Original Article

Coverage of Japanese Encephalitis Vaccine in Kalaburagi City, Karnataka, India: A Cross-Sectional Study after the Vaccination Campaign

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Abstract

Introduction: Group B arbovirus is the cause of Japanese encephalitis (JE), with a 20–40% case fatality rate, is spread by the culicine mosquito.[1] Due to the rise in incidence reported in Karnataka, JE immunization campaign with inactivated JENVAC vaccine was conducted in December 2022 in 10 Karnataka districts including Kalaburagi, an undeveloped district vaccinating children aged 1-15 years.[2]

Objectives: To evaluate vaccine coverage and the challenges faced among children in Kalaburagi city, following the campaign.

Materials & Methods: 210 children were chosen using 30*7 cluster sample method.[3] Eligible children residing at Kalaburagi city were included, although recently immigrated and immunized residents of surrounding talukas were not. This survey was conducted two months following the campaign. JE vaccination status was assessed using a pretested, semi-structured questionnaire from reliable informants.SPSS software version 16 was used for analysis after the data were entered into an Excel sheet. Statistical tests like Chisquare, frequency and percentage were used.

Results: Of the 210 children, the majority were younger than five years old. Estimated vaccine coverage was 68.6% with the major reason being unawareness followed by hesitancy for vaccination with no significant association with sociodemographic factors.

Conclusion: Raising awareness through the media andmedical professionals contributes to the vaccination's ability to lower the prevalence of JE and vaccinating nonvaccinators unless contraindicated.

Keywords: Japanese encephalitis, campaign, Kalaburagi city, 1-15 years children, vaccine hesitancy

Introduction

The Japanese Encephalitis(JE)-causing agent is the Group B arbovirus, also known as the flavivirus, which has a 20–40% case fatality rate and long-term consequences that was initially discovered in Japan in 1935.[1] An enzootic cycle that includes culicine mosquitoes and amplified vertebrate hosts: mostly

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pigs, maintains the virus. Due to the proximity of humans to these vertebrate hosts, the disease is primarily found in rural and peri-urban areas, often associated with rice farming. Transmission rates are highest during the monsoon and post-monsoon seasons because of increased mosquito populations.[4] This is the most common cause of encephalitis in Asia and the Western Pacific, affecting most children under the age of fifteen. India is responsible for a sizable share of JE cases worldwide. The JE virus transmission was initially discovered in 1952 in Nagpur, and the first JE case was documented in Vellore, Tamil Nadu, in 1955. Nearly two decades later, in 1973, the first outbreak was reported in Burdwan and surrounding West Bengal districts. Massive outbreaks occurred in eastern Uttar Pradesh, Bihar, and Assam in 2005. There are thousands of cases recorded annually, however, the exact true burden of the disease is not fully represented due to underreporting and challenges with surveillance.[5]

Currently, the only way to cure JE is to manage its symptoms, which have a 72-hour "golden period" after which the condition can be fatal. Since there are other virus reservoirs than humans, it is extremely unlikely that JE infection will be eradicated from society. The WHO advises implementing effective JE prevention and control measures in all areas where JE is a recognized public health concern. The control measures include vaccination, in addition to enhancing surveillance and reporting systems. The Government launched an initiative that included three stages to contain the outbreak, the three stages were: 1) surveillance, 2) a vaccination campaign (multidistrict) using a vaccine that was imported from China (the live, attenuated SA14-14-2 vaccine); this is done in collaboration with the National Vector-Borne Disease Control Program (NVBDCP) and the Immunization Division of the Ministry of Health and Welfare, and 3) an Information, Education and Communication(IEC) campaign in the affected districts to overcome outbreak. JE immunization initiatives were started in 2006 in 11 districts of 4 Indian states, including the Bellary district of Karnataka. A five-year strategy (2006–2010, with a mop-up effort in 2011) was devised to cover the 104 districts in India that were identified as high-risk JE-endemic areas. The average coverage of these districts was 82% (range from 69–98%) targeting children aged between 1 and 15 and then incorporated into the Universal Immunization Program (UIP).In endemic regions, JE immunizations are currently given in two doses, the first between 9 and 12 months and the second between 16 and 24 months. JE vaccines are used in 15 countries worldwide.[5]

Large-scale vaccination campaigns for children are only permitted with the agreement of the Indian government. 10 districts, including Davanagere, Chitradurga, Dharwad, Mandya, Kolar, Chikkaballapur,Vijayapur, Koppal, Raichur, and Bellary were approved for Karnataka to administer the vaccination as part of UIP. After receiving reports of 21 cases of JE in Karnataka through in the month of October 2022, the State's Health Department launched a three-week JE vaccination campaign in December 2022, targeting children aged 1-15 in 10 additional districts including Kalaburagi. December month was chosen for the campaign which mostly targeted government and private schools in the first week followed by hospitals, Anganwadi centers, and communities over the course of the following two weeks.[2]The campaign used the JENVAC (inactivated) vaccine which had a 4-fold seroconversion of 93.14% for those aged ≥1 year to ≤50 years and 98.67% seron-protection.[6]

Kalaburagi City is the largest city in Hyderabad-Karnataka (also known as Kalyana-Karnataka) with a projected population of 6,10,076 as per GOI. Being a part of a backward district of North Karnataka, this study was conducted to evaluate children's JE vaccination coverage following the campaign. Using the WHO survey method, the proposed study was able to find the coverage and barriers to non-vaccination.[3]

OBJECTIVE OF THE STUDY

1. To estimate JE vaccination coverage post-campaign in Kalaburagi city.
2. To identify the barriers to non-vaccination of children and the association between sociodemographic profile and non-vaccination.

Materials and Methods

In Kalaburagi City, a community-based cross-sectional study was carried out in the months that followed the campaign, from January to February

2023. Institutional ethical clearance was obtained. Eligible participants were chosen using the WHO immunization survey's 30*7 cluster approach.[3] With the help of reliable informants, children between the ages of 1 and 15 who live in Kalaburagi City and have given their consent(from parents)/assent to the study were included. The study excluded individuals who had recently moved to this area as well as received a JE vaccination from other talukas or districts. With a total of 540 Anganwadi centres in the city, 30 clusters were divided with each cluster having an approximate population of 18000 and 18 anganwadies. Starting from the center of the cluster, 7 eligible children were selected by interviewing the subsequent houses in a sequential pattern. In case of more than one child present in the house, the youngest was considered and in the absence of eligible participants, the next house was taken until a sample size of 210 was achieved. Reliable informants were enquired after obtaining verbal consent/assent in their native language. Questions regarding the child's sociodemographic characteristics make up the first section. Questions regarding vaccination status, adverse events following immunization, and reasons for not vaccinating in case of non-vaccination make up the second section. Vaccination cards were checked for confirmation. In case of non-availability, data like date, and vaccination site were asked and rechecked with available health records. Microsoft Excel was used to enter the data, while SPSS version 16 was used for analysis. Statistical tests like frequency, percentage, and Chi-square tests were applied to find the association between sociodemographic factors with vaccination coverage. The results were considered statistically significant if P value < 0.05.

Result and Discussion

Table 1 shows the sociodemographic profile of the children. Out of 210 children, the majority belongs to the Under 5 age group-44.8%(94) with the mean age being 6.4(±3.6) years old. The majority of parents have completed secondary education and belong to the lower middle class. As it is an urban area, the majority belong to a family with less than 5 members 69%(145). Figure 1 shows the vaccination coverage of children. 68.6%(142) of children were vaccinated at the time of data collection. Table 2 describes the vaccination details. The majority received vaccination from school-73.2%(14). A minority had reactions -23.9%(34) following immunization which were pain and redness at the site of injection with none reporting major reactions. Figure 2 enlists the reasons for not vaccinating. Nearly 31.4%(68) were not vaccinated and the reasons given were that they were unaware of the vaccine-36.8%(25) and showed hesitancy for getting their children vaccinated-35.3%(24). Table 3 shows the association between the sociodemographic profile and the vaccination status of children wherein association could not be elicited.

Table 1. Socio-demographic profile of participants

Sociodemographic profile		**Frequency (n=210)**
Age(in years)	1-5	94(44.8)
	6-10	82(39)
	11-15	34(16.2)
Gender	Boys	107(51)
	Girls	103(49)
Father's education	Illiterate	24(11.4)
	Primary	23(11)
	Middle	3(1.4)
	Secondary	90(42.9)
	Graduate	70(33.3)
Mother's education	Illiterate	31(14.7)
	Primary	52(24.8)
	Middle	12(5.7)
	Secondary	81(38.6)
	Graduate	34(16.2)
Family members	1-5	145(69)
	6-10	65(31)
SE class (according to modified BG Prasad classification)	Upper	10(4.8)
	Upper Middle	40(19)
	Middle	39(18.6)
	Lower Middle	68(32.4)
	Lower	53(25.2)

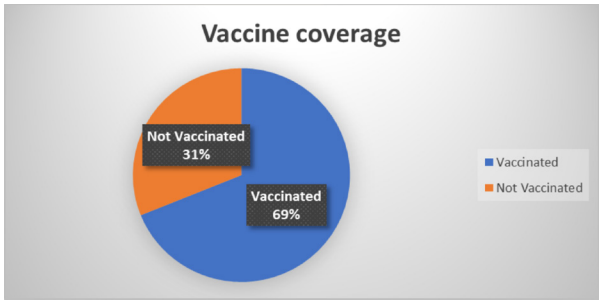

Fig. 1. Vaccine coverage

Table 2. Vaccination details of children

Particulars		Frequency(n) (%)
Place of vaccination (n=142)	School	104(73.2)
	PHC	18(12.7)
	Anganwadi	20(14.1)
Card	Yes	51(36)
	No	91(64)
Reactions	Yes	34(23.9)
	No	108(76.5)

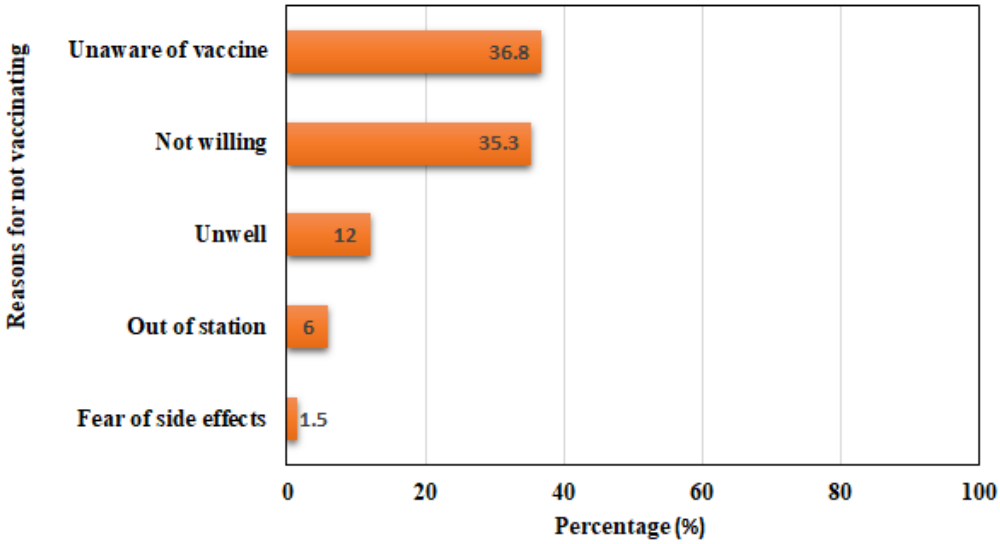

Fig. 2. Reasons for not vaccinating children

Table 3. Sociodemographic association with vaccination status

Sociodemographic profile		Vaccination status		Chisquare value (X^2, p-value)
		Vaccinated (n=142)	Not vaccinated (n=68)	
Age (in years)	1-5	60(63.8)	34(36.2)	1.29,0.52
	6-10	57(69.5)	25(30.5)	
	11-15	25(73.5)	9(26.5)	
Gender	Boys	72(67.3)	35(32.7)	0.01,0.92
	Girls	70(68)	33(32)	

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Father's education	Illiterate	12(50)	12(50)	5.96,0.20
	Primary	17(73.9)	6(26.1)	
	Middle	1(33.3)	2(66.7)	
	Secondary	62(68.9)	28(31.1)	
	Graduate	50(71.4)	20(28.6)	
Mother's education	Illiterate	21(67.7)	10(32.3)	0.01,1.00
	Primary	35(67.3)	17(32.7)	
	Middle	8(66.6)	4(33.3)	
	Secondary	55(67.9)	26(32.1)	
	Graduate	23(67.6)	11(32.4)	
Family members	1-5	97(66.9)	48(33.1)	0.31,0.58
	6-10	46(70.8)	19(29.2)	
SE class (according to modified BG Prasad classification)	Upper	9(90)	1(10)	0.01,1.00
	Upper Middle	30(75)	10(25)	
	Middle	26(66.6)	13(33.3)	
	Lower Middle	41(60.3)	27(39.7)	
	Lower	35(66)	18(34)	

Our study succeeded in estimating JE vaccine coverage following the campaign along with reasons for not vaccinating which helps authorities to make decisions accordingly to increase coverage. Our coverage data was compared with the data obtained from the District Health Office, which showed a higher percentage of coverage (76%) excluding nonfunctioning anganwad is and minority populations. Comparing with other studies showing vaccination coverage of 92.8% (95% CI: 90.0−94.9) in Telangana and 94.8%(95% CI: 92.7−96.3) in Maharashtra[10]; 96% in Odisha;[11] 75%(95% confidence interval (CI): 71.0-78.9) and 42.3% (95% CI: 37.8-46.8) following 1st and 2nd doses in Gorakhpur division, Uttar Pradesh[12]; 92% coverage in the Mandya district and 83.85 % in the Koppal districts of Karnataka.[13] Our study had the majority of Under 5 children(44.8%) which was similar to the study conducted in Assam and UP(54.4%)[14] & Mandya and Koppal study(46% and 32.7%).[13] Similar to our findings, there were no disparities in coverage based on gender in either the states of Maharashtra or Telangana with vaccination card retention rates being 90.3% and 70.4%, respectively, while in our study it was 36% with one reason being few were not provided with card following vaccination.[10] Similar to our study(36.8%), the majority of people were unaware of the vaccine in the Koppal district(45.63%).[13]

STRENGTH

This study was conducted soon after the campaign was completed, which could have limited the chance of recall bias. Samples were chosen randomly from the cluster that had reduced selection bias using the WHO 30*7cluster method.

LIMITATION

A follow-up study could not be done once the JE vaccine was introduced into the UIP schedule to look for an improvement in vaccine coverage and a reduction in cases with long-term complications. Hence further studies are required to assess coverage and disease burden.

Conclusion and Recommendations

Our study was able to get the coverage of the vaccine following the campaign and reasons for

not vaccinating which shows coverage was not as expected. Since many people were unaware and hesitant to get vaccinated, awareness campaigns regarding the disease and ways of prevention are to be held through mass media, IEC sessions to people through health care providers and paramedical staff with intersectoral collaboration of IAP and IMA. Recruitment of more Health staff, ASHA workers, and volunteers to mobilize people. Post-campaign, vaccine was introduced as a part of UIP in these districts which would help to increase coverage and help in the reduction of case burden. Non-vaccinators need to be identified and vaccinated at the earliest unless contraindicated. Strengthening technical support for JE surveillance, and evaluation of JE vaccine effectiveness will help in the reduction of burden.

Authors contribution: **First author:** Data collection, Review of literature, Methodology, Data analysis and interpretation, Writing-original draft and editing, **Second and Third author:** Conceptualization, supervision, writing-review

Ethical clearance:

The study was approved by Institutional Ethics Committee of Gulbarga Institute of Medical Sciences, Kalaburagi vide Letter no. GIMS/KLB/PHARMA/IEC/216/2024-25.

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