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Coverage evaluation of mission indradhanush immunization program in Urban and Rural Communities of Ahmedabad District of Gujarat

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Abstract
Background: Mission Indradhanush has been launched in December 2014 as a special drive to vaccinate all unvaccinated and partially vaccinated children. This study was conducted with an aim to know vaccines coverage after Mission Indradhanush immunization program was launched in Urban and Rural communities of Ahmedabad District, Gujarat.
Methods: Community based cross-sectional study carried out at places such as Urban slums with migration, Nomadic sites, Brick kilns, Construction sites, Underserved & hard to reach areas from July 2015 to July 2017. Cluster sampling method has been used, adapted from WHO 30-cluster sampling. Thirty (30) clusters were selected using probability proportional to the population size (PPS). Each PHC/UHC was taken as one cluster.
Results: Out of total 210, proportion of appropriately immunized children according to their respective age was 67.14% (141) & fully immunization coverage (FIC) rate in children age group 12-23 months was 74.60% (94). Completely missed children rate was 9.52% (12). Coverage of birth dose of oral polio (OPV_0) was highest 86.19% (181) with and coverage of birth dose of Hepatitis B ($HepB_0$) was lowest 43.33% (99) with. BCG coverage was 85.71%, OPV1, 2, and 3 coverage was 83.00%, 81.57% and 80.55% respectively. $Penta_{1, 2}$ and $_3$ coverage was 80.00%, 76.84% and 75.00% respectively. $Measles_1$ coverage was 74.65%. DPT booster coverage was 57.50% and $Measles_2$ coverage was 55.00%.
Conclusions: Present study found that around 5% children in age group 0-23 months received any vaccine for the first time in life. It was the group which usually missed by routine immunization and never contacted before Mission Indradhanush was launched. Due to Mission Indradhanush this 5% brought for vaccination and it was positive change. On another side 8.3% children did not receive any due vaccine in MI. Full immunization coverage rate was around 10-12% higher than National average coverage rate and around 25% higher than NFHS-4 (2015-16) Gujarat data. Significantly, males & children residing in urban communities aged 0-23 months were more likely to be immunized than females & rural communities.

Keywords: mission Indradhanush, cluster sampling, coverage evaluation, brick kilns

1. Introduction
Vaccines are one of the most successful and cost-effective health investments in history [1]. According to the State of the World's Vaccines and Immunization 2009 report, Immunization - even with the addition of the new, more costly vaccines - remains one of the most cost-effective health interventions [2].
The Expanded Programme on Immunization (EPI) was initiated by the Government of India in 1978 with the objective of reducing morbidity, mortality and disability from Vaccine Preventable Diseases (VPD) by making vaccination services available to all eligible children free of cost through the public health sector [3]. Immunization programme-World`s largest such programme in 1985. Initially the target was set to cover at least 85% of infants. However national socio-demographic goals in National Population Policy set a target of achieving Universal immunization of children by 2010 [4].
The Ministry of Health and Family Welfare, Government of India (MoHFW- GoI), launched Mission Indradhanush in December 2014 as a special drive to vaccinate all unvaccinated and partially vaccinated children. The Mission focuses on interventions to improve full immunization coverage for children in India from 65% in 2014 to at least 90% earlier than 2020; this will be done through special catch- up drives [5]. For successful implementation of immunization service all its components – planning of immunization sessions, cold-chain and logistics management, community mobilization, appropriate technique of vaccination etc. should be carefully looked into. In view of this, requires an in-depth evaluation [6]. The present study was conducted with an aim to know vaccines coverage after Mission Indradhanush immunization program was launched in urban and rural communities of Ahmedabad District, Gujarat.

Methods
A community based cross-sectional study was conducted in Urban and Rural communities of Ahmedabad District. These include immunization session sites at areas such as Urban slums with migration, Nomadic sites, Brick kilns, Construction sites, Underserved & hard to reach areas.
Cluster sampling method has been used which was adapted from WHO 30-cluster sampling. Thirty (30) clusters were selected using probability proportional to the population size (PPS) [7]. Each PHC or UHC was taken as one cluster [7] a list of all PHCs and UHCs of Ahmedabad was procured. A class interval (2, 43,844) was obtained by dividing the total

population by 30 (number of clusters). A random number less than the cluster interval (2, 43,844) was generated with the help of a currency note. The cluster, which represented this number, was picked up as the first cluster and subsequent clusters were selected by adding the cluster interval of 2, 43,844. Thus, 30 clusters were selected. 7 children of 0-23 months of age per cluster were observed. So total 30*7 = *210 children* were observed. The study was carried out from July 2015 to July 2017.

Data was collected by interviewing the parents of children with the help of pre tested, pre designed structured questionnaire & by observing them. Before data collection, informed consent was obtained from the participants. Data entry was done in Microsoft Excel and Data were analysed using Epi Info software (7.1.0.6). Collected data was checked for consistency. Simple proportions calculated and χ^2 test was applied to check statistical significance.

Results

Table 1: Area-wise distribution of children in the age group 0-23 months lived in Ahmedabad District (N=210)

Priority Areas	Ahmedabad District		
	Male No (%)	Female No. (%)	Total No. (%)
Urban slums with migration	87 (41.42)	75 (35.72)	162 (77.14)
Nomadic sites	06 (2.86)	05 (2.38)	11 (5.24)
Brick kilns	08 (3.80)	07 (3.34)	15 (7.14)
Construction sites	06 (2.86)	05 (2.38)	11 (5.24)
Underserved & hard to reach	06 (2.86)	05 (2.38)	11 (5.24)
Total	11 (53.80)	97 (46.20)	210 (100.00)

(Figures in parenthesis show percentages) χ^2=0.009 df=4*p value* = 0.99

Table-1 shows that out of total 210, maximum 77.14% (162) studied children lived in urban slums with migration areas. Amongst them 41.42% (87) were males and 35.72% (75) were females. Followed by 7.14% (15) children, lived at brick kilns. At nomadic sites, construction sites and underserved & hard to reach areas 5.24% (11) children lived in each. Out of total 210 children, 53.80% (113) were males and 46.20% (97) were females. Gender wise distribution in these areas was not found statistically significant.

Table 2: Age-wise distribution of children in the age group 0-23 months lived in Urban &Rural areas of Ahmedabad District (N=210)

Age Group (months)	Urban areas		Rural Areas		
	Male No. (%)	Female No. (%)	Male No. (%)	Female No. (%)	Total No. (%)
0-11	33 (15.71)	29 (13.81)	12 (5.71)	10 (4.76)	84 (40.00)
12-23	54 (25.71)	46 (21.91)	14 (6.67)	12 (5.71)	126 (60.00)
Total	87 (41.42)	75 (35.72)	26 (12.38)	22 (10.47)	210 (100.00)
Mean Age ± 2SD	12.11 (6.38)	12.25 (6.47)	12.17 (6.41)	12.42 (6.68)	12.23 (6.18)

χ^2=0.0032, df= 1, *p value* = 0.95 (Figures in parenthesis show percentages and ±2standard deviation in last row)

Table 2 depicts out of 210 studied children, 162 children (77.15%) lived in urban areas of Ahmedabad district. In age group of 0-11 months, 33(15.71%) were males and 29(13.81%) were females. In age group of
12-23 months, 54(25.71%) were males and 46(21.91%) were females.
Out of 210 studied children, 48 children (22.85%) lived in rural areas of Ahmedabad district. In age group of 0-11 months, 12(5.71%) were males and 10(4.76%) were females. In age group of 12-23 months, 14(6.67%) were males and 12(5.71%) were females. There was no statistically significant difference found in distribution between urban-rural & male-female population.

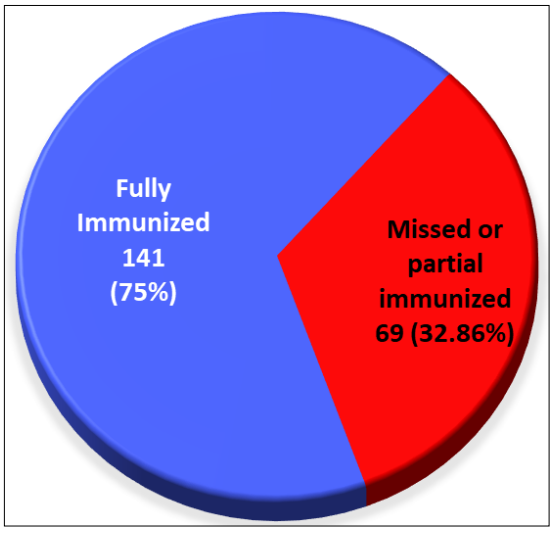

Fig 1: Immunization status of studied children in the age group 0-23 months lived in Ahmedabad District (N=210)

Figure 1 showed out of 210 surveyed children, 141 children (*67.14% with 95% CI, range: 60.52% to 73.48%*) were found appropriately immunized according to their respective age and 69 children (*32.86% with 95% CI, range: 26.52%to 39.48%*) were found partially or unimmunized.

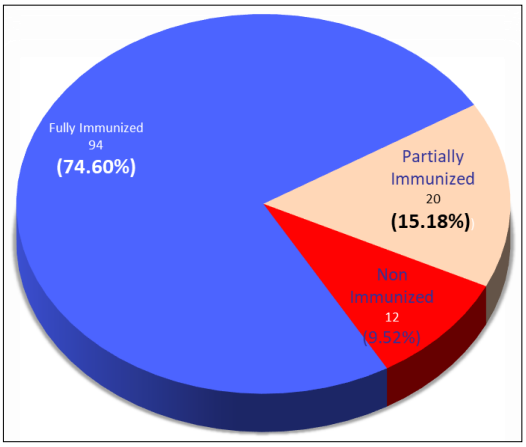

Fig 2: Fully Immunization coverage (FIC) status of children in age group 12-23 months of Ahmedabad District (N=126)

Figure 2 depicts out of 126 children in age group 12 – 23 months, 94 children (*74.60% with 95%CI, 68.60% to 80.60%*) were fully immunized, and 20 children (15.87% with 95% CI, 10.85% to 20.89%) were partially immunized and 12 children (9.52% with 95% CI,

Table 3: Availability of vaccination cards among children in age group 0-23 months lived in Urban & Rural areas of Ahmedabad District (N=210)

Vaccination cards		Urban N (%)	Rural N (%)	Total N (%)	P value and $\chi 2$
	Yes	121(57.62)	34(16.19)	155(73.80)	0.28
	No	41(19.52)	14(6.66)	55(26.20)	and
Total %		162(77.14)	48(22.85)	210(100)	0.6

(Figures in parenthesis show percentages)

Table 3 shows that out of 210 surveyed children, vaccination cards were available with 155 children. (73.80%, with 95% CI: 67.74 to 79.86%) Vaccination cards were not available with 55 children. (26.20%, with 95% CI: 20.14 to 32.26)

In Urban communities, 121 children (57.62%) out of 162 studied children had vaccination cards available whereas in rural communities, 34 children (16.19%) out of 48 studied children had vaccination cards available. There was no statistically significant difference found in availability of vaccination cards among urban and rural communities of Ahmedabad.

Table 4: Association between Immunization status and priority areas of present study among studied children in age group0-23 months lived in Ahmedabad District (N=210)

Priority Areas	Immunization status appropriate to age			χ^2 and p value
	Yes N (%)	No N (%)	Total No. (%)	
Urban slums with migration	119 (56.67)	43 (20.47)	162 (77.14)	
Nomadic sites	05 (2.38)	06 (2.86)	11 (5.24)	
Brick kilns	08 (3.80)	07 (3.34)	15 (7.14)	15.28 and
Construction sites	03 (1.42)	08 (3.82)	11 (5.24)	0.0041
Underserved & hard to reach	06 (2.86)	05 (2.38)	11 (5.24)	
Total	141 (67.14)	69 (32.86)	210 (100.00)	

(Bold data were statistically significant at 95% CI and P = 0.05)

Figures in parenthesis show percentages

Table 4 shows area-wise immunization status. Higher appropriate Immunization, 119(56.67%) was found in Urban slums with migration than rest of other areas. Lowest appropriate immunization, 03(1.42%) was found at construction sites. Difference in immunization status at different areas was found statistically significant.

Table 5: Coverage for individual vaccine in children age group 0-23 months lived in Urban & Rural areas of Ahmedabad District.

Vaccine coverage	Urban (%)	Rural (%)	Total (%)	95% CI
BCG	143 (68.09)	37 (17.62)	180 (85.71)	80.4 - 90.2
$HepB_0$	73 (34.76)	18 (8.57)	91 (43.33)	36.1 - 49.8
OPV_0	145 (69.04)	36 (17.14)	181 (86.19)	81.1 - 90.7
OPV_1 (2-23 months)	133 (66.50)	33 (16.50)	166 (83.00)	78.9 - 89.1
OPV_2 (3-23 months)	127 (66.84)	28 (14.73)	155 (81.57)	77.3 - 88.6
OPV_3 (4-23 months)	122 (67.77)	23 (12.78)	145 (80.55)	76.5 - 86.7
$Penta_1$ (2-23 months)	130 (65.00)	30 (15.00)	160 (80.00)	75.3 - 85.4
$Penta_2$ (3-23 months)	123 (64.74)	23 (12.10)	146 (76.84)	71.6 - 84.1
$Penta_3$ (4-23 months)	113 (62.78)	22 (12.22)	135 (75.00)	69.4 - 81.6
$Measles_1$ (9-23 months)	83 (56.55)	26 (17.80)	109 (74.65)	71.2 - 79.2
DPT booster (16-23 months)	37 (46.25)	09 (11.25)	46 (57.50)	48.7 - 68.5
$Measles_2$ (16-23 months)	36 (45.00)	08 (10.00)	44 (55.00)	45.5 - 67.35

Table 5 depicts coverage of different vaccines among studied 210 children in age group 0-23 months of Ahmedabad district. Coverage of birth dose of oral polio (OPV_0) was highest 181(86.19% with 95% CI: 81.1 - 90.7%) and coverage of birth dose of Hepatitis B ($HepB_0$) was lowest 99 (43.33% with CI: 36.1 - 49.8). BCG coverage was 85.71%, $OPV_{1, 2, \text{ and } 3}$ coverage was 83.00%, 81.57% and 80.55% respectively. $Penta_{1, 2 \text{ and } 3}$ coverage was 80.00%, 76.84% and 75.00% respectively. $Measles_1$ coverage was 74.65%. DPT booster coverage was 57.50% and $Measles_2$ coverage was 55.00%.

Discussion

In present study total 210 children of age group 0-23 months were included as study participants from five different types of MI specific priority areas. They were urban slums with migration 162(77.14%), nomadic sites 11(5.24%), brick kilns 15(7.14%), construction sites 11(5.24%) and underserved - hard to reach areas 11(5.24%). 162(77.14%) children were in urban communities (Urban slums with migration) and 48(22.85%) children were in rural communities (Nomadic sites, brick kilns, construction sites and underserved - hard to reach areas). (Table 1)

113 (53.80%) were males and 97 (46.20%) were females. Majority were Hindus. Similar distribution of male-female was found in a study done by GS Bhatt *et al.* in Ahmedabad 51.9% and 48.1% respectively.

Mean age of males in urban areas was 12.11 ± 6.38 months and of females was 12.25 ± 6.47 months. In age group of 0-11 months, 33(15.71%) were males and 29(13.81%) were females. In age group of 12-23 months, 54(25.71%) were males and 46(21.91%) were females. (Table 2)

Mean age of males in Rural was 12.17±6.41 months and of females was 12.23±6.18 months. In age group of 0-11 months, 12(5.71%) were males and 10(4.76%) were females. In age group of 12-23 months, 14(6.67%) were males and 12(5.71%) were females. (Table 2)

Out of total 210, proportion of appropriately immunized children according to their respective age was 141 (67.14%) & fully immunization coverage (FIC) rate in children age group 12-23 months was 94 (74.60%). Completely missed children rate was 12 (9.52%). (Figure 2, 3)

NFHS-4 [8] Gujarat reported, 50.4% FIC rate, Coverage Evaluation Survey [9] reported 56.6% FIC rate, 2.6% completely missed and DLHS-3[10] reported 54.9% FIC rate and 6.7% completely missed. Present study showed higher FIC rate around 25%, 18% and 20% respectively as compared to these (NFHS-4, CES, DLHS-3) surveys. Such results were found due to improvement in service delivery in Mission Indradhanush and also due to good access to the services. Significantly, higher appropriate Immunization found in urban slums with migration than rural. (Table 4)

Studies of GS Bhatt *et al.* [11] in Ahmedabad, Pankaj Kumar Gupta *et al.* [12] in Pune reported higher FIC rate (84% - 93%) than present study (74.60%). It was due to more vulnerable population selected from sensitive areas. It also showed more focused efforts needed in such areas.

Different factors were found to be associated with immunization coverage. Variations in the immunization coverage status based on gender, residence, socio-economic class and mother`s education were found significant and religion-wise not significant. Illiteracy and females were found to be significantly associated with partial or non-immunization. Similarly, Nath *et al.* [13] in Lucknow reported that illiteracy of the mother was significantly associated with partial immunization. A secondary analysis of NFHS-4 and DLHS-3 data also showed similar results.

A study was done by Kadri AM *et al.* [14] in urban slums of Ahmedabad showed no significant association between gender and immunization coverage but in present study it was opposite and found significant association.

When compared with a study done by MM Angadi *et al.* [15] in Bijapur city, Karnataka, found opposite results. That study reported factors such as mother's educational status and sex of the child were not statistically significant with immunization while in my study it was statistically significant.

Conclusion

Present study found that around 5% children in age group 0-23 months received any vaccine for the first time in life. It was the group which usually missed by routine immunization and never contacted before Mission Indradhanush was launched. Due to Mission Indradhanush this 5% brought for vaccination and it was positive change. On another side 8.3% children did not receive any due vaccine in MI.

Finally, Mission Indradhanush has played important role to increase immunization coverage and quality of process was cherry on the cake but it must be sustained.

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