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Immunization coverage in the district Sirmaur, Himachal Pradesh, India: evaluation using the 30 x 7 cluster sampling technique

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ABSTRACT

Background: Immunization plays an important role in reducing morbidity and mortality in children. Despite all the efforts put in by government for 100% immunization coverage, it was only 53.1% in District Sirmaur among children aged 12-23 months as per District level Health Survey -4. The objectives were to assess the primary immunization coverage among children in District Sirmaur of Himachal Pradesh as compared to NFHS-3 and DLHS-4.

Methods: A cross-sectional study was conducted in District Sirmaur using the World Health Organization's 30 X 7 cluster sampling method for evaluation of immunization coverage during the period October 2015- January 2016.

Results: A total of 210 children aged 12-23 months were covered for the evaluation, of which 95.20% of the children were fully immunized. However, immunization card was available with 77.14% of them. Zero dose of OPV was given to only 47.62% children and BCG scar was present in 82.38% of the study participants. The most common cause for partial immunization was being 'unaware of need for immunization.

Conclusions: Majority of the children ages 12-23 months were fully immunized. The key to further improvement is to monitor drop out at any stage of vaccination before completion of full course of immunization.

Keywords: 30X 7 cluster sampling technique, Coverage evaluation, Full immunization

INTRODUCTION

Sirmaur is the most south-eastern rural district of Himachal Pradesh, India. It is largely mountainous with 90% of its population living in villages. According to the 2011 census, District Sirmaur has a population of 5, 29, 855, sex ratio of 918 females for every 1000 males and a literacy rate of 78.88%.¹

Immunization forms the major focus of child survival programmes throughout the world. A recent estimate suggests that approximately 18.7 million infants worldwide are still missing out on basic vaccines with almost 98 per cent of them residing in developing countries.² Though some improvement has taken place in

the past few years, India still accounts for 7.4 million children who are not immunized.³

In India, though immunization services are offered free in public health facilities, only 44 per cent of the infants are fully immunized. As per National Family Health Survey-III (NFHS-III) this is much less as compared to the desired goal of achieving 85 per cent coverage.⁴

Vaccination coverage data released by official sources such as the Ministry of Health and Family Welfare, Himachal Pradesh consistently suggested acceptably high levels of vaccine coverage in Himachal Pradesh. In contrast, independent sources such DLHS 4 and NFHS 3 have shown that the complete vaccination coverage is

actually 63% and 74.2 % respectively. 5.6 District wise full immunization coverage of children aged 12-23 months is shown in Figure 1. In Himachal Pradesh full

immunization coverage of children (aged 12-23 months) in urban areas (72.2%) is higher than in rural areas (62%).⁵



Figure 1: District wise full immunization coverage of children aged 12-23 months.

The full immunization coverage of District Sirmaur was 53.1 percent among children (aged 12-23 months) as per DLHS- 4 which is comparatively much lower than other districts of Himachal Pradesh.⁶

The present study was conducted to assess the immunization coverage in Sirmaur as this was the worst performing among all districts of Himachal Pradesh (as depicted by DLHS 4)(Figure 1) and to find out the various reasons for partial or non-immunization of children using the WHO's 30 X 7 cluster sampling technique.

Objectives

- To assess the immunization coverage among children aged 12-23 months in Districts Sirmaur of Himachal Pradesh
- To identify the reasons of partial immunization/no immunization among children aged 12-23 months in District Sirmaur of Himachal Pradesh.

METHODS

Study design

It was a cross sectional study conducted by a team from the Community Medicine Department, IGMC Shimla under the aegis of National Health Mission, Himachal Pradesh.

Study area

Both rural as well as urban areas of Districts Sirmaur in ratio of 90:10 (27 rural and 3 urban clusters) according to the population distribution.

Study period

Study was conducted in the month of October 2015 - January 2016.

Sampling design

The 30×7 cluster sampling design developed by WHO in 1978 was adopted for the survey. The goal of this sampling design was to estimate primary immunization coverage within ± 10 percentage points of the true proportion, with 95% confidence.

Calculation of sample size and selection of study clusters

The study sample included 30 clusters from the entire population of the district, selected through the 30×7 cluster sampling method, as proposed by WHO.

This is a two-stage cluster sampling where in the first stage 30 clusters are selected with population proportion to size (PPS) sampling from the list of the villages/wards in the district (census 2011) and thereafter in the second stage 7 units are selected within each cluster. 30 clusters were chosen from a single district so as to find out pocket

of unimmunized children if any and look into the factors thereof. All households were covered till the desired sample of 7 units was reached. A total of seven children aged 12-23 months were taken in each cluster, thus giving us the sample size of 210.

Strategy for data collection

Two teams comprising of two members each were trained for data collection in the district. The teams were formed in such a manner that, preferably, one of the members was familiar with the local area and language. A single team comprised of either an intern and/or a postgraduate student and and/or a Social worker from the Community Medicine Department. Selected clusters were allotted to the teams after training of team members with regards to the method of data collection which was conducted in the department. Each team stayed in the allotted cluster at a stretch till the desired sample was reached. The entire district clusters were covered within a span of fifteen days. The senior residents acted as supervisors and one Consultant from the department was overall in-charge of each district. Identification of random household after entering the Village/ward (cluster) was done in consultation of the local village leader. After taking Informed Consent, mothers were asked about the immunization received by them and regarding other variables, and this information was verified by crosschecking the vaccination card; wherever available.

Proof of immunization

The child was considered as immunized or not immunized based on information on the immunization card. For those without a card, information from the mother was gathered to know whether the child had been immunized. If the mother could not recollect anything

about the vaccination, the child was considered as not immunized with the vaccine under consideration. In case of a partially/non-immunized child the most important single reason for not immunizing the child was asked. The child was considered fully immunized if he/she had received primary immunization i.e. one dose of BCG, three doses of DPT, three doses of OPV, and one dose of measles (pentavelent vaccine was not introduced during the time of survey).

Child was considered to be unimmunized if he/she had received none of these vaccines and was considered partially immunized if some doses were given, but immunization was not complete. Non-immunized meant not being given any vaccine. The birth dose OPV and pulse polio immunizations (PPI) were not considered for classification.

Statistical analysis

The data was analyzed by using Microsoft excel and the findings of vaccination coverage and reasons for partial/non-immunization are given in percentages or proportions.

RESULTS

Total of 210 children aged 12-23 months were covered for evaluation of the primary immunization coverage. To complete the sample size, 3119 houses were surveyed as per WHO methodology. There were 51% boys and 49% girls in the selected clusters (Table 1). Immunization card was available with 77.14 % of the subjects. BCG scar was present in 82.38% of the children (Table 1).

Table 1: Household visited, children covered, immunization card and BCG scar positivity in district Sirmaur of Himachal Pradesh for evaluation of the primary immunization coverage.

	Present study (30X 7 cluster sampling)	DLHS-4 (Sirmaur)	NFHS- 3 (H.P.)
Total clusters covered	30	40	100
Total house holds visited	3119	1059	2790
Total children covered	210 M-107 (51%) F-103 (49%)	56	194
Immunization card available	162 (77.14%)	15.3%	57%
BCG scar positive	173 (82.38 %)	Not mentioned	Not mentioned

It was found that 95.20% of the children were fully immunized against all the six vaccine-preventable diseases, 3.80% were partially immunized and 0.50% were non immunized; as per standard definition of WHO (Table 2). When only card is taken for evaluation for

fully immunized, unimmunized and partially immunized respectively, the coverage was 69.50%, 23.80% and 6.70% respectively (Table 2).

Regarding individual vaccine coverage in children, the coverage was highest for BCG (98.50%) and lowest for measles and DPT3 (96.20% both). A consistent decline in coverage rate from the first to the third dose was observed in DPT and OPV. Dropout rate for both DPT and OPV from the first to the third dose was 2.40% and 1.90%, respectively. The dropout rates for measles compared to BCG was 2.30% (Table 3). A total of 8

children out of total 210 (3.80%) were found to be partially immunized and 1 child was found unimmunized. The major causes for partial/unimmunization were 'Unaware of need for immunization'. (Figure 2). Other reasons were fear of side effects, post pone until another time, unaware of need to return for $2^{\text{nd}}/3^{\text{rd}}$ dose and no faith in immunization.

Table 2: Immunization coverage in district Sirmaur, Himachal Pradesh during 30X 7 cluster evaluation.

District Sirmaur	Fully immunized		Partially immunized		Un-immunized	
	Card	Card/or history, whichever is available	Card	Card/or history, whichever is available	Card	Card/or history, whichever is available
Present study	69.50%	95.20%	6.70%	3.80%	23.80%	0.50%
DLHS 4	NA	53.10%	NA	45.30%	NA	1.6%
NFHS 3	NA	74%	NA	24%	NA	2%

Table 3: Comparison of immunization coverage of individual vaccine with DLHS-4 & NFHS-3 in Himachal Pradesh for evaluation of the primary immunization coverage.

	DLHS-4	HS-4 NFHS 3		Present Study (Sirmaur)		
	(Sirmaur)	(H.P.)	With card N (%)	Card/or history, whichever is available N (%)		
Received BCG vaccination (%)	88.1%	97.2%	73.80%	98.50%		
Received 3 doses of DPT (%)	64.5%	85.1%	74.70%	96.20%		
Received 3 doses of OPV (%)	75.7%	88.6%	75.23%	96.70%		
Received measles vaccine (%)	78.3%	86.3%	71.90%	96.20%		
Received zero dose of OPV (%)	17.4%	66.7%	34.29%	47.62%		

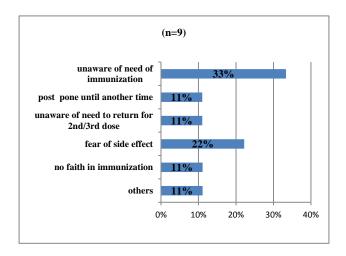


Figure 2: Reasons for partial immunization in district Sirmaur of Himachal Pradesh for evaluation of the primary immunization coverage.

DISCUSSION

The WHO 30-cluster sample survey for estimating immunization coverage among children has been found

to be very useful by public health administrators in developing countries, because it is rapid, operationally convenient, and cost-effective.⁷

In the present study, the percentage of fully immunized children was found to be very high as compared to NFHS-3 and DLHS-4 data (Table 3). The NFHS-3 (2005-06) had reviewed the full immunization coverage in the Himachal Pradesh, which was 74.2%, and is lower than that in the present study.⁵ A survey done by DLHS-4 (2011-12) had shown that full immunization coverage in District Sirmaur Himachal Pradesh was 53.10% which is markedly low as compared to present study.⁶ Rapid survey on children in 2013-14 done by ministry of women and child development, government of India show the full immunization coverage in Himachal Pradesh of 80.2% which is also low as compared to our study.⁸

Methodology adopted in DLHS-4 & NFHS-3 was multistage stratified sampling while it was cluster sampling in our survey (WHO standard methodology). Sample size in our study was larger than DLHS4 (210 in present study as compared to 56 in DLHS4) (Table 1). Collection of information of all children born to women during the last 5 years period was done in NFHS 3 and last 3 years was done in DLHS 4. In our survey information was collected only for the 12-23 months of age, hence, there were less chances of recall bias. Collection of immunization details for past 3-5 years period when actually data for 1 year was required increases workload of the investigators and may lead to increased error rates.⁹

Possible reasons of failure to elicit the required information from the mother could be lack of commitment, varying levels of interest, training given to surveyors and skills to elicit the right information; which are all prime factors in data collection. The length of the questionnaire which takes almost one hour for completion including questionnaire on household, married women, nutrition, family welfare, diseases, and facility apart from immunization sets in a fatigue factor which may compromise on quality of data collected. 9

Immunization card was available with 77.14% of the subjects whereas DLHS-4 data for Sirmaur showed that in only 15.3% of the children immunization card was available.⁶ NFHS -3 57% of them could show the immunization cards, while majority of them in RSOC 2013-14 report (95.2%) could reproduce the card; which was higher than our study.⁸ This indicates lesser importance given to the immunization cards by people. The importance of having a card should be stressed to them in the take home messages given at the end of vaccination.

The coverage of BCG was higher (98.50%) in our study when compared to the NFHS-3 (97.2%) and DLHS-4 (95%) done on 2005-06 and 2012-13 respectively. ^{5,6} The higher coverage of BCG might be because of more institutional deliveries nowadays due to effective implementation of national health programmes in the state. Similar to BCG, the coverage of OPV3, DPT3, and measles was also higher in the present study than in the NFHS-3 and DLHS-4. ^{5,6}

In the current study, it has been seen that coverage of measles was the lowest as observed by others studies. ^{5,6,8} The low coverage of measles vaccine as compared to other vaccines reflects that Special campaigns for measles vaccine need to be organized.

The dropout rate (2.40%) in the present study was lower than the dropout rates found in DLHS-4 and NFHS-3 which could be attributed to effective communication efforts and other awareness campaign.^{5,6} It has been observed that vaccine coverage has increased over a period of time, indicating a move towards universal immunization.

Our study found that only 82.38% of the study participants had a visible post vaccination BCG scar representing a scar failure rate of 17.62%. Maximum scar failure was found in cluster Bain kuan where only 3

children out of 7 had scar formation. However scar failure is a well-known phenomenon with prevalence varying from 1% to 20% but this was comparatively higher than other Indian studies on term infants by Dhanawade (8.6%) & Rani (10%). ^{10,11} Development of BCG scar depends on the strain, injected dose and technique of administration. Larger studies to reveal the true magnitude of the problem and regular evaluation of BCG vaccination programs are necessary.

A significant number of children were not getting 'Zero 'dose of Oral Polio Vaccine with only 47.62% children being vaccinaged with zero dose of OPV. Similar results were found in DLHS-4 &NFHS-3 (Table 3). These results were found in spite of 79.5% institutional deliveries in district Sirmaur which points out that zero dose polio vaccination is not given much importance and all the neonates are not vaccinated in hospital before discharge. Counseling of health staff and parents for need of zero dose polio will help in improving polio vaccination for most of children.

In the present study, the parents of children who were partially /un-immunized were Unaware of need for immunization. For improving the situation, efforts should be made to impart information, education, and communication activities. A web based Mother and Child Tracking System (MCTS) needs to be strengthened to enable tracking of all pregnant women and newborns; so as to monitor and ensure that complete services are provided to them.

CONCLUSION

The target of 85% coverage has been achieved in District Sirmaur of Himachal Pradesh, but sustained efforts are required to achieve 100% universal coverage of immunization.

Recommendations

Activities aimed at reducing "drop-outs" and "BCG Scar failure" need to be scaled up. State routine immunization monitoring system can play an important role in training, monitoring and supervision of immunization activities.

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