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LOTS QUALITY COVERAGE SURVEY TECHNIQUE FOR ASSESSMENT OF DETERMINANTS OF IMMUNIZATION COVERAGE IN URBAN SLUM OF MUMBAI

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ABSTRACT

Context: Universal immunization of children is crucial and cost-effective public health intervention to reduce morbidity and mortality. Evaluation of immunization coverage provides evidence whether substantial progress towards achieving immunization targets is being made.

Aims: The study aimed to assess immunization coverage in urban slum area, reasons for incomplete immunization and impact of socio-demographic profile on the immunization status.

Methods and Material: A cross-sectional, descriptive epidemiological study was carried out in urban slum during January 2013 to December 2013. Total 336 children between age of 12-23 months were selected from 21 Lots by using lots quality survey technique. Data was analysed using suitable statistical tests.

Results: The overall coverage of immunization in urban slum area was 75.0% (fully immunized), 22.3% (partially immunized) and 2.7% (unimmunized). Reasons for delayed, partial and non-immunization were categorized as lack of information (21.13%), lack of motivation (13.40%) and Obstacles(65.46%). Immunization status was statistically significantly associated with socio-economic status, birth order, place of birth, presence of immunization card, mother's literacy.

Conclusions: Completeness of Immunization was significantly correlated with knowledge of mothers on immunization and adequate attention should be given to this if high coverage levels are to be sustained.

Key-words: WHO, Community Health Volunteer, EPI, GAVI.

INTRODUCTION

World Health Organization estimated that more than one million of deaths among under 5 children were due to vaccine preventable diseases.[1] Universal immunization is crucial public health intervention and cost effective strategy to reduce infant and child morbidity and mortality. Utilization of immunization services is dependent not only on provision of these services but also on other factors related to mother, child, health workers and availability of vaccination materials.[2-4]

Primarily purpose of immunization coverage assessment is to evaluate progress in service delivery and achievement of program objectives.[5] Secondarily it highlights progress towards achievement of set immunization targets which is essential for getting support from initiatives like Global Alliance for Vaccine and Immunization.[6]

This paper reports on a survey assessing immunization coverage for infants and factors impacting coverage in urban slum of Mumbai. Under universal Immunization Programme (UIP), vaccines pro-

vided for infants are BCG, DPT, OPV, HBV and measles.[7] In India, only 44 percent of children age12-23 months are fully vaccinated, and 5 percent have not received any vaccinations in year 2005-06.[8] Primary immunization coverage in Mumbai suburb was 72%. The relatively low percentages of children vaccinated with the third dose of DPT and measles are mainly responsible for the low proportion of children fully vaccinated.[9]

Though there are enormous efforts taken by governmental and non-governmental organizations for 100% immunization coverage, there are still pockets of low coverage areas. Urban slums constitute one of high risk areas for vaccine preventable diseases possibly due to population migration leading to congestion and extra pressure on already overburdened health infra-structure of the cities.[10] Present study was undertaken to assess determinants of immunization coverage of children aged 12-23 months and also the efforts were made to know the reasons for delayed and non-immunization. Since lot quality sampling method requires only small sample size and easy to use, it is feasible for routine monitoring of vaccination coverage.[11] This method is useful for quick and scientific identification of poor performing areas and developing tools and strategies to improve coverage and service quality.

METHODS AND MATERIAL

A cross-sectional, community based, descriptive epidemiological study was carried out in the field practice area (Shivajinagar urban health centre, Govandi, Mumbai) of the Topiwala National Medical College, Mumbai during the period of January 2013 to December 2013.

The inclusion criteria for study subjects were all children between 12 months and 23 months of age with availability of either an immunization card or a responsible person for key information regarding immunization and who were permanent residents (residing for more than 6 months) of the study area. Mother and child not available at the time of actual visit to the respective home and children who do not satisfy above conditions were excluded from the survey purposes.

The area was divided into 21 lots based on geographical service areas under 21 community health volunteers (CHV) functioning in health post. The study population comprised of all children aged 12–23 months. This age group was chosen for analysis because both International and Government of India guidelines specify that children should be fully immunized by the time they complete their first year of life. Children who received BCG, measles, and three doses each of DPT and polio (excluding polio 0) are considered to be fully immunized. Partially immunized child is one who has missed any one or more of the above doses irrespective of having received polio vaccination on Pulse polio days and a child who has not received even a single dose of any of the vaccines under UIP schedule other than polio vaccination on Pulse polio days is considered unimmunized . All the vaccines must be administered by the time the child is one year of age.

Sample size for the study was calculated to be 336, based on 5% level of accuracy and 95% level of significance.[12] The estimated sample size for each lot was 16. A decision value (highest number of individuals in a lot not receiving a quality service and yet lot is acceptable) of 2 was selected based on lot sample size of 16 and low and high threshold set at 65% and 95%, respectively. Trained investigators collected the information from 16 children in each lot. Only one child was selected from each household. Households were selected by simple random sampling method by using random number tables. Information regarding birth date, immunization card, dates of vaccines received, presence of BCG scar and reasons for incomplete or no vaccination was collected through pretested questionnaire and interview schedule. Dates of vaccines received were verified from office record in case vaccination card was not available. Response rate was 100%. Criteria that meet the 'Quality' vaccination include those children who have received all vaccinations recommended in National immunization schedule at appropriate age and interval with presence of immunization card and BCG scar in those who received BCG vaccine.

Information collected was analyzed to check number of children fulfilling the quality criteria of vaccination, lot-wise. Lot performance was judged unacceptable if it finds more than two children not accepting quality criteria. To get an overall single estimate of individual qualities of vaccination, data was aggregated from all 16 lots. Reasons for below quality immunization were analyzed in aggregate. The ethics committee of the institute approved the study. Socio economic status of the study population was determined as per the Modified Prasad's classification April 2013.[13] Results were analyzed by using Statistical Package of Social Sciences (SPSS) version 16.0. Statistical significance was set at $P \leq 0.05$.

RESULTS

Three hundred and thirty six children were surveyed under this study. Table 1 shows the socio-demographic characteristics of the mothers/caregivers and children.

Table 1: The Bio-social characteristics of study population (n=336)

Bio-social characteristics	Frequency (%)
Sex	
Female	184 (54.76)
Male	152 (45.24)
Religion	
Hindu	92 (27.38)
Muslim	236 (70.24)
Others	08 (2.38)
Type of family	
Nuclear	180 (53.60)
Joint	105 (31.30)
Extended	51 (15.10)
Education(mother)	
Illiterate	49 (14.58)
Primary	37 (11.01)
Secondary	181 (53.87)
Higher Secondary	53 (15.77)
Graduate	16 (4.77)
Socio-economic Class (modified Prasad's classification 2013)	
1	6 (1.8)
2	43 (12.8)
3	76 (22.6)
4	172 (51.2)
5	39 (11.6)
Birth Order	
1	130 (38.7)
2	103 (30.6)
3	71 (21.1)
≥ 4	32 (9.6)
Place of Delivery	
Home	31 (9.2)
Hospital	305 (90.8)
Place of Immunization (N=327)	
Government or Municipal hospital	311 (95.1)
Private hospital	16 (4.9)
Immunization Card (N=336)	
Yes	285 (84.9)
No	51 (15.1)
BCG Scar (N=336)	
Yes	292 (86.8)
No	44 (13.2)
Immunization status	
Fully immunized	252 (75.0)
Partially immunized	75 (22.3)
Unimmunized	09 (2.7)

Among study subjects female children (54.76%) were more than male (45.24) children which signifies healthy sex ratio. As Urban slum community consists mainly of Muslim population and therefore 70.24% of children in study group belong to the Muslim religion, followed by Hindu. Mother was informant in case of 94.7% children and in rest of cases father, grandmother and other relatives were informant. Majority of families were nuclear i.e. 53.60%**.** About 65% fathers and mothers were educated up to secondary education and nearly 15% were illiterate.

Table 2: Reasons for partial and unimmunization*

Reasons	Freq (%)
Lack of information	
Unaware of need of immunization	19 (9.79)
Unaware of need to return for 2nd and 3rd dose	4 (2.06)
Unaware of place and time immunization	5 (2.58)
Fear of side reactions	9 (4.64)
Wrong ideas about contradictions	04 (2.06)
Lack of motivation	
Postponed until another time	12 (6.19)
No faith in immunization	04 (2.06)
Rumours	10 (5.15)
Obstacles	
Place of immunization too far	03 (1.55)
Inconvenient time of immunization	04 (2.06)
Vaccinator absent	02 (1.03)
Mother too busy	14 (7.22)
Family problem including illness of mother	08 (4.12)
Child ill not brought	34(17.53)
Child ill brought but vaccine was not given	19 (9.79)
Long waiting time	03 (1.55)
Vaccine not available	09 (4.64)
Other	
Been to native place	31(15.98)

* Multiple responses

Most of mothers were housewives (80.06%) and fathers were skilled (34.52%) workers which include drivers, clerks, foremen and artists etc. Most of the study population belonged to socio economic class IV (51.2%) followed by class III (22.6%) and II (12.8%). Average per capita income was 1417.6±1009.12 Indian national rupees. Most of families had one or two children i.e. 69.3%, 32(9.6%) families had more than three children. Mean birth order was 2.06±1.11. Immunization services available in government or municipal health facilities were utilized by 95.1% children. Immunization card was available with 84.9% caregivers/mothers. About 87% children were having BCG scar. Immunization coverage: 75% children were fully immunized, 22.3% were partially immunized and 2.7% were unimmunized.

As observed from Table 2, according to the informants, the main reason for partial or non-immunization of the child was child being ill and not brought to hospital (17.53%), followed by the child being to native place (15.98%), unaware of need of immunization (9.79%), mother too busy (7.22%), postponed till another time (6.19%), fear of side effects (4.64%), and unavailability of vaccine at the session site (4.64%) etc. Family problem including illness of mother was also cited by 8 (4.12%) mothers as one of the reason for non immunization or partial immunization of their child.

Table 3: Association of Immunization coverage with socio-demographic factors (n=336)

Socio-demographic factors	Fully immunized (n=252) (%)	Partially/Unimmunized (n=84) (%)	Total	P value
Sex				
Female	113 (74.3)	39 (25.7)	152	0.800
Male	139 (75.5)	45 (24.5)	184	
Religion				
Hindu	62 (67.4)	30 (32.6)	92	0.139
Muslim	184 (78)	52 (22)	236	
Others	6 (75)	2 (25)	8	
Socio-economic status				
1 & 2	33 (67.3)	16 (32.7)	49	0.005
3	54 (71.1)	22 (28.9)	76	
4	142 (82.6)	30 (17.4)	172	
5	23 (59.0)	16 (41)	39	
Birth order				
1	103 (79.2)	27 (20.8)	130	<0.001
2	81 (78.6)	22 (21.4)	103	
3	55 (77.5)	16 (22.5)	71	
>=4	13 (40.6)	19 (59.4)	32	
Place of delivery				
Home	17 (54.8)	14 (45.2)	31	0.007
Hospital	235 (77)	70 (23)	305	
Presence of immunization card				
Yes	223 (78.2)	62 (21.8)	285	0.001
No	29 (56.9)	22 (43.1)	51	
Education(mother)				
Graduate	11 (68.8)	5 (31.2)	16	<0.001
Higher Secondary	43 (81.1)	10 (18.9)	53	
Secondary	153 (84.5)	28 (15.5)	181	
Primary	26 (70.3)	11 (29.7)	37	

P value <0.05 is significant

Table 4: Logistic Regression analysis between Immunization status as a dependent variable and various independent variables

Independent variables	Crude OR(95% C.I)	Adjusted OR(95% C.I)	P value
Gender(Female)	1.07(0.649-1.75)	0.169(0.076-0.376)	<0.001
Religion(Hindu)	0.59(0.345-0.998)	1.757(0.955-3.232)	0.070
Mother's Education(Illiterate & primary)	0.23(0.133-0.389)	17.527(7.363-41.725)	<0.001
Socio-economic class(II)	0.64(0.33-1.235)	7.555(2.279-25.047)	0.001
Socio-economic class(III)	0.77(0.433-1.362)	10.147(2.953-34.867)	<0.001
Place of Delivery(Home)	0.36(0.169-0.771)	0.849(0.310-2.320)	0.749
Immunization card(Absent)	0.37(0.196-0.682)	2.115(0.99-4.518)	0.053

OR=Odds Ratio

As evident from table 3, the association between socio demographic variables like socio economic status, birth order, place of birth, presence of immunization card, literacy of the parents and the immunization status were found to be statistically significant among these children. The association variables like Sex of the child, religion, occupation of the parents, type of family and the immunization status were not found to be statistically significant among these children.

As seen in table 4, the logistic regression model explained 30.8% (Nagelkerke R2) of the variance in partially immunized/unimmunized and correctly classified 78.6% of cases. Sensitivity was 40.5%, specificity was 91.3%, positive predictive value was 60.7% and negative predictive value was 82.1%. Of the seven predictor variables only three were statistically significant: gender, education of mother and SE class 2 and 3. Female children had associated with reduction in likelihood of being partially immunized or unimmunized than male children. Children of Illiterate or primary educated mothers had 17.527 times higher odds to remain partially immunized/unimmunized than mothers having education more than or equal to secondary level. Children belonged to SE class II & III had 7.5 & 10.14 times higher odds to remain partially/unimmunized than SE class V.

DISCUSSION

In this study, immunization coverage was: 75% children were fully immunized, 22.3% were par-

tially immunized and 2.7% were unimmunized, which is less than the desired goal of achieving 85% coverage.[8] The present study shows higher immunization coverage 80.95% as compared to NFHS-III (2005-06) data (43.5%).[8] It was due to efforts taken by health services in urban slum. Yadav et al revealed that percentage for fully immunized children was 73.3% and for partially immunized children it was 23.8%, and for unimmunized it was 2.8%.[14] Somewhat similar findings were seen in the study by Tapare et al at Miraj.[15] Another study by Punith et al also found that overall vaccination coverage of completely immunized children was 92.10% and the percentage of partially immunized was 6.58%, and unimmunized children accounted for 1.31%.[16] Similar level of coverage was also documented in other studies by Kumar and Chaudhary et al, Kar et al and Khokhar et al in urban slums of Delhi and Ahmadabad city.[17-19]

It was observed in our study the main reason for non-vaccination of the child was child being ill and not brought to hospital(17.53%), followed by the child being to native place(15.98%), unaware of need of immunization(9.79%), mother too busy(7.22%), postponed till another time(6.19%), and fear of side effects(4.64%) etc. The parents perceived that illness of the child was a contraindication for immunization of the child and hence the child did not receive immunization. Parents in their preoccupation to earn their livelihood postponed the immunization to suit their requirements and immunization of the children was not given priority. Nath et al have stated that the commonest reasons for partial immunization of children was unavailability of both parents (17.2%) to fulfill the child needs as they were preoccupied with livelihood generation activities.[20] Other reasons were visit to native place (14.7 %), carelessness (11.7%), apprehensiveness due to sickness of the child as a result of vaccination (11.7%) and lack of knowledge (10.4%). Kar et al (2001) stated that lack of knowledge in mothers was the major cause of non-immunization.[18] Visit to native place, carelessness (11.7%), apprehensiveness due to sickness of child or a sibling were the reasons for partial immunization. In the study done by Mathew et al (2002), the major reasons for non-immunization of the children were: migration to a native village (26.4 %); domestic problems (9.6 %); the immunization center was located too far from their home (9.6 %); child was unwell when the vaccination was due (9 %).[21] Twelve percent of the mothers could not give any reasons for non-immunization.

In contrary to the normal belief that the girl child is usually neglected and not fully immunized, in our study we did find difference but was not found to be statistically significant. Similar trend was noted in study conducted by Kar et al[20] (2001) in slum areas of Delhi 2004.[18] Study by Nirupam et al (1990), revealed among fully immunized children males (39%) were more than females (30%).[22] There was significant association between the socio economic status and the immunization status of children. Percentage of unimmunized children decreased as socioeconomic status improved. Similar trend of fully immunized children in modified Prasad's Socio-economic classes was noted in study done by Kumar and Chaudhary et al (2010).[17] It is observed that those children born in hospital had a higher immunization coverage rates than those delivered at home. In the study conducted at urban slums of Lucknow by Nath et (2008) found that children born at home were found to be less likely to receive any vaccination.[20] As level of education of mother increases number of unimmunized children decreased. In study by Chhabra P et al (2007), literate mothers were 1.43 times more likely to get their children fully immunized.[23]

Among the employed mothers, number of fully immunized children was more than that of in home maker women. It can be appreciated that the mothers in spite of being employed found time to get their children fully immunized.

These variations in reasons for non-immunization in different areas and different studies might probably be due to variations in the literacy, socio demographic variation in different geographical locations, availability of health facility, efficiency of immunization services, lack of supervision and health monitoring systems across the country.

Since immunization is multi-sectoral activity, it definitely needs active intersectoral cooperation. Parents are to be educated about the importance of right time of immunization and maintaining immunization records and its role in the health of the child. Vigilant and frequent supervision and monitoring of immunization services is required. Timely reporting of new migrants by anganwadi workers will help to improve coverage at local level and reduce cases of non-immunization. Regular health education sessions and motivation through an encouraging and persuasive interpersonal approach, regular reminders and removal of misconceptions prevailing among people and improving the quality of the services at the health facility will solve the problems of delayed, partial and non-immunization.

As a slum mainly having Muslim population, interventions like awareness sessions for community leaders may be organized to increase community participation, display banners and posters in mosque or durgah with due permission and provision of IEC material printed in Urdu or Hindi or Marathi. Pulse polio days should be utilized as a

good opportunity for the advocacy of routine immunization to caregivers.

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REFERENCES

1. WHO Factsheet. Available at: [http://www.who.int/ mediacentre/factsheets/fs378/en/] .Accessed on November 7th 2014.
2. Matsumura T, Nakayama T, Okamoto S, et al. Measles vaccine coverage and factors related to uncompleted vaccination among 18-month-old and 36-month-old children in Kyoto, Japan. BMC Public Health 2005; 5:59-65.
3. Torun SD, Bakirci N. Vaccination coverage and reasons for non-vaccination in a district of Istanbul. BMC Public Health 2006; 6:125-30.
4. Anand S, Bärnighausen T. Health workers and vaccination coverage in developing countries: an econometric analysis. Lancet 2007; 369:1277-85.
5. Bonu S, Rani M, Baker TD. The impact of the national polio immunization campaign on levels and equity in immunization coverage: evidence from rural North India. Soc Sci Med 2003; 57:1807-19.
6. Brugha R, Starling M, Walt G. GAVI, the first steps: lessons for the Global Fund. Lancet 2002; 359:435-38.
7. K Park, Park's Textbook of Preventive and Social Medicine, 22 edition, Jabalpur: Bhanot Publishers; 2013; p 113-233.
8. International Institute for Population Sciences, 'Introduction, Child Health, Maternal Health in National family Health Survey (NFHS-III), Volume I, International Institute for Population Sciences publishers, 2005-06; p 198-278.
9. International Institute for Population Sciences, 'District Level Household Survey IV', International Institute for Population Sciences publishers Mumbai, 2012-13; p 1-7.
10. Lodha R, Dash NR, Kapil A, et al. Diphtheria in urban slums in north India. Lancet 2000; 355:204-9.
11. Jutand M, Salamon R. Lot quality assurance sampling: methods and applications in public health. Rev Epidemiol Sante Purlieu 2000; 48:401-8.
12. World Health Organization, 'Monitoring immunization services using the lot quality technique', Geneva, World Health Organization, 1996 (WHO/VRO/TRAM/96.01); p 1-11.
13. Sharma R. Revision of Prasad's social classification and provision of an online tool for real-time updating. South Asian Journal of Cancer. 2013; 2:157-162..
14. Yadav S, Mangal S, Padhiyar N, et al. Evaluation of immunization coverage in urban slums of Jamnagar city. Indian J Community Med 2006; 31:300-1.
15. Tapare VS, Borle PS. Assessment of vaccination performance by lot quality technique in an urban community of Miraj. Indian J Community Med 2006; 31:182-5.
16. Punith K, Lalitha K, Suman G, et al. Evaluation of primary immunization coverage of infants under universal immunization programme in an urban area of Bangalore city using cluster sampling and lot quality assurance sampling techniques. Indian J Community Med 2008; 33:151-5.
17. Chaudhary V, Kumar R, Agarwal VK, et al. Evaluation of Primary immunization coverage in an urban area of Bareilly city using Cluster Sampling Technique. NJIRM 2010; 1:10-5.
18. Kar M, Reddaiah VP, Kant S. Primary immunization status of children in slum areas of south Delhi - The challenge of reaching the urban poor. Indian J Community Med 2001; 26:151-4.
19. Khokhar A, Chitkara A, Talwar R, et al. 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; 36:83-6.
20. Nath B, Singh JV, Awasthi S, et al. KAP Study on Immunization of Children in a City of North India – A 30 Cluster Survey. OJHAS 2008; 7:1-6.
21. Mathew JL, Babbar H, Yadav S. Reasons for non-immunization of children in an urban, low income group in North India. Trop Doct 2002; 32:135-8.
22. Nirupam S, Chandra R, Srivastava VK. Sex bias in immunization coverage in urban area of UP. Indian Paediatrics 1990; 27:338-41.
23. Chhabra P, Nair P, Gupta A, et al. Immunization in Urbanized village of Delhi. Indian Journal of Pediatrics 2007; 74:131-4.