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ORIGINAL ARTICLE

A SURVEY ON IMMUNIZATION COVERAGE AMONG CHILDREN OF RURAL SOUTH KERALA

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ABSTRACT: BACKGROUND: Immunization is one of the most cost effective public health interventions since it provides direct and effective protection against preventable morbidity and mortality of children. As per CES 2009, there are 4 states including Kerala where >80% of children between 12-23 months of age are fully immunized. **OBJECTIVES:** 1. To assess the immunization coverage of children of 12 to 24 months of age in Thiruvananthapuram district, Kerala. 2. To find out any socio demographic factors associated with immunization coverage **METHODOLOGY:** Study Design- Community-based Cross sectional study. Study Area: Thiruvananthapuram district, Kerala. Study population: Clusters of Children below the age of 12 to 24 months and their mothers. Data are collected using pretested questionnaire and from Immunization cards. **RESULTS:** Out of 210 children covered 90% were fully immunized for age, 10% were partially immunized and no child was unimmunized. The coverage was more among female children. Measles coverage was 93.33%. 100% had received BCG immunization. The drop-out rate for DPT, HepB and OPV from 1st to 3rd dose was 5.7%. 91.28% developed a scar after BCG vaccine. 79.52% took BCG within three months of age. 73.80% had measles vaccine between 9th and 12th month. 90% of the children received immunization from government hospital and health centers. Less than 10% got immunization from private sources. 100% of mothers of infants were immunized against Tetanus. There was significant association between low socio economic status and partial immunization status. **CONCLUSION:** If immunization coverage survey is done frequently it will help to get a true picture of the Immunization status of the target population, the agency through which the immunizations are given in the area and various reasons for immunization failure and drop out. The knowledge can be used for devising strategies to attain 100% immunization coverage, which enables to prevent the vaccine preventable diseases successfully.

KEYWORDS: fully immunized for age, partially immunized, unimmunized.

INTRODUCTION: 'Research',[1] means 'to examine closely and carefully, to test and try to probe again anew, over again'. Immunization[2] is the process by which an individual is made immune or resistant to an infectious disease, typically by the administration of a vaccine. Vaccine-preventable diseases are a major source of mortality and morbidity among children throughout the developing world, causing deaths in millions every year.

To prevent these diseases, vaccines are delivered through routine health services and through supplemental immunization activities to the children targeted. Measuring immunization coverage helps evaluation of immunization services and when linked to surveillance data, assessment of the success of immunization strategies in preventing disease. Although most countries routinely assess immunization coverage using administrative data, results can usually be unreliable.

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When new vaccines are being introduced to the health system by the Government, there are chances of low immunization coverage due to various reasons related to both the beneficiaries and the service providers.

Government of India launched the Expanded Programme[3] on Immunization in 1978 to protect children against diphtheria, pertussis, tetanus, and typhoid. Vaccination against polio through oral polio vaccine (OPV) was added to the programme in 1979-80 and BCG vaccination against tuberculosis was added in 1981-82.

Vaccination against measles was included in 1985-86.In the late 1980s, the World Health Organization developed the Expanded Program on Immunization (EPI) Survey Methodology,[4] which has since then been widely used to assess immunization coverage achieved by 'routine immunization' provided through health services. WHO emphasized the goal of achieving universal immunization by 1990 and the Global Program was renamed as "Universal Child Immunization -1990".

The Strategy under Universal Immunization Program was:

a) Hundred percent coverage of expectant mothers with two doses of Tetanus Toxoid
b) At least 85 % coverage of infants with 3 doses of DPT and OPV and one dose each of BCG and Measles Vaccine before the child celebrates first birthday.

In India, the current National Immunization schedule followed is recommended under NRHM.[5]

Roughly 3 million children die each year of vaccine preventable diseases (VPDs) with a large number of these children residing in developing countries.[6] Recent estimates show that approximately 34 million children are not completely immunized with almost 98 % of them residing in developing countries.[7] Vaccination coverage in India is also far from complete in spite of the long-standing commitment to universal coverage. Gains in coverage was rapid throughout the 1980s, but subsequent gains have been limited.[8]

In India, as per CES 2009, there are 4 states including Kerala where >80% of children between 12-23 months of age are fully immunized for age.[9] CES 2009 reported BCG, OPV and DTP3 doses coverage, and measles first dose coverage as 86.9%, 70.4%, 71.5%, and 74.1%, respectively.[10]

According to DLHS-3 and NFHS-3 the figures were 86.7%, 66%, 63.5%, and 69.5%, and 78.1%, 78.2%, 55.3%, and 58.8%, respectively.[11]

If immunization coverage survey is done frequently it will help to get a true picture of the Immunization status of the target population, the agency through which the immunizations are given in the area and various reasons for immunization failure and drop out and to identify operational and programmatic challenges in new vaccine introductions.

Now Government of India has also expanded the Universal Immunization Programme (UIP) by introducing 2nd dose of Measles, Hepatitis B and Pentavalent vaccination[9]. Pentavalent vaccine is a combination of vaccines against five diseases (Diphtheria, Pertussis, Tetanus, Hepatitis B and Haemophilus influenza B).

Since November 2012, pentavalent vaccine is being administered in India instead of DPT1, DPT2, DPT3, Hep B1, Hep B2, Hep B3, Hib1, Hib2 and Hib3 from 42 days after birth.

The Immunization coverage survey of a primary health centre area, for the year 2013 is an attempt to find out the true picture of the immunization status of this rural area in South Kerala where the maternal and child health services are rendered through the department of Health services

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and private institutions of the area. The knowledge can be used for devising strategies based on the out-come of the study to attain 100% immunization coverage, which enables to prevent the vaccine preventable diseases successfully.

The Immunization coverage survey is conducted with the objectives: a) to assess the immunization coverage of children of 12 to 24 months of age in Thiruvananthapuram district, Kerala and b) to find out any socio demographic factors associated with immunization coverage.

METHODOLOGY:

Study Design: Community-based Cross sectional study.

Study Area: Thiruvananthapuram district, Kerala.

Study population: Children below the age of 12 to 24 months and their mothers.

Sample size: Is calculated using the formula $4pq/d^2$.

Prevalence, P =85

Q = 100-50 = 15

Precision = 5

Sample size $= \frac{4 \times 85 \times 15}{25} = 5100/25 = 204$ the sample size is = 210

K = N/n Total population 5 x 800 = 4000; n=210; K=4000/210=19

By systematic random sampling method, every 19th house having children of age group of age 12 to 24 months is visited to get the sample subjects.

Selection of Study subjects: Survey was carried out by Cluster Sampling Technique. Based on the population thirty clusters were selected from all 7 wards. List of thirty clusters selected is given in the appendix. The selection of clusters was done as stipulated in the WHO module.

Multistage Random sampling is used at the level of Grama panchayats in Thiruvananthapuram district and wards in Grama panchayats. From the wards selected each cluster of children are obtained. By systematic random sampling method, every 19th house having children of age group 12 to 24 months is visited to get the sample subjects.

The survey was conducted from 24th December 2013 to 16th January 2014.

Study Period: Three months from December 2013. Before starting the study, Ethics Committee clearance is obtained from the Institutional Ethics Committee. Informed consent is obtained from the parents of study subjects.

Method of Data Collection: Data are collected using UIP child coverage survey household form and UIP mother coverage survey household form from all the thirty clusters by interviewing mothers and examining vaccination cards. Socio demographic details and data on newly introduced vaccines are collected through the questionnaire administered to the mother. Socio economic status is assessed using modified Kuppuswamy's scale.

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Statistical Analysis: Data are entered in Excel spreadsheet. Descriptive statistical analysis is done with the help of computer package SSPS.

Immunization Coverage of each vaccine for age is computed.

Analysis of association between immunization coverage and various socio demographic variables is done by using Chi square test.

RESULTS AND DISCUSSION:

Base Line Data:

Total number of households visited	:	1507
Average number of household visited/cluster	:	51
Number of Children under 5 years	:	612
Number of children between 12 to 23 months	:	210
Number of male children	:	105
Number of female children	:	105

IMMUNIZATION STATUS OF CHILDREN: According to immunization schedule all primary vaccinations (BCG, DPT, OPV, HepB V and Measles) should be completed by the time the child is 12 months old i.e., fully immunized. If any one dose for age is not administered, it is considered partially immunized. If no vaccine has been administered, it is referred to as non-immunized or unimmunized.

After the introduction of Hepatitis B Vaccine (HepBV1, HepBV2 and HepBV3) it was received by children along with DPT1, 2 & 3. After the introduction of Pentavalent vaccine (in November 2012) that includes DPT, HepB V and Heamophyllus influenza (Hib) vaccines was received by children instead of DPT &HBV.

Immunization status	No of Children		No of Males		No of Females	
	No	%	No	%	No	%
Fully immunized	189	90	95	90.48	94	89.52
Partially immunized	21	10	10	9.52	11	10.48
Non-Immunized	Nil	Nil	Nil	Nil	Nil	Nil
Total	210	100	105	100	105	100

Table I: Immunization Status of Children

Out of 210 children surveyed, 189(90%) were fully immunized for age, 21(10%) were partially immunized for age and no child was unimmunized.

Out of 105 male children, 95 (90.48%) were fully immunized, 10(9.52%) were partially immunized.

Out of 105 female children 94(89.52%) were fully immunized and 11(10.48%) were partially immunized.

The immunization coverage of female children was more than that of male children.

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IMMUNIZATION COVERAGE OF INDIVIDUAL VACCINES:

Vaccine	Female		Male		Total	
	No.	%	No.	%	No.	%
DPT1&HBV1	105	100	105	50	210	100
DPT2, HBV 2	105	100	105	50	210	100
DPT3, HBV 3	100	95.23	98	93.33	198	94.28
OPV.I	105	100	105	100	210	100
OPV.II	105	100	105	100	210	100
OPV.III	100	95.23	98	93.33	198	94.28
Measles	99	94.28	97	92.38	196	93.33
BCG	105	100	105	100	210	100

Table II: Immunization Coverage of individual Vaccines

Regarding the coverage at various vaccines maximum coverage was for BCG (100%) followed by DPT and Hep B (94.28%) and OPV (94.28%) and Measles (93.33%). Only 15 children received pentavalent vaccine.

DROPOUT RATE OF DPT, OPV& HEP B:

Vaccine	First	Second	Third	Drop	%
DPT, HepB	210	210	198	12	5.72
OPV	210	210	198	12	5.72

Table III: Dropout Rate of DPT, OPV & Hep B

The drop rate for DPT and Hep B from 1st to 3rd dose was 5.72% and that for OPV was 5.72%.

Scar rate for BCG vaccination		
BCG	No.	%
Scar Present	198	94.28
Scar Absent	12	5.72

Table IV: Scar rate for BCG Vaccination

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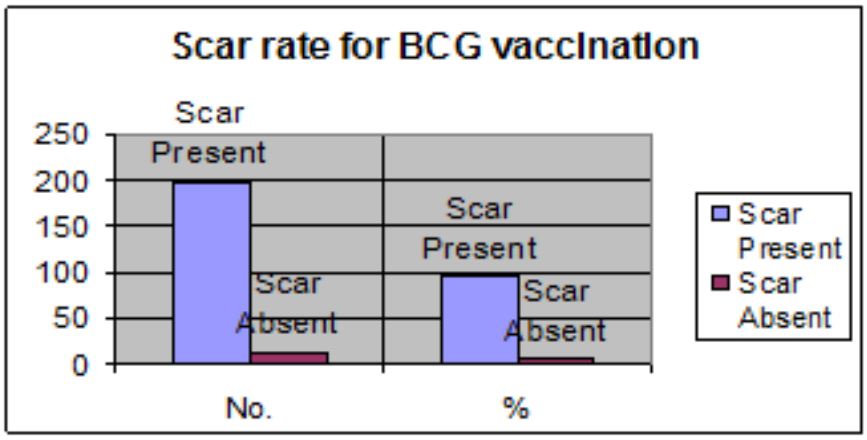

198(94.28%) showed the scar. 5.72% did not develop a scar after B.C.G vaccination.

AGE IN MONTHS AT THE TIME OF STARTING IMMUNIZATION:

Month	BCG	DPT &HepB	OPV	Measles
1	96(45.72%)	3 (1.54%)	3 (1.54%)	
2	42(20%)	66(33.33%)	66(33.33%)	
3	29(13.8%)	74(37.37%)	74(37.37%)	
4	4(1.90%)	26(13.13%)	26(13.13%)	
5	3(1.43%)	4(2.02%)	4(2.02%)	
6	3(1.43%)	2(1.01%)	2(1.01%)	
7				
8				
9	1 (0.48%)	1(0.5%)	1(0.5%)	65(30.95%)
10		1(0.5%)	1(0.5%)	39(21.67%)
11				16(8.89%)
12		1(0.5%)	1(0.5%)	35(19.44%)
13	2(0.96%			17(8%)
Date Unknown	30 (14.28%	20(10.10%)	20(10.10%)	24(13.33%)
Total	**210 (100%)**	**198 (100%)**	**198(100%)**	**196(100%)**

Table V: Age in months at the time of starting immunization

An enquiry into the age of the child at the time of starting the immunization revealed that 45.72% of infants had BCG vaccination during the 1st month it-self. In the case of OPV, 89.3% had completed the primary immunization at the age of 6 months. 73.80% of children had measles immunization at the recommended age of 9 to 12 months.

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IMMUNIZATION BY SOURCE:

SOURCE	BCG	MEASLES	DPT, HBV			OPV		
			I	II	III	I	II	III
Hospital	190 (90.47%)	12 (5.71%)	NIL	NIL	NIL	NIL	NIL	NIL
Health centre	12 (5.71%)	64 (30.47%)	80 (38.1%)	80 (38.1%)	80 (38.1%)	80 (38.1%)	80 (38.1%)	80 (38.1%)
Out reach	NIL	NIL	NIL	NIL	NIL	NILNIL	NIL	NIL
Private	2 (0.95%)	10 (4.7%)	20 (9.5%)	20 (9.5%)	20 (9.5%)	20 (9.5%)	20 (9.5%)	20 (9.5%)
Subcentre	6 (3.8%)	110 (52.3%)	110 (52.3%)	110 (52.3%)	98 (52.3%)	110 (52.3%)	110 (52.3%)	98 (52.3%)
TOTAL	**210**	**196**	**198**	**210**	**198**	**210**	**210**	**198**

Table VI: Immunization by source

Out of 210 children 182(86.6%) had their immunization card. Out of 210 children 190(90.47%) received BCG vaccination form hospitals, 12 (5.71%) from health centre, 2 (0.95%) from private institutions, and 6(3.8%) from subcentres.

In the case of DPT and OPV 110 (52.3%) children got vaccinated from subcentres and 80(38.1%) from health centre and 20 (9.5%) from private institutions. 110 (52.3%) Children got vaccinated for measles from subcentres.

AWARENESS ABOUT VACCINE PREVENTABLE DISEASES IN HOUSEHOLDS:

DISEASES	No. s	%
None Known	0	0
Diphtheria	256	45.7
Pertussis	320	57.14
Tetanus	392	70
Poliomyelitis	510	91
Measles	480	85.7
T B	520	92.85
Total Households	**560**	

Table VII: Awareness about vaccine preventable diseases in households

520 (92.85%) were aware of Tuberculosis. Awareness about Poliomyelitis and Pertussis was 91% and 57.14% respectively. None gave a negative answer.

The majority, 480(85.7%) had received the information on vaccine preventable diseases from the health staff and 80(14.2%) from the newspapers, posters and from the radio and television and other sources of information like the relatives, neighbors and volunteers.

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REASON FOR IMMUNIZATION FAILURE:

Reasons	No
I Lack of information	
1. Unaware of need for immunization	
2. Unaware of need to return for 2nd and 3rd dose	3
3. Place and time of immunization unknown	-
4. Fear of side reaction	8
5. Wrong ideas about contra indications	4
II Lack of motivation	
1. Postponed till another time	8
2. No faith in immunization	-
3. Rumors	2
III Obstacles	
1. Place of immunization too far to go	-
2. Time of immunization inconvenient	-
3. Vaccinator absent	-
4. Vaccine not available	-
5. Mother too busy	1
6. Family problems including illness of mother	2
7. Child ill not brought	9
8. Child ill, brought, not given	1
9. Long waiting time	-

Table VIII: Reason for Immunization Failure

The reasons for failure of immunization were considered under three headings namely Lack of information, Lack of motivation and Obstacles. 8(3.8%) abstained from getting the vaccine because of fear of side reaction and an equal number postponed immunization till another time. In the case of 9(4.2%) children, immunization failure was attributed to the fact that the child was ill and hence not bought for immunization.

It is felt that strengthening of Health Education activities can improve the immunization coverage, by removing the misconception about immunization and the fear of side reactions. Since minor illnesses are not contradictions for immunization, majority of them could have received the vaccines if they were brought for immunization. Strengthening of health education can definitely improve the coverage to almost 100 percent

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SOURCE OF IMMUNIZATION OF MOTHERS AGAINST TETANUS:

TETANUS TOXOID	HOSPITAL	HEALTH CENTRE	OUT REACH	PRIVATE	SUB CENTRE	NOT TAKEN
1st Dose	6 (2.8%)	90(42.8%)	Nil	4(1.9%)	110(52%)	Nil
2nd Dose	4 (1.9%)	92(43.8%)	Nil	6(2.8%)	108(51.4%)	Nil

Table IX: Source of immunization of mothers against tetanus

Among the 210 mothers surveyed, all the mothers had received the full course of tetanus toxoid during the antenatal period. Source of immunization was the Sub-Centre in 52% and Health Centre 43%.

PLACE OF DELIVERY WITH PERSONS ATTENDED:

PERSONS ATTENDED	PLACE OF DELIVERY		
	HOSPITAL/HEALTH CENTRE	HOME	TOTAL
HEALTH STAFF	208	Nil	208
TRAINED DAI	Nil	Nil	Nil
UNTRAINED DAI	Nil	Nil	Nil
OTHER REASON	Nil	2	2
TOTAL	208	2	210

Table X: Place of delivery with persons attended

Out of 210 deliveries 94.8% were hospital deliveries and 2 home deliveries attended by relatives and taken to hospital after delivery.

LOW SOCIO ECONOMIC STATUS AND PARTIAL IMMUNIZATION STATUS: 48% the families belonged to low socio economic status according to Kuppuswamy's scale. There was statistically significant association between low socio economic status and partial immunization status (Chi-square 18.01, $P < 0.001$).

SUMMARY AND CONCLUSION: The universal immunization program coverage survey in Kunnathukal area was carried out during the period from December 2013 to January 2014 by cluster sampling technique. The total 210 children of 12 to 24 months of age and their mothers were surveyed. Out of 210 children covered 90% were fully immunized for age, 10% were partially immunized and no child was found unimmunized. The coverage was more among female children than for male children.

Measles coverage was 93.33%. 100% Children had received BCG immunization. The drop-out rate for DPT, HepB and OPV from 1st to 3rd dose was 5.7%. 91.28% of children developed a scar after BCG vaccine. 79.52% Children took BCG within three months of age. 73.80% of children had measles vaccine between 9th and 12th month. Almost 90% of the children received immunization from government hospital and health centers. Less than 10% got immunization from private sources.

The awareness of vaccine preventable diseases in the area was quite high. Better Health Education activities could have improved the immunization coverage to almost 100%.

100% of mothers of infants were immunized against Tetanus. 99% of deliveries were conducted in Hospitals or Health Centers and were attended by trained personnel.

There was significant association between low socio economic status and partial immunization status.

RECOMMENDATIONS:

At state and district levels: Quality trainings, effective supervision and monitoring, improving documentation of data and reporting are key factors for improvement. The additional focus on Hep B birth dose administration may help in improving coverage of Hep B vaccination. The lessons from this survey can possibly be utilized for future introduction of any new vaccine in India or in any other developing country setting.

1. Short term recommendation – Strengthen health education to improve the knowledge regarding need and safety of immunization procedures and new vaccines being introduced.
2. Long term recommendations:
    i. Improve infrastructure facilities wherever in adequate.
    ii. Posts of health personnel to be filled in wherever there is vacancy
    iii. Intensify supervision and monitoring so that quality of services can be improved and 100% immunization coverage for all vaccine preventable diseases may be ensured.

It is concluded that for successful introduction of any new vaccine in national or state immunization program, clear and timely central level instructions and oversight and improved stock management are required.

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