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Research Article

ASSESSMENT OF JAPANESE ENCEPHALITIS VACCINATION STATUS IN TRIBAL AREAS OF THE MAYURBHANJ DISTRICT OF ODISHA – A COMMUNITY-BASED CROSS-SECTIONAL STUDY

DEBASISH SETHY[1], MUKTIKANTA SINGH[1], SHUSHRUTA MOHANTY[2], LOMAPADA NAYAK[3], DURGA MADHAB SATAPATHY[1], SANJAYA KUMAR SAHOO[4]*

[1]Department of Community Medicine, MKCG Medical College, Berhampur, Odisha, India. [2]Department of Pathology, MKCG Medical College, Berhampur, Odisha India. [3]Department of Community Medicine, Shaheed Rendo Majhi Medical College, Bhawanipatna, Odisha, India. [4]Department of Community Medicine, Shri Jagannath Medical College, Puri, Odisha, India.
*Corresponding author: Sanjaya Kumar Sahoo; Email: sanju_dr97@yahoo.co.in

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ABSTRACT

Objectives: Japanese encephalitis (JE) is a vector-borne viral disease that primarily infects swines, equids, and humans. Outbreaks of JE-acute encephalitis syndrome were reported from September to November 2012 and 9th September to 2nd December 2016 in Malkangiri district, Odisha. Due to the paucity of studies on JE transmission, causation, and prevention in tribal areas, the present study was undertaken to assess the JE vaccination status of children between 12 and 36 months in the Mayurbhanj district and to determine the association between sociodemographic characteristics of study participants with JE vaccination status.

Methods: To estimate the JE vaccination coverage, a cluster sampling method was adopted to conduct survey in the Mayurbhanj district of Odisha by selecting 45 clusters. Twenty children aged 12–36 months were selected from each cluster, and their mothers were interviewed about JE vaccination. House-to-house survey was conducted in selected villages. Mothers were interviewed about the knowledge on JE vaccination.

Results: A total of 900 children were surveyed, of which a majority were born in government hospitals. The association between the literacy status of mothers and awareness regarding JE is found to be statistically significant. Furthermore, it was found that the association between vaccination coverage and area of residence of the beneficiaries in relation to session sites is statistically significant.

Conclusion and Recommendation: The association of maternal literacy status with JE vaccination coverage was not significant, whereas the association with the awareness regarding JE was statistically significant. Four key messages of immunization should be delivered to every mother during vaccination.

Keywords: Japanese encephalitis vaccination, tribal area, Mayurbhanj district.

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INTRODUCTION

Japanese encephalitis (JE) is primarily a zoonotic disease caused by group B arbovirus (flavivirus). It is a leading cause of viral encephalitis in Asia and Western Pacific countries. The annual incidence of clinical cases varies both across and within countries, ranging from <10 to >100/1, 00,000 population. The annual estimated clinical case of JE is 68,000 with 20,400 deaths due to the disease [1]. From the public health point of view, the disease is important because of its case fatality rate and serious neurological sequel among the survivors. A major outbreak occurred in the Bankura district of West Bengal in 1973 [2]. The most affected states comprise Andhra Pradesh, Assam, Bihar, Haryana, Karnataka, Kerala, Maharashtra, Manipur, Tamil Nadu, Odisha, Uttar Pradesh, and West Bengal.

Odisha witnessed the outbreak of JE in 1989 in Sundargarh district. Sporadic cases of JE have been diagnosed in hospitalized children between 1992 and 1995. It was a public health concern due to JE and acute encephalitis syndrome outbreak affecting 336 children with 103 deaths in Malkangiri district of Odisha from September to November 2016 [3]. Similarly, outbreaks were seen in the Mayurbhanj and Jajpur districts in 2015 and 2016, respectively.

To prevent and control JE, the Government of India has undertaken various strategies such as strengthening and expanding vaccination against JE, reinforcing disease surveillance activities, integrated vector management, and involvement of trained personnel in behavior change communication/information education communication (IEC) activities. Above all, JE vaccination is the single most cost-effective measure. Following large outbreaks, the vaccination was first introduced in India with live attenuated SA 14-14-2 JE vaccine in 2005–2006 and second dose in 2013 [2]. The Government of Odisha launched a massive JE vaccination campaign on 27th November, 2017, in 13 districts [4]. Subsequently, it was introduced in the routine immunization (RI) program.

Under the national immunization schedule, all beneficiaries are given 2 doses of inactivated Vero cell-derived JE vaccines; the first dose is given between 9 and 12 months and the second dose at 16–24 months of age under the Universal Immunization Programme. The catch-up vaccination is recommended for missed doses under intensified Intensified Mission Indradhanush (IMI) campaign maximum up to 15 years [5].

A conducive ecosystem along with vaccination is a highly effective weapon to eliminate JE in all sections of the society including the high-risk groups that include rural, tribal, and peri-urban areas. In Odisha, there are many tribal-dominated districts, where JE outbreaks were seen with high morbidity and mortality. From this input, the Government of Odisha initiated JE vaccination to the children in those tribal-dominated high-risk districts for JE in a campaign mode. Subsequently, JE vaccination was introduced in the routine immunization program. This is the rationality behind the study.

Objectives

1. To assess the JE vaccination status among children of Mayurbhanj district
2. To determine the association between sociodemographic characteristics with JE vaccination status.

METHODS

A community-based cross-sectional study was conducted among mothers of the children aged 12–36 months who are residing in villages from tribal blocks of Mayurbhanj district, Odisha, from August to September 2022. One-stage cluster sampling technique was used. The village list and the respective cumulative population were obtained from the census 2011, and the expected current population was estimated using a population growth rate of 1.4. Considering each village as a single cluster, a total of 45 clusters were selected by probability proportional to size. From each cluster, 20 tribal mothers of children aged 24–36 months were interviewed by house-to-house visits. The first house was selected randomly; then, adjacent houses were visited till the required sample size was achieved. Mothers other than the tribal category were excluded from the study. In case the desired sample size was not achieved in a cluster, then the neighboring villages or habitats were included to obtain the same. The effective sample size (ESS) was calculated from "WHO reference manual for vaccination coverage cluster survey" [6]. According to health management information system data, the coverage rate for JE-1 and JE-2 vaccines in Odisha were about 72% and 62.1%, respectively [7]. At 95% confidence interval and 10% absolute precision, the ESS was found to be 103 for each dose of JE vaccination. Considering intracluster correlation coefficient of 0.33, the design effect was found to be 3.97 for one-stage cluster sampling. Taking non-response rate of 10%, the final sample for the survey was found to be 900.

Before interview, the purpose of the study was explained to the mothers of the children aged 16–24 months. The study participants those who did not give consent were excluded from the study. Data related to vaccination status were obtained from the mother and child protection (MCP) card. In case of non-availability of MCP card, study-related data were generated by interviewing the participants with the help of the study tool. The data were collected using KOBO APP and analyzed by the Statistical Packages for the Social Sciences software (version 17) and MS EXCEL.

RESULTS

A total of 900 participant interviews were taken. Table 1 provides a summary of the demographic characteristics of the respondents. Majority (87.7%) of the mothers were literate.

Around 92.4% of the participants delivered their babies through normal vaginal delivery. It was found that 19.3 of the babies delivered were low birth weight (LBW) babies. Majority (99%) were delivered in government hospitals, followed by 0.6% and 0.4% in private hospitals and homes, respectively (Fig. 1).

During home visit, 99.1% respondents could show their MCP cards. Rest cards were misplaced or kept with the Anganwadi worker (AWW). JE vaccination status was correctly recorded in 97.6% of MCP cards (Fig. 2).

It was observed that 894 (99.3%) beneficiaries were vaccinated with the 1st dose of JE vaccine. Of which, 881 (97.9%) were vaccinated at appropriate age and only 13 (1.4%) were vaccinated at delayed age. Only 6 (0.7%) remained unvaccinated.

Among the beneficiaries due for the second dose (894), majority (92.5%) received at the appropriate age, while 2.2% at delayed age and 5.3% failed to receive it (Table 2).

Various reasons encountered for partial and non-immunization were lack of awareness (32.1%), migration of family (24.5 %), shortage of JE vaccine/no RI session (22.6%), and beneficiary sickness (20.8%) (Table 3).

Table 4 shows that minor adverse events following immunizations (AEFIs) were reported among 27.6% of the study population. Only 6.1% AEFIs were reported after the 1st dose, whereas it was 60.3% following the 2nd dose which was due to the simultaneous administration of DPT booster administration. The majority, i.e., 87.4% of AEFIs were managed by auxiliary nurse midwives (ANMs). Only 4.9% received treatment in the primary health cares (PHCs).

Table 1: Sociodemographic distribution of the study population (n=900)

Gender of the child n (%)	
Female	432 (48)
Male	468 (52)
Mother's education	
Illiterate	111 (12.3)
Literate	789 (87.7)

Table 2: JE vaccination status of the study population

Total study population	(n=900)
Vaccinated with the 1st dose	894 (99.3)
Vaccinated at the appropriate age	881 (97.9)
Vaccinated at a delayed age	13 (1.4)
Unvaccinated	6 (0.7)
Beneficiaries due for the 2nd dose	894
Vaccinated at the appropriate age	827 (92.5)
Vaccinated at a delayed age	20 (2.2)
Vaccinated with the 1st dose only	47 (5.3)

JE: Japanese encephalitis

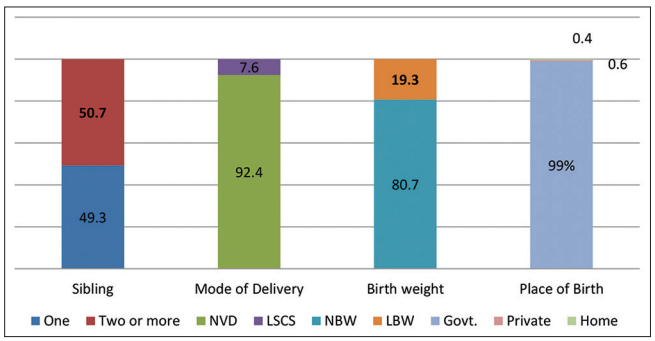

Fig. 1: Maternal and neonatal characteristics of the study population (n=900)

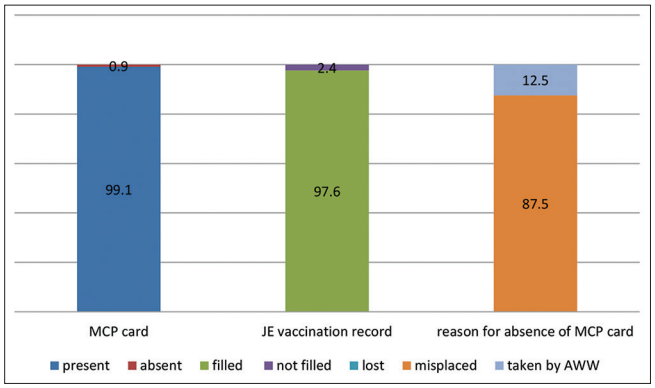

Fig. 2: Mother and child protection card status of the participants

The association of various sociodemographic variables of the participants with JE vaccination status was described in Table 5. It was found that the difference in vaccination status between hard-to-reach areas (HRAs) and easily accessible areas is statistically significant. The differences seen in other variables such as the mother's education, gender of the child, birth weight of the baby, and sibling order with JE vaccination status are not statistically significant (Table 5).

It is found that the association between the literacy status of mothers and awareness regarding JE is found to be statistically significant, p<0.001 (Table 6).

DISCUSSION

Following the implementation of Janani Shishu Suraksha Karyakram, it is expected that all pregnant mothers should deliver their babies in health institutions. In our study, it was observed that 99% of deliveries were in government hospitals, followed by 0.6% and 0.4% in private hospitals and domiciliary, respectively. It showed that there was an increase in health awareness among the study participants. The literacy rate among the mothers of study participants was found to be 88%. The association between the literacy status of mothers and awareness regarding JE was found to be statistically significant, whereas the association of maternal literacy rate with JE vaccination coverage was not found to be statistically significant.

In the present study, it was found that the association between vaccination coverage and area of residence of the beneficiaries in relation to session sites is statistically significant.

During door-to-door survey, it was found that 99% of the MCP cards were kept with the beneficiaries which were produced before the investigators. This showed that the beneficiaries are responsible to preserve the cards with them. Few cards were not found, either were misplaced or kept with the AWW. In a study by Melwani *et al*., in the Bhopal city, around 6% of the beneficiaries were not aware of that MCP card is used for immunization [8]. During assessment, vaccination coverage with the first dose of JE vaccine was 99.3%, whereas with the second dose, the coverage was 94.7%. The various reasons encountered for shortfalls with the second dose of JE vaccination were lack of awareness (32%), migration of family (24.5%), sickness of beneficiaries (21%), etc. As per the National Family Health Survey -5 Odisha, the vaccination coverage of children between ages 12 and 24 was 90% [9].

AEFI was reported among 28% of recipients. Of those, 6% followed the first dose and 60% followed the second dose. The increase of AEFI following 2nd dose of JE vaccine may be associated with 1st booster dose of DPT. AEFI identified were mostly of minor type which were managed by HW(F) (88%). Only 5% had to receive treatment at the PHC level. In the World Health Organization position paper on JE (2015), frequently reported AEFI in children between 2 months and 18 years were rash, fever, and headache which are of minor type [10].

In the present study, 19% of the participants had LBW which is similar to the findings in the study conducted by Bharati *et al*., where LBW was reported to be 20% [11].

Table 3: Reason for partial and non-immunization (n=53)

Lack of awareness	17 (32.1)
Migration of family	13 (24.5)
Shortage of JE stock/no RI session	12 (22.6)
Beneficiary sickness	11 (20.8)

JE: Japanese encephalitis, RI: Routine immunization

Table 4: AEFI after JE vaccination

History of AEFI after JE vaccination (n=894)	n (%)
Yes	247 (27.6)
No	647 (72.4)
AEFI after vaccination dose (n=247)	n (%)
1st dose	15 (6.1)
2nd dose	149 (60.3)
Both doses	83 (33.6)
Treatment taken from (n=247)	n (%)
ANM	216 (87.4)
PHC	12 (4.9)
Home	19 (7.7)

AEFI: Adverse events following immunizations, JE: Japanese encephalitis, ANM: Auxiliary nurse midwives, PHC: Primary health cares

Table 5: Association between immunization status and sociodemographic variables of the participants (n=900)

Sociodemographic Variables	Complete n (%)	Partial n (%)	Unimmunized n (%)	Total n (%)	p-value
Mother's education					
Illiterate	104 (93.6)	7 (6.4)	0 (0)	111 (12.3)	0.9
Literate	743 (94.1)	40 (5.1)	6 (0.8)	789 (87.7)	
Area of residence					
Easy accessible	828 (94.1)	46 (5.2)	6 (0.7)	880 (97.8)	<0.001*
HRA	13 (95)	4 (5)	3 (0)	20 (2.2)	(Sig.)
Gender of child					
Male	436 (93.2)	29 (6.2)	3 (0.6)	468 (52)	0.4
Female	411 (95.1)	18 (4.2)	3 (0.7)	432 (48)	
Birth weight					
Normal	679 (93.5)	43 (5.9)	4 (0.6)	726 (80.7)	0.07
LBW	168 (96.6)	4 (2.3)	2 (1.1)	174 (19.3)	
Sibling order					
One	413 (93)	29 (6.5)	2 (0.5)	444	0.55
Two or more	434 (95.2)	18 (3.9)	4 (0.9)	456	
Total	847 (94.1)	47 (5.2)	6 (0.7)	900 (100)	

HRA: Hard-to-reach areas, LBW: Low birth weight

Table 6: Association between mother's literacy status and awareness regarding JE (n=900)

Mother's literacy status	Yes n (%)	No n (%)	Total n (%)	p-value
Illiterate	1 (0.9)	110 (99.1)	111 (12.3)	<0.001
Literate	177 (22.4)	612 (77.6)	789 (87.7)	
Total	178 (19.8)	722 (80.2)	900	

JE: Japanese encephalitis

Whereas only 15 (8.4%) of them knew that JE is vaccine preventable, 6 said JE may cause disability in children and 1 (0.5%) knew that the JE virus can infect adult humans. According to a study by Konwar *et al*., 63% knew that JE is transmitted by the bite of a mosquito, whereas only 12% knew about the vaccine available for JE [12].

CONCLUSION

Ensuring robust JE vaccination coverage is crucial for safeguarding the health of the children of primarily the high-risk areas. Adequate vaccination coverage not only protects individuals from the potentially devastating effects of JE but also contributes to the broader healthy community. To achieve this goal, it is essential to address barriers to vaccination access, educate communities about the importance of JE immunization, and maintain a strong healthcare infrastructure for effective vaccine delivery. By prioritizing JE immunization coverage, we can work towards a future where the threat of this deadly disease is significantly reduced, saving lives and improving the well-being of vulnerable population contributing towards the productivity of the country.

Recommendations

It is time to consider the reallocation of session sites as well as special vaccination campaigns like IMI to accelerate the vaccination coverage in HRA. The field staff should be more meticulous during the preparation of the microplan involving all the members of executive group as well as the consultative group in block and panchayat levels. The role of BPHOs is crucial to supervise the above activities.

As lack of awareness was the major reason for partial/non-immunization, health campaigns on JE should be conducted and awareness generation should be done by IEC activities. ANMs must be sensitized to deliver the seven key messages of immunization to every mother after vaccination or village health nutrition day (VHND) session and advise them to bring their MCP cards available during the subsequent visits. In areas with less effective vaccine coverage PHCs may conduct vaccination schedule including catchup.

Health education on other preventive measures can be provided before and during the rainy season through VHND/Urban Health and Nutrition Day, Swastha Kantha, and at sites. Posters and banners of JE in the local language should be displayed at the immunization site, appropriate leaflets should be distributed, and folk plays, dramas, or videos should be conducted.

Ethical consideration

The study was approved by State Ethics Committee, Odisha, Bhubaneswar, not to harm physically, psychologically, or emotionally, maintaining privacy, self-respect, and confidentiality.

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CONFLICT OF INTEREST

None declared.

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