

Barriers of Newborn Vaccination Coverage among Institutional Deliveries: A Mixed-method Study from Sonapat, Haryana

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ABSTRACT

Introduction: World Health Organisation (WHO) recommends the administration of three vaccines soon after birth, namely Hepatitis B Virus (HBV) vaccine, Bacillus Calmette-Guerin (BCG), and Oral Polio Vaccine (OPV). Various studies reported that early administration of these vaccines have a marked beneficial impact on infant survival. As birth is the most reliable point of healthcare contact worldwide and effective vaccination at birth would provide early protection for newborns. Hence, expanding and improving the available means of neonatal vaccination is an unmet medical need and a public health priority.

Aim: To determine left-out vaccination rate for birth doses and the barriers of newborn vaccination coverage among institutional deliveries, in Sonapat District, Haryana.

Materials and Methods: A mixed-method study (qualitative and quantitative) was conducted in rural tertiary healthcare institute and two secondary (district hospital Sonapat and sub-divisional hospital Gohana) public healthcare facilities of district Sonapat

during 1st June 2019 to 31st July 2019. Records of live births that occurred during the study duration at selected facilities were taken to find out the left-out vaccination rate for birth doses. Focus Group Discussions (FGDs) of staff nurses posted at immunisation clinic, labour room, obstetrics and gynecology and paediatrics department were carried out to find the barriers of newborn vaccination.

Results: Total 1943 live births occurred at selected public healthcare facilities during the study duration. Vaccination coverage of birth doses recorded among 1381 (71.1%) neonates and 562 (28.9%) were left-out. Barriers for newborn vaccination were non availability, vaccine at birth places, training and skill to administer vaccine by staff, human resource constraints, and socio-demographic factors.

Conclusion: This study provided a roadmap to develop a vision for strengthening newborn vaccination coverage among institutional deliveries.

Keywords: Birth dose vaccination, Institutional births, Left-out vaccination rate, Public healthcare facilities

INTRODUCTION

In India a substantial decrease in child mortality occurred since year 2000 with major decline in 2010-2015 [1]. As per World Health Organisation (WHO) estimates that 2 million children deaths were prevented in year 2003 through vaccination. Nonetheless, far more deaths could be prevented through optimal use of currently existing vaccines [2]. Because of deficiencies in both adaptive and innate immunity, as well as the potentially suppressive effects of maternally derived antibodies the newborns have impaired immune responses [3]. India's Universal Immunisation Programme (UIP) is among the largest routine childhood immunisation programs in the world with an annual budget of \$2 billion. The UIP recommends a nation-wide immunisation schedule specifying the vaccines, doses and appropriate ages for vaccination with aims to immunise 26 million newborn children annually [4,5]. Administration of three vaccines soon after birth, namely Hepatitis B Virus (HBV) vaccine, Bacillus Calmette-Guerin (BCG) and Oral Polio Vaccine (OPV) is recommended by WHO [6-8].

It has been reported by various studies that the early administration of a birth dose of OPV (zero dose) have a significant beneficial impact on infant survival [9-12]. Similarly one dose of BCG vaccine earliest possible after birth recommended in order to give beneficial effect on survival by immune-enhancing effects [13,14]. Also birth dose of Hepatitis B vaccine prevents perinatal transmission of infection while delay results in an increased risk of Hepatitis B infection [8,15]. According to the National Family Health Survey (NFHS-4), institutional deliveries have increased from 39% in 2005 to 2006 to 79% in 2015 to 2016. Further, the institutional births in public institutions have increased from 18% to 52% in the same time period

[16]. Also as per NFHS-5 available data set till now, institutional births have increased substantially with over four-fifth of the women delivering in institutions in 19 States and UTs. Institutional delivery is over 90% in 14 out of the total 22 States and UTs. Almost 91% of districts recorded over 70% institutional deliveries of births in the five years preceding the survey [17].

National estimates reflected only 62% of 12 to 23-month-old Indian children received full immunisation {BCG, measles, and three doses each of polio and Diphtheria Pertussis Tetanus (DPT)} [16,18]. In addition to the low coverage, failure to vaccinate children at recommended ages has remained a major challenge [2]. Among institutional deliveries there is an opportunity to vaccinate neonate at birth thus reducing child morbidity and mortality [19]. But if we miss this opportunity than it's obvious that vaccination coverage rate would decrease further in community settings. Hence, the aim of the study was to determine barriers related to newborn vaccination coverage among institutional deliveries are essential for planning immunisation programme and identifying vulnerable groups or areas that need targeting of increased resources assessing acceptability of a programme.

MATERIALS AND METHODS

The present mixed-method study (qualitative and quantitative) was conducted during the study period 1st June 2019 to 31st July 2019. One Rural Tertiary Healthcare Institute, Khanpur Kalan and two secondary (district hospital Sonapat and sub-divisional hospital Gohana) public healthcare facilities were selected considering major delivery load of district Sonapat, Haryana, India. Due permission was sought out from the concerned healthcare authorities for the study and thereafter Institutional Ethics Committee Bhagat Phool

Singh Government Medical College For Women, Khanpur, Kalan, Sonapat, Haryana had approved it (vide letter no. BPSGMCW/RC/449/IEC/19).

Records of live births that occurred during the study duration at these public healthcare facilities were considered for the study. Socio-demographic attributes and day of vaccination done was noted from the file records. To understand the barriers associated with newborn vaccination coverage, Focus Group Discussions (FGDs) were carried out of all the staff nurses posted at Immunisation Clinic, Labour Room, Obstetrics and Gynaecology and Paediatrics Department in these public healthcare facilities.

Inclusion criteria: Records of live births that occurred during the study duration at these public healthcare facilities were considered for the study.

Exclusion criteria: Those who had incomplete records, allergic/medical contraindications to vaccination and those study participants who had not given their written informed consent to take part in focus group discussion were excluded from the study.

Study Procedure

Immunisation coverage referred to proportion of newborns who had received recommended vaccines given at birth [6-8]. Those newborns who had not received the birth dose vaccination were considered as left out cases. The left out cases were identified from the records of discharge file. The identified cases were contacted telephonically and confirmation sought out. A total of 45 staff nurses were directly involved in care of newborns at the selected healthcare facilities. Hence, FGDs were done among the staff nurses only. Six FGDs (six to eight participants each) were conducted at their respective healthcare facilities. Authors conducted FGDs on working week days during morning and afternoon hours to involve all the study participants without affecting their routine work.

Primary topic of the FGDs was to find out the factors affecting the newborn vaccination coverage among institutional deliveries. Principal investigator supervised the FGDs to check any deviation.

STATISTICAL ANALYSIS

Newborn vaccination coverage rate was analysed for quantitative data using Statistical Package for Social Sciences (SPSS version 20.0). Percentages, proportions, Chi-square test was applied and p-value <0.05 was taken as statistically significant. To find out the barriers of newborn vaccination coverage, transcripts for analysis of FGDs were prepared in two copies and arranged in order. Thereafter all the transcripts read in one setting and from those large sheets of paper were prepared and it continued till all transcripts were reviewed. Summary of the conclusion was drawn till saturation achieved. Transcription of incomplete sentences, half-finished thoughts, and parts of words, odd phrases and other characteristics of the spoken words likewise with special intensity and depth of feeling were picked up. Systematic audio recording of specific events done and behavior and non-verbal communication during FGDs discussions was converted into specific units of information. Authors entered the newly found domain in excel sheet and subsequently added gave one score if domain was found repeated. Hence, authors selected most repeated/saturated domains for analysis.

RESULTS

A total number of 1943 live births occurred at selected public healthcare facilities during the study period. Mean age of delay in receipt of first dose of Bacillus Calmette Guerin (BCG), Oral Polio Vaccine (OPV)-0 dose and Hepatitis B vaccine was 0.9 ± 2.7 days as per records analysed. The overall vaccine coverage for birth dose

vaccination was 1381 (71.1%) for HBV, BCG and OPV zero dose. However left out vaccination at birth among institutional deliveries was recorded among 562 (28.9%) neonates.

In the present study left-out vaccination at birth was reported higher among male children (314, 31%), urban locality (171, 33.7%), not literate mothers (177, 35.1%), third or more order births (188, 39.7%), delivered through cesarean section (47, 49%), admitted in sick neonatal care unit/Kangaroo mother care unit 134, 88.7%). Role of these social determinants was found to be statistically significant (p-value <0.05) [Table/Fig-1].

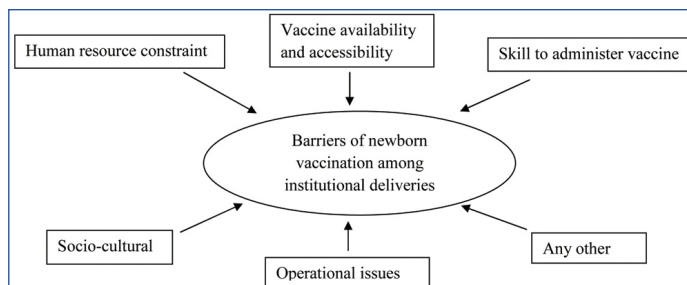
The present study also recorded the responses of the staff nurses participated in FGDs for determining factors affecting birth dose vaccination at the selected public health facilities. The results of the study presented according to themes that emerged in FGDs likewise vaccine availability and accessibility at birth place, skill and training of staff to administer vaccine at birth, human resource constraint, socio-cultural factors, any operational issues pertaining to administration of vaccine and any other [Table/Fig-2].

| Socio-demographic attributes | Vaccination done (n, %) | Vaccination not done (n, %) | Total |
|---|-------------------------|-----------------------------|------------|
| Gender | | | |
| Males | 700 (69%) | 314 (31%) | 1014 (100) |
| Females | 681 (73.3%) | 248 (26.7%) | 929 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=1, p-value <0.05 | | | |
| Location | | | |
| Rural | 1044 (72.8%) | 391 (27.2%) | 1435 (100) |
| Urban | 337 (66.3%) | 171 (33.7%) | 508 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=1, p-value <0.05 | | | |
| Mother's education | | | |
| Not literate | 327 (64.9%) | 177 (35.1%) | 504 (100) |
| Upto primary school | 671 (73.6%) | 241 (26.4%) | 912 (100) |
| Upto high school | 330 (70.8%) | 136 (29.2%) | 466 (100) |
| Senior secondary/ Graduate/ Postgraduate | 53 (86.9%) | 8 (13.1%) | 61 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=3, p-value <0.05 | | | |
| Birth order | | | |
| First order | 469 (77.4%) | 137 (22.6%) | 606 (100) |
| Second order | 627 (72.6%) | 237 (27.4%) | 864 (100) |
| Third order | 218 (61.8%) | 135 (38.2%) | 353 (100) |
| Fourth or more | 67 (55.8%) | 53 (44.2%) | 120 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=3, p-value <0.05 | | | |
| Mode of delivery | | | |
| Caesarean section | 49 (51.0%) | 47 (49.0%) | 96 (100) |
| Normal delivery | 1332 (72.1%) | 515 (27.9%) | 1847 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=1, p-value <0.05 | | | |
| Admitted in | | | |
| Sick Neonatal Care Unit/Kangaroo Mother Care unit | 17 (11.3%) | 134 (88.7%) | 151 (100) |
| Not admitted | 1364 (76.1%) | 428 (23.9%) | 1792 (100) |
| Total | 1381 (71.1%) | 562 (28.9%) | 1943 (100) |
| df=1, p-value <0.05 | | | |

[Table/Fig-1]: Distribution of newborn vaccination with socio-demographic attributes among institutional deliveries (N=1943). Figures in parentheses indicate percentages

| Major domains and recorded responses of study participants | |
|--|---|
| Rural tertiary healthcare facility | District and sub-divisional healthcare facility |
| <p>Issue: Vaccine availability and accessibility at birth place There is no provision of vaccination among institutional births occurred in evening and night hours. Responses: ".....the deliveries conducted in evening and night hours; those newborns discharged without vaccination." <i>Participant No. 13</i> Exploration regarding if vaccine availability ensured at birth contact: Issue pertaining to non availability of Ice Lined Refrigerator for storage of vaccine in ward was highlighted.</p> | <p>Issue: Vaccine availability and accessibility at birth place The services for vaccination provided in Immunisation clinic during morning hours. Leading question: "Then how those newborns delivered in evening and night hours has been vaccinated at your health facility?" Responses recorded: "those newly born child were vaccinated in morning in immunisation clinic." <i>Participant No. 26</i> Also, the recorded responses in the form of assurance to vaccinate the newborns were: "...the list of young ones delivered in evening and night hours given to ANM Sister; she vaccinate them in morning" <i>Participant No. 28</i></p> |
| <p>Issue: Human resource constraint and training and skill development If Vaccine storage facility ensured; participants answered issue pertaining to lack of manpower and training/capacity building after joining the institution. Responses: ".....there is shortage of staff, more staff will be required." <i>Participant No. 16</i> "..... we have not vaccinated newborns earlier.... No any formal training has been done" <i>Participant No. 1 and 10</i></p> | <p>Issue: Human resource constraint If vaccine availability ensured at birth contacts: participants answered issue pertaining to vaccine storage facility, workload of reporting and lack of manpower at their healthcare facilities: Responses: ".....we have to complete the records, more than 90 columns are filled for one delivery case." <i>Participant No. 31</i> "...when Sister is vaccinating then there is no need to vaccinate here." <i>Participant No. 34.</i> Similar responses from <i>participants 41, 27 and 29</i> with an addition "...wastage of vaccine would occur in this way"</p> |
| <p>Issue: Socio-cultural and operational After exploration of other reasons for left-out vaccination at birth; participants raised socio-cultural and operational issues: Responses: ".....villagers demand early discharge as they have to perform rituals at home." <i>Participant No. 5.</i> In continuation; participant's responses were recorded related to discharge of postnatal mothers without knowledge of vaccination of newborns. "...discharge cards were issued by house surgeon and we here enter it in the register, hence not comes to our knowledge." <i>Participant No. 11</i></p> | <p>Issue: Operational and supervision issues Exploration regarding any other reason they vaccinate newborns later on; responses recorded related to discharge of postnatal mothers without knowledge of vaccination of newborns. Responses: "... Duty Medical Officers come from other PHCs; they discharge the patient and not come to our knowledge." response from <i>participants 43 and 35.</i> On exploration regarding checking i.e. supervision; <i>Participant No. 45</i> added "... we maintain our labour room records nicely, our SMO Sir check it in between." In continuation; participant's responses were: "... preterm low birth weight babies were shifted to SNCU, we vaccinate them later on" <i>Participant No. 24</i> ".... also shift in Kangaroo Mother Care unit and vaccinate later." <i>Participant No. 29</i></p> |
| <p>"Have we missed anything or anyone of you wants to add related to today's discussion?" The moderator added in the last to know further. Majority of participants responded in the form of "No." The only new response recorded was "...If entry regarding vaccination status to be mentioned on front page of discharge file and discharge card; then no any newborns would left unvaccinated." <i>Participant No. 18.</i> After this response similar quotes by nodding/yes recorded for the <i>participants 2, 9, 6 and 11</i></p> | <p>In response to the question raised; mechanism to ensure left-out vaccination could not occur; participants answered: "... due list of newborns to be given to morning staff and check the entries in register, so there will be no chance that children left unvaccinated." <i>Participant No. 36</i></p> |

[Table/Fig-2]: Responses recorded during FGD regarding barriers of newborn vaccination coverage among institutional deliveries.



[Table/Fig-3]: Major domains for barriers of newborn vaccination coverage among institutional deliveries.

left-out vaccination at birth. Hence, authors explored the facts by conducting this study.

HBV vaccine, BCG and Oral Polio Vaccine (OPV zero dose) provided at birth among institutional deliveries here in our study area as per UIP. Various studies had also advocated beneficial effects of vaccination at birth [9-13,20-25]. In the present study overall left-out vaccination rate at birth recorded among 562 (28.9%) newborns at tertiary and secondary (district and sub-divisional) public healthcare facilities. However in various other studies reported low coverage of birth dose vaccination among newborns [26-29]. The above mentioned studies were community based which reported vaccine coverage evaluation surveys. The reported studies were from West Africa region where vaccination coverage was low due to health infrastructure, socio-demographic factors and human resource constraints. However, the present study was conducted at institutions i.e. tertiary and secondary care public health facilities located in rural and urban area respectively and as per recommendations of provision of vaccination at birth among institutional deliveries might be the reason for higher coverage of birth dose vaccination. In the present study it was found that 171 (35.1%) non vaccinated newborn's mothers were illiterate. It was significantly associated with left-out vaccination at birth [Table/Fig-3]. Similar findings reported in a study conducted among Gambian children by Odotola A et al., [20].

In the index study it was found that 1044 (72.8%) study participants residing in rural locality were vaccinated, while the number was 337 (66.3%) in urban area [Table/Fig-3]. Similarly Payne S et al., had recorded that immunisation coverage was more among children of the rural areas (56%) as compared with urban locality (47%) [27]. However, Kuruvilla TA et al., observed BCG vaccination coverage at birth was similar among rural and urban area children (3%), OPV zero dose coverage was higher among rural area (7.9%) while HBV coverage was more among children having urban background [26]. However none of the above mentioned studies could establish significant association with respect to locality of study participants.

The present study determined the barriers for newborn vaccination among institutional deliveries. It was found that staff posted at immunisation clinic had working duty hours in the morning. However, staff nurses posted in labour rooms, maternity and paediatrics ward were working in shift duties. Hence there was non availability of vaccine for the newborns delivered during evening and night duty hours. Also, there was no any provision of placement of vaccine vials at birth place of newborns. Resentment of staff for placement of vaccines at birth place and advocacy of workload and staff related issues during evening and night hours were observed while majority of deliveries occurred in evening and night hours. Hence, the newborns were left unvaccinated as they were discharged in morning without knowing whether birth dose vaccination was received or not. Notes about vaccination of baby at birth were not entered on front page of discharge file however the same was

Major domains related to factors associated with left-out vaccination among institutional births occurred at these healthcare facilities represented above [Table/Fig-3].

DISCUSSION

Left-out vaccination is one of the major barriers which hinder the benefits of immunisation to children, family and the nation. Therefore it is imperative to understand the factors that enhance

mentioned inside the file; where nobody bother to cross check it. It was due to the fact that discharge notes were prepared by junior resident doctors in tertiary care institute while at sub-divisional and district healthcare facilities by Medical Officers posted for emergency duties from different primary health centres of the district. More over there was no any provision of supervision to ensure that newborn had been vaccinated before discharge or not. However, at sub-divisional public healthcare facility due list of newborns delivered in evening and night duty was prepared by labour room staff and handed over to immunisation clinic staff. Those newborns were vaccinated in morning by them. At sub-division healthcare facility, the records were supervised periodically by Senior Medical Officer but it was not done on regular basis.

One of the important factors for left-out vaccination at birth among institutional deliveries at tertiary care institute was recorded that the attendants request for early discharge of mother and newborns. It was due to the fact that institute is situated in deep seated rural area and majorities of the deliveries occurred here belonged to rural background. The rural people perform their cultural norms related to new births in the family hence they want early discharge or even leave against medical advice i.e. without discharge.

Another important finding observed that training and skill development of staff posted at labour room, obstetrics and gynecology and paediatrics ward had not been done since joining their service in the institute. It is due to the fact that no any initiative was taken by the healthcare facilities for training and skill development of the staff nurses.

It was observed that 134 (88.7%) preterm, premature, low birth weight and sick newborns admitted in Kangaroo Mother Care (KMC) unit and Sick Neonatal Care Unit (SNCU) were not vaccinated. It was due to the fact that those newborns discharged due to lack of supervision at tertiary and secondary (district and sub-divisional) healthcare facilities.

Baxter D suggested that early-life immunisation, preferably at birth, might be the key to reducing the burden of diseases [30]. Similarly, Strunk T et al., also recorded similar observations in context to preterm newborns [31].

Limitation(s)

Institutional births occurred during the study period taken, hence the findings could not be generalised.

CONCLUSION(S)

This study provided a vision to address the existing policies regarding newborn vaccination. Hence it is the need of hour to take steps to improve newborn vaccination coverage in the healthcare facilities. Vaccine availability and accessibility at birth places, capacity building and conducting on-the-job training of staff nurses posted in delivery rooms for for birth/newborn vaccination, and effective supervision for newborn vaccination coverage at healthcare facilities. Socio-cultural barriers and operational issues to be addressed by conducting further qualitative and operational research at institutional level. Hence addressing and strengthening the existing means of neonatal vaccination is an unmet need and a public health priority.

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