Original Article

A study to assess the immunization coverage in an urban slum of Mumbai by lot quality technique

Abstract

Background: Immunization against childhood disease is one of the most cost effective public health interventions available and has saved the lives of millions of children in the past three decades. Immunization also prevents many more millions from suffering debilitating illness and lifelong disability. Achieving and maintaining high level of immunization among children is necessary for the control and elimination of the major preventable diseases of childhood. **Objectives**: A present study was conducted to assess the immunization coverage and the impact of socio-demographic profile on that in an urban slum area in Mumbai city. **Material and Methods**: A cross-sectional study was carried out in the field practice area (cheetah camp urban health centre) of the T. N. Medical College, Mumbai during the period of January 2007 to October 2008. A total of 352 children from cheetah camp area in the age group of 12–23 months during the study period were selected by using lot quality technique. Results were analyzed using Statistical Package of Social Sciences (SPSS) version 13.0. **Results:** In the present study, out of the 352 children taken in to consideration, 55.40% were males and 44.60% were females. The overall coverage of immunization in the urban slum area was 88.07%. The most common reasons for not immunizing the child were: due to the visit to native place/village (14.00%), child was ill, hence not brought (8.20%), unaware of need to return for second and third dose (5.70%), and mother too busy (5.00%). **Conclusion:** In this study, as the overall coverage of immunization among the urban slum area is good but still it has pockets of non-immunization. Hence, more vigilant surveys should be conducted so that these pockets are identified properly and proper actions can be taken.

Key words: Immunization coverage, lot quality technique, primary health care, urban slum

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INTRODUCTION

National immunization program in India has a primary objective of reducing morbidity and mortality due to vaccine preventable diseases. The program employed a strategy based on immunization targets, which were quantitative and easy to monitor. Although the immunization coverage increased, the corresponding decline in vaccine preventable diseases was lower than expected.[1] It was realized that in the zeal to achieve targets, inadequate attention was given to the quality of immunization services. Mere providing vaccination does not guarantee a reduction in disease morbidity and mortality.[2] Lot quality technique is the recent technique developed to assess the vaccination performance rapidly. The purpose of utilization of lot quality technique is to identify quickly and scientifically the areas with poor performance and provide information for developing strategies to improve service quality. To evaluate the immunization coverage, the cluster sampling technique has been the most commonly used technique. But of late, lot quality sampling technique, which was commonly used in the industrial set-up to assess the quality of the lots of their products, is now used in the health services such as in evaluation of immunization coverage. Since lot quality sampling method requires only a small sample size and easier for staff to use, it is feasible for routine monitoring of vaccination coverage.[3] Hence the present study attempts to highlight methodology and application of lot quality technique to assess child vaccination performance in an urban slum community of Mumbai.

MATERIAL AND METHODS

A population-based cross-sectional survey was carried out in the field practice area (cheetah camp urban health centre) of the Topiwala National Medical College, Mumbai during the period of January 2007 to October 2008. The inclusion criteria for study subjects were those 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. The area was divided into 16 lots based on geographic divisions. 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 vaccinated 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 vaccinated. 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 352, based on 5% level of accuracy and 95% level of significance.[4] The estimated sample size for each lot was 22. A decision value (highest number of individuals in a lot not receiving a quality service and yet lot is acceptable) of 3 was selected based on lot sample size of 22 and low and high threshold set at 65% and 95%, respectively.

Trained investigators collected the information from 22 children in each lot. Only one child was selected from each household. Households were selected by simple random sampling method. Information regarding birth date, vaccination card, dates of vaccines received, presence of BCG scar and reasons for incomplete or no vaccination was collected through pretested questionnaire 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 three 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 nonquality 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 Kuppuswamy's classification.[5] Results were analyzed by using Statistical Package of Social Sciences (SPSS) version 13.0. Statistical significance was set at $P \leq 0.05$.

RESULTS

As observed from Table 1, among the study group, 55.4% were males and 44.6% were females. Majority (70%) of both mothers and fathers of the children under the study had middle to high school education and 4.9% mothers and 9.1% fathers had education above graduation level, only 12.2% of the mothers and 7.4% of the fathers under the study were illiterate. According to the Kuppuswamy's scale of socioeconomic status classification, nearly 13.35% of the families under study were from class II, whereas 63.57% of the populations were from class IV and class V and not a single family belonged to class I. Higher proportions (92.1%) of women in the study area were of parity 1–3. Immunization cards were available with 87.78% of the mothers' of children aged between 12 and 23

Table 1: The Bio-social characteristics of the study population (*n*=352)

Bio-social characteristics	Number	Percentage	χ^2 value d.f. *P*-value
Sex			$\chi^2 = 3.889$
Male	195	55.4	d.f.= 1
Female	157	44.6	*P*= 0.0486
Religion			
Hindu	224	63.6	$\chi^2 = 202.79$
Muslim	122	34.7	d.f.= 2
Christian	06	1.7	*P*<0.0001
Education (mother)			
Illiterate	43	12.2	$\chi^2 = 263.30$
Primary	16	4.6	d.f.= 5
Secondary	118	33.5	*P*<0.0001
Higher secondary	137	38.9	
Graduate	36	10.2	
Postgraduate	02	0.6	
Education (father)			
Illiterate	26	7.4	$\chi^2 = 357.97$
Primary	13	3.7	d.f.= 5
Secondary	116	32.3	*P*<0.0001
Higher secondary	155	44.1	
Graduate	37	10.6	
Postgraduate	05	1.5	
Occupation (mother)			
Unemployed	342	97.1	$\chi^2 = 1310.01$
Unskilled worker	01	0.3	d.f.= 4
Semiskilled worker	02	0.6	*P*<0.0001
Skilled worker	01	0.3	
Semi-professional	00	0.0	
Professional	06	1.8	
Occupation (father)			
Unemployed	12	3.4	$\chi^2 = 161.64$
Unskilled worker	60	17.0	d.f.= 5
Semiskilled worker	56	15.9	*P*<0.0001
Skilled worker	113	32.1	
Semi-professional	09	2.6	
Professional	102	28.9	
Socioeconomic status			
Class I	00	0.0	$\chi^2 = 133.43$
Class II	47	13.4	d.f.= 3
Class III	83	23.6	*P*<0.0001
Class IV	178	50.5	
Class V	44	12.5	
Birth order			$\chi^2 = 240.18$
1–3	324	92.1	d.f.= 1
>3	28	7.9	*P*<0.0001
Place of birth			$\chi^2 = 237.27$
Health facility	321	91.2	d.f.= 1
Home	31	8.8	*P*<0.0001
Presence of immunization card	309	87.8	$\chi^2 = 247.23$ d.f.= 1
Have	43	12.2	*P*<0.0001
Don't have			
Immunization status			
Fully vaccinated <1 year	271	76.9	$\chi^2 = 301.91$
Fully vaccinated >1 year	39	11.2	d.f.= 2
Not fully immunized	42	11.9	*P*<0.0001

Table 2: Reasons for nonimmunization in the study population (*n*=42)

Reasons for nonimmunization	Frequency	%
Lack of information		
Unaware for need for immunization	28	8.00
Unaware of need to return for 2nd and 3rd dose	20	5.70
Place and/or time of immunization unknown	11	3.10
Fear of side effects/reactions	07	2.00
Wrong ideas about contraindications	06	1.70
Lack of motivation		
Postponed until another time	06	1.70
Obstacles		
Place of immunization too far	02	0.60
Time of immunization inconvenient	01	0.30
vaccinator absent	01	0.30
Vaccine not available	09	2.60
Mother too busy	19	5.40
Family problem including illness of mother	10	2.80
Child ill not brought	29	8.20
Child ill brought but not given immunization	07	2.00
Long waiting time	02	0.60
Others	50	14.00

Others – includes visit to native place or other siblings not well

months. Among the study group, the percentage of births occurring in a health facility is 91.9%. Vaccination coverage: 76.99% of the children were fully immunized in less than 1 year, 11.08% of the children were immunized above the age of 1, and 11.93% of the children were not fully immunized among the study group.

As observed from Table 2, according to the respondents, the most common reasons for not immunizing the child were: due to the visit to native place/village (14%), child ill and not brought (8.20%), unaware of need for immunization (8%), unaware of need to return for second and third dose (5.70%), and mother too busy (5%).

As evident from Table 3, the gender of the child did not significantly affect the immunization status of the child. But there was significant association between religion and immunization status of the children. There was no significant difference between the socio-economic status and the immunization status of the children even though the study group consisted of 13.35% of the population belonging to higher socio-economic class but still there were 12.80% of the children unimmunized. In the study, it was found that those children born in hospital had a higher immunization coverage rates than those delivered at home. There was significant association between immunization status of the children and the place of delivery of the children. It was also found that, those mothers having the

Table 3: Association of immunization coverage with socio-demographic factors

Socio-demographic factors	Immunization status			Total
	No. of fully vaccinated children < 1 year	No. of fully vaccinated children > 1 yr	No. of unimmunized children	
Sex				
Male	155 (79.50%)	15 (7.70%)	25 (12.80%)	195 (100%)
Female	116 (73.90%)	24 (15.30%)	17 (10.80%)	157 (100%)
Total	271 (77.00%)	39 (11.10%)	42 (11.90%)	352 (100%)
Chi-square value= 5.171, df= 2, ***P***-value=0.0753 (not significant)				
Religion				
Muslim	159 (71.00%)	32 (14.30%)	33 (14.70%)	224 (100%)
Hindu ^	107 (87.70%)	7 (5.70%)	8 (6.60%)	122 (100%)
Christian ^	5 (83.30%)	0 (0.00%)	1 (16.70%)	6 (100%)
Total	271 (77.00%)	39 (11.10%)	42 (11.90%)	352 (100%)
Chi-square value= 12.650, df= 2, ***P***-value=0.0018 (significant), ^ - Row data pooled and chi-square test reapplied				
Socio-economic status				
Class I $	00 (0.0%)	00 (0.0%)	00 (0.0%)	00 (0.0%)
Class II	33 (70.20%)	8 (17.00%)	6 (12.80%)	47 (100%)
Class III	61 (73.50%)	9 (10.80%)	13 (15.70%)	83 (100%)
Class IV	139 (78.10%)	16 (9.00%)	23 (1290%)	178 (100%)
Class V	38 (86.40%)	6 (13.60%)	0 (0.00%)	44 (100%)
Total	271 (77.00%)	39 (11.10%)	42 (11.90%)	352 (100%)
Chi-square value= 97.98, df= 6, ***P***-value=0.1334 (not significant) $= not included in calculation				
Place of delivery				
Health facility	255 (79.40%)	36 (11.20%)	30 (9.30%)	321 (100%)
Home	16 (51.60%)	3 (9.70%)	12 (38.70%)	31 (100%)
Total	271 (77.00%)	39 (11.10%)	42 (11.90%)	352 (100%)
Chi-square value= 23.332, df= 2, ***P***-value=0.0001 (highly significant)				
Immunization card				
Have	244 (79.00%)	39 (12.60%)	26 (8.40%)	309 (100%)
Don't have	27 (62.80%)	0 (0.00%)	16 (37.20%)	43 (100%)
Total	271 (77.00%)	39 (11.10%)	42 (11.90%)	352 (100%)
Chi-square value= 32.941, df= 2, ***P***-value=0.0001 (highly significant)				

immunization card had immunized their child completely rather than those who did not have the card. There was significant association between immunization status of the children and the presence of the immunization card.

DISCUSSION

In the present study, immunization cards were available with 87.78% of the mothers' of children aged between 12 and 23 months. Coverage was better in case of children who had their immunization cards available. This shows that mothers probably were well motivated and have understood the importance of maintaining such records with them for follow-up. Similar results were shown in the studies conducted by Tapare *et al.*[6] and Kadri *et al.*[7] in which 81.25% and 88.4% of the mothers possessed the immunization card with them, respectively. Similarly the study conducted by Yadav *et al.*[8] for evaluation of immunization coverage in urban slums of Jamnagar city, showed that the immunization card was possessed with 74.28% mothers of children aged 12–23 months. It was also evident from National Family Health Survey III (NFHS-III)[9] survey results that only 12.22% of the mothers did not have the immunization cards with them.

In this study, vaccination coverage was: 76.99% of the children were fully immunized in less than 1 year, 11.08% of the children were immunized above the age of 1 year, and 11.93% of the children were not fully immunized among the study group, which is less than the desired goal of achieving 85% coverage.[9] NFHS-III reports that only 54.7% of the urban children are fully vaccinated.[9] Somewhat similar findings were seen in the study by Tapare *et al.*[6] at Miraj. Yadav *et al.*[8] 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%. Another study by Punith *et al.*[10] 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%. Similar level of coverage was also documented in other studies by Kadri *et al.*,[7] Khokhar *et al.*,[11] and Kar *et al.*[12] in urban slums of Ahmadabad and Delhi city, respectively.

According to the respondents, the most common reasons for not immunizing the child was: due to the visit to native place/village (14%), child ill and not brought (8.20%), unaware of need for immunization (8%), unaware of need to return for second and third dose (5.70%), and mother too busy (5%). Similarly, a study conducted at Lucknow by Nath *et al.*[13] showed similar results, visit to the native place/village (14.7%), carelessness (11.7%), apprehensiveness due to sickness of the child or an elder sibling as a result of vaccination (11.7%), and lack of knowledge (10.4%). Kar *et al.*[12] also revealed that the major cause for incomplete immunization was postponement of vaccination due to illness of the child (30.8%), lack of knowledge of immunization schedule (23.1%), and migration to native village (23.1%). Another study by Yadav *et al.*[8] also found that the main reasons for dropout or unimmunization of children were visit to native place/village in about 80% and 20% inconvenience in the rest. Kadri *et al.*[7] also revealed that the main reason for dropout or nonimmunization of the children may be ignorance and illiteracy among parents. Punith *et al.*[10] also revealed that unaware of the need of immunization followed by fear of side reaction was the major reason for nonacceptance/discontinuation of immunization.

As observed, gender of the child did not significantly affect the immunization status of the child. Similar results were found in another study at Delhi by Kar *et al.*,[12] which reported that the sex of the child did not affect significantly the immunization of the child. The percentage of births occurring in a health facility is 91.9% and remaining mothers gave birth to their babies at home among the study group. This finding was slightly similar to the NFHS-III data, which shows that 67.5% of the births in urban area do occur in the health facility.[9] This might be due to the availability of health facilities in their vicinity. Present study shows higher vaccination coverage (88.07%) as compared with the National data 43.5%[9] and studies conducted in Madhya Pradesh[14] and in Rajasthan[15] that found 60.8% and 67.3% coverage rate of vaccination, respectively.

There was significant association between religion and immunization status of the children. The children belonging to the Hindu community have a higher coverage of vaccination as compared with the Muslim community. A study conducted at Lucknow by Nath *et al.*[13] found similar results with the impact of religion on the immunization status of the children.

In the study, it was found that those children born in hospital had a higher immunization coverage rates than those delivered at home. Similarly the study conducted at urban slums of Lucknow by Nath *et al.*[13] found that children born at home were found to be less likely to receive any vaccination.

CONCLUSION

In this study, as the overall coverage of immunization among the urban slum area is good but still it has pockets of nonimmunization. Immunization is often cited as being one of the most cost-effective public health interventions. Hence, more vigilant surveys should be conducted so that these pockets are identified properly and proper actions can be taken. 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 nonimmunization.

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