Original Research Article

Polio vaccination coverage among children aged 12-23 months in a health block in North Kerala

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ABSTRACT

Background: Polio (poliomyelitis) is a highly infectious viral disease which affects the nervous system and can result in irreversible paralysis within hours. There is no cure for polio, hence it becomes necessary to prevent the disease through vaccination. Thus, the objective of this study was to evaluate the polio vaccination coverage among children aged 12-23 months in a health block in Kannur, North Kerala.

Methods: A community based cross sectional study was conducted among the children in the age group of 12-23 months residing in Pappinisseri block of Kannur district. Stratified random sampling was used. The details of 321 children were obtained using a pre-tested semi-structured questionnaire. The data was entered into Microsoft Excel 2007 spread sheet and analyzed using SPSS version 16.0 software.

Results: Of the 321 children, males constituted 173 (54%) and females constituting 148 (46%). The total coverage of oral polio vaccines (OPV) (considering OPV-0, 1st, 2nd and 3rd doses) was found to be 92.8% and the inactivated poliomyelitis vaccine (IPV) coverage (IPV 1st and 2nd doses) to be 90.7%. Also, majority of the respondents were unaware of the use of OPV and IPV vaccines in the UIP.

Conclusions: In spite of the efforts taken by the Government and the health officials, the OPV and IPV coverage has not reached 100% and also, the knowledge of mothers regarding the diseases prevented by the vaccines were very low. The reasons for this needs to be further evaluated.

Keywords: IPV, Immunization, OPV, Polio, Vaccination coverage

INTRODUCTION

Immunization is the process by which a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. A vaccine is an immuno-biological substance designed to generate specific protection against a given disease. They stimulate the body's own immune system to protect the person against subsequent infection or disease.[1] It is one of the most cost effective interventions known till date, which helps to prevent the suffering that comes from avoidable disease, disability and death. It has clearly defined target groups; it can be delivered effectively through outreach activities; and vaccination does not require any major lifestyle change.

Currently, immunization averts around 2-3 million deaths every year. However, if the global vaccination coverage improves further, we could avoid an additional 1.5 million deaths. Global vaccination coverage remains at 85%, with no significant changes during the past few years. In 2017, an estimated 19.9 million infants worldwide were not reached with routine immunization services. Around 60% of these children live in the following 10 countries: Angola, Brazil, the Democratic Republic of Congo, Ethiopia, India, Indonesia, Iraq, Pakistan, Nigeria and South Africa.[2]

Despite improvements and developments in technology, the burden of vaccine preventable disease remains high in India, in comparison to developed countries and also many developing countries. NFHS-4 (2015-16) survey reveals the primary immunization coverage as 62% and OPV coverage for children between 12-23 months to be 72.8% in India.[3] Also, it revealed an average immunization coverage of 82.1% in Kerala with the OPV coverage being 88.5%.[4]

Polio (poliomyelitis) is a highly infectious viral disease which affects the nervous system and can result in irreversible paralysis within hours. There is no cure for polio, only treatments to alleviate the symptoms, and hence it becomes necessary to prevent the disease through vaccination. Multiple doses of polio vaccine, almost always, give protection for life. The development of effective vaccines to avert paralytic polio was one of the major medical breakthroughs of the 20th century.[5]

With the objective of achieving 100% coverage of OPV, the pulse polio programme was launched in the year 1995. Since then, our country has witnessed several rounds of pulse polio, which is still continuing. Finally, it resulted in India being declared as polio free by the WHO in 2014.[6] Since then, the Government of India has scaled up its activities against polio endgame. For this, the Government targets on virus eradication and the subsequent withdrawal of type 2 virus strain from oral polio vaccine (OPV). However, before we could initiate the switch from trivalent OPV (t-OPV) to bivalent OPV (b-OPV), it was recommended that we include inactivated poliovirus vaccine (IPV) in the national immunization schedule (NIS). This was done in order to benefit the vaccine naïve population against type 2 strain of poliovirus. Thus, the Government of India decided to introduce a single dose of IPV at 14 weeks since October 2015. In addition to this, the Government also suggested the introduction of two intradermal doses of IPV in few states since April 2016.[7]

Hence, according to the need of the hour, the purpose of this study is to assess the vaccination coverage of OPV and IPV in already identified high and low immunization coverage areas in a health block in Northern Kerala.

Objectives

To evaluate the polio vaccination coverage among children aged 12-23 months in a health block in Kannur, North Kerala.

METHODS

Study design

This study was a community based cross sectional study.

Study setting

Pappinisseri block is located in Kannur district of Kerala state. It has got a total population of around 220,000.

Study population

This study includes children in the age group of 12-23 months residing in Pappinisseri block of Kannur district.

Inclusion criteria

All children in the age group of 12-23 months residing in Pappinisseri block were included.

Exclusion criteria

The children for whom mother child protection (MCP) cards were not available with the parent were excluded.

Study period

The study duration was 13 months, from June 2018 to July 2019.

Sample size

According to NFHS-4 data (2015-2016), the primary immunization coverage in Kerala was found to be 82.1 %. So, by taking 82.1% as prevalence rate and 5% as absolute precision, using the formula $4pq/d^2$, the sample size was found to be 235. Further, by considering 20% non-response rate, the minimum sample size obtained was 282, which was rounded off to 300.

Sampling method was stratified random sampling. First the area coming under Pappinisseri block was divided into two groups (high and low coverage areas). Then, from each group, two sub centres were randomly selected, making a total of 4 sub centres.

Selection of houses

All the houses in each of the 4 sub centres, with children in the specified age group were covered. As per the birth rate of the previous years, the population of children in the required age group was found to be around 320 in four sub centres.

Study materials and tools

Data was obtained using a pre-tested semi-structured questionnaire. The questionnaire for quantitative data consists of 2 parts:

Part 1 includes questions on demographic variables such as age, gender, address, total family income, head of the family, education and occupation of the head of the

family as well as the mother, above poverty line (APL) or below poverty line (BPL).

Part 2 includes questions on the details of pregnancy and delivery and the details on polio vaccination status of the child in the study.

The mother of the child included in the study was chosen as the respondent.

Analysis

The data was entered into Microsoft Excel 2007 spread sheet and analyzed using SPSS version 16.0 software. The descriptive statistical methods like mean, standard deviation, frequencies and proportions were used.

Pilot testing

Pilot testing was done among 30 children in the study area and the required changes were made in the questionnaire.

Socio economic scale

In this study, socio economic status (SES) was assessed using modified B. G. Prasad (2018) scale. B. G. Prasad scale, which is based on the per capita income of an individual, is classified into five classes.[8]

Operational definition

High and low immunization coverage areas: According to the previous year data obtained from the health centres, the highest coverage in the area of this study was found to be 100%, and the lowest coverage was found to be 80%. In my study, the areas with coverage below 90% were taken as low coverage area and above it were taken as high coverage area.

RESULTS

The total number of children included in the study was 321, distributed across 4 sub centres. Mottammal and Morazha were the sub centres with high immunization coverage and Narath and Malott were the ones with low coverage. Mothers of the children included in the study were considered as the respondents.

Figure 1 shows the distribution of people in the four sub centres included in the study. It can be seen that the areas with low immunization coverage have more number of children.

Majority of the study population (99.7%) belonged to Hindu and Muslim religion. Also, 47% of the study population belonged to the joint family and 39% belonged to 3 generation family. 92% of the study population belonged to families with ≤10. Even though only 8% of the children came from families with more

than 10 members, 46% of the children came from families with 6-10 members. This can be attributed to the 3 generation and joint type of families existing in the society.
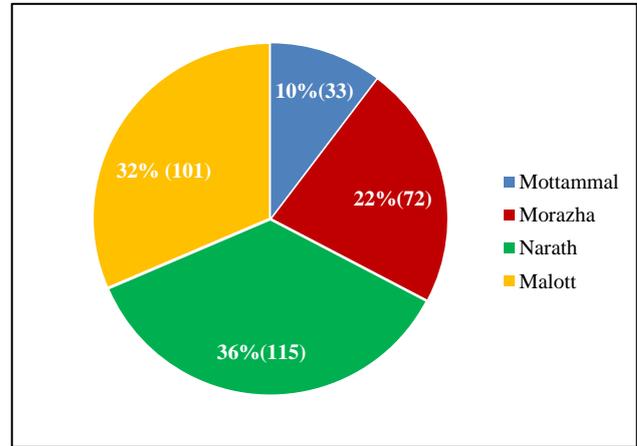
Figure 1: Distribution of study population according to the sub center area (n=321).

It was observed that 38.9% of the study population belong to Class II socio-economic scale according to Modified B. G. Prasad scale 2018. Also, 41.5% belong to Class III to V socio-economic scale which is the middle to lower socio-economic class. As per their ration card 67.6% of the study population belonged to APL category.
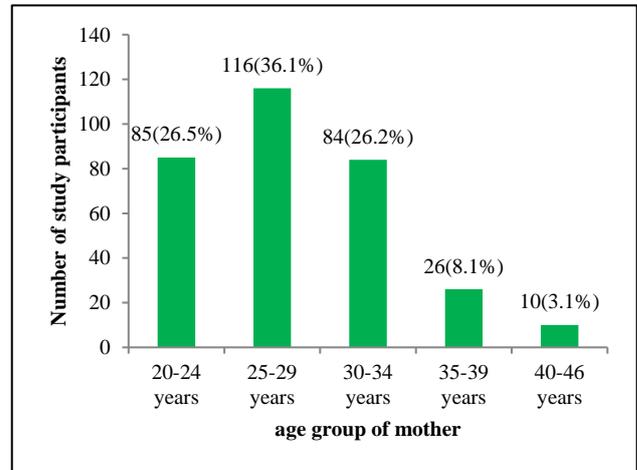

Figure 2: Age distribution of mother (n=321).

Figure 2 demonstrates the age distribution of the mothers included in the study, with 36.1% of them belonging to the age group 25-29 years. The mean age of the mothers was 28.32±4.96 years.

It was found that 39.9% of the mothers are either graduates or post graduates and majority of them (78.9%) have educational qualification above the level of high school. Also, it was observed that even though majority of the mothers are either graduates or post graduates, 95.6% of the mothers are home makers.

Pregnancy and delivery details of mothers in the study population

TT vaccination during pregnancy had been given to almost all mothers (99%) in the study population. Also, it was observed that normal deliveries were more common (60%) than caesarean section (40%). Majority of the children (60%) in the study population were delivered at private hospitals, while 39% were delivered at government hospitals and 1% at co-operative hospitals.
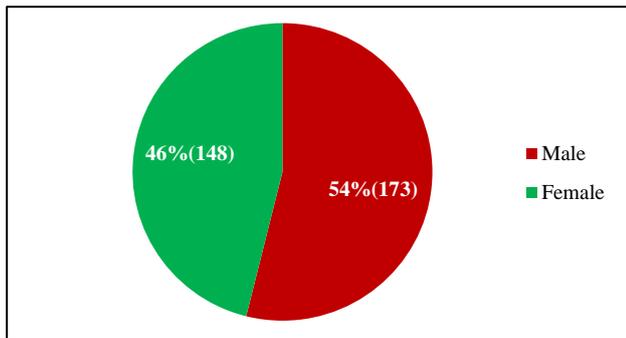
Figure 3: Distribution based on gender of the child included in the study (n=321).

The figure shows that there is an almost equal distribution of male and female children in the study, with males constituting 54% and females constituting 46%.

Table 1: Distribution based on the perceived need for immunization (n=321).

Perceived need	Frequency	Percentage
Needed	307	95.6
Not needed	11	3.4
Doubtful	3	1.0
Total	321	100.0

Table 2: Status of OPV vaccination among the study population (n=321).

	Frequency	Percentage
OPV-0 dose status		
Immunised	319	99.4
Unimmunised	2	0.6
Total	321	100.0
OPV-1st dose status		
Immunised	306	95.3
Unimmunised	15	4.7
Total	321	100.0
OPV 2nd dose status		
Immunised	301	93.8
Unimmunised	20	6.2
Total	321	100.0
OPV 3rd dose status		
Immunised	298	92.8
Unimmunised	23	7.2
Total	321	100.0

Immunization details of child included in the study population

Table 1 indicates that, theoretically, 95.6% of the mothers felt that immunization was required for their children.

Table 2 shows that only 92.8% of the population received the 3rd dose of OPV.

Table 3: Time of OPV vaccination.

	Frequency	Percentage
OPV-0 time		
Within 15 days	317	99.4
Delayed	2	0.6
Total	319	100.0
OPV-1 time		
Right time	286	93.5
After said date	20	6.5
Total	306	100.0
OPV 2 time		
Right time	270	89.7
After said date	31	10.3
Total	301	100.0
OPV 3 time		
Right time	265	88.9
After said date	33	11.1
Total	298	100.0

Table 3 shows that majority (99.4%) received OPV-0 dose within 15 days of birth. However, when it came to the 3rd dose of OPV, 88.9% received the vaccine at the right time.

Table 4: OPV coverage in the study population (n=321).

OPV status	Frequency	Percentage
Complete	298	92.8
Incomplete	23	7.2
Total	321	100.0

Table 4 displays the coverage of OPV (considering OPV-0, 1st, 2nd and 3rd doses) in the study to be 92.8%.

Table 5: Status of IPV vaccination among the study population (n=321).

	Frequency	Percentage
IPV-1st dose status		
Immunised	303	94.4
Unimmunised	18	5.6
Total	321	100.0
IPV 2nd dose status		
Immunised	291	90.7
Unimmunised	30	9.3
Total	321	100.0

The drop-out rate from OPV-1 to OPV-3 was found to be 2.61%.

Table 5 shows that 5.6% (18) of the children did not receive IPV 1st dose, and 9.3% (30) of the children did not receive IPV 2nd dose. It was also seen that among the 303 children who received IPV 1st dose, only 272 children, i.e. 89.8% of them obtained it on the said date. And, for IPV 2nd dose, only 84.5% of them obtained it on the said date, along with OPV and Pentavalent vaccine 3rd dose.

Table 6: IPV coverage in the study population (n=321).

IPV status	Frequency	Percentage
Complete	291	90.7
Incomplete	30	9.3
Total	321	100.0

Table 6 indicates the IPV coverage (IPV 1st and 2nd doses) in the study population to be 90.7%.

The drop-out rate from IPV-1 to IPV-2 was found to be 3.96%.
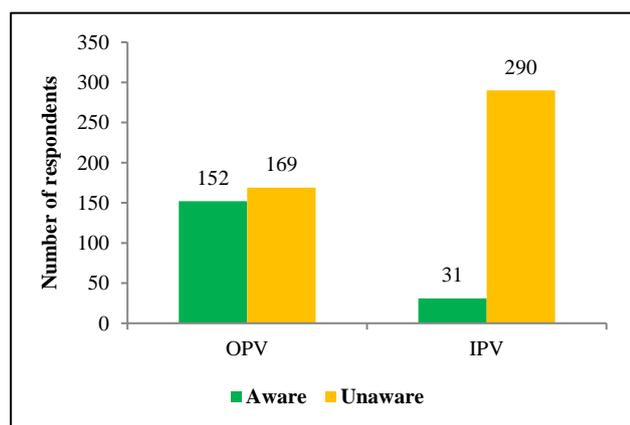
Figure 4: Awareness among mothers regarding the polio vaccines in the immunization schedule (n=321).

Figure 4 demonstrates that majority of the respondents are unaware of the use of OPV and IPV vaccines in the UIP, more so in the case of IPV.

DISCUSSION

Socio-demographic profile

Present study was done in four sub centre areas, which included 2 high immunization coverage areas and 2 low immunization coverage areas, based on previous year data obtained from the health facility. Immunization coverage of 90% or above in the previous year in these sub centres was considered as high coverage and the rest were considered as low coverage.

In present study, majority of them belonged to Hindu religion (58.6%) and 41.1% were Muslims. This was found to be almost similar to the NFHS-4 Kerala report which showed majority of the household heads belonged to Hindu religion (58.8%), followed by Muslims (22.9%). However, the Christian family constituted only 0.3% of our study population, which was in contrast to the NFHS-4 Kerala report which showed the percentage of Christian headed households in the state to be 18.2%.[4] This was however similar to the finding obtained in the study conducted by Rajeev et al at Cheruthazham in 2013, where the number of Christians made up to only 4.7%.[9]

Majority of the children in our study belonged to joint families (47%) and only 14% children belonged to nuclear families. This was in contrast to the NFHS-4 Kerala statistics where it was revealed that 55.5% of households in Kerala were of the nuclear family type.[4] This difference in finding can be understood by looking into the cultural demographics of Kannur and Kerala. The Muslim population in the state of Kerala is mainly settled in the Malabar region. Kannur, which is a district in the Malabar region of Kerala, has the 4th largest Muslim population in the state.[10] In earlier days, the joint family system was increasingly practiced among the Muslim community. With the passage of time, the joint family system began fading away.[11] But even today, this practice persists in many Muslim families in North Malabar region of the state. Thus, we can attribute our finding of increased number of joint families to the fact that Muslim community constitutes a significant proportion of our study population.

In the present study, majority (92%) of the children had less than 10 members in their family, in which 46% had ≤5 members and 46% had 6-10 members. Eight percentage of the children had more than 10 family members residing in the house. This was almost similar to the NFHS 4 rural India report, which stated that 5.4% of the households had 9 or more members living in the home.[3]

In this study, 19.6% and 38.9% belonged to class I and II of B. G. Prasad socio-economic classification 2018. According to NFHS 4 Kerala report, 48% of the households belonged to the highest wealth quintile and only 0.5% belonged to the lowest wealth quintile.[4]

In present study, 28.7% of the children belonged to BPL category as per the ration card. This was in accordance with the finding from NFHS 4 Kerala data, which found that 30% of the households in Kerala held BPL cards.[4]

Majority of mothers of the 12-23 months old children of different birth orders included in our study, belonged to the age group of 25-29 years (36.1%) and 11.2% of the mothers were aged 35 years and above. Whereas, in a study conducted by Goyal et al in Rohtak, Haryana in 2015-16, it was observed that more than two-fifth of the mothers belonged to the age group of 21-25 years.[12]

Present study revealed that 39.9% of the mothers included in the study were either graduates or post graduates and majority of them (78.9%) had educational qualification above the level of high school. As per NFHS 4 report of Kerala, 28.7% of women have completed 12 or more years of schooling and 19% completed 10-11 years of schooling.[4] This study result was seen to be contrasting with the 19% of mothers who had educational qualification above the level of high school, as seen in the study done in Jaipur, Rajasthan by Pandey et al.[13] In spite of the high educational qualification of the mother, 95.6% of the mothers in our study were home makers/ unemployed. Comparable results were obtained in another study conducted in Tamil Nadu in 2015, by Murhekar et al, which found that even though 23.8% of the mothers in their study had minimum educational qualification of graduate level, 84.5% of the mothers were unemployed.[14]

Pregnancy and delivery of the mother

Present study exhibited that there was 100% institutional deliveries, of which 39% of the deliveries took place in government hospitals and 1% in co-operative hospitals. The rest of the deliveries were conducted in private hospitals. Also, 60% of the deliveries were normal and the remaining 40% was caesarean section. Identical results were declared in the NFHS 4 Kerala report, according to which 99.9% of the deliveries in the state were institutional deliveries, of which 38.4% were conducted in public health facilities across the state. In case of the type of delivery, 35.8% was caesarean section. The achievement in the rate of institutional deliveries in Kerala is commendable when compared with the national average of 78.9% institutional deliveries. However, the lower proportion of deliveries in the public sector and the higher number of caesarean sections in the state when compared with the national rates of 52.1% and 17.2% respectively is thought provoking and need to be contemplated.[3,4]

Present study included 54% male children and 46% female children. Similar findings were obtained in another study done by Chaturvedi et al in U. P. in 2013, where they had 51.43% male children and 48.57% female children.[15] A study conducted in Tamil Nadu in 2015 also presented with similar results with 51% boys and the remaining girls.[14]

Immunization details of child

The OPV-0 dose vaccination coverage in the study population was computed as 99.4% with almost all of them receiving the vaccine within 15 days of birth. There were 2 children in our study who had not received OPV-0 dose vaccination, which may be because of the unavailability of the vaccine in the health facility. This was in contrast to the result of a coverage evaluation survey of UIP carried out in North-Eastern India in 2017, where only 37.1% of the children received the birth dose

of OPV.[16] Also, the awareness regarding the disease prevented by administration of all doses of OPV was present only among 47.4% of the mothers interviewed in the study. Whereas, in a study organised in Trivandrum district of Kerala to understand the rural-urban differences in immunization coverage, the awareness regarding OPV was found to range between 60.6% and 70.2%.[17] The coverage of OPV (birth dose followed by 3 doses) in our study was 92.8%. Further, the drop-out rate from OPV 1st dose to OPV 3rd dose was estimated to be 2.61% in our study, which is almost identical to the drop-out rate calculated from the study conducted at Cheruthazham by Rajeev et al in 2013, which came up to 2%.[9] However, this was contrary to the result obtained from the study done in U. P. by Chaturvedi et al, where the drop-out rate was as high as 25.88%.[15]

In the present study, 94.4% of the children received 1st dose of IPV and 90.7% received the 2nd dose. The drop-out rate in our study was determined to be 3.96%. The coverage was similar to the study conducted by Kaithery et al in Northern Kerala where 94.24% of the children had received both doses of IPV.[18] The coverage was found to be higher in another study conducted in Yogyakarta, an Indonesian province in 2010, where it was 99.5%.[19] Further, the awareness regarding the role of IPV in preventing polio was found among 9.7% of the mothers in present study.

CONCLUSION

A community based cross sectional study was conducted in 4 sub centre areas of Pappinisseri health block in Kannur district, to evaluate the immunization status of children aged 12-23 months and the factors associated with low coverage. Of the total 321 children included in the study, 54% were males. Among the study population, 58.6% were Hindus, 41.1% were Muslims and 0.3% was Christian. Mothers were the respondents in the study, with their mean age being 28.32±4.96 years. Most of the mothers (78.9%) have educational qualification above the level of high school. However, 95.6% of mothers were home makers. 38.9% of the study population belonged to Class II socio-economic scale according to B. G. Prasad classification 2018. The status of OPV (4 doses) and IPV (2 doses) were 92.8% and 90.7% respectively. Regarding the knowledge of mothers about the diseases prevented by the vaccines, 9.7% knew about IPV and 47.4% knew about OPV.

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