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Japanese Encephalitis Mass Vaccination Coverage Survey in Five Districts of Nepal

Bijay Khatri,[1] Sulav Deo,[2] Lakshmi Narayan Deo[2]
[1]BP Eye Foundation, Kathmandu, Nepal.
[2]Mithila Public Health Services, Saptari, Nepal

ABSTRACT

Introduction: The World Health Organization recommends mass vaccination campaigns in children under 15 years before introducing the Japanese Encephalitis (JE) vaccine into the routine immunization program as the most effective immunization strategy in JE disease-endemic countries. The study was conducted to assess the JE vaccine coverage during the recent mass vaccination campaign in five districts of Nepal in 2016.

Methods: A stratified three-stage cluster design was used for this cross-sectional sample survey. The JE mass vaccination campaign of 2016 targeted children aged between 1-14 years, and the interview was conducted among systematically sampled households' mothers and guardians of children aged between 2-15 years in 2017.

Results: The coverage of the JE mass vaccination campaign in the year 2016 was 96.9%; the males had slightly higher coverage (97.4%) than females (96.6%). The vaccine utilization increased with an increase in age, 94.0%, 98.1%, and 99.1% coverage among children aged 2-5 years, 6-10 years, and 10-15 years, respectively. The school enrolled children were four-times (OR: 4.016, CI: 2.595–6.216) likely to be vaccinated than out-of-school children and association was statistically significant. Among 86 children who were not vaccinated, 45.3% were ill during the campaign. Besides, 6.6% of out of school children also didn't get the vaccination. Only three in ten (30.4%) respondents knew that the JE vaccine was given to protect against JE disease or brain fever. More than one-third (36.3%) of respondents reported that the recommendation from the health workers was the main reason for vaccinating their children. Only 1.1% of vaccinated children had minor issues following vaccination.

Conclusion: Despite low awareness about the specific protection of the JE vaccine, the vaccination coverage was high during the JE mass vaccination campaign. Increasing awareness about the particular vaccine and including activities to vaccinate out-of-school children could help achieve universal coverage in future mass vaccination campaigns.

Keywords: *Awareness, Brain fever, Campaign, Children, Specific protection.*

INTRODUCTION

Japanese encephalitis (JE) virus is the most important cause of viral encephalitis in Asia caused by a mosquito-borne flavivirus.[1] JE virus is transmitted to humans through the bite of Culex mosquitoes, particularly *tritaeniorhynchus* species. The virus cycle involves mosquitoes and vertebrate hosts, primarily pigs and wading birds, with humans as incidental or dead-end hosts.[2] JE disease is a public health problem in Nepal, with every person at risk.[3] The outbreak has been recorded since 1978 with up to 500 cases a year, mostly in the southern lowland plain of Nepal, with few cases in other terrains.[3-7] JE disease shows a seasonal trend with most cases occurring during the monsoon season in Nepal.[3,7-10]

According to the World Health Organization (WHO), the case-fatality rate can be as high as 30% among those with JE disease symptoms.[1] The systematic surveillance of JE disease in Nepal from 2007 to 2015 showed an overall case fatality rate as high as 6.6%.[9] Among those who survive, about 30% may have a low quality of life due to neurologic devastation and ongoing psychiatric symptoms suffering permanent intellectual, behavioral or neurologic issues ranging from paralysis, recurrent seizures, or inability to speak or perform independent activities of daily living.[1,11]

The total disability-adjusted life years (DALYs) lost due to JE disease in Nepal was 493.92, with higher DALY among males (286.86) than for females (207.05).[12] There is no antiviral treatment available for patients with

Correspondence: Bijay Khatri, MPH, Academic and Research Officer, Academic and Research Department, B.P. Eye Foundation, Kathamndu, Nepal, Email: bj.khatri@gmail.com

JE disease, and the treatment is supportive to relieve symptoms and stabilize the patient, whereas there is little evidence to support a reduction in JE disease burden from interventions other than the vaccination of humans.[1] The live attenuated SA14-14-2 vaccine manufactured in China has become the most widely used vaccine in endemic countries and was prequalified by WHO in October 2013.[1] JE vaccine was introduced in the routine immunization in a phase-wise manner and is available over Nepal since July 2016 for 12 months old children as a single dose and had 79.5% national coverage (achievement) in the fiscal year 2017/18.[13] WHO recommends a one-time campaign in the target population (usually children <15 years) before introducing it into the routine immunization program as the most effective immunization strategy in JE disease-endemic countries.[14] Mass vaccination programs are based on the concept of herd immunity by reaching the minimum threshold, stopping disease transmission, and thereby halting an existing or potential outbreak.[15]

Nepal has been conducting mass vaccination campaigns in phases since 2006 and completed in 31 endemic districts by 2011. JE vaccine was introduced in the routine immunization of these 31 districts since 2012. After these measures, the burden of JE disease reduced significantly in Nepal. However, over the years, JE disease was reported from other districts, including hilly and mountain regions of Nepal.[9,10] Before introducing the JE vaccine in routine immunization in the remaining districts, another JE mass vaccination campaign was conducted in the remaining 44 districts and three more districts with recent JE disease outbreaks of Nepal in May and June 2016. This survey was conducted to assess the JE vaccine coverage during the 2016 mass vaccination campaign among eligible children in Doti, Gorkha, Morang, Rolpa, and Sindhupalchowk districts.

METHODS

Study design

This study is a cross-sectional survey to assess the JE vaccine coverage during the latest JE mass vaccination campaign in May and June in 2016.

Study area

The five districts, namely Doti, Gorkha, Morang, Rolpa, and Sindhupalchowk, were purposively selected by the funding organization considering the three ecological regions, district neighboring JE disease-endemic area, and an endemic district with a recent outbreak. Morang is a plain lowland Terai district, which is JE disease-endemic and had the most recent outbreak in 2015. Doti and Rolpa are hilly districts neighboring JE disease-endemic districts Kailali and Dang, respectively. Gorkha is from the mountains, and Sindhupalchowk is another mountainous district neighboring endemic Kathmandu valley.

Study population and respondents

The JE mass vaccination campaign targeted to vaccinate all the children aged between 1-14 years in 2016. This study was carried out a year later in 2017 to assess vaccine coverage of the 2016 campaign. Hence, the study population of this survey was the children aged 2-15 years in those districts. The mothers and guardians of children were the respondents, with the mothers given priority to participate in the interview where available.

Exclusion criteria

Any household who had recently migrated inside the study district from any other districts after the JE vaccination campaign of May and June in 2016 were excluded from the study.

Sampling frame

A stratified three-stage cluster design was used to select the sample for this study. Ecological and urban-rural stratification were considered in the sampling for the study. In the first stage of sampling, the five districts, namely Doti, Gorkha, Morang, Rolpa, and Sindhupalchowk, were purposively selected. These five districts were considered as the primary sampling units. In the second stage, the clusters or enumeration areas from the selected districts were pooled and then were randomly selected using probability proportionate to size. The districts were then divided into Village Development Committees and Municipalities, which in turn were divided into wards. In the third stage, the households were systematically sampled following a listing and mapping exercise, with the same number sampled in each cluster. The number of households for each ward was taken from the National Population and Housing Census 2011.

Sample size

The sample size was determined using the single population proportion formula assuming JE vaccine coverage of 90% with a 5% level of significance, design effect of 2, 10% non-response rate, and five strata (districts). The sample size yielded in 1,544. Further, all children living in the selected household from age 2 to 15 years were enumerated to obtain vaccine coverage.

Study tool

A study tool was drafted in the Nepali language to meet study objectives from the literature review. The draft tool was developed into a semi-structured questionnaire with

immunization experts' advice. The questionnaire was pre-tested among 75 households at Ranipauwa town of Kakani, Nuwakot district, and amended for the flow and sequence of questions. Nuwakot district was also one of the 47 districts included in the mass JE vaccination campaign in May and June in 2016.

Data Collection techniques

The trained enumerators with fluency in local language and supervisors coordinated with key local leaders, local health workers, and Female Community Health Volunteers (FCHVs) in each selected ward to conduct the mapping of the cluster. The data were collected by face-to-face interviews using the semi-structured questionnaire by the enumerators. The mothers of children were given priority to participate in the interview process where available. The interviewees were cross-questioned about the site of injection and location of the vaccination center to ensure their vaccination status during the campaign. All the eligible children from selected households aged between 10 to 15 years, if present, were also asked in the presence of a guardian if they had had JE vaccination last year and were also asked to show the site of injection to ascertain their vaccination status during the campaign. During the campaign, all school-going children were vaccinated at their schools, and the site of injection was right upper arm.[10]

Data analyses

All data were entered and then systematically cleaned using EpiData 3.1. Statistical analysis software SPSS version 23 was used for data analyses. The frequencies and percentages were computed to assess the distribution of children's characteristics and vaccination status and respondents' characteristics, knowledge about the JE vaccine, and their reasons for accepting and rejecting vaccination for their child. The bivariate analyses were computed for each explanatory variable and outcome variable (vaccination status).

Ethical consideration

Ethical approval was obtained from the Nepal Health Research Council (Ref. No.: 1967 (2017)). The survey permission was taken from the then Child Health Division and respective District (Public) Health Offices. The health workers and FCHVs in selected enumeration areas were briefed on the purpose of the study. The purpose of the study and the nature of information needed was explained to the parents or guardians of eligible children before taking written consent. The participants were assured of the confidentiality of the information. They were also informed about their right to skip questions or withdraw anytime from the interview.

RESULTS

Among 1,608 households with children aged 2-15 years old children approached for the interview, only 1,577 households completed the survey and were included in the analyses. Among the respondents, 71.0% were female, one in ten (10.6%) were above 50 years, and nearly one-fifth (20.8%) were illiterate, as shown in Table 1.

Table 1: Sociodemographic characteristics of respondents by districts (N=1,577)

Characteristics	Doti (%)[a]	Gorkha (%)[a]	Morang (%)[a]	Rolpa (%)[a]	Sindhupalchowk (%)[a]	Total (%)[b]
Sex						
Male	60 (13.1)	56 (12.3)	204 (44.6)	25 (5.5)	112 (24.5)	457 (29.0)
Female	90 (8.0)	182 (16.3)	576 (51.4)	138 (12.3)	134 (12.0)	1,120 (71.0)
Age-group						
18 – 30 years	57 (7.8)	127 (17.3)	301 (41.1)	84 (11.5)	163 (22.3)	732 (46.4)
31 – 50 years	81 (12.0)	94 (13.9)	354 (52.2)	67 (9.9)	82 (12.1)	678 (43.0)
51 & above years	12 (7.2)	17 (10.2)	125 (74.8)	12 (7.2)	1 (0.6)	167 (10.6)
Educational status						
Illiterate	32 (9.8)	15 (4.6)	214 (65.2)	43 (13.1)	24 (7.3)	328 (20.8)
Literate	118 (9.4)	223 (17.9)	566 (45.3)	120 (9.6)	222 (17.8)	1,249 (79.2)
Residence						
Urban	49 (13.0)	42 (11.2)	142 (37.8)	85 (22.6)	58 (15.4)	376 (23.8)
Rural	101 (8.4)	196 (16.3)	638 (53.1)	78 (6.5)	188 (15.7)	1,201 (76.2)

a:Row percentage; b:Column percentage

Only three in ten (30.4%) respondents knew that the JE vaccine was given to protect against JE disease or brain fever. Less than four in ten (37.9%) respondents knew that during the JE mass vaccination campaign, children aged 1-14 years old were eligible for vaccination and a similar proportion (37.6%) were also aware that children who had JE vaccine during routine immunization could also be given JE vaccine during the campaign as depicted in Table 2.

Table 2: Knowledge and awareness on JE vaccine among respondents by districts

Correct Responses	Doti (%) n=150	Gorkha (%) n=238	Morang (%) n=780	Rolpa (%) n=163	Sindhupalchowk (%) n=246	Total (%) n=1,577
JE vaccine protects against JE disease or brain fever	31 (20.7)	6 (2.5)	391 (50.1)	32 (19.6)	20 (8.1)	480 (30.4)
Recommended age for JE vaccine during the mass campaign was 1-14 years old children	36 (24.0)	4 (1.7)	430 (55.1)	90 (55.2)	37 (15.0)	597 (37.9)
JE vaccine during the mass campaign can be given to the child who had JE disease during routine immunization	53 (35.3)	4 (1.7)	443 (56.8)	60 (36.8)	33 (13.5)	593 (37.6)

In 1,577 households, there were 2,857 eligible children for the mass vaccination campaign. The vaccination status of children during the mass vaccination campaign is presented in Table 3. Among all eligible children, 2,771 (96.9%) had received the JE vaccine during the mass vaccination campaign. The coverage was slightly higher among boys (97.4%) than girls (96.6%). In this study, the utilization of vaccines increased with increasing age, which was statistically significant. The children who were enrolled at schools or Early Childhood Development Center (ECDC) were nearly four times likely to get vaccination during the campaign compared with the children who were not enrolled. Doti district had the highest (98.6%) coverage, whereas Gorkha had the least (94.6%) coverage among the five districts during the mass vaccination campaign.

Table 3: Vaccination status of children during the mass vaccination campaign (N=2,857)

Characteristics	Vaccinated with JE Vaccine		p-value	Crude OR
	Yes (%)[a]	No (%)[a]		
Respondent's Sex				
Male	875 (97.1)	26 (2.9)	0.792	1.065 (0.668 – 1.699)
Female	1896 (96.9)	60 (3.1)		1
Respondent's Age-group				
18 – 30 years	1122 (96.2)	44 (3.8)	0.422	0.743 (0.359 – 1.538)
31 – 50 years	1340 (97.6)	33 (2.4)	0.660	1.183 (0.560 – 2.497)
51 & above years	309 (97.2)	9 (2.8)		1

Respondent's Educational status				
Illiterate	626 (96.6)	22 (3.4)		1
Literate	2145 (97.1)	64 (2.9)	0.514	1.178 (0.720 – 1.927)
Residence				
Urban	546 (97.5)	14 (2.5)	0.431	1.262 (0.707 – 2.254)
Rural	2225 (96.9)	72 (3.1)		1
Children's Sex				
Male	1,414 (97.4)	38 (2.6)	0.211	1.316 (0.854 – 2.028)
Female	1,357 (96.6)	48 (3.4)		1
Children's Age				
2-5 years	920 (94.0)	59 (6.0)		1
6-9 years	1,047 (98.1)	20 (1.9)	<0.001*	3.357 (2.006 – 5.618)
10-15 years	804 (99.1)	7 (0.9)	<0.001*	7.366 (3.346 – 16.217)
ECDC or school enrollment status of a child during the vaccination campaign				
Enrolled	2,059 (98.3)	36 (1.7)	<0.001*	4.016 (2.595 – 6.216)
Not enrolled or Out of school	712 (93.4)	50 (6.6)		1
Endemic area				
Endemic district	1,405 (96.6)	49 (3.4)	0.252	0.777 (0.504 – 1.198)
Non-endemic district	1,366 (97.4)	37 (2.6)		1
District				
Morang	1,405 (96.6)	49 (3.4)		1
Rolpa	285 (98.3)	5 (1.7)	0.140	1.988 (0.785 – 5.033)
Doti	350 (98.6)	5 (1.4)	0.052	2.441 (0.966 – 6.172)
Sindhupalchowk	417 (97.9)	9 (2.1)	0.187	1.616 (0.787 – 3.317)
Gorkha	314 (94.6)	18 (5.4)	0.076	0.608 (0.350 – 1.059)

a: Row percentage;
*: Statistically significant at p<0.05
ECDC: Early Childhood Development Center; OR: Odds Ratio.

In query to any adverse effects following vaccination, 31 children (1.1% of total vaccinated) reported minor issues as depicted in Table 4. About half of them (51.6%) had redness around the site of injection.

Table 4: Adverse effect following JE vaccination after the mass vaccination campaign (N=31)

Adverse effect following vaccination	2-5 years (%)[a]	6-9 years (%)[a]	10-15 years (%)[a]	Total (%)[b]
Redness around the site of injection	8 (50.0)	3 (18.8)	5 (31.2)	16 (51.6)
Fever in the evening of the day of immunization	3 (30.0)	4 (40.0)	3 (30.0)	10 (32.2)
Vomiting	2 (66.7)	0 (0.0)	1 (33.3)	3 (9.7)
Rashes around the skin	1 (50.0)	0 (0.0)	1 (50.0)	2 (6.5)

a: Row percentage; b: Column percentage

Following the health issue, more than three-fourth (n=24, 77.4%) of children didn't need any care as they said they knew it would subside soon, while five children took advice from FCHVs, and two children were taken to the nearest health facility.

There were 86 children not vaccinated from 49 households during the campaign. Among them, nearly half (45.4%) of children were ill, just below two in ten's (19.8%) parents or guardians didn't know about the mass vaccination campaign, while 10.5% of the parents or guardians thought the additional dose was not necessary as their children recently had the vaccine on routine immunization schedule as shown in Table 5.

Table 5: Main reason for not vaccinating the children during the mass campaign by districts

Main reason for not vaccinating children	Doti (%)[a] n=5	Gorkha (%)[a] n=18	Morang (%)[a] n=49	Rolpa (%)[a] n=5	Sindhupalchowk (%)[a] n=9	Total (%)[b] n=86
The child was ill	2 (5.1)	7 (17.9)	28 (71.8)	0 (0.0)	2 (5.1)	39 (45.4)
Didn't know about the mass vaccination campaign	1 (5.9)	2 (11.8)	10 (58.8)	1 (5.9)	3 (17.6)	17 (19.8)
The child was not at home or district	1 (8.3)	6 (50.0)	2 (16.7)	1 (8.3)	2 (16.7)	12 (13.9)
The child had recently had the vaccine on the routine immunization schedule	0 (0.0)	0 (0.0)	9 (100.0)	0 (0.0)	0 (0.0)	9 (10.5)
Fear of side-effect of vaccine	0 (0.0)	2 (28.6)	0 (0.0)	3 (42.8)	2 (28.6)	7 (8.1)
The vaccine was for trial/test	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.3)

a: Row percentage; b: Column percentage

There were 1,528 households who had at least one child vaccinated during the campaign. In query to the reasons for accepting vaccination during the campaign, more than eight in ten (80.6%) respondents reported that they vaccinated their children for their good health. More than two-thirds (36.3%) and nearly one-fourth (24.3%) reported that health workers and teachers respectively recommended that the vaccine was good for the child's health, as shown in Table 6.

Table 6: Reasons for accepting vaccination for their children during the mass campaign by districts (multiple responses)

Statement	Doti (%) n=148	Gorkha (%) n=226	Morang (%) n=755	Rolpa (%) n=159	Sindhupalchowk (%) n=240	Total (%) n=1,528
For good health of the child	82 (55.4)	203 (89.8)	649 (86.0)	84 (52.8)	214 (89.2)	1232 (80.6)
To control JE disease	85 (57.4)	2 (0.9)	485 (64.2)	77 (48.4)	53 (22.1)	702 (45.9)
Health workers recommended that the vaccine was good for child's health	92 (62.2)	175 (77.4)	76 (10.1)	70 (44.0)	142 (59.2)	555 (36.3)
Other children were also immunized	63 (42.6)	136 (60.2)	76 (10.1)	4 (2.5)	117 (48.8)	396 (25.9)
School teachers recommended that the vaccine is good for child's heath	12 (8.1)	61 (27.0)	138 (18.3)	22 (13.8)	138 (57.5)	371 (24.3)
Aware of disability could be caused JE disease	6 (4.1)	1 (0.4)	91 (12.1)	13 (8.2)	128 (53.3)	239 (15.6)
Governmental vaccination campaign	9 (6.1)	2 (0.9)	180 (23.8)	1 (0.6)	16 (6.7)	208 (13.6)
Aware from mass media advertisement of JE vaccination campaign	23 (15.5)	72 (31.9)	64 (8.5)	13 (8.2)	27 (11.3)	199 (13.0)
Free availability of vaccine during campaign	11 (7.4)	25 (11.1)	121 (16.0)	3 (1.9)	5 (2.1)	165 (10.8)
Aware that JE disease could cause death	3 (2.0)	2 (0.9)	101 (13.4)	7 (4.4)	9 (3.8)	122 (8.0)
Accepted by the mother or father of child	3 (2.0)	4 (1.8)	79 (10.5)	1 (0.6)	16 6.7)	103 (6.7)

DISCUSSION

The coverage of the JE mass vaccination campaign in the year 2016 was 96.9%, and boys had slightly higher coverage (97.4%) than girls (96.6%). The main reason for not vaccinating their child was due to the child being ill (45.3%), whereas one of the common reasons for vaccinating their children was for the good health of their children.

The coverage of the 2016 JE mass vaccination campaign in this study was 96.9%. This finding is similar to coverage reported in the 2008 campaign (96%) but higher as reported in previous campaigns in Nepal in 2005 and 2006 with 81.8% and 76% coverage, respectively.[16] The coverage for the 2006 and 2007 JE vaccination campaign in Karnataka, India, was 81%.[17] The lessons learned from previous campaigns could have been applied in this present campaign for maintaining higher coverage of the vaccine. The higher coverage during the campaign means a higher chance of herd immunity, a lower incidence, and reduced disease burden following the campaign as shown in the impact study in Nepal.[18]

This survey showed that the Doti district had the highest (98.6%) JE vaccination coverage during the campaign, whereas Gorkha had the least (94.6%) coverage. As Doti is a neighboring district to JE disease-endemic districts like Kailali and Kanachanpur, awareness about JE disease could be higher in Doti in comparison to Gorkha, even though Gorkha has also reported cases of JE disease in the past.[19,20] Moreover, the 2015 earthquake's epicenter was in Gorkha, which caused losses in the health infrastructure and disruption of health-care service delivery in the district, which in turn could have even affected the mass JE vaccination campaign of 2016. Besides, this survey also showed that the respondents of Gorkha were least aware of the specific protection of the JE vaccine and the health impacts of JE disease.

The vaccine coverage was slightly higher among the males and the utilization of vaccine increased with increasing age. The 6-9 years old children were three times more likely, whereas 10-15 years old children were nearly seven times more likely to get vaccinated than 2-5 years old children in the present study. The higher coverage among boys and older-aged children might be due to their higher presence in schools where the vaccination campaign was primarily conducted to reach out to most target populations. These are supported by the other finding of our study, which shows that children enrolled at schools or ECDC were nearly four times more likely to be vaccinated than those who were not yet enrolled or out of school. Besides, among unvaccinated children, 6.6% were out-of-school children. This finding shows the need for active surveillance as an additional community activity to reach out-of-school children and achieve universal coverage during similar campaigns.

Only 1.1% of vaccinated children during the campaign reported minor issues following vaccination in this study. No severe adverse events were observed in this study as in a similar JE mass vaccination campaign with the same live-attenuated SA14-14-2 vaccine in Kolar, India.[21] A review study has shown that live attenuated SA14-14-2 vaccine can safely be given to children as young as eight months of age.[22] The orientation and training to vaccinators before the mass JE vaccination campaign with particular emphasis on preparation, handling, storage, and administration might have played a crucial role in avoiding adverse events. Besides, 39 children who were reportedly ill, as described by their mothers and guardians during the campaign, also skipped the vaccination campaign.

Following the minor health issue, more than three-fourth (77.4%) children did not seek any treatment as they knew it would subside soon, while only two children were taken to the nearest health facility. This finding shows that vaccinators could have counseled the children, teachers, parents about such minor issues before the administration of the vaccine. Moreover, balanced counseling encourages greater acceptance, improves attitudes towards a vaccine, and counters vaccine hesitancy.

In the present study, only three in ten (30.4%) respondents knew about the specific protection of the JE vaccines. Besides, only 37.8% and 37.6% of respondents knew about the eligible age for mass vaccination were children between age 1-14 years, and the children who had JE vaccination during routine immunization could also be given a JE vaccine during the campaign, respectively. Among the respondents who had their children vaccinated, one of the reasons for accepting vaccination during the campaign was for the good health of their children. Nearly eight in ten respondents replied good health as one of the many reasons, but only 8 to 16% were aware of the health impact of JE diseases. Similarly, nearly two in ten (19.8%) parents or guardians who did not vaccinate their children during the campaign reported that they didn't know about the campaign, and 10.5% thought the additional dose was not necessary as their children had the vaccine on the routine immunization schedule. Additionally, 10.5% of parents and guardians either feared about presumed side-effects of the vaccine or thought the vaccine was for trial/test.

These findings show that the public didn't have enough awareness about the usefulness of the campaign, the specific protection of the vaccine, and had unreasonable fears about vaccine and vaccine safety. The lack of awareness on the safety and the usefulness of vaccines has been a significant barrier to refusing vaccines that have been well established in the literature.[23-25] The barriers to immunization are one of the major factors to increased incidence of some vaccine-preventable diseases. Hence, in future vaccination campaigns, there is a need to focus on raising awareness of the particular vaccine and countering any vaccine hesitancy.

This study had certain limitations like the vaccination status of these children was assessed based on guardian and mother's responses during the data collection process as there was no system of distribution of vaccination cards following the mass campaign. But the study team tried to ascertain the vaccination coverage by cross-questioning the respondents about the site of injection and location of the vaccination center. Besides, the children above 10 years old, if present at home during the interview, were also cross-questioned in the presence of their parents about the site of injection.

CONCLUSION

Despite low awareness about the specific protection of the JE vaccine, the vaccination coverage was high. The out-of-school children was missed during the campaign. There is a need for active surveillance of missed children during such campaigns and there is need to raise awareness about the vaccine to counter any vaccine hesitancy to achieve universal coverage during similar mass vaccination campaigns in the future to reduce the burden of vaccine-preventable diseases.

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CONFLICT OF INTEREST

The findings and conclusions in this report are the authors and do not necessarily represent the official position of the funding organization.

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