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Original Research Article

Vaccination coverage of children in tribal Narmada district of Gujarat: a cross sectional study

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ABSTRACT

Background: Vaccination being one of the cheapest and safest methods of primary prevention, indicators of maternal and child healthcare are crucial. Multi-indicator cluster survey was planned to check these objectives as set up in reproductive child health (RCH)-II and National Rural Health Mission (NRHM) plan. This study was initiated to determine the vaccination coverage among the children in tribal district in Gujarat and to determine factors associated with partial immunization and non-immunization.
Methods: A community based cross-sectional study was done in tribal district Narmada in Gujarat for a period of four months from May 2011 to August 2011. The study population consisted of all children aged between 12-23 months. After using cluster sampling method, assessment of vaccination programme was obtained from 346 out of total 352 children scattered across 30 clusters. A pre-tested semi-structured questionnaire was administered by interview technique.
Results: Highest coverage was seen in the first dose of diphtheria, pertussis, and tetanus (DPT) 95.7% (CI 92.3-99) followed by Bacillus Calmette-Guérin (BCG) 95.4% (CI 92-98.7) and first dose of oral poliovirus vaccines (OPV) 95.4% (CI 92-98.7). The proportion of fully immunized children was 77.7% (CI 69.4-86.1), whereas 2.9% (CI 0.0-6.1) children were not vaccinated at all. The drop-out rate was 8.76% from DPT1 to DPT3 and 16% for DPT1 to measles.
Conclusions: Vaccination coverage was highest for DPT first dose followed by BCG. The drop- out rate was 8.76% from DPT1 to DPT3 and 16% for DPT1 to measles. Non-awareness regarding subsequent doses of vaccines was most common reason for partial or non-vaccination.

Keywords: Multi-indicator cluster survey, Cluster sampling, Vaccination coverage, Drop-out

INTRODUCTION

The concept of immunity was first described by Thucydides in 430 BC when the 'plague' hit Athens. But later, it was Louis Pasteur's germ theory of diseases which explained how bacteria causes disease, and how, following the infection, human body gains resistance against that disease.[1]

Vaccine is an immunobiological substance designed to produce specific protection against a given disease and stimulates the production of protective antibody and other immune mechanisms.[2]

"World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) report on The State of the World's Vaccines and Immunization" mentions vaccination as one of the

cheapest and safest methods of primary prevention.[3] With the exception of safe water, no other modality, not even antibiotics, have had such a major effect on mortality reduction.

The Center for Disease Control (CDC) has placed vaccination as one of top ten achievements in the field of public health in the twentieth century. Through herd-effect, it not only protects individual but also provides protection to the community and thus hinders circulation of the infectious agent. These strategies show effect of vaccination rapidly, as evident by the eradication of small pox. Thus, vaccine helps healthy individuals to stay healthy and therefore aids human development.[4]

The Expanded Programme of Immunization (EPI) was launched by the World Health Organization (WHO) in May 1974 to protect all children of the world from six vaccine preventable diseases (VPD) by the year 2000. The programme is now called Universal Child Immunization Programme (UIP) and the Indian version UIP was launched on 19th November 1985.[5] Widespread use of vaccines has prevented millions of premature deaths, paralysis, blindness, and neurologic damage.[6] Despite their public health benefit, vaccination programs face obstacles. One obstacle is public perception of the relative risks of vaccination. Vaccine scares and sudden spikes in vaccine demand remind us that the effectiveness of mass vaccination programs is governed by the public perception of vaccination.[7] Adverse event following immunization (AEFI) also play a role in deciding the uptake and thereby coverage of vaccination. Each individual and family weigh the perceived risks and benefits, reflect on the value of participation, and consider potential consequences of vaccination.[8] These factors can affect vaccine coverage defined as the percentage of people who receive one or more vaccine in relation to the overall population.

Further, knowing reasons for non-participation can help frame a counselling tool. This study was initiated in order to determine the vaccination coverage among the children in tribal district in Gujarat and to determine factors associated with partial immunization.

Objectives

The objective of this study was to find out vaccination coverage among children aged 12-23 months in tribal Narmada district and to find out dropout rate and reasons behind dropout or non-immunization.

METHODS

This was a community based cross-sectional study done in tribal district Narmada in Gujarat for a period of four months between May 2011 to August 2011. The study population consisted of all the children aged between 12 to 23 months in tribal district Narmada in Gujarat. All the children between 12 to 23 months of age and residing in that area since birth were included. Children from migrant families and children of parents who did not give consent were excluded.

Standard 30 clusters probability proportionate to size (PPS) sampling method was followed.[9] This is an accepted UNICEF methodology. Thirty individual clusters were identified and in each cluster 60 households were selected, thereby surveying a total of 1800 households. Considering an average household size of five, data was collected from 9000 population and an adequate representation of various demographic groups was thus achieved.

In the first stage, a complete list of the existing villages of Narmada district (referred to as clusters in subsequent discussion), with the total number of households, as of 2009, was obtained from Chief District Health Office. A listing of all the 609-villages including Rajpipla urban slums with their population was made and a cumulative frequency calculated. A total population of 560429 was recorded. For selecting the clusters, the total cumulative population was divided by 30 to obtain the class interval of 18681. A single random number between 1 and 18681 was obtained using first five digits of a thousand rupee note. This was 06751. The cluster, whose cumulative frequency interval had this number, was picked up as the first cluster. The class interval of 18681 was added to identify subsequent 29 clusters. Thus, a systematic random sampling was used to select total 30 clusters, which would be proportional to their size.

In the second stage, 60 households were identified to be surveyed from the entire cluster. Each cluster was divided into four quadrants. Total houses in each quadrant were recorded and taking a random number using a currency note, the survey was initiated from the house of that number and continued in one direction till 15 houses were completed from that quadrant. All the houses that came in this direction were studied. This was repeated for all four quadrants. This ensured that every household selected had equal probability of being selected.

Method of collection of data

A pre-tested semi-structured questionnaire was administered by interview technique. The participants were informed about the study and each question was explained to them in a language which they could understand. The variables were collected under two sections. Section 1 included, information related to socio-demographic factors. This included data for name of head of family, address, religion, total family members, type of the family, total no of children and no of children in age group 12-23 months. Section 2 included information related to immunization. This included the details about the availability of immunization card, details of various vaccination received, reason for partial immunization.

The data so obtained was checked for its completeness, quality and internal consistency. The data were then entered and analyzed using the Epi-Info Version 6.04d and

statistical tests like proportion, chi square test and odds ratio (with 95% CI) were used. Since majority of the data was qualitative, simple proportions and their confidence intervals were calculated. Informed oral consent for the study was obtained from the parents of the children before collecting information.

Few terms used in study

Fully immunized: Children who had completed the recommended EPI immunization schedule of Bacillus Calmette-Guérin (BCG), oral poliovirus vaccines (OPV), diphtheria-pertussis-tetanus (DPT) and Measles vaccine before one year of age.[10]

Partially immunized: A child who was not yet fully immunized, that is, partially immunized but up to age and partially immunized but not up to age.

Unimmunized: Child who had not yet received any vaccine for the age, though eligible.

Not immunized: Child received none of the prescribed vaccines doses considered to protect against vaccine preventable diseases.

Dropout rate: Percentage difference in coverage between two different doses in sequence.

RESULTS

The necessary information for assessment of the vaccination programme could be obtained from 346 out of total 352 children between 12-23 months of age scattered across 30 clusters.

Highest coverage was seen in the first dose of DPT 95.7% (CI 92.3-99) followed by BCG 95.4% (CI 92-98.7) and first dose of OPV 95.4% (CI 92-98.7). Least coverage was seen in third dose of DPT 87.3% (CI 81.2-93.3) and measles 80.4% (CI 72.7-88). Coverage dropped from 95.7% to 87.3% in case of first and third dose of DPT. Similarly, coverage dropped from 95.4% to 88.2% in case of first and third dose of OPV. The coverage of fully immunized children was 77.7% (CI of 69.4-86.1). The left-out proportion is 2.9 (CI 0-6.1) who did not receive any vaccine, while 19.4% (CI 11-27.7) were partially vaccinated and termed as "drop outs" (Table 1).

As in Table 2, the most common reason for partial or non-vaccination was non-awareness regarding subsequent doses of the vaccines.

Table 3 shows the place of vaccination. The immunization was carried out at the Mamta (mother and child protection) Kendra on Mamta Divas in almost 94% of the children. Around 3% received it at Anganwadi on a day other than Mamta Divas. So, government centers continue to be preferred centers for vaccination of children.

Table 4 shows the drop-out rates for Narmada district. The drop-out rates for the first to third dose of DPT and OPV were 8.76% and 7.57% respectively while from DPT1 to measles it is as high as 16%. The lower and higher drop-out rates should not be viewed in isolation; and it is more meaningful only when overall vaccine coverage is studied, and at the end of drop outs, what proportion remains vaccinated.

Table 1: Vaccination status of children among 12-23 months of age in Narmada district (n=346).

Indicator		N	%	CI
Immunization card/Mamta* card availability				
Yes, card seen		160	46.2	38.7-53.8
Yes, card not seen		140	40.5	32.6-48.3
No		43	12.4	7.6-17.3
Don't know		3	0.9	0-1.9
Coverage of individual antigen				
BCG		330	95.4	92-98.7
DPT	1st dose	331	95.7	92.3-99
	2nd dose	322	93.1	89.1-97
	3rd dose	302	87.3	81.2-93.3
OPV	1st dose	330	95.4	92-98.7
	2nd dose	325	93.9	90.2-97.6
	3rd dose	305	88.2	82.3-94
Measles		278	80.4	72.7-88
Overall immunization status				
Fully immunized		269	77.7	69.4-86.1
Partially immunized		67	19.4	11-27.7
Unimmunized		10	2.9	0-6.1

*Mother and child protection card is known as Mamta card.

Table 2: Reasons for partial immunization/unimmunized children (n=77).

Reason	N	%
Not aware	52	67.5
No faith	2	2.6
No time/out of station	4	5.2
Child sick	3	3.9
No one to take child for vaccine	3	3.9
Worker didn't come	4	5.2
Other	9	11.7

Table 3: Place of immunization (n=336).

Place of immunization	N	%
Mamta Divas	315	93.7
Anganwadi centre other than Mamta Divas	10	3
Primary health centre or other government center	5	1.5
Private clinic	1	0.3
Home visit	3	0.9
Other	2	0.6

Table 4: Vaccine drop-out rates.

Vaccine	Coverage of first antigen	Coverage of last antigen	Drop-out rate	Drop-out rate proportion (%)
DPT1 to DPT3	331	302	29	8.76%
OPV 1 to OPV 3	330	305	25	7.57%
DPT1 to measles	331	278	53	16%

Drop-out rate= Coverage of first antigen-Coverage of last antigen; Drop-out rate%= (Coverage of first antigen-Coverage of last antigen) × 100/Coverage of first antigen.

DISCUSSION

Vaccine coverage is an important strategy to achieve future elimination and/or eradication of several vaccine preventable diseases. This study focuses on vaccination coverage in a tribal district Narmada, Gujarat along with reasons for the non-coverage of vaccines. Addressing these issues can further inform policy and practice to improve vaccination coverage especially in tribal regions.

In the present study, the vaccination coverage among children aged 12-23 months reflects that 77.7% of the children were fully immunized. Similar level of coverage was documented in other studies by Sarker et al. in Bangladesh and Khokhar et al in urban slums of Delhi.[11,12] A study by Khargekar et al reported 71.1% completely immunization.[13] Study by Agrawal et al reported full immunization coverage (FIC) of 58.6%.[14] According to National Family Health Survey-IV (NFHS-IV) data, 2015-16, which was conducted all over India by Ministry of Health and Family Welfare Government of India, complete vaccination coverage in India is 62% and in Gujarat it is 50%.[15] According to recent studies on routine immunization coverage, there has been a considerable decline in the coverage in some major states.[16-20]

However, this coverage is still far below the desired level of UIP comprehensive multi-year plan 2018-22 targets which are 90%.[21] In the current study, vaccination coverage for all the vaccines was almost similar to NFHS-IV data.[15]

Drop outs were maximum for first to third dose of DPT and OPV and for measles. Thus, majority of the children not fully vaccinated belonged to the category of drop outs suggesting the need of health contacts with them at least once and then continued motivation to complete the vaccination schedule.

In this study, it was seen that coverage of measles was the lowest amongst all other vaccines, which was around 80.4%. This measles coverage was almost similar to the NFHS-IV report, total measles vaccination coverage all over India was 81.1%, was 83.2% for urban population and 80.3% for rural population.[15] This could be explained by different geographical area and the time at which study was conducted or could be because of different methodology adopted. Similar findings were observed in other study by Sarker et al also.[11]

In the current study, the main reason for partial immunization was lack of awareness (67.5%). A study reported the main reason for partial immunization being

community centered. However, this partial vaccination may be a failure on the part of providers also, as well as the community. The providers need to emphasize on giving four key messages to the beneficiaries after vaccination which includes reminding them for next dose and bring the card for next visit.

One of the observations in this study was that the immunization coverage was significantly less among the children whose immunization cards were unavailable at the time of assessment of their immunization status. This assessment was based on the predefined criteria of confirming immunization based on Mamta card or recall. Agrawal et al also reported lack of awareness regarding the need for returning for subsequent doses to be the reason among 60.3% of children who were partially immunized.[14] This could be reflection of parent's negligence in preserving immunization card of their child for long time. Immunization card can act as reminder for the next immunization session.

We have reported the vaccination coverage along with its confidence intervals as per cluster sampling methodology.[9] Interpretation of important parameters like immunization should take into account the confidence intervals also apart from sample proportions. The confidence interval gives a range of the coverage and the actual coverage in population may lie anywhere in this range. This gives us the range of immunization coverage which may be anticipated in future if the same methodology were to be repeated to assess coverage.

CONCLUSION

Even after decades of implementation of UIP, not all the children were fully immunized. Vaccination coverage was highest for DPT first does followed by BCG.

The proportion of fully immunized children was 77.7% (CI of 69.4-86.1). Whereas 2.9% (CI 0.0-6.1) children were not vaccinated at all. The drop-out rate was 8.76% from DPT1 to DPT3 and 16% for DPT1 to measles.

Limitation of the study

It should be noted that the percentage of children vaccinated here indicates actual proportion of children vaccinated and not a programmatic evaluation done based on the targets versus vaccination given.

There is a possibility of over 100% coverage in programmatic targets and the study findings may report less coverage; these are not contradicting each other. There could be an error in the assumption of a proportion of children to be of certain age. Errors inherent to the cluster sampling methodology are bound to occur.

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REFERENCES

1. Agarwal S, Basannar DR, Bhalwar R, Bhatnagar A, Bhatti VK, Chatterjee K. Textbook of public health and community medicine. 1st edition. 2009: 985.
2. Park K. Park's textbook of preventive and social medicine. Bhanot Publishers; 2015: 146-147.
3. The Unbelievable Impact of Vaccines. 2013. Available at: http://www.vaccinenation.org/2013/08/27/unbelievable- impact-vaccines-image/. Accessed on 21 November 2019.
4. Regmi J. Socio-Cultural Influences on Vaccination-Vaccinators Perspective, Study from Nepal; 2014.
5. Kishore J. National health programs of India: national policies & legislations related to health. New Delhi: Century publications; 2014: 950.
6. Halsey NA. The science of evaluation of adverse events associated with vaccination. Semin Pediatr Infect Dis. 2002;13(3):205-14.
7. Reluga TC, Bauch CT, Galvani AP. Evolving public perceptions and stability in vaccine uptake. Math Biosci. 2006;204(2):185-98.
8. Ali A, Jafri RZ, Messonnier N, Tevi-Benissan C, Durrheim D, Eskola J, et al. Global practices of meningococcal vaccine use and impact on invasive disease. Pathogens and Global Health. 2014;108:11-20.
9. Hoshaw-woodard S. Description and comparison of the methods of cluster sampling and lot quality assurance sampling to assess immunization coverage. Who/V&B. 2001;1:21.
10. Sokhey J, Bhargava IBR. The immunization program in India: a handbook for medical officers; 2017. Available at: https://nhm.gov.in/New_Updates_2018/NHM_Components/Immunization/Guildelines_for_immunization/Immunization_Handbook_for_Medical_Officers 2017.pdf. Accessed on 21 November 2019.

11. Sarker AR, Akram R, Ali N, Sultana M. Coverage and factors associated with full immunisation among children aged 12-59 months in Bangladesh: Insights from the nationwide cross-sectional demographic and health survey. BMJ Open. 2019;9(7):1-11.
12. Khokhar A, Chitkara A, Talwar R, Sachdeva TR. A study of reasons for partial immunization and non-immunization among children aged 12-23 months from an urban community of Delhi. Indian J Prev Soc Med. 2005;36(3-4):83-6.
13. Khargekar NC, Khargekar VC, Shingade PP. Immunization status of children under 5 years in a tribal area, Parol, Thane district. Natl J Community Med. 2015;6(4):522-7.
14. Agrawal K, Nagaonkar SN, Agrawal SK. Coverage evaluation of vaccines using 30×7 cluster survey in rural area of Dhule, Maharashtra. Int J Community Med Public Heal. 2019;6(7):28-32.
15. Indian Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), 2015-16: India. Int Inst Popul Sci ICF. 2017;1-192. Available at: http://www.rchiips.org/nfhs%0Ahttp://rchiips.org/NFHS/NFHS-4Reports/UttarPradesh.pdf%0Ahttps://dhsprogram.com/pubs/pdf/FR338/FR338.UP.pdf. Accessed on 21 November 2019.
16. Murhekar MV, Kamaraj P, Kanagasabai K, Elavarasu G, Rajasekar TD, Boopathi K, et al. Coverage of childhood vaccination among children aged 12-23 months, Tamil Nadu, 2015, India. Indian J Med Res. 2017;145(3):377-86.
17. Rajnesh Kumar KM. Vaccination coverage and its determinants in rural areas of district Doda of Jammu and Kashmir, India. Int J Community Med. 2019;6(10):4401-6.
18. Vohra R, Bhardwaj P, Srivastava J, Gupta P, Vohra A. Immunization coverage and its determinants among 12-23 months old children of Lucknow. Muller J Med Sci Res. 2013;4(2):90.
19. Phukan RK, Barman MP, Mahanta J. Factors associated with immunization coverage of children in Assam, India: Over the first year of life. J Trop Pediatr. 2009;55(4):249-52.
20. Urban Health Resource Centre. Child Health Scenario in the Slums of Meerut, Uttar Pradesh: Implications for Program and Policy g y MNCH Study in Meerut Slums MNCH Study in Meerut Slums. 2007. Available at: http://uhrc.in/downloads/Presentations/ Child_health.pdf. Accessed on 21 November 2019.
21. Government of India. Universal Immunization Programme Comprehensive Multi-Year Plan 2018-22. Available at: https://nhm.gov.in/New_Updates_2018/NHM_Components. Accessed on 21 November 2019.

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