EVALUATION OF PRIMARY IMMUNIZATION COVERAGE AMONG CHILDREN AND FACTORS INFLUENCING THE IMMUNIZATION COVERAGE IN URBAN AREA OF RAICHUR

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ABSTRACT

Background: Despite the concerted efforts of the government, a large proportion of vulnerable infants and children remain unimmunized. Though overall immunization coverage rates of Karnataka appear to be acceptable, some districts within the state have poor coverage rates. Districts in North Karnataka have poor immunization coverage when compared to districts in South Karnataka.
Objectives: 1. To assess the primary immunization coverage in children aged between 12-23 months. 2.To study the factors influencing the immunization coverage.
Material & Methods: Community based cross sectional study carried out in the urban area of Raichur town among children aged between 12-23 months by WHO-Cluster sampling method.
Results: 71% of the children were fully immunized, 28.1% were partially immunized and 0.9% of them were not immunized. The coverage of BCG, OPV3, DPT3, and measles was 95.7%, 79%, 79% and 72.9% respectively. The coverage of Hep3 was 79.5%. Factors like socio-economic status, occupation and education of parents, place of delivery, birth order of the child, presence of immunization card and number of antenatal visits were found to influence the immunization coverage.
Conclusion: The immunization coverage in the urban area of Raichur has improved markedly over the past years. But still there is scope for improvement by concentrating on the factors which are influencing utilization of immunization services.
Keywords: Primary immunization, Fully immunized, Partially immunized, Immunization coverage, WHO-30 Cluster sampling.

INTRODUCTION

Immunization is one of the most successful and cost-effective health interventions ever. It has eradicated small-pox, lowered the global incidence of polio so far by 99% and achieved dramatic reductions in illness, disability and averted millions of death resulting from vaccine preventable diseases. Despite these achievements, global commitment to immunization has not been sustained in all countries. In 2003 an estimated 27 million infants worldwide remained in need of immunization[1]. In May 1974, the World Health Organization (WHO) officially launched a global immunization programme, known as the Expanded Programme on immunization (EPI). EPI was launched in India in 1978. The programme was revised & renamed as Universal Immunization Programme (UIP) in 1985 [2]. The impact of UIP is measured in terms of Vaccine Preventable Disease (VPD) burden. Over the last 15 years

there has also been a general decline in the reported number of cases of the six main VPD[3]. In spite of its undisputed past success and promising future, however immunization remains an unfinished agenda[1]. India has the largest pool of never immunized children in the world[4]. Strengthening the routine immunization can have a major impact on under- five mortality and morbidity not only in India, but also globally[5]. As per National Family Health Survey-3 (NFHS-3), in India only 44% of children aged 12-23 months are fully vaccinated[6]. In Karnataka, there has been a decline in full vaccination coverage between NFHS-2(60%) and NFHS-3(55%), and full vaccination coverage in NFHS-3 is only slightly higher than it was at the time of NFHS-1(52%)[7]. Though overall immunization rates in Karnataka are acceptable, some districts have poor immunization rates and there is a clear divide between north and south Karnataka in comparison to immunization coverage. Districts in North Karnataka have

poor immunization coverage when compared to southern district [8]. Hence this study was carried out in urban area of Raichur, a district in North Karnataka to assess the primary immunization coverage in children aged 12-23 months.

OBJECTIVES

➢ To assess the primary immunization coverage in children aged between 12-23 months.
➢ To study the factors influencing the immunization coverage.

MATERIALS & METHODS

The present Community based cross sectional study was carried out in the urban area of Raichur town among children aged between 12-23 months from June 2011-July 2011. The research protocol was approved by the Institutional Ethics Committee. WHO 30 Cluster sampling technique was used for the selection of subjects. The sample size to assess immunization coverage in children aged 12-23 months was obtained by the formula [9].

$$n_{min} = DE \times \frac{Z^2_{1-\alpha} \times p \times (1-p)}{d^2}$$

n_{min} = minimum total number of children to be sampled, DE = Design Effect = 2,

$Z_{1-\alpha}$ = 1.96, P = the expected coverage in the local area was assumed to be 50%

d = desired width of the confidence interval = 10%

$$= 2 \times \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.1)^2} = 192$$

Number of children in each cluster = 192/30 = 6.4 = 7.

Hence the sample size was = 7 x 30 = 210

After taking informed verbal consent, a predesigned questionnaire was used to collect data from the immediate caretakers of children aged between 12 and 23 completed months for assessing immunization coverage. Immunization cards of the children were also verified to assess their immunization status. In case of children without immunization card, immunization history was collected from the caretaker regarding the time when the child was immunized and the site of injection. Data was entered in Microsoft Excel and analysis was done using Epi Info 6.

RESULTS

The present study was carried out in the urban area of Raichur town among children aged between 12-23 months. The mean age of the study subjects was 17.2 months ± 3.6 SD.

Table 1: Distribution of children based on their age and gender

Age of the child in months	Gender of the child		Total
	Male	Female	
	Frequency (%)	Frequency (%)	Frequency (%)
12-14	29 (48)	32 (52)	61 (29.0)
15-17	22 (59.5)	15 (40.5)	37 (17.6)
18-20	27 (42.9)	36 (57.1)	63 (30.0)
21-23	28 (57.1)	21 (42.9)	49 (23.3)
Total	106 (50.5)	104 (49.5)	210(100)

As seen in Table 1, majority of children were in the age group of 18-20 months (30%), followed by 29% children belonging to the age group 12-14 months. In our study 50.5% of the children were males and 49.5% were females.

Majority of the children, i,e 56.7% were Hindus, 42.4% were Muslims and 0.9% were Christians. About 56.7% children belonged to joint family while 43.3% children belonged to nuclear family. Majority of the children (48.6%) belonged to upper socio-economic class like class I and class II, 27.1% belonged to middle class and 24.3% belonged to lower socio-economic class like class IV and class V. Out of 210 children, 71% (149) were fully immunized, 28.1% (59) were partially immunized and 0.9% (2) of them were not immunized.

Table 2: Association between socio-demographic factors and immunization status

Variable	Partially &Not Immunized (n=61) n (%)	Completely immunized (n=149) n (%)	χ^2	p
Gender Male Female	30(28.3) 31(29.8)	76(71.7) 73(70.2)	0.058	>0.05
Religion Hindu Non-Hindus	31(26.1) 30(33.0)	88(73.9) 61(67.0)	1.197	>0.05
Type of family Nuclear Joint	27(29.7) 34(28.6)	64(70.3) 85(71.4)	0.030	>0.05

Socioeconomic Status				
Upper	06(5.90)	96(94.1)		<0.01**
Middle	27(47.4)	30(52.6)	52.38	
Lower	28(54.9)	23(45.1)		
Occupation of Father				
Professional	01(2.40)	40(97.6)		
Business	14(23.3)	46(76.7)		<0.01**
Agriculture	01(6.70)	14(93.3)	37.32	
Skilled	20(40.8)	29(59.2)		
Unskilled	25(55.6)	20(44.4)		
Occupation of Mother				
Housewife	52(27.1)	140(72.9)	4.194	<0.05*
Working	09(50.0)	09(50.0)		
Education of Father				
Illiterate	23(59.0)	16(41.0)		
Primary	32(39.0)	50(61.0)	44.79	<0.01**
Secondary	04(21.1)	15(78.9)		
Graduate	02(2.90)	68(97.1)		
Education of mother				
Illiterate	30(58.8)	21(41.2)		
Primary	26(29.5)	62(70.5)	42.19	<0.01**
Secondary	05(21.7)	18(78.3)		
Graduate	00(0.00)	48(100)		
Antenatal checkups				
< 3	18(90.0)	02(10.0)	39.84	<0.01**
≥ 3	43(22.6)	147(77.4)		
Place of delivery				
Hospital	46(24.7)	140(75.3)	14.71	
Home	15(62.5)	09(37.5)		<0.01**
Birth order				
First	13(16.7)	65(83.3)		
Second	22(27.8)	57(72.2)	16.15	<0.01**
Third & above	26(49.1)	27(50.9)		
Immunization Card				
Present	40(22.5)	138(77.5)	24.50	<0.01**
Absent	21(65.6)	11(34.4)		
Distance from Immunization Center				
<30 min walk	52(29.9)	122(70.1)	0.345	>0.05
>30 min walk	09(25.0)	27(75.0)		

(* Significant, ** Highly significant)

As seen in Table 2, there was not much difference between the immunization status of males and females. It was observed that, Hindus (73.9%) had slightly better immunization status than Non Hindus like Muslims and Christians (67%). However it was not found to be statistically significant (P>0.05). About 71.4% of the children belonging to joint families and 70.3% belonging to nuclear families were fully immunized. The percentage of fully immunized, children were almost identical in both family types. Our study found that children belonging to upper socio economic classes like Class I and Class II were better immunized than those belonging to middle and lower socio-economic class (Class IV & Class V), and this was found to be highly significant(<0.01). About 97.6% of the children whose fathers were professionals were fully immunized. Our study found a highly significant association between the immunization status of children and

occupation of father (p<0.01). Children whose mothers were housewives were more completely immunized (72.9%) when compared to children of working mothers. Children whose parents were graduates had better immunization status when compared to children of illiterate parents or those children whose parents were educated up to primary school and secondary school. Our study found a highly significant association between the immunization status of children and education of both parents (p<0.01).

About 77.4% children whose mothers had three or more antenatal visits during pregnancy were fully immunized, while only 10% children whose mothers had less than three antenatal visits were found to be fully immunized. Our study found a highly significant association between the immunization status and the number of antenatal visits (P<0.01). About 75.3% children born at the hospital were fully immunized while 37.5% children born at home were fully immunized. Our study found a highly significant association between the immunization status and place of delivery (P<0.01). About 83.3% of the children who were of first birth order were fully immunized, 72.2% children who belonged to second birth order were fully immunized while only 50.9% children of birth order third and above were fully immunized. Hence our

study shows a significant association between the birth order and immunization status (p<0.01). It was observed that 77.5% children who had immunization card were fully immunized, while only 34.4% of the children who did not have immunization card were fully immunized. This association was found to be highly significant.

The caretakers of children were enquired about the time taken to reach the immunization centre by walk. It was observed that children whose caretaker had to walk for more than 30 minutes to reach immunization centre were better immunized (75%) when compared to the children, whose caretaker had to walk for less than 30 minutes (70.1%) However this was not statistically significant (p>0.05).

Our study found that the coverage for BCG, DPT3, OPV3 and measles were 95.7%, 79%, 79% and 72.9% respectively. The coverage for Hep B3 was 79.5%. The coverage for BCG (95.7%) was found to be highest and that for measles (72.9%) was found to be lowest. 72.4% children had received Vitamin A along with measles at 9 months.

As seen in Table 3, the drop out rates between first and third dose of OPV (OPV1-OPV3) and first and third dose of DPT (DPT1-DPT3) were identical 15.3%.Drop out rate for Hep B vaccine was 13%.

Table 3: Drop-out rates for Immunization

Immunization status	Total No. of children	No. of children vaccinated	Percentage of drop-outs
BCG-DPT1	201	196	2.5
DPT1-DPT2	196	185	5.6
DPT2-DPT3	185	166	10.2
DPT1-DPT3	196	166	15.3
DPT3-Measles	166	153	7.8
BCG-Measles	201	153	23.9

A progressive increase was seen in the drop-out rate from the first to the third dose of each of the above mentioned vaccine. 201 children had received BCG vaccination and 153 children received measles vaccination. The dropout rate for primary immunization i.e. from BCG to Measles was found to be 23.9%.

Caretakers of children who were partially immunized and not immunized were asked the reason for not immunizing. The reasons were grouped under three categories as lack of information, lack of motivation and obstacles. Multiple responses were observed from some caretakers. Table 4, shows that majority of the caretakers quoted obstacles (60.6%) and lack of information (52.4%) as the reason for incomplete

immunization. About 24.5% parents told lack of motivation as the reason for non immunization.

Our study found that the major obstacles for incomplete immunization was illness of the child because of which parents did not take the child to the immunization centre (34.4%) and mother being too busy (9.8%) in her household work to take the child for immunization. Under the category lack of information, majority of the caretakers quoted fear of side reactions (31.1%) followed by unaware of the need for immunization (9.8%) as reasons for incomplete immunization. Under the category lack of motivation, 13.1% of the caretakers told they postponed immunization to a later date and 9.8% said they did not immunize the child as they did not have faith in immunization.

Table 4: Reasons for failure of immunization

Categories	Reasons for failure of immunization n = 61	Total	%
Lack of information	Unaware of need for immunization	6	9.8
	Unaware of the need to return for the second or the third dose	1	1.6
	Place &/ time of immunization unknown	4	6.5
	Fear of side reaction	19	31.1
	Wrong ideas about contraindications	2	3.3
	Total	32	52.4

Lack of motivation	Postponed until another time	8	13.1
	No faith in immunization	6	9.8
	Rumours	1	1.6
	Total	**15**	**24.5**
Obstacles	Place of immunization too far	2	3.3
	Time of immunization inconvenient	2	3.3
	Vaccine not available	1	1.6
	Mother too busy	6	9.8
	Family problems including illness of mother	1	1.6
	Child ill not brought	21	34.4
	Child ill, brought but not given immunization	4	6.5
	Long waiting time	0	0
	Total	**37**	**60.6**

DISCUSSION

Our study found that 71% of the children were fully immunized, 28.1% were partially immunized and 0.9% were not immunized. As per the DLHS-3 report, in Raichur district, 45.2% of the children were found to be fully immunized [10]. Our study shows a marked improvement in the immunization coverage when compared to the previous survey.

The Hindu children were found to be slightly better immunized than non-hindu children, but it was not statistically significant (p>0.05). A study carried out by Kar M et al[11] revealed almost similar immunization coverage among Hindus (69.9%) and non Hindus (66.7%). While a study by Trivedi SS et al [12] revealed that the immunization coverage was better in Hindu children than non Hindus and this association was statistically significant. Our study did not show much difference in the immunization status of children belonging to Nuclear and joint family. Kar M et al found that children belonging to nuclear families (70.2%) were more likely to be completely immunized when compared to those belonging to joint families (60%). However the association was not statistically significant[11].

The immunization status of children belonging to Upper socio-economic class like class I and class II was better when compared to children from middle and lower socio-economic class. This association was found to be highly significant (P<0.01). Hence immunization status of children improves with increase in the socio-economic status. Poor immunization coverage among low socio economic status may be due to the thinking that they might loose a day's income if they take their children to immunization centre. In contrast to our finding, Kar M et al in their study showed that lower income group (73.5%) had better coverage when compared to higher income group (59.2%)[11].

Children whose father were professionals were better immunized (p<0.01), this can be due to better awareness and increased affordability of health services. Children whose mothers were housewife were found to be better immunized than children of working mothers (p<0.05). This show the working mothers were very busy and could not get their children immunised as per schedule.

The children whose parents had higher education were more completely immunized and this was found to be statistically highly significant (<0.01). Study carried out by Chhabra et al[13] and Chaudhry et al[14] showed similar findings. Dhadwal et al in their study revealed that increasing maternal education was associated with complete immunization[15]. This shows parental education especially maternal education plays a vital role in improving immunization status of children. Immunization status increases with increase in the level of education of parents.

Children whose mothers had three or more antenatal checkup were more completely immunized when compared to children whose mothers had less than three antenatal checkup (p<0.01). This might be because mothers attending antenatal visits are given health education by the hospital staff and made aware about the availability of health services. Children born at hospitals were more completely immunized than children born at home (p<0.01). Delivery in hospital exposes mothers to health personnel, making them aware about the immunization of children which may be probable cause of significant association in present study. Study carried out by Trivedi et al and Chabbra et al showed similar findings[12,13]. Mothers who deliver at home may be non users of health services in general. Hence there is a need to stress upon the institutional deliveries. It was observed that the percentage of fully immunized children decreased with increase in the birth order. Our study found a highly significant association between the birth order of children and their immunization status (p<0.01). This stresses the importance of small family size so that the children get proper care and attention.

Our study found a highly significant association between the presence of immunization card and the immunization status of children (p<0.01). Study carried out by Chabbra et al and Kumar et al showed similar findings[13,16]. Presence of immunization card reminds the mothers of the subsequent vaccinations to be given and thereby avoids drop outs and encourages them to completely immunize the child.

Our study did not find any significant association between the immunization status and distance from immunization centre (p>0.05). In contrast to our findings a study carried out by Ibnouf et al[17] showed that the walking time to the nearest place of immunization strongly influences the immunization status of children. A Study carried out by Nath et al showed that children whose caretakers took 20 minutes to reach the immunization site were more completely immunized as

compared to those who took more than 20 minutes[18].

Immunization coverage and drop-out rates:

In our study the coverage of BCG, OPV3, DPT3, and measles was 95.7%, 79%, 79% and 72.9% respectively. The coverage of Hep3 was 79.5%. The vitamin A coverage was 72.4%. As per DLHS-3 (2007-2008) reports, in Raichur district 45.2% of the children were found to be fully immunized. The coverage of BCG, OPV3, DPT3 & measles was 89.9%, 79.6%, 53.4% and 70% respectively. The Vitamin A coverage was found to be 47.5% [10]. Hence our study shows a marked improvement in the immunization coverage in Raichur over the past years.

In our study drop out rate between DPT1-DPT2 was 5.6%, DPT2-DPT3 was 10.2%, DPT1-DPT3 was 15.3% and BCG-Measles was 23.9%. The drop out rates between first and third dose of OPV (OPV1-OPV3) and first and third dose of DPT (DPT1-DPT3) were identical i.e. 15.3%. As per coverage evaluation survey carried out by UNICEF in 2009 [19], the drop out rate between DPT1-DPT2 was 5%, DPT2-DPT3 was 9%, DPT1-DPT3 was 13% and BCG-Measles was 15%.

Caretakers of children who were partially immunized and not immunized were asked the reason for not immunizing. The major reasons quoted by the caretakers were illness of the child (34.4%), fear of side reactions (31.1%), postponed immunizing until another time (13.1%), mother being too busy in household work (9.8%),unaware of the need for immunization (9.8%), no faith in immunization (9.8%) and unaware of the place or time of immunization (6.5%).

A study carried out by Gulati et al showed that the main reason for failure of immunization was illness of the child and family problems [20]. Study carried out by Yadav RJ et al showed that the main reason for incomplete immunization were lack of information and obstacles[21]. Study carried by Kar M et al showed that the major cause for incomplete immunization was postponement of immunization due to the illness of the child whereas mothers lack of information about place, schedule and eligible age of immunization constituted the main reason for non-immunization[11].

CONCLUSION

Our study showed that the primary immunization coverage in children in Urban area of Raichur has improved markedly over the past years, but there is still scope for improvement by concentrating on the factors influencing the immunization coverage.

REFERENCES

1. WHO. Global Immunization Vision & Strategy 2006-2015. 2005. Geneva. Available from: http://www.who.int/immunization_delivery/systems_policy /GIVS.pdf.
2. Park K, Park's Textbook of Preventive and Social Medicine, 20th Ed. Jabalpur: Banarsidas Bhanot Publishers;2009.
3. Kishore J. J. Kishore's National Health Programs of India. 8th Ed. New Delhi: Century Publications; 2009.
4. UNICEF. Progress for Children Report - A Statistical Review. 2007. New Delhi. Available from: http://www.unicef.org/india/media_3766.html.
5. WHO. India Universal Immunization Programme review. Available from: http://www.whoindia.org/linkfiles/Routine_immuniz ation_acknowledgements_contents.pdf.
6. IIPS and Macro International.2007. National Family Health Survey (NFHS-3), 2005-2006; India: Volume 1. International Institute for Population Sciences (IIPS) and Macro International, Mumbai: IIPS.
7. IIPS. Karnataka, National Family Health Survey (NFHS-3) 2005-06. Available from: http://www.nfhsindia.org/NFHS-3%20Data/Karnataka_report.pdf.
8. Government of India. Immunization, State UIP Plan-Karnataka. Ministry of Health and Family Welfare, Government of India. Available from: http://www.mohfw.nic.in/NRHM/PIP_07_08/karnata ka/immunisation_Text.pdf.
9. WHO. Immunization coverage cluster survey-Reference manual. 2005. Geneva.
10. IIPS, 2010. District Level Household and Facility Survey (DLHS-3), 2007-2008: India: Key Indicators: State and Districts, Mumbai: IIPS. Available from: http://www.rchiips.org/pdf/DLHS-3_KI.pdf.
11. Kar M, Reddaiah VP, kant S. Primary immunization status of children in slum areas of South Delhi- The challenge of reaching urban poor. Indian J Community Med 2001:26(3):151-54.
12. Trivedi SS, Mundada CR, Chudasama RK. Evaluation and impact of various factors affecting Universal Immunization Programme (UIP) coverage in Surat. Int J Epidemiol 2009; 6(2). Availablefrom:http://www.ispub.com/journal/the_int ernet_journal_of_epidemiology.html.
13. Chhabra P, Nair P, Gupta A, Sandhir M, Kannan A.T. Immunization in urbanized villages of Delhi. Indian J Pediatr 2007; 74(2):131-34.
14. Chaudhry V, Kumar R, Agarwal V.K, Joshi HS, Sharma M. Evaluation of primary immunization coverage in an urban area of Bareily city using cluster sampling technique. NJIRM.2010;1(4):10. Available from:http://njirm.pbworks.com/f/2Evaluation+of+Pri mary+immunization.pdf
15. Dhadwal D, Sood R, Gupta AK, Ahluwalia SK, Vatsayan A, Sharma R. Immunization coverage among urban and rural children in the Shimla hills. J Commun Dis. 1997;29(2):127-30.
16. Kumar D, Aggarwal A, Gomber S. Immunization status of children admitted to a Tertiary care hospital of North India: Reasons for partial immunization or non-immunization. J Health Popul Nutr 2010; 28(3):300-04.
17. Ibnouf AH, Vanden Borne HW, Mearse JAM. Factors influencing immunization coverage among children under five years of age in Khartoum state, Sudan. SA Fam Pract2007; 49(8):14. Available from:http://www.ajol.info/index.php/safp/ article/viewFile/13392/15707.

18. Nath B, Singh JV, Awasthi S, Bhushan V, Kumar V, Singh S.K. KAP study on immunization of children in a city of North India-A 30 Cluster survey. Online J Health Allied Scs.2008; 7(1):2. Available from: http://www.ojhas.org/ issue25/2008-1-2.htm.

19. UNICEF. Coverage Evaluation Survey, Government of India, Ministry of Health & Family Welfare, New Delhi: 2009. P.23-81

20. Gulati N, Sahgal K, Gogia V, Jain BK. Factors influencing immunization status of urban and rural children in Delhi. Indian J Community Med 1990; 15(4):180-84.

21. Yadav RJ, Singh P. Immunization status of children and mothers in the state of Madhya Pradesh. Indian J Community Med 2004; 29(3):147-48.