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Coverage of Japanese Encephalitis vaccine among children 12-36 months of age of migrant workers and factors determining it in metro city of Southern Karnataka– A cross-sectional study

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Abstract

Background

Vaccination is the most successful and cost-effective weapon against vaccines preventable diseases including Japanese Encephalitis(JE). Every year 3 billion people globally are at a risk of getting infected and 68,000 clinical manifest the disease with 6000 deaths. Frequent shifts of places, poor knowledge and lower socioeconomic status make children of migrant workers suffer from JE. Objectives were to assess the coverage of JE vaccine among children 12-36 months of age of migrant workers; to identify the reasons for partial and no-immunisation and to determine factors associated with coverage.

Methods:

A community based cross-sectional study was undertaken among 280 children 12-36 months aged residing in migrant areas of urban areas of southern Karnataka. Cluster sampling method was adopted. Data was collected using pre-tested semi-structured questionnaire and analysed using Epi InfoTM version-7.2.1.

Results:

Out of 280 children who were from JE endemic districts, 216(77.14%) received JE-1st dose and 64(22.86 %) did not receive. Out of 207 children who were eligible for JE-2nd dose, 85(41.06%) received vaccine and 122(58.94%) did not receive. The most common reasons for partial/no immunization were migration, unaware of need for immunization, busy schedule of parents etc. There was a significant association between age of the child and presence of immunization card with JE vaccine uptake.

Conclusion: Coverage of JE-1st and 2nd dose was 77.14% and 41.06%. Awareness must be generated regarding initiation and continuation of vaccination, capacity building of health workers and better utilization of the services provided by the government.

Key words: JE, migrants, southern Karnataka, 12-36 months.

Introduction

Immunization is the most successful and cost-effective weapon against vaccine preventable diseases. Many infectious diseases like tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, hepatitis B, H.Influenza, measles, rubella including Japanese Encephalitis (JE) can be prevented by immunization.[1]

Japanese Encephalitis is a vector borne zoonotic disease. Among World Health Organisation (WHO) regions, 24 countries in South-East Asia and Western Pacific regions are endemic to JE virus transmission. Approximately every year 3 billion people globally are at a risk of getting infected with JE virus with 68,000 clinical manifestation and 6000 deaths. [2,3] In India, there are 171 districts in 19 states which are endemic to JE virus infection and in Karnataka 10 districts are endemic to it namely Tumkur, Bellary, Bijapur, Dharwad, Gadag, Haveri, Kolar, Koppal, Mandya and Raichur. [4]

As JE mainly affects children, Government of India has included JE vaccine under National Immunisation Schedule in all the areas wherever JE is considered as a public health issue wherein 2 doses of JE vaccine are given at 9-12 months and 16-24 months along with measles 1st and 2nd dose.

Children suffer from lack of immunization because of frequent shift of places, poor knowledge and lower socioeconomic status.[5] By active immunization, mortality rate due to JE can be reduced especially among children of migrant workers. The objectives of the study were to assess the Japanese Encephalitis vaccination status of children 12-36 months age of migrant workers; to assess the factors associated with the coverage; to identify the reasons for non-immunization or partial immunization amongst these children

Methods:

A Community based cross sectional analytical study design was adopted. All the migrant areas under each Primary Health Centres of Bangalore Urban East were included. These migrant areas are situated mainly near construction areas, brick kilns, slums and temporary settlements. Duration of the study was one year and six months, from February 2019 to August 2020. Children of migrant workers aged between 12-36 months who were residing in migrant areas of Urban Bangalore east were the study population. The study was conducted after obtaining institution ethics committee clearance.

Sample size was calculated based on National Health and Family Survey Data–4 (NFHS-4) where the prevalence of children 12-23 months who were fully immunized in India was 62%.[6] The required sample size was 251. With 10% non-response rate, the information was gathered from 280 participants.

Selecting the clusters: Cluster sampling method was incorporated in the study. All Primary Health Centres in Bangalore East were listed. From these, migrant areas were identified. Population of each area was noted and the cumulative population was calculated. The sampling interval was then calculated by dividing population to be surveyed by 28. A random number which was less than or equal to the sampling number was selected. The 1st cluster was formed by selecting the cumulative population which was equal to or greater than the random number. The 2nd cluster was formed by adding the sampling interval to the random number and the cumulative population listed for that area will be equal to or greater than the number that is being calculated. The 3rd to 28th clusters were formed by adding the sampling interval to the previous cluster. From each cluster 10 children were selected so as to get a sample size of 280.

Figure 1 depicts the flowchart of process of data collection.

Selecting a household in each cluster: In the migrant area, the central location was identified. A pen was rotated on an even ground and the direction was decided where the tip of the pen pointed. Then the interviewer walked in the direction selected. First house was interviewed if the child between 12-36 months was present. If two or more eligible children were present in the same house then all of them were incorporated in the study. The next house was selected which was nearest to the 1st house. In this manner, 10 children from each cluster were selected.

Parents/ guardians who gave consent to participate in the study and children who were present during the study period were included in the study and **c**hildren 12-36 months of age without any adult informant were excluded from the study.

The interviewer used a pre-tested semi-structured questionnaire after pilot study and validating the questionnaire. Age of the child was confirmed from parents/guardians, birth certificate and immunization cards. A child was considered immunized based on the immunization card. In the absence of it, information from parents/guardians was considered. If the child was not immunized then the most important reasons for non-immunization were enquired. [7,8]

Tool for Data Collection: Contained 3 sections:
Section A: Sociodemographic details namely age, gender, birth order, religion, caste, number of children 12-36 months of age in the family, type of family, marital status of parents, age of parents/guardians, education and occupation of parents/guardians, socioeconomic status classification, duration of stay in Bangalore and previous place of stay before migrating.
Section B: Details of JE vaccine uptake
Section C: Reasons for non-immunisation or partial immunization
Operational Definitions:

Immunised till date - A child was considered immunised till date if he/she has taken all the doses required for that particular age.
Left outs – Beneficiaries who are neither identified nor listed and hence not immunised by the health workers. [9]
Drop out – Children who receive one dose of vaccination but do not receive subsequent immunization. [9]
Migrant –The person residing in brick kilns, rice mills, slums, construction sites, nomads, temporary settlements and families coming from outside Bangalore and residing for more than one month prior to the date of interview and up to 6 months. [10]
Data entry and data analysis:
Data was entered and analysed in Epi Info TM software and Statistical Package for Social Sciences (SPSS). The data was summarized and presented as frequencies and percentages using appropriate tables and graphs. Chi Squared test was applied to for the association between various factors affecting immunisation status of the children and P-value < 0.05 was considered statistically significant.

Results:

The mean age of the children was 24.84 ± 8.72 months. There were 47.14% females and 52.86% males. Majority (37.86%) of the children belonged to 31-36 months of age group which was followed by 12-18 months (36.79%), 25-30 months (15.71%) and 19-24 months (9.64%) aged children. Approximately 40.36% children were of birth order one, 34.64% children were of birth order 2 and 25.00% children were of birth order 3 or more. Nearly 67.14% of the children belonged to Hindu religion and 32.86% were non-Hindus. Migrant children belonging to nuclear family were 71.79%, to a joint family were 17.86% and to a three-generation family were 10.36%.

Majority (51.79%) of the fathers of study participants were more than 30 years of age, 43.21% of the fathers were between 25-29 years of age and 5.00% were between 20-24 years. Majority (44.64%) of mothers were between 25-29 years of age followed by 20-24 years (34.29%) and 30 or more than thirty years of age (21.07%). Illiteracy was more among fathers (52.14%) when compared with mothers (47.14%). Nearly 51.43% mothers of the study participants were married before the age of 18 years and 17.14% fathers were married before the age of 21 years. Fathers of 31.79% children were construction workers and mothers of 54.64% children were homemakers. Nearly 74.29 % children belonged to upper lower class according to Modified Kuppuswamy classification followed by 20.71% children from lower middle class and 5.00% from upper middle class. None of the children were from upper or lower class.

Nearly 7.50% children were staying in Bangalore for the past 1 month, 11.79% for 2 months, 17.50% for 3 months, 13.57% for 4 months, 25.71% for 5 months and 23.93% for 6 months. Majority of these migrant children were staying nearby a health care facility in Bangalore.

Among 280 children, 50.71% had immunisation card. Majority of the children received their vaccines from government set-up followed by private set-up.

Figure 2 shows the distribution of study participants based on immunisation status of the vaccine with JE vaccine. Out 280 children, 47.86% (134) children were immunised with JE dose completely and 29.29 % (82) children were partially immunised. Nearly 22.86% (64) children were not at all immunised with JE vaccine.

Figure 3 shows coverage of Japanese Encephalitis (JE) vaccine among children who lived in endemic areas. In the present study, out of 280 children, all were eligible for 1st dose and 207 children were eligible for 2nd dose of JE vaccine. Out of 280 children who were eligible for JE-1st dose, 216 (77.14%) received vaccine and 64 (22.86 %) did not receive. Out of 207 children who were eligible for JE-2nd dose, 85 (41.06%) received vaccine and 122 (58.94%) did not receive the vaccine.

The most common reasons for partial immunisation were migration, unaware of need for immunisation, unaware when to return for next dose of immunisation, etc. The reasons for partial immunisation for both the doses are shown in table 1.

In univariate analysis, age of the child; gender; parent's age; parent's education; birth order; number of children 12-36 months of age in the family; type of family, socioeconomic status and presence of immunisation card were the factors used to look for its association with immunisation status of the child. However, we found that only age of the child and and presence of immunisation card were the factors determining the immunisation status of the child and this is depicted in table 2. Children younger age group (12-18 months) had better immunisation status when compared with children of older age group i.e, 19-36 months (p-value=0.0026).

Children who possessed immunisation card had better immunisation status when compared with children who did not possess immunisation card (p-value <0.001).

Discussion:

Immunisation is a weapon against many vaccines preventable diseases. Immunising a child will reduce infant morbidity and mortality rate to a significant extent. Frequent shift of place and poor knowledge regarding immunisation among migrants leads to poor utilization of immunization services and also make them more vulnerable to vaccine preventable diseases. The present study was conducted among 280 children of migrant workers aged 12-36 months residing in urban Bangalore East.

In the present study only 50.71% have immunisation card and in the study done by Murhekar MV et al only 66.07% had immunisation card. [11]

The coverage of JE 1st and 2nd dose of vaccine in present study was 77.14% and 41.04%. This was comparable with a study done by Tandale BV et al in 2022 where the coverage of JE vaccine is 94.80% in Maharashtra and 92.80% in Telangana. [12] This shows higher improvement in JE vaccine coverage.

However, the study by Murhekar MV from Gorakhpur, Uttar Pradesh reported JE vaccination coverage rate of 51% in 2013 which was very less when compared to our study. [13] The study done by Murhekar MV et al in 2014-2015 reported JE 1st and 2nd dose 75.00% and 42.00% respectively which is also very less when compared to the present study. [11]

The most common reasons for partial immunization in the present study for both 1st and 2nd dose were migration, unaware of need for immunisation, unaware when to return for next dose of immunisation and inconvenient time for parents/ guardians to take their children for immunisation. In a similar study done by Tandale et al in 2022 among children 2-6 years of age the most common reasons for partial immunisation were shortage of vaccine and parental migration. [12]

There was no association between gender and immunization status of the children. Similar finding were reported by Tandale et al. [12] This highlights that there was no gender disparity among parents/guardians about immunization of their children.

Under Universal Immunization Programme, the 1st dose of JE vaccine is administered along with 1st dose of Measles- Rubella (MR) and 2nd dose of JE vaccine is administered along with 2nd dose of MR and DPT (Diphtheria Pertussis and Tetanus) booster. [14] Data from the published studies have shown that administration of JE along with DPT and MR vaccine has an acceptable safety profile and does not affect the immunogenicity of the individual. [15,16]

In the present study, Measles Rubella-1 coverage is 87.60% and Measles Rubella-2, Diptheria Pertussis and Tetanus booster coverage is 87.60%. Due to poor knowledge and frequent shift of places, though both the doses are given at same time i.e., 9-12 month and 16-24 month; the coverage was not the same. However, a study done by Tandale et al, there was a good agreement between JE and MR coverage. [12]

The present study had a limitation, 50.71% children did not have an immunization card. History given by parents'/ guardians' was considered to assess vaccination taken by the child. This could have led to recall bias.
Hence, we recommend that efforts must be directed to achieve 100% immunization coverage with JE vaccine among migrant workers children. Efforts must be made not only to initiate immunisation but also follow up of vaccines to reduce the drop-out rate is necessary. Reasons for partial immunisation must be addressed to achieve full immunisation coverage. Children of migrant workers suffer from lack of immunization because of frequent shift of places and lack of knowledge of the parents. Immunisation sessions and camps must be organised near the high-risk areas at time when parents are available. Along with routine immunization, awareness must be generated among the caretakers regarding antenatal care registration, regular antenatal and postnatal visits and institutional deliveries as these improve the immunization coverage. Capacity building of health workers must be done to motivate the migrants for routine immunisation and follow up for next dose of vaccine so as to prevent the drop-outs. Digitalised tracking and monitoring of these migrants' children helps in achieving 100% immunisation coverage, preventing the drop-outs and maintaining records for national statistics.

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Tables and figures:

Figure 1: Flow-chart showing the process of data collection

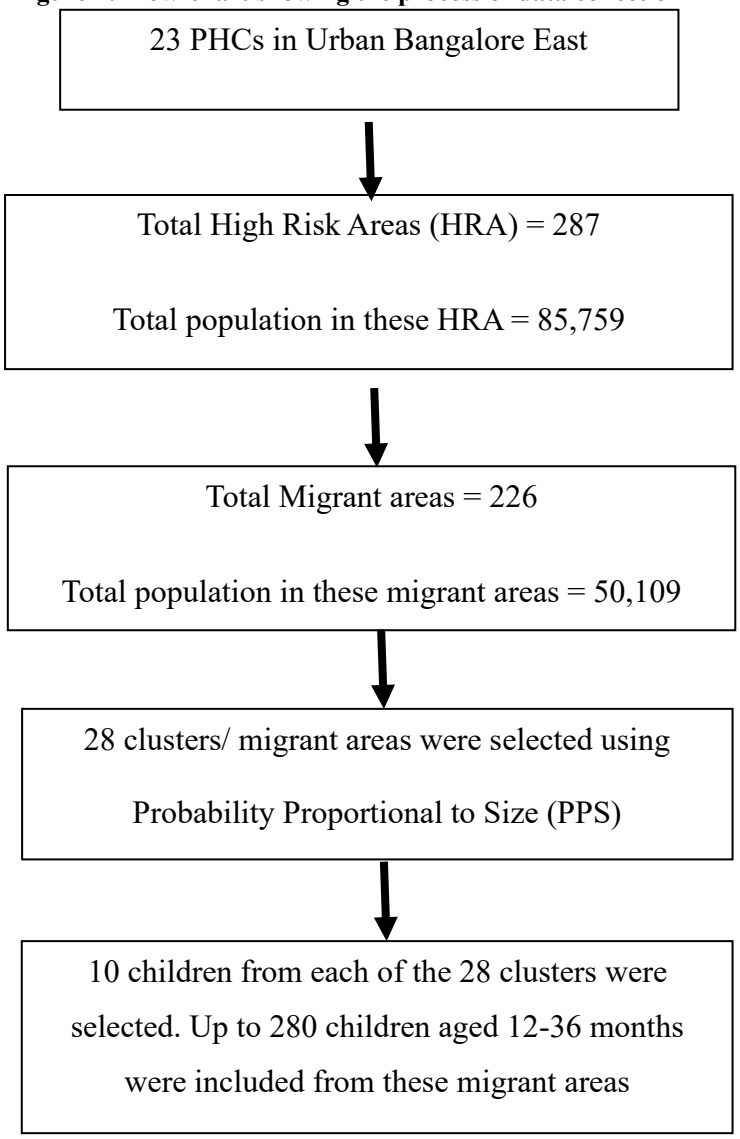

Figure 2: Distribution of study participants based on immunisation status with JE vaccine(N=280)

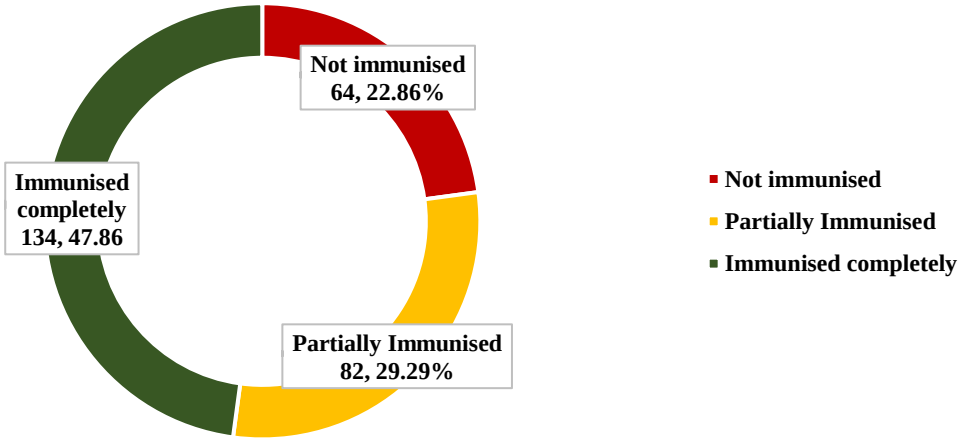

Figure 3: Coverage of Japanese Encephalitis (JE) vaccine among children who were lived in endemic areas

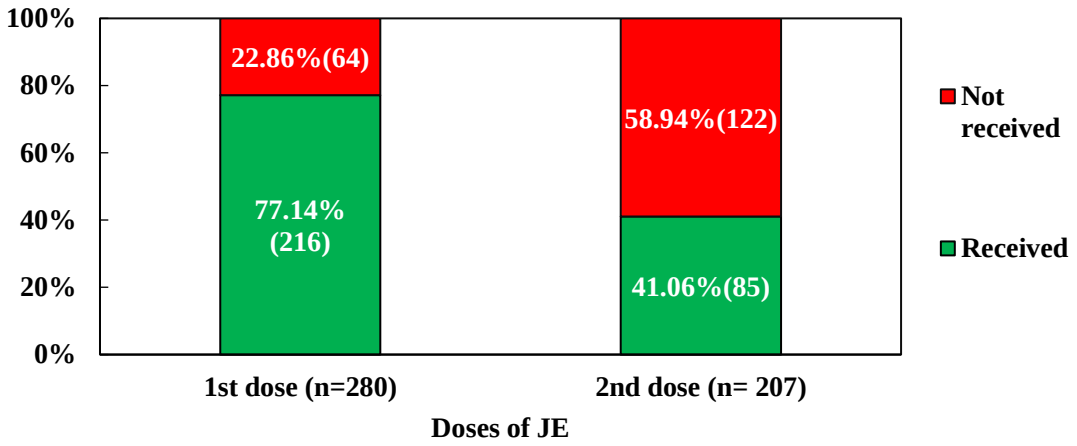

Table 1: Reasons for partial immunisation for 1st and 2nd dose of JE vaccine:

Sl.No.	Reasons for Partial Immunization	1st dose n=64	2nd dose n=122
1.	**Migration**	**18**	17
2.	Unaware of need for immunization	14	0
3.	Busy schedule of parents	13	23
4.	Time inconvenient for immunisation	11	23
5.	Lack of motivation	11	12
6.	Fear of side-effects	8	11
7.	Family problems including mothers illness	7	7

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8.	Unavailability of vaccine	6	4
9.	Place of immunization far and unknown	2	0
10.	Child ill hence not brought for immunization	1	0
11.	Child ill and is brought for immunization but not given	1	0
12.	**Unaware when to return for next dose of immunisation**	0	**32**

Note: Multiple responses. Numbers are not mutually exclusive

Table 2: Association between various variable and immunisation status with JE vaccine (N=280)

Sl.No.	Variable	Immunisation Status				χ^2	p-value
		Immunised with both doses		Partial and no-immunisation			
		Number	%	Number	%		
1.	Age (months)						
	12-18	63	47.01	40	27.40	14.21	**0.0026***
	19-24	7	5.22	20	13.70		
	25-30	18	13.43	26	17.81		
	31-36	46	34.33	60	41.10		
2.	Gender						
	Male	72	53.73	76	52.05	0.0788	0.78
	Female	62	46.27	70	47.95		
3.	Birth Order						
	1	46	34.33	67	45.89	3.96	0.14
	2	52	38.81	45	30.82		
	≥ 3	36	26.87	34	23.29		
4.	Number of children 12-36 months of age in the family						
	1	60	44.78	64	43.84	2.061	0.36
	2	61	45.52	74	50.68		
	3	13	9.70	8	5.48		
4.	Fathers age						
	20-24	7	5.22	7	4.79	0.03	0.9850

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	25-29	58	43.28	63	43.15		
	≥ 30	69	51.49	76	52.05		
5.	Fathers Education						
	Illiterate	67	50.00	79	54.11	0.98	0.81
	Primary	50	37.31	48	32.88		
	Middle	7	5.22	6	4.11		
	High	10	7.47	13	8.90		
6.	Mothers age						
	20-24	44	32.84	52	35.62	1.9545	0.3763
	25-29	57	42.54	68	46.58		
	≥ 30	33	24.63	26	17.81		
7.	Mothers Education						
	Illiterate	62	46.27	70	47.95	5.78	0.123
	Primary	59	44.03	51	34.93		
	Middle	8	5.97	10	6.85		
	High	5	3.73	15	10.27		
8.	Type of family						
	Nuclear	93	69.40	108	73.97	0.9614	0.6184
	Three generation	14	10.45	15	10.27		
	Joint	27	20.15	23	15.75		
9.	Religion						
	Hindu	90	67.16	98	67.12	0.123	0.9405
	Muslim	19	14.18	19	13.01		
	Christian/Others	25	18.66	29	19.86		
10.	Socioeconomic Status						
	Lower middle	31	23.13	27	18.49	0.99	0.60
	Upper lower	96	71.64	112	76.71		
	Upper middle	7	5.22	7	4.79		

11.	Immunisation card						
	Present	128	95.52	14	9.59	206.43	< **0.001***
	Absent	6	4.48	132	90.41		
Total		134	100	146	100		

*P-value <0.05

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