Closing the Immunisation Gap: Immunisation Coverage Evaluation in Kollam Corporation, Kerala

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ABSTRACT

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Objectives: The objective of the current study was to assess the immunization coverage and various socio-demographic factors affecting the same in the urban population of Kollam Corporation.

Methodology: The 30*7 cluster sampling method of WHO was used for evaluation of immunization coverage. Seven subjects between age group of 12–23 months were selected from each of the 30 clusters. A child between 12–23 months old who received one BCG, three doses of pentavalent, three doses of OPV and a measles vaccine was considered as fully immunized; as unimmunized if received none of these vaccines and partially immunized if some dose given but immunization not complete. The collected data was numerically coded and entered in Microsoft Excel 2007, and then transferred to the SPSS (ver. 17). Bivariate and Multivariate analysis were conducted to identify independent predictors of immunization coverage.

Results: Eight (3.8%) children were partially immunized, while everybody had received at least one vaccine. The proportion of children fully immunized was 96.2% [95% CI 93.5- 98.8%]. The coverage of hepatitis B zero dose was 86.2%. Around 20 % of children born at a private hospital and 8% of the children born at a Government hospital had not received hepatitis B zero dose (p 0.008). About 50% of children had not received a dose of vitamin A in their first year of life. In the final model, lower educational status of mother (<10th standard) and not obtained a Government Immunization card during antenatal period were identified as factors associated with the partial immunization status of children.

Conclusion: There are partially immunized children in the community and appropriate action is to be taken. Coverage of vitamin A and hepatitis B zero doses need improvement.

Keywords: Immunisation coverage, Partial coverage, Complete coverage, antenatal immunisation, Determinants, Demographic factors

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INTRODUCTION

Immunization is one of the most cost-effective public health interventions to date, averting countless childhood deaths and protecting millions of children from disability and illness.[1] Polio is on the verge of eradication and deaths from measles have declined by 71 per cent worldwide, as a direct effect of immunisation.[2] However, immunization has not yet realized its full potential. Global vaccination coverage—the proportion of the world's children who receive recommended vaccines—has remained steady for the past few years. In 2013, an estimated 21.8 million infants worldwide were not reached with routine immunization services, of who nearly half live in 3 countries: India, Nigeria and Pakistan.[3]

The World Immunization Week signals a renewed global, regional, and national effort to accelerate action to increase awareness and demand for immunization by communities, and improve vaccination delivery services. This year's campaign focuses on closing the immunization gap and reaching equity in immunization levels as outlined in the Global Vaccine Action Plan, which is a framework to prevent millions of deaths by 2020 through universal access to vaccines for people in all communities.[4]

Immunization coverage refers to information on the proportion of children who have received specific vaccines or are up to date with the recommended vaccine schedule. This information is essential for planning immunization programmes, identifying vulnerable groups or areas that require targeting of increased resources, assessing the acceptability of a programme, and predicting likely vaccine-preventable disease epidemics.

The proportion of fully immunized children in Kerala

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State was estimated to be 75.3 per cent by the National Family Health Survey (2005-06).[5] The District-level Health Survey (2012-13) put it at 82.5 per cent.[6] Recently Kerala witnessed re-emergence of many vaccine preventable diseases which is alleged to be due to a drop in immunization coverage.

Even if State's immunization coverage levels are sufficiently high to block disease transmission, pockets of susceptibility may act as potential reservoirs of infection. It is therefore essential to know if undervaccination is a problem in specific population group, which involves determining inequalities in coverage level. Corporation areas are a concern, as the primary health care infrastructure and delivery are not so robust in urban settings in Kerala. The present cross-sectional study was undertaken to assess the immunization coverage and various socio-demographic factors affecting the same in the urban population of Kollam Corporation

METHODOLOGY

Kollam city has a population of about 3.6 lakhs. About 47,000 people are residing in slums. The Arabian Sea bordered the north-western region of Kollam city where many people earn a living by fishing. The literacy rate is 92%.

WHO's 30 cluster sampling method was used for evaluation of immunization coverage. Thirty clusters in the community were demarcated based on its population and sector-wise distribution. This included 4 slum areas. Seven subjects between age group of 12–23 months were selected from each of the 30 clusters. So, the final sample size was 210 children. The first household was selected randomly in each cluster and every next household was studied in a sequence, until a total of seven eligible children in the age group of 12–23 months were covered. On reaching the selected household, the mother of the eligible child (12–23 months) was interviewed by trained nurses.

Age was confirmed by birth certificate or immunization card or, when it was not available, by asking the mothers. SES was assessed using modified Kuppuswamy's scale. The child was considered as immunized or not, based on the immunization card. For those without an immunization card, information from the mother in the family stating that the child has been immunized was considered. The acceptability of the questions and logical structure were checked in the field during pre-testing.

A child between 12–23 months old who received one BCG, at least three doses of pentavalent, three doses of OPV and a measles vaccine was considered as fully immunized; as unimmunized if received none of these vaccines and Partially immunized if some dose given but immunization not complete

Preformed, pretested, structured questionnaire was used to collect information from mothers regarding socio-demographic parameters, status of immunization of their child, and reasons for noncompliance (if applicable).

The collected data was numerically coded and entered in Microsoft Excel 2007, and then transferred to the SPSS (ver. 17). Bivariate and Multivariate analysis were conducted to identify independent predictors of immunization coverage. Odds and Adjusted Odds Ratio (OR & AOR) and 95% Confidence Interval (CI) were used to estimate the strength of association between independent variables and the dependent variable

RESULTS

A total of 2413 houses were visited. Out of the 210 children studied, 54.8% were boys (115/210); 51.4% (108/210) were Hindus and 14.8% (31/210) were scheduled castes or scheduled tribes. Among them 51.4% (108/210) possessed a BPL Ration card while 3.8% (8/210) had no ration card at all. The socio demographic details of the study families were as shown in **Table 1**.

Table 1. Socio-demographic Characteristics of the study subjects (N=210)

Characteristics	Categories	Frequency	Percentage
Gender of child	Male	115	54.8
	Female	95	45.2
Religion	Hindu	108	51.4
	Christian	65	31
	Muslim	37	17.6
Caste	ST	04	1.9
	SC	27	12.9
	OBC	116	55.2
	Others	63	30
Ration Card	BPL	108	51.4
	APL	94	44.8
	No ration card	8	3.8
SES (Modified Kuppuswamy's scale)	Upper	10	4.8
	Upper Middle	28	13.3
	Lower Middle	48	22.9
	Upper Lower	122	58.1
	Lower	02	1

Table 2. Immunization status of the study children (N=210)

Immunization status	Frequency	Percentage
Fully Immunized	202	96.2
Partially Immunized	8	3.8
Un Immunized	0	-

Immunization coverage

In the study, eight (3.8%) children were partially immunized, while everybody had received at least one vaccine. The proportion of children fully immunized was 96.2% (202/210) [95% CI 93.5- 98.8%]

The immunization coverage status was shown in **Table 2** and the coverage of individual vaccines was shown in **Table 3**.

Table 3. Coverage of individual vaccines in the study children (N=210)

Name of vaccine	Frequency	Percentage
BCG	210	100
OPV (ZERO)	207	98.6
HEP-B (ZERO)	181	86.2
PENTA- 1	208	99
PENTA-2	206	98.1
PENTA-3	204	97.1
MEASLES	204	97.1

The coverage of hepatitis B zero dose was 86.2%. 20.2% (21/104) of children born at a private hospital and 7.7% (8/104) of the children born at a Government hospital had not received hepatitis B zero dose (p 0.008). All children in the study had received BCG Vaccine. BCG Scar was present in 95.6% (197/206) of the children examined. It was absent in 4.3% (9/206) of the children examined.

The coverage of hepatitis B zero dose was 86.2%. The coverage for pentavalent vaccine 1, 2 and 3 were 99, 98.1 and 97.1% respectively. The measles coverage was 97.1%. In the study, 50% (105/210) of children had not received a dose of vitamin A in their first year of life.

Determinants of immunization status

Among the males 3.5% and among the females 4.2% were partially immunized (p 0.53). In the study, 5.98% (7/124) of children from lower SES families, 1.3% (1/76) of middle SES families and none from the upper SES families were partially immunized. Out of the two children born at home, one was partially immunized. There was no statistically significant difference noticed between immunization status and caste or birth order. Educational status of mother <10th standard (OR 17.80, 95% CI 2.12-144.9, p 0.001) and the occupation of father as fisherman (OR 8.61, 95% CI 2.10-37.02, p 0.008) was significantly associated with the partial immunization status of the children. The results of the univariate analysis were shown in **Table 4**.

Table 4. Univariate analysis of factors associated with Immunization status of the children

Characteristics	Categories	Partially Immunized	Fully Immunized	Odds Ratio (95% CI)
Gender	Male	4 (3.5%)	111 (96.5%)	0.82 (0.19-3.36)
	Female	4 (4.2%)	91 (95.8%)	
Caste	SC/ST	1 (3.2%)	30 (96.8%)	0.82 (0.09-6.91)
	Others	7 (3.9%)	172 (96.1%)	
SES	Lower	7 (5.6%)	117 (94.4%)	5.08 (0.61-38.72)
	Middle/High	1(1.2%)	85 (98.8%)	
Education of Mother	<10th standard	7 (10.9%)	57 (89.1%)	17.80 (2.12-144.9)*
	>=10th std.	1(0.7%)	145 (99.3%)	
Occupation of Father	Fisherman	4 (16%)	21 (84%)	8.61 (2.10-37.02)*
	Others	4 (2.2%)	181 (97.8%)	
Place of Delivery	Home	1 (50%)	1 (50%)	33.6 (1.67-676.3)*
	Government	3 (2.9%)	101 (97.1%)	1
	Private	4 (3.8%)	100 (96.2%)	1.34 (0.29-6.17)
Birth order	1	4 (3.5%)	111 (96.5%)	1
	2	3 (3.8%)	77 (96.3%)	0.92 (0.20-4.25)
	3 and more	1 (7.1%)	14 (92.1%)	0.46 (0.05-4.5)
Received Govt MCP Card	No	6 (6.5%)	86 (93.5%)	4.05 (0.79-20.53)
	Yes	2 (1.7%)	116 (98.3%)	

*p<0.05

Variables with p <0.2 obtained in the univariate analysis were entered in to a backward conditional logistic regression model- educational status of mother (<10th standard), SES (lower), Occupation of father (Fisherman), Possessed a Government MCP card during delivery. In the final model, lower educational status of mother (<10th standard) and not obtained a Government Immunisation card during antenatal period were identified as factors associated with the partial immunization status of children in the study.

In the final model, lower educational status of mother (<10th standard) and not obtained a Government Immunization

Table 5. Multivariate analysis of factors associated with partially immunized status of children in Kollam Corporation

Characteristics	Adjusted Odds Ratio	95% CI
Education of mother (<10th standard)	17.67	1.63-189.9*
SES (Lower)	1.36	0.11-17.68
Occupation of father (Fisherman)	4.51	0.79-25.79
Got a government MCP card (No)	7.48	1.29-43.27*

card during antenatal period were identified as factors associated with the partial immunization status of children in the study. The results of the multivariate analysis are shown in **Table 5.**

Reasons for not completing immunization

Mothers were asked about the major reason for not completing the immunization for their child.

The following responses were obtained (shown in **Table 6**).

Table 6. Reasons for not completing the child's immunization (N=8)

Reason	Frequency (Percentage)
Did not feel the need to immunize the child	01
Did not know what vaccine to be given	01
Fear of side effects	01
Illness of the child	03
Had an adverse event following previous Immunization	02

DISCUSSION

The WHO 30-cluster sample survey for estimating immunization coverage among children has been found to be very useful by public health administrators in developing countries, because it is rapid, operationally convenient, and cost-effective. The current study found a prevalence of fully immunized children as 96.2% (95% CI 93.5- 98.8%).

The coverage of hepatitis B zero dose was only 86.2%. Many private hospitals may not be giving zero dose of hepatitis B. Around 20% of children born at a private hospital and 8% of the children born at a Government hospital had not received hepatitis B zero dose. This issue needs to be addressed.

Maternal education <10th standard was associated with partial immunization status of the child. There are many other studies from India and other countries reporting that education of mother increases the vaccination chance of a child. Mothers with lower educational status could be a group for greater care and motivation in this area.

Only 50% of children received a dose of vitamin A in this study. Vitamin A has been additionally described as a solution given in a tea spoon through mouth, while interviewing mothers. Vitamin A had been out of stock for a long time in Government system. Also private sector may not be issuing vitamin A routinely. Vitamin A is necessary not only for prevention of xerophthalmia but also for preserving integrity and maintaining the function of several organs in the body. Available evidence has established the role of vitamin A in preventing childhood morbidity and mortality.[7] Even though a good proportion of children were completely immunized for vaccine-preventable disease up to the age of one, they had not received vitamin A supplement, suggestive of missed opportunity. This further corroborates the fact that "access" to health system does not necessarily translate into delivery of quality services to beneficiaries. The study reflects low vitamin A-first dose coverage in children residing in the urban areas of Kollam Corporation and requires appropriate corrective measures.

Having obtained a Government card during antenatal/ intranatal period was found as a protective factor for full immunization. Possessing a government card is an indicator that the mother is registered and is being tracked. Only half of the mothers had received a Government card in this area. This clearly points to a deficiency in the field level activities. Having registered in private hospital may not be a reason for not issuing MCP card to mothers.

Father's occupation as fisherman was found associated with immunization status of the child. The occupation may only be considered as a proxy indicator of people residing in coastal areas. The people residing at coastal areas might be poor with low educational status living in isolation with their own cultural beliefs.

Report by the mother may overestimate the immunization coverage. Because mother may forgot the total doses of vaccine that the child took. Beside, this study did not consider the validity of the doses of vaccines child took. Sample size was not adequate enough to study the factors associated with partial immunization status.

It is felt from this study that most of these reasons for non-vaccination could be overcome through professionally–designed behaviour change communication interventions. There is need to strengthen the programme management skills of the lower- and mid-level managers to address the dropout. The surveillance and referral systems in the area also need

reinforcing so as to identify defaulters of immunization and reduce the drop-out rate.

END NOTE

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