The written and informed consent was obtained from the parents. Data were collected using the semistructured questionnaire.

The results were categorized according to the following three groups:

1. *Fully immunized*: Child had received one dose of Bacillus Calmette–Guérin (BCG), three doses of diphtheria-tetanus-pertussis (DPT), three doses of oral polio vaccine (OPV), and one dose of measles
2. *Partially immunized*: Some doses were given, but immunization was not complete.
3. *Unimmunized*: Child had received none of the vaccines.

This immunization status was assigned based on the immunization card. On first visit if they did not have immunization card, they

were requested to produce it on next visit and status modified accordingly. OPV given on National Polio Day was not assumed in the classification. Those who did not have immunization card, information by mother or father was relied upon.

Statistical analysis

All data were entered and analyzed in Microsoft Excel 2020 and Statistical Package for the Social Sciences (SPSS) software, version 20.0, respectively. Qualitative variables were expressed in terms of percentages. McNemars Chi-square test was used for association; the significance level was set at 0.001 and all the results were tailed.

Results

Table 1 shows that of 194 children, 128 (65.98%) of the children had complete immunization, 45 (23.2%) were partially immunized, and 21 (10.82%) were not immunized. Among the study group, 59.8% were men and 40.2% were women. Approximately, 92.78% belonged to Hindu and 7.22% belonged to Muslim religion. A total of 91.75% of the respondents were the permanent residence of locality, whereas 8.25% were the migrants. Higher proportions (80.41%) of women in the study area were of parity 1–2. Among the study group, the percentage of institutional births was 76.29%. Immunization cards were available with 72.16% of the mothers. The mean age of the mothers was 26.17. In total, 50% of the mothers were illiterate and 47.94% were studied up to primary.

There was significant association between immunization status and sex of the children, permanent residence, birth order, and institutional births, the presence of the immunization card, age and education of mother. Religion was found to be statistically nonsignificant with immunization status.

Majority of the females could tell correct schedule [Table 2] for OPV (81.44%) followed by BCG (71.65%). All the respondents (100%) had heard about immunization [Table 3] and primary source of information was the healthcare workers (87.63%), antenatal care (ANC) clinics (72.17%) followed by family and relatives (53.25%).

Table 4 shows that 99.5% of the mothers rendered immunization services from government facilities. We found significant association between distance of immunization center and immunization status. In total, 78.9% of the immunized live within 20 min reach of immunization center [Table 5].

Table 6 shows that nearness of immunization center was the main motivation factor (57.03%) for completion of immunization followed by motivation by health worker (25.77%).

Table 7 shows that the most common reasons for not immunizing the child were that they did not know the importance of immunization (60.61%), followed by inconvenient time of immunization (43.94%) and distality of immunization center (32.79%).

Table 1: Sociodemographic profile of under-five children and association with immunization status

| Sociodemographic characters | | Immunization status | | | Total 194 (%) | Chi-square values |
|-------------------------------|------------------|---------------------------|------------------------|-----------------------------|---------------|--------------------------------------------|
| | | Complete n=128(65.98%) | Partial n=45(23.2%) | Unimmunized n=21(10.82%) | | |
| Sex | Male | 83 (64.84) | 14 (31.11) | 11 (52.38) | 116 (59.8) | X ² =15.46 df=2 p=0.0004 |
| | Female | 45 (35.16) | 31 (68.89) | 10 (47.62) | 78 (40.2) | |
| Religion | Hindu | 122 (95.31) | 42 (93.33) | 16 (76.19) | 180 (92.78) | X ² =9.88 df=2 p=0.0071 |
| | Muslim | 6 (4.69) | 3 (6.67) | 5 (23.81) | 14 (7.22) | |
| Residence | Permanent | 128 (100) | 35 (77.78) | 15 (71.43) | 178 (91.75) | X ² =30.94 df=2 p=0.00001 |
| | Migrant | 0 | 10 (22.22) | 6 (28.57) | 16 (8.25) | |
| Birth order | 1st | 38 (29.69) | 26 (57.78) | 13 (61.90) | 77 (39.69) | X ² =19.039 df=4 p=0.0007 |
| | 2nd | 64 (50) | 9 (20) | 6 (28.58) | 79 (40.72) | |
| | 3rd and more | 26 (20.31) | 10 (22.22) | 2 (9.52) | 38 (19.59) | |
| Place of birth | Institutional | 115 (89.84) | 33 (73.33) | 0 | 148 (76.29) | X ² =80.78 df=2 p=0.00001 |
| | Home | 13 (10.16) | 12 (26.67) | 21 (100) | 46 (23.71) | |
| Presence of immunization card | Yes | 114 (89.06) | 26 (57.78) | 0 | 140 (72.16) | X ² =77.28 df=2 p=0.00001 |
| | No | 14 (10.94) | 19 (42.22) | 21 (100) | 54 (27.84) | |
| Age of mother | 16-20 years | 19 (14.84) | 6 (13.33) | 4 (19.05) | 29 (14.95) | X ² =36.89 df=6 p=0.00001 |
| | 21-25 years | 49 (38.28) | 6 (13.33) | 3 (14.29) | 58 (29.9) | |
| | 26-30 years | 42 (32.82) | 9 (20) | 11 (52.38) | 62 (31.95) | |
| | 31-35 years | 18 (14.06) | 24 (53.34) | 3 (14.29) | 45 (23.2) | |
| Education of mother | Mean age 26.17±5 | | | | | |
| | Illiterate | 47 (36.72) | 33 (73.33) | 17 (80.95) | 97 (50) | X ² =27.77 df=6 p=0.0001 |
| | Primary | 78 (60.94) | 11 (24.45) | 4 (19.05) | 93 (47.94) | |
| | Secondary | 2 (1.56) | 1 (2.22) | 0 | 3 (1.55) | |
| | Higher secondary | 1 (0.78) | 0 | 0 | 1 (0.51) | |
| Graduate | 0 | 0 | 0 | 0 | | |

Table 2: Knowledge of mothers about schedule of vaccines

| Vaccines | Total respondents 194 | Percentage (%) |
|-------------|-----------------------|----------------|
| BCG | 139 | 71.65 |
| OPV | 158 | 81.44 |
| DPT | 117 | 60.30 |
| Measles | 90 | 46.39 |
| Vitamin A | 102 | 52.58 |
| Hepatitis B | 122 | 62.89 |

Table 3: Primary source of information about immunization

| Source of information | n=194 | Percentage (%) |
|-----------------------|-------|----------------|
| ANC clinic | 140 | 72.17 |
| Doctor | 97 | 50 |
| Health workers | 170 | 87.63 |
| Television | 33 | 17.01 |
| Newspaper | 1 | 0.5 |
| Family and relatives | 103 | 53.09 |

Table 4: Type of facility visited for immunization

| Health facility | n=173 | Percentage (%) |
|-----------------|-------|----------------|
| Government | 172 | 99.5 |
| Private | 1 | 0.5 |

Discussion

In this study, 65.98%, 23.2%, and 10.82% of the children were completely, partially and unimmunized respectively. A survey done by District Level Household and Facility Survey 3 (DLHS-3) (2007–2008) has shown that full immunization coverage in rural Maharashtra is 67.6%.^[5] Coverage Evaluation Survey (CES) (2009) (61%) depicts the same.^[6] National Health Family Survey 4 (NFHS-4) 2015–2016 for Maharashtra shows 56.6% immunization for rural Maharashtra and 56.3% for overall Maharashtra.^[7] It also shows 35.5% and 8.2% partial and nonimmunized children in Maharashtra.^[7] These findings are somewhat different from our study. This is because the NFHS data also include the most backward areas in the states. The complete immunization status of children in other studies shows regional variations.^[8-10] Male children have skewed proportion of complete immunization (71.55%) than female children (57.69%). DLHS-3 data also corroborate the similar findings.^[5] NFHS-4 shows 54.8% for male children and 57.8% for female children.^[7] Gender has the significant association with the immunization status. Similar association was also found in study conducted by Naveen C Khargekar and Verma SK.^[9,10]

Permanent residence showed better immunization coverage (100%) than the migrant population. Migrant status favors

Table 5: Time taken to reach the immunization center

| Time taken | Immunization status | | | Total n=194 (%) | Chi-square values |
|------------------|----------------------|---------------------|--------------------------|-----------------|------------------------|
| | Complete n=128 (65%) | Partial n=45(23.2%) | Unimmunized n=21(10.82%) | | |
| Less than 20 min | 101(78.9) | 28 (62.22) | 8(38.1) | 137(70.62) | X ² =16.472 |
| More than 20 min | 27(21.09) | 17(37.28) | 13(61.9) | 57(29.38) | df=2 p=0.0002 |

Table 6: Reasons for completion of immunization

| Reasons | n=128 | Percentage (%) |
|------------------------------------------------|-------|----------------|
| He is son and going to be a Waaris | 30 | 23.44 |
| Father is sensitive about health of a baby | 23 | 17.99 |
| ASHA and Anganwadi workers told to complete it | 50 | 25.77 |
| Health facility is near so went for it | 73 | 57.03 |
| Television adds motivated for it | 17 | 13.28 |
| Doctor reminded about it | 1 | 0.78 |
| I am educated and know the importance | 1 | 0.78 |

Table 7: Reasons for partial and non-immunization

| Reasons | n=66 | Percentage (%) |
|----------------------------------------------|------|----------------|
| migrant and came for work so could not do it | 16 | 24.24 |
| place and time of immunization did not know | 17 | 25.76 |
| didn't know immunization is necessary | 40 | 60.61 |
| could invite wrath of "Kuldevata" hence | 7 | 10.61 |
| immunization place is too far | 20 | 32.79 |
| inconvenience of time for immunization | 29 | 43.94 |
| too busy in work | 16 | 24.24 |

context of alienation and livelihood insecurity.^[11] Migrant population is often ambulatory making them inaccessible to outreach services. This is been evident in Indian and international experiences.^[11-15] First and second borne child had better outcome with respect to immunization status and this has been proven statistically significant in the study. This inequality is also found in studies conducted by Reena Titoria, Laxmikant Purohit.^[16,17]

Approximately 77.70% children who were delivered in Institutions had completed the primary immunization and none of them is unimmunized, whereas all the unimmunized children are delivered in home setting. This high immunization coverage among institutional births ($P = 0.00001$) is also found in Indian and International studies.^[9,10,18-20] This may be because vaccination was started at birth, and parents were sensitized about it. Therefore, institutional deliveries should be promoted to increase the coverage of immunization. In this study, 72.16% of the mothers possessed the immunization card. The immunization cards were found in a higher percentage of the completely immunized children (81.43%) compared to the partially immunized (18.57%) and nonimmunized children (none). This signifies the need of prompt documentation and record-keeping during immunization visits. Studies conducted by Naveen C Khargekar, Laxmikant Purohit, and Devendra Kumar also show better immunization coverage among children with immunization card.^[9,17,21]

This study highlights that maternal age ($P = 0.00001$), education ($P = 0.0001$), and parity of mothers ($P = 0.0007$) are important determinants of immunization. The finding that younger mothers were more likely to have fully immunized children could be due to the fact that they were likely to have fewer children and are thus self-motivated to provide care; this has been also supported by the findings of other studies.^[22,23] It must be emphasized that improving access to Primary Health Centres could help address inequities in vaccination coverage in areas characterized by lower levels of maternal education.^[24]

Most of the mothers are aware about the BCG (71.65%) and OPV (81.44%) vaccine schedule. A total of 87.63% and 72.17% of the mothers asserted health workers and ANC clinics as their primary source of information respectively. Health personnel's (ANM, accredited social health activist [ASHA], and Anganwadi workers) act as connecting link and they need to be adequately trained to spread the awareness up to the doorstep of the population. Bhola Nath *et al.* and MC Singh *et al.* who concluded that auxiliary nurse midwives (ANMs), paramedical workers, and ANC centers were found to be the major sources of information.^[25,26]

Almost all the respondents (99.5%) availed government immunization facilities. NFHS-4 also shows that 93% of the children were immunized in government facilities.^[7] Mahalingam S too have reported that rural mothers preferred and trusted government health facilities.^[27] This was probably because of the expense that would be incurred in a private health facility which a rural mother cannot afford.

Our study revealed that distality and reaching time are the two prime deterring factors linked with the refusal or hesitancy of the vaccine. Congruent to our findings, access or distance to services was mentioned as a reason to undervaccination in children in low middle-income countries by Indian and other studies.^[28-30]

In total, 57.03% respondents asserted that nearness of the immunization center was the primary reason behind completing the immunization. This is followed by prompt guidance by health workers (25.77%). Approximately 23.44% respondents asserted that son being the Waaris of the family must be vaccinated. These findings are corroborated by the studies.^[9,10,25-30]

According to the respondents, the most common reasons for not immunizing the child were unaware of need for immunization (60.61%) followed by inconvenient time of immunization (43.94%) and distality of immunization center (32.79%). India's poor rural people have far worse health

indicators than the general population. Most people live in remote rural hamlets in hilly, forested, or desert areas. This is compounded by the lack of awareness among these populations about the measures needed to promote positive health.^[24] This invites the prompt mobilization of healthcare outreach by healthcare functionary and strong political commitment toward rural infrastructure development.^[9,28]

Conclusion

This study depicts the grim reality of low immunization completion rate among study subjects and highlights maternal determinants associated with it. The findings emphasized that full immunization status was significantly associated with sex, residence, birth order, place of delivery, age, educational status of mother, and occupancy of immunization card. Religion was nonsignificant factor. Health workers such as ANM, ASHA, and Anganwadi workers found to be the primary source of information for mothers. Nearness of immunization center was the prominent motivation factor for the completion of immunization. Unawareness about necessity of immunization, distality of immunization center, and inconvenient timing for immunization were prominent deterrents. To achieve the World Health Organization standard on immunization coverage, policymakers should establish a need-based program targeting the above factors in policy implementation. The initiatives like Intensified Mission Indradhanush (IMI) by Government of India may increase the immunization coverage. There is need to strengthen communication, education, and information skills of health workers to improve service provision and health education among mothers/guardians. The community surveillance and prompt referral systems in the area also need strengthening so as to identify defaulters of immunization and reduce the dropouts. The dropouts among disadvantaged, vulnerable, and downtrodden need to be addressed through strong political commitment, infrastructure development, and community outreach to achieve the goal of universal immunization.

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Conflicts of interest

There are no conflicts of interest.

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