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Original Research Article

The universal immunization programme coverage and determining factors among tribal children under the age of five in the Wayanad district of Kerala, South India

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ABSTRACT

Background: Globally an estimated two to three million deaths occur every year in all age groups, from six major vaccine-preventable diseases and accounts for almost a quarter of all deaths in children under the age of five years. As Immunization is one of the most successful and cost-effective methods for preventing infectious diseases, the Indian government initiated a vaccination programme to reduce infant mortality and morbidity owing to vaccine-preventable diseases, and achieve vaccine self-sufficiency. In Kerala, about 1.5% of the total population makes up Scheduled Tribes, a socioeconomic group with continuously poor health indicators.
Methods: Through a community-based cross-sectional study using cluster sampling technique, this study intends to determine the coverage of the universal immunization programme among tribal children (0-59 months), the factors affecting vaccination coverage as well as the reasons for partial immunization in Noolpuzha Panchayat, Wayanad. A semi-structured questionnaire was used to collect information from caregivers/mothers.
Results: Out of 289 study population, 64.4% were fully immunized and 35.6% were partially immunized. Children's age and the father's education were found to affect immunization.
Conclusions: As a lack of knowledge about immunizations and subsequent doses was the primary reason for partial immunization. There is a need to create awareness about the importance of vaccination and the subsequent doses among the tribal people of Wayanad.

Keywords: Immunization, Kerala, Tribal, Under-five, Wayanad

INTRODUCTION

The major cause of child mortality and morbidity is infectious diseases. Globally, three million children die from vaccine-preventable diseases every year, and several others become disabled.[1] In India, 5 lakh yearly deaths of children are recorded because of diseases that can be prevented by vaccination.[2] To prevent these infectious diseases, immunization is one of the most successful and cost-effective methods. It forestalls an estimation of two to three million deaths every year in all age groups from six major vaccine-preventable diseases that make a significant contribution to the nation's health by lowering the percentage of vaccine-preventable diseases.[3] The Universal Immunization Programme (UIP) is one of the largest public health programmes targeting close to 2.67 crore newborns and 2.9 crore pregnant women annually through 90 lakh sessions every year. Under UIP, immunization is provided free of cost vaccination against 12 vaccine-preventable diseases.[4]

Following UIP, the Indian Government initiated a vaccination Programme intending to reduce infant mortality and morbidity owing to vaccine-preventable

diseases and achieving vaccine self-sufficiency. According to the data from NFHS-4 and NFHS-5, India is currently 38 percent away from meeting the target of 90 percent universal vaccination coverage.[5] Though immunization services are offered free in public health facilities, despite rapid increases, the immunization rate remains low in some areas and the inequity continues especially among the vulnerable people belonging to tribal groups.[6]

According to the 2011 Census, 104 million Scheduled Tribes reside mostly in the rural parts of India. They are a marginalized community with limited access to healthcare services, difficult geopolitical environments, different cultures, and social standing in society. Additionally, they suffer from poor health outcomes due to low immunization coverage and high infant mortality rates.[7]

In Kerala, the scheduled tribe population is 1.5 % of the total population. With eight scheduled tribes residing in Wayanad, the state has the greatest tribal population.[8] According to the National Family Health Survey (NFHS)-5 data, the proportion of 12-23 months of children fully immunized is 77.8% in Kerala state and 86.4% in the Wayanad district.[9] The sociocultural, political, and topographical diversity of Kerala's tribal groups, as well as their healthcare needs, attitudes, and healthcare-seeking behaviours, differ from the nontribal population, posing a challenge to the current service-delivery system.[9]

Since the vaccination status among the tribal population of Wayanad district is still in the research phase with a paucity of literature on immunization programme challenges in vaccination coverage and reasons for low coverage, the purpose of this study was to determine the need and demand for immunization services in this demographic, to investigate evidence gaps in universal health access and immunization coverage with the socio-cultural practices and beliefs in child immunization among tribes to contribute in the strengthening of the country's immunization programme in tribal population.

METHODS

A cross-sectional study was conducted from March to May 2022, among tribal children (0-59 months of age) in Noolpuzha panchayat of the Wayanad district, Kerala. There are eight scheduled tribes living in Wayanad, making it the largest tribal population in Kerala. The Noolpuzha panchayat is one of the Grama panchayat located 8km away from Sulthan Bathery taluk with 4 scheduled tribes namely Paniyar, Kurumar, Kattunaikar, and Urali. As per the 2011 census, there are about 3,299 houses in Noolpuzha village with a population of 14,133 of which 6965 males and 7168 females.[8]

The sample size calculation was done, by using the formula:

$N= (Z\ 2\ PQ) \times 2/d^2$

Considering the anticipated coverage of immunization among under-five age group children belonging to tribal colonies as 87%, sample size was calculated with a 95% confidence interval and 5% absolute precision.[8,10] Multiplied with a design effect of two the total sample size obtained was 350. All children in the age group of 0-59 months in Noolpuzha panchayat tribal colonies were included. Parent of a sick child (common cold, fever, and diarrhea), participants reluctant to give consent during data collection, COVID-19 affected houses and Families in quarantine at the time of data collection were excluded. Cluster sampling is used to select children, taking colonies as the cluster units. Details regarding the number of colonies were available from the Tribal extension office, Government of Kerala which was collected as a part of a socio-economic survey being conducted by the tribal welfare office. As per this survey, a total of 215 tribal colonies were registered in the Tribal Welfare Office of Noolpuzha Grama Panchayat. There was no dependable estimate of the number of children in each of these colonies, it was assumed that 13.5 percent of the tribal population would be children 0-59 months.

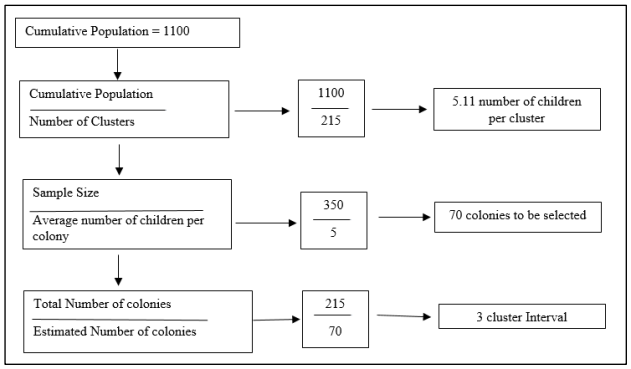

Figure 1: Estimated sample collection.

The cumulative total of children population in the Panchayat was estimated (n=1100). The cumulative total was divided by the number of clusters (215) to estimate the average number of children per colony. The sample size (350) is divided by the average number of children per colony (n=5) to estimate the number of colonies to be selected. The total number of colonies (215) has to be divided by the estimated number of colonies (n=70) to get a cluster interval. The cluster interval obtained was 3, therefore, every other colony was selected from the list of tribal colonies.

Permissions were obtained from the scheduled tribes Development Department, Kerala State and, the Kerala Forest Department. The principal investigator was accompanied by tribal promoters, who are being appointed by the Scheduled Tribes Development. There

were twenty-five tribal promoters under the Noolpuzha Panchayat tribal extension office. Access into the tribal colonies was made easy for the investigator with the help of tribal promoters. Any household with an eligible child was selected and the caregiver of that child was interviewed through face-to-face interviews. The primary respondent was the mother. In the absence of the mother, father was considered to be the respondent. In case of the absence of both of them, caregivers/adult in the household who remained with the child most of the time or had taken the child for immunization for at least one vaccination was interviewed. The survey was mostly performed in the early mornings and late evenings to facilitate the participation of employed caregivers. The immunization status was confirmed by inspecting the immunization card of the child. In absence of a card, BCG immunization was inspected for the presence of a scar, and DPT, measles, and hepatitis B vaccination we considered recall information provided by the respondent.

Statistical analysis

Data collected from the study were entered in the EpiData EntryClient and checked for completeness and correctness before analysis using Microsoft Excel 2016. Later, subsequently analyzed using SPSS 21.0 software package. Quantitative variables were presented as frequency and percentage while the Chi-square test was used to find the association between dependent and independent variables. All statistical analysis was done at a 5% level of significance and a p-value <0.05 was considered significant.

RESULTS

A total of 289 children in the age group of 0 to 59 months, majority of them were males with 53% and predominantly belonging to the age group of 37-48 months and 24-36 months with 24.6% and 24.2%.

The mean standard age of the children included in the study was 33.3 months ±15.06 SD. Majority of the tribes were Paniyar (48%). Joint families were predominant (56%) residing mostly in Pucca house (76.1%). Mothers were mostly educated up to secondary level (35.6%) whereas majority of fathers had primary level education (38.4%). A total of 96.2% fathers were employed, whereas 67.1% mothers were homemakers.

Table 2 shows that, 88.6% of the respondents were having knowledge about the Universal Immunization Programme (UIP) and a majority 49.5% of them had received information about the UIP from ASHA workers or health personnel.

Figure 2 shows, mothers of 59% of children attended health education meetings. ASHA employees and healthcare professionals performed frequent immunization-related sensitization sessions for respondents during group meetings.

Table 1: Socio-demographic details of study participants.

Socio-demographic variables		N=289	%
Age (months)	Less than 12 months	19	6.5
	12-23	69	23.8
	24-36	70	24.2
	37-48	71	24.6
	49-59	60	20.7
Gender	Male	152	52.6
	Female	137	47.4
Type of tribes	Paniyar	138	48
	Kurumar	35	12
	Kattunaikar	92	32
	Urali	24	8
Type of family	Nuclear	127	44
	Joint	162	56
Type of house	Kutcha	42	14.5
	Semi-pucca	27	9.3
	Pucca	220	76.1
Place of delivery	Home delivery	12	4.2
	Hospital delivery	277	95.8
Distance to the nearest health facility (km)	<1 km	39	13.5
	1-3 km	111	38.4
	>3 km	139	48
Education of mother	Illiterate	40	13.8
	Primary	87	30.1
	Secondary	103	35.6
	Higher secondary	59	20.4
Education of father	Illiterate	44	15.2
	Primary	111	38.4
	Secondary	102	35.3
	Higher secondary	32	11.1
Employment status of mother	Employed	95	32.9
	Un-employed	194	67.1
Employment status of father	Employed	278	96.2
	Un-employed	11	3.8

Table 2: Knowledge on vaccine related information.

Variables	Response	Frequency (n=289)	Percentage (%)
Knowledge about Universal Immunization Program	Yes	256	88.6
	No	33	11.4
Knowledge of disease being prevented by vaccination	Yes	206	71.3
	No	83	28.7
Consequences if not vaccinated	Yes	240	83
	No	49	17

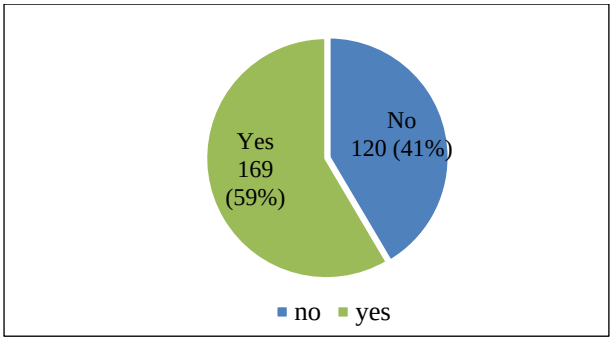

Figure 2: Attended health education meetings (Regarding lactation, immunization and post-natal care).

Figure 3 shows, the immunization status of children, 64.4% (186) were fully immunized, and 35.6% (103) were partially immunized.

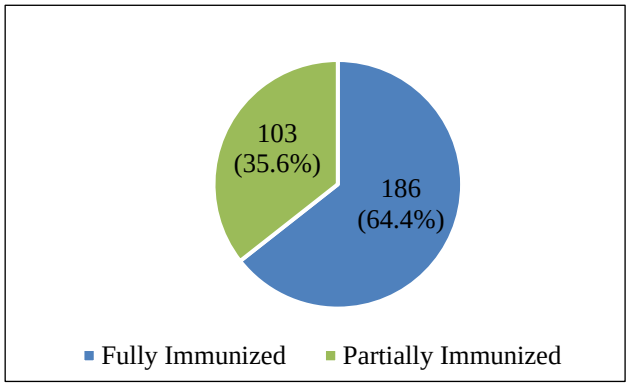

Figure 3: Immunization status of children.

Table 3 shows BCG coverage was 98.3% whereas measles coverage was 77% and the dropout rate determined for entire the immunization was 21.8% (using BCG and measles as proxy vaccines, BCG as entry vaccine, and measles as exit vaccine (BCG coverage-measles coverage/BCG coverage *100).

Table 3: Coverage rate and dropout rate of individual vaccines.

Vaccines	Coverage rate		Dropout rate	
	(n=289)	%	(n=289)	%
BCG	284	98.3	5	1.7
OPV-0	260	90	29	10
HEP-B	247	85.5	42	14.5
OPV-1	277	95.8	12	4.2
OPV-2	261	90.3	28	9.7
OPV-3	248	85.8	41	14.2
DPT-1	277	95.8	12	4.2
DPT-2	261	90.3	28	9.7
DPT-3	248	85.8	41	14.2
Measles*	222	77	65	23

*Only 287 children were eligible for measles vaccination

Reasons for partial immunization

Out of 103 children who were partially immunized, the respondents lacked information regarding the vaccination followed by a lack of motivation and obstacles.

Table 4: Reasons for partial immunization.

Reasons of partial immunization	Frequency (n=103)	Percentage (%)
Lack of information*		
Unaware for need of immunization	28	27.2
Unaware of need to return for 2nd dose and 3rd dose)	32	31.1
Fear of side effects	11	10.7
Wrong ideas about contraindications	10	9.7
Lack of motivation		
Postponed until another time	26	25.2
Obstacles*		
Place of immunization too far	12	11.7
Time of immunization inconvenient	15	14.6
Vaccinator absent	2	1.9
Vaccination not available	2	1.9
Child ill brought but not given immunization	18	17.5
Long waiting time	7	6.8

*Multiple responses

The respondents who were not completing the child's vaccination were asked for reasons of failure. According to table 05, it is inferred that most of the respondents replied that they were postponing the vaccine until another time (25.2%). Also, 27.8% were unaware of the need for vaccination and 31.1% were unaware of the subsequent doses, ill brought but not given vaccination (17.5%). Followed by the common reasons were the time of vaccination inconvenient (14.6%) and fear of side effects (12.6%) (Table 4).

The higher number of fully immunized children 29.6% were in the 37-48 age group and was found to be significantly associated with the immunization status of the children. The probability of fully immunized children was higher in literate mothers with 88.7%, whereas partially immunized children were also higher in literate mothers with 86.2%. The education status of mothers was not significantly associated with the immunization status of their children. Immunization coverage of children was significantly related to the education level of their fathers. Fathers with no education were less likely to vaccinate their children, the proportion of fully immunized children was found higher in literate groups (89.2%). The occupation status of parents were not significantly affecting the immunization status (Table 5).

Majority 94.1% of fully immunized children were found among the respondents who had heard about the Universal Immunization Programme (UIP), and mothers who attended health education meetings had a higher number of fully immunized children with 64% which is significantly associated with immunization status. Mothers who knew about the consequences if not vaccinated properly had a higher number 89.8% of fully immunized children which is significantly associated with immunization status (Table 6).

In the binary logistic regression analysis, factors found to be statistically significant with the immunization status were the occupation of father, knowledge about UIP, attended health education meetings, and consequences if not vaccinated properly. It is observed that the education of the father is predicting factor for the immunization status, as the exponential B suggests that the odds of occupation as a predicting factor for immunization status is increased by 1.1 units (OR-1.874, S.E = 0.355, df. = 1, which is statistically significant (Table 7).

Table 5: Factors associated with demographics and immunization status.

Variables	Immunization status				Association		
Gender	**Fully immunized (n=186)**		**Partially immunized (n=103)**		**Total (%)**	**x^2**	**P value**
	N	**%**	**N**	**%**			
Male	96	51.6	56	51.4	152 (52.6)	0.202	0.653
Female	90	48.4	47	45.6	137 (47.4)		
Total	186	100.0	103	100.0	289 (100)		
Age group (in months)							
Less than 12	3	1.6	16	15.5	19 (6.6)	51.273	0.000
12-23	28	15.1	41	39.8	69 (23.9)		
24-36	52	28	18	17.5	70 (24.2)		
37-48	55	29.6	16	15.5	71(24.6)		
49-59	55	29.6	16	15.5	71(24.6)		
Total	186	100.0	103	100.0	289 (100)		
Place of delivery							
Home	6	3.2	6	5.8	12 (4.2)	1.125	0.289
Institution	180	96.8	97	94.2	277 (95.8)		
Total	186	100.0	103	100.0	289 (100)		
Type of family							
Nuclear	87	46.8	40	38.8	127 (43.9)	1.696	0.193
Joint	99	53.2	63	61.2	162 (56.1)		
Total	186	100	103	100	289 (100)		
Education of mother							
Illiterate	21	11.3	19	18.4	40 (13.8)	2.487	0.092
Literate	165	88.7	84	81.6	249 (86.2)		
Total	186	100.0	103	100.0	289 (100)		
Education of father							
Illiterate	20	10.8	24	23.3	44 (15.2)	8.087	0.004
Literate	166	89.2	79	76.7	245 (84.8)		
Total	186	100.0	103	100.0	289 (100)		
Occupation of mother							
Employed	62	33.3	33	32	95 (32.9)	0.050	0.822
Unemployed	124	66.7	70	68	194 (67.1)		
Total	186	100.0	103	100.0	289 (100)		
Occupation of father							
Employed	177	95.2	99	96.1	276 (95.5)	0.141	0.707
Unemployed	9	4.8	4	3.9	13 (4.5)		
Total	186	100.0	103	100.0	289 (100)		

Table 6: Association between knowledge on vaccine related information and immunization status.

Knowledge on vaccine related information	Fully immunized (n=186)		Partially immunized (n=103)		Total (%)	x^2	P value
	N	%	N	%			
Knowledge about Universal Immunization Programme (UIP)							
Yes	175	94.1	81	78.6	256 (88.6)	15.634	0.000
No	11	5.9	22	21.4	33 (11.4)		
Total	186	100.0	103	100.0	289 (100)		
Attended health education meetings (lactation, immunization and post-natal care)							
Yes	119	64	50	48.5	169 (58.5)	6.504	0.011
No	67	36	53	51.5	120 (41.5)		
Total	186	100.0	103	100.0	289 (100)		
Knowledge that disease being prevented by vaccination							
Yes	139	74.7	67	65	206 (71.3)	3.036	0.081
No	47	25.3	36	35	83 (28.7)		
Total	186	100.0	103	100.0	289 (100)		
Know about consequences if not vaccinated properly							
Yes	167	89.8	73	70.9	240 (83)	16.837	0.000
No	19	10.2	30	29.1	49 (17)		
Total	186	100.0	103	100.0	289 (100)		

Table 7: Immunization status predictors based on multiple logistic regression.

	B	S.E	Wald	df	Sig.	Exp (B)	95% C.I. for Exp (B)	
							Lower	Upper
Education father	0.628	0.355	3.135	1	0.077	1.874	0.935	3.756
Knowledge about UIP	0.842	0.453	3.448	1	0.063	2.321	0.954	5.643
Attended health education meetings	0.307	0.273	1.261	1	0.261	1.359	0.796	2.322
consequences if not vaccinated	0.712	0.389	3.353	1	0.067	2.038	0.951	4.366
Constant	-1.056	0.181	34.205	1	0	0.348		

DISCUSSION

Immunization is one of the most cost-effective public health interventions, which is, directly and indirectly, responsible for reducing the morbidity and mortality of the under- five age group. In the current study, it was found that the majority 64.4% were fully immunized and 35.6% were partially immunized when compared to a study by Mithrason et al where 47.62 percent had fully immunized and 52.38% were partially immunized.[11] In another study conducted by Khargekar et al in 2015 in the tribal community of Parol, Thane district, 71.1 percent of children were fully immunized, 17.8 percent were only partially immunized which when compared to our study showed increased vaccination coverage.[12]

Coverage in terms of individual vaccines, the maximum coverage was for BCG and the least was for MR and DPT doses, which is consistent with findings reported by Mithrason et al, and Kumar et al in Noolpuzha panchayat, the dropout rate is determined using coverages of BCG as entry vaccine and Measles as exit vaccines. The Dropout rate is a proxy measure of utilization of the Immunization Programme.[11,13] Though there are still dropouts in immunization services, the dropout rate in the present study was higher than the WHO recommended cut-off point (10.0%). It was 21.8% in our study differs from previous studies conducted in Ghana (2017) and Senegal (2005) where 5.6% and 30.9% were reported as dropout rates respectively.

Knowledge of vaccine-related information

The knowledge regarding the vaccination was quite satisfactory among the respondents. 70.8% of them said that they were aware of the diseases which are prevented by vaccines available in the UPI which is consistent with the results of earlier investigations such as 75.3 percent for Kumar et al and 65.16 percent for Angadi et al.[13,14]

Reasons for partial immunization

The Main reasons behind the partial immunization were found to be a lack of knowledge on the need for immunization and its subsequent doses, place and time of immunization, unknown, fear of side effects, time

inconvenient, and place of immunization too far, which was in accordance to the study conducted by Mithrason et al and Kumar et al nand contrasted to the study conducted by Khargekar et al.[11-13] This was also revealed by Kar et al were the major causes for incomplete immunization were the postponement of vaccination due to illness of the child, lack of knowledge of the immunization schedule, and migration to the native village.[15]

Socio-demographic factors associated with immunization status

In the present study, the age group of children is significantly associated with immunization coverage, which is in accordance with the study conducted by Cao et al, in China, Kurane et al and Mangalik et al which also stated that the probability of being fully immunized appears to increase with age because older children have more opportunities to access immunization.[16-18] The study also revealed that gender did not have any significant effect on partial immunization which is similar to the study conducted by Khargekar et al and Angadi et al and Kadri et al.[15,18,19] In study by Dhilip Kumar et al, stated that there was a significant difference in family size on immunization status.[20] In the present study, the education of the father had a significant effect on the immunization status whereas a study conducted by Kurane et al and Priyanka et al observed that parental education had a significant effect on the immunization status.[17,21] Additionally, the likelihood of having had all recommended vaccinations increased with paternal education levels, indicating that raising paternal knowledge of vaccinations improves children's immunization status.[16] The occupation of the mother had no significant effect on immunization status which is in contrast to a study by Kurane et al and Priyanka et al stated that there was a significant association between the mother's occupation and immunization status.[17,21] Children who had their immunization cards on hand had higher coverage. This demonstrates that mothers were presumably highly motivated and were aware of the significance of keeping such information on hand for follow-up.[22,23]

Predictors of immunization status based on multiple logistic regression analysis

The education of father came out to be a significant independent predictor of immunization status. The reason may be because almost fathers are decision-makers of the family. In contrast to other research, Kumar et al study's found that mothers' occupations are an independent predictor of immunization status rather than being linked to vaccine coverage. In this study, knowledge of UIP and the consequences of non-immunization was a significant predictor factor for immunization status. Attending health education meetings was also a significant predictor factor similar to a study by Kumar et al.[16]

This study has some limitations. Due to the presence of COVID-19 cases in some hamlets of the study area, the size was not achieved accurately. Recall bias of respondents was considered as a limitation as they were not sure of the vaccine given. Two participants were omitted due to missing immunization cards and were not able to recall immunization information.

CONCLUSION

From the results of this study, we conclude that more than half of the study population that is 64.4% were fully immunized and 35.6% were partially immunized with an overall dropout rate of 21.8%. The most common reason for partial immunization was found to be unaware of the need for immunization and their subsequent doses. Regarding knowledge, most of the mothers were aware on universal immunization programme and the consequences if not vaccinated. When compared to socio-demographic factors, age and education of the father were significantly associated with complete immunization and it was also observed that the majority of mothers had information about immunization of children, which is substantially associated with vaccine coverage and paternal education as an independent predictor for immunization status. Though the likelihood of receiving all recommended vaccinations tends to rise with maternal education and institutional delivery, there is a need to create awareness about the importance of vaccination and the subsequent doses among tribal people.

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Ethical approval: The study was approved by the Institutional Ethics Committee of the Tamil Nadu Dr. MGR Medical University, Chennai

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