ORIGINAL ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

# Impact of a Community-based Health Literacy Intervention on Knowledge, Risk Perception, and Preventive Practices Regarding Japanese Encephalitis among Adults in a Selected Urban Community: A Pre-experimental Study

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## Abstract

**Introduction:** Japanese encephalitis (JE) is a potentially fatal mosquito-borne viral disease associated with substantial neurological morbidity and mortality. Although vaccination is the principal preventive intervention, community knowledge, risk perception, and preventive practices are also important components of JE prevention. Community-based health-literacy interventions may help improve these behavioral and educational determinants, particularly among adults who contribute to household and community health decisions. **Methods:** A quantitative, pre-experimental one-group pre-test–post-test design was adopted to assess the effect of a community-based health-literacy intervention on knowledge, risk perception, and preventive practices regarding JE. Sixty adults residing in a selected urban community in Bhubaneswar, Odisha, India, were recruited using a non-probability sampling technique. Baseline data were collected using a structured knowledge questionnaire, risk-perception scale, and preventive-practice assessment tool. Participants received a structured health-literacy intervention addressing JE transmission, risk factors, clinical manifestations, mosquito-bite prevention, environmental sanitation, vaccination awareness, early recognition of warning signs, and appropriate healthcare seeking. Post-test assessment was subsequently conducted using the same instruments. Data were analyzed using descriptive statistics and paired *t*-tests. Statistical significance was set at $P < 0.05$. **Results:** The mean knowledge score increased from 10.80 ± 3.10 at pre-test to 17.20 ± 2.40 at post-test, with a mean difference of 6.40 points ($t = 15.20$, $P < 0.001$). The mean risk-perception score increased from 24.60 ± 5.20 to 34.80 ± 4.10, with a mean difference of 10.20 points ($t = 13.80$, $P < 0.001$). The mean preventive-practice score increased from 11.70 ± 3.40 to 18.90 ± 2.70, with a mean difference of 7.20 points ($t = 14.60$, $P < 0.001$). Statistically significant improvements were therefore observed in knowledge, risk perception, and preventive practices following the intervention. **Conclusion:** The community-based health-literacy intervention was associated with significant improvements in knowledge, risk perception, and preventive practices regarding JE among adults. The findings support the potential role of structured community-based health education as a nursing intervention for strengthening JE-prevention behaviors. Further controlled studies involving larger samples and longer follow-up are warranted.

**Keywords:** Health education, Health literacy, Japanese encephalitis, Knowledge, Mosquito-Borne disease in India, Preventive practices, Risk perception

*Asian Pac. J. Health Sci.*, (2026); DOI: 10.21276/apjhs.2026.13.3.25

## Introduction

Japanese encephalitis (JE) is a potentially fatal mosquito-borne viral disease caused by Japanese encephalitis virus (JEV), a flavivirus transmitted predominantly by infected *Culex* mosquitoes, particularly *Culex tritaeniorhynchus*. JEV is an important cause of viral encephalitis in Asia and the Western Pacific. Twenty-four countries in the World Health Organization (WHO) South-East Asia and Western Pacific Regions have areas with JEV transmission, exposing more than three billion people to risk of infection. Although most JEV infections are asymptomatic or result in mild febrile illness, approximately one in 250 infections progresses to severe clinical disease. Among patients who develop encephalitis, case fatality may reach 30%, and approximately 30–50% of survivors may develop permanent neurological, cognitive, or behavioral sequelae.

JEV transmission occurs through a zoonotic cycle involving *Culex* mosquitoes and amplifying vertebrate hosts, particularly pigs and water birds. Humans are considered dead-end hosts because they generally develop insufficient viremia to infect feeding mosquitoes. Transmission is influenced by ecological and environmental conditions, including irrigated agricultural areas, stagnant water, mosquito-breeding habitats, and proximity to amplifying hosts.

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**How to cite this article:** Routray D, Gain K, Sahoo A, Kujur P, Joshi D. Impact of a Community-based Health Literacy Intervention on Knowledge, Risk Perception, and Preventive Practices Regarding Japanese Encephalitis among Adults in a Selected Urban Community: A Pre-experimental Study. Asian Pac. J. Health Sci., 2026;13(3):126-132

**Source of support:** Nil.

**Conflicts of interest:** None.

**Received:** 11/06/2026 **Revised:** 27/07/2026 **Accepted:** 21/08/2026

India continues to experience JE transmission, with considerable regional variation in disease burden. Although children account for a large proportion of clinical cases, adults can also develop severe disease. Studies from endemic regions of India have identified environmental and behavioral factors associated with JE risk. A hospital-based case–control study in North-East India identified ecological and household factors associated with JE infection, highlighting the importance of combining biomedical interventions with individual and environmental preventive measures.[2]

Prevention remains the cornerstone of JE control because there is no specific antiviral treatment for established infection. Management is primarily supportive, and severe cases require urgent medical care. Vaccination is the principal population-level preventive intervention, and WHO recommends JE vaccination in areas where JE is recognized as a public-health priority. Personal protection against mosquito bites and appropriate vector-control and environmental measures provide additional layers of prevention.[1,3]

Adult vaccination is also relevant in endemic settings. In Assam, India, a community-based evaluation of a single-dose live attenuated SA 14-14-2 JE vaccine among adults aged 15–65 years estimated vaccine effectiveness at 77.0% over 7 years. Adult JE incidence declined from 10.5/100,000 during the pre-vaccination period to 5.7/100,000 during the post-vaccination period. However, estimated adult vaccination coverage in the two study districts was only 40.1%, demonstrating the importance of community engagement and preventive awareness.[4]

Vaccination alone does not address all determinants of JE prevention. Community members require adequate knowledge regarding disease transmission, mosquito-breeding environments, clinical manifestations, personal protective measures, environmental sanitation, vaccination, and appropriate healthcare seeking. Evidence from community-based research has identified gaps in knowledge and awareness despite high vaccination coverage. A study conducted in Yangon, Myanmar, reported inadequate community knowledge regarding JE and emphasized the need for strengthened health education.[5]

Risk perception represents another important behavioral dimension of disease prevention. Individuals who perceive themselves as susceptible to a disease and recognize its potential severity may be more likely to adopt preventive behaviors. This is particularly relevant to JE because the disease is often regarded primarily as a childhood illness, despite the fact that adults may also be affected. Effective health education should therefore address perceived susceptibility, perceived severity, benefits of prevention, and practical barriers to protective behavior.

Community-based health-literacy interventions may provide a practical approach to addressing these interconnected determinants. Health-literacy education can improve individuals' ability to understand health information, recognize health risks, make informed decisions, and undertake appropriate preventive actions. In JE prevention, such interventions can integrate information on transmission and symptoms with practical education regarding mosquito-bite prevention, environmental sanitation, vaccination awareness, early recognition of illness, and timely healthcare seeking.

Evidence from other community-based health-education programs also supports the potential value of structured educational interventions in improving health-related knowledge and strengthening preventive capabilities among community members. Rout *et al*. evaluated a child-protection education program among mothers in selected communities of Durg district and reported improvement following the educational intervention, highlighting the potential role of organized community-based education in strengthening health-related awareness and protective practices.[6] Although the intervention addressed child protection rather than JE, its findings support the broader principle that appropriately designed, community-focused educational programs can improve participants' understanding and preparedness to undertake health-promoting actions. Such an approach may be applicable to JE prevention when education is tailored to disease-specific risks, including mosquito-bite prevention, environmental sanitation, vaccination awareness, early recognition of symptoms, and timely healthcare seeking.[7-11]

Community perceptions and health-seeking practices may also influence JE prevention and disease outcomes. Research from an endemic district in North India demonstrated gaps in community understanding of JE/acute encephalitis syndrome (AES) and highlighted the need for promotive interventions addressing awareness, prevention, and healthcare-seeking behavior.[12,13]

Community participation is similarly relevant in Odisha, where research has highlighted the importance of health-system preparedness and community engagement in JE/AES prevention.[14]

Although vaccination and vector-control strategies have received considerable attention, there remains a need for community-based approaches that examine knowledge, risk perception, and preventive practices together, particularly among adults who may influence household health decisions and environmental practices.

Therefore, the present study was undertaken to evaluate the effect of a structured community-based health-literacy intervention on knowledge, risk perception, and preventive practices regarding JE among adults residing in a selected urban community in Bhubaneswar, Odisha.

## Problem Statement

"A study to assess the impact of a community-based health-literacy intervention on knowledge, risk perception, and preventive practices regarding Japanese encephalitis among adults in a selected urban community: A pre-experimental study."

## Objectives

I. To assess the baseline levels of knowledge, risk perception, and preventive practices regarding JE among adults in a selected urban community
II. To assess the post-intervention levels of knowledge, risk perception, and preventive practices regarding JE among adults in a selected urban community
III. To determine the effect of the community-based health-literacy intervention on knowledge, risk perception, and preventive practices regarding JE among adults.

## Hypothesis

$H_1$: There will be a statistically significant difference between

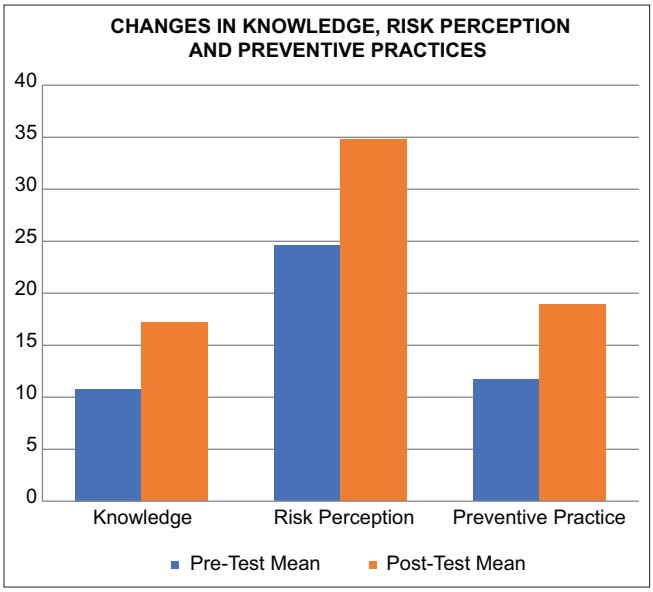


**Figure 1:** Comparison of pre-test and post-test mean scores for knowledge, risk perception, and preventive practices

the pre-test and post-test mean scores of knowledge, risk perception, and preventive practices regarding JE among adults following the community-based health-literacy intervention.

$H_0$: There will be no statistically significant difference between the pre-test and post-test mean scores of knowledge, risk perception, and preventive practices regarding JE among adults following the community-based health-literacy intervention [Figure 1].

## Methods

### Study Design

A quantitative, pre-experimental one-group pre-test–post-test design was employed to evaluate the effect of a community-based health-literacy intervention on knowledge, risk perception, and preventive practices related to JE. The study followed the sequence of pre-test assessment, intervention, and post-test assessment.

### Study Setting

The study was conducted in a selected urban community in Bhubaneswar, Odisha, India. The setting was selected based on accessibility of the study population and feasibility of implementing a community-based health-literacy intervention.

### Study Population

The target population comprised adults residing in the selected urban community in Bhubaneswar who fulfilled the predetermined eligibility criteria.

### Sample Size and Sampling Technique

A total of 60 adults participated in the study. Participants were recruited using a non-probability sampling technique. Eligibility was established before enrolment, and only individuals who fulfilled the inclusion criteria and provided written informed consent were included [Table 1].

### Study Period

The study was conducted over a period of 20 days, including participant recruitment, baseline assessment, intervention delivery, and post-intervention assessment.

### Eligibility Criteria

*Inclusion criteria*

Adults were eligible if they:

1. Were aged 18 years or older;
2. Had been residing in the selected urban community;
3. Could understand the language used for data collection;
4. Were available during the study period; and
5. Provided written informed consent.

*Exclusion criteria*

Individuals were excluded if they:

1. Were acutely or seriously ill during the study period;
2. Had participated in another structured JE health-education program during the study period; or
3. Were unavailable for the post-test assessment.

### Study Variables

The independent variable was the community-based health-literacy intervention.

The dependent variables were knowledge, risk perception, and preventive practices regarding JE.

Selected demographic characteristics included age, sex, educational level, occupation, and previous exposure to information regarding JE.

### Data Collection Instruments

Data were collected using a structured assessment package comprising four sections.

*Section I: Demographic characteristics*

A structured questionnaire was used to obtain information regarding selected demographic and background characteristics of participants.

*Section II: Knowledge questionnaire*

A structured questionnaire assessed knowledge regarding JE, including its causative agent, mode of transmission, mosquito vector, risk factors, clinical manifestations, complications, environmental risks, personal protection, vector-control measures, vaccination, early recognition, and appropriate healthcare seeking.

Each correct response received one mark, whereas incorrect and "don't know" responses received zero. The total possible score was 20.

### *Section III: Risk-perception scale*

A structured scale assessed participants' perceptions regarding susceptibility to and severity of JE. The domains included perceived individual and household susceptibility, environmental risk, perceived severity and consequences of infection, perceived importance of preventive measures, and perceived need for timely healthcare seeking.

The maximum possible score was 40, with higher scores indicating greater perceived risk.

### *Section IV: Preventive-practice assessment*

A structured assessment tool evaluated preventive behaviors related to JE, including mosquito-net use, mosquito-repellent use, protective clothing, environmental sanitation, elimination of stagnant water, household mosquito-control practices, prevention of mosquito breeding, awareness of vaccination services, and timely healthcare seeking.

The maximum possible score was 20, with higher scores indicating more appropriate preventive practices.

## Validity and Reliability

The study instruments were validated by experts in community health nursing, public health, epidemiology, and nursing research. Necessary modifications were made based on expert recommendations.

The reported Cronbach's alpha coefficients were 0.82 for the knowledge questionnaire, 0.86 for the risk-perception scale, and 0.80 for the preventive-practice tool, indicating satisfactory internal consistency.

## Community-based Health-literacy Intervention

A structured community-based health-literacy intervention was developed to improve knowledge and promote preventive practices related to JE. The intervention used simple, culturally appropriate language and practical examples relevant to the community.

The intervention addressed:

- Causation and transmission of JE;
- Mosquito vectors and risk factors;
- Signs, symptoms, and complications;
- Personal protection against mosquito bites;
- Household mosquito control;
- Environmental sanitation;
- Elimination of stagnant water and mosquito-breeding sites;
- Vaccination awareness;
- Early recognition of warning signs;
- Appropriate healthcare seeking; and
- Community participation in JE prevention.

The intervention emphasized practical and actionable preventive measures to facilitate the translation of health information into daily practice.

## Data Collection Procedure

Following ethical approval and administrative permission, eligible participants were recruited after written informed consent was obtained.

Baseline data were collected using the demographic questionnaire, knowledge questionnaire, risk-perception scale, and preventive-practice assessment tool.

The community-based health-literacy intervention was subsequently administered to the participants. The same outcome

**Table 1:** Distribution of participants according to selected demographic characteristics (*n*=60)

| *Variable* | *Category* | *n* | *%* |
|---|---|---|---|
| Age | 18–27 years | 16 | 26.7 |
| | 28–37 years | 20 | 33.3 |
| | 38–47 years | 14 | 23.3 |
| | ≥48 years | 10 | 16.7 |
| Sex | Male | 27 | 45.0 |
| | Female | 33 | 55.0 |
| Education | Primary/secondary | 21 | 35.0 |
| | Higher secondary | 19 | 31.7 |
| | Graduate and above | 20 | 33.3 |
| Occupation | Homemaker | 18 | 30.0 |
| | Employed | 22 | 36.7 |
| | Self-employed | 12 | 20.0 |
| | Other | 8 | 13.3 |
| Previous information regarding JE | Yes | 17 | 28.3 |
| | No | 43 | 71.7 |

**Table 2:** Comparison of pre-test and post-test knowledge scores regarding Japanese encephalitis (*n*=60)

| *Assessment* | *Mean±SD* | *Mean difference* | *Paired t* | *P-value* |
|---|---|---|---|---|
| Pre-test | 10.80±3.10 | 6.40 | 15.20 | <0.001 |
| Post-test | 17.20±2.40 | | | |

The mean knowledge score increased by 6.40 points, representing an approximate 59.3% increase relative to the pre-test mean. The paired *t*-test demonstrated a statistically significant difference between pre-test and post-test knowledge scores ($t$=15.20, $P$<0.001). SD: Standard deviation

**Table 3:** Comparison of pre-test and post-test risk-perception scores (*n*=60)

| *Assessment* | *Mean±SD* | *Mean difference* | *Paired t* | *P-value* |
|---|---|---|---|---|
| Pre-test | 24.60±5.20 | 10.20 | 13.80 | <0.001 |
| Post-test | 34.80±4.10 | | | |

The mean risk-perception score increased by 10.20 points, corresponding to an approximate 41.5% increase relative to the pre-test mean. The difference was statistically significant ($t$=13.80, $P$<0.001). SD: Standard deviation

**Table 4:** Comparison of pre-test and post-test preventive-practice scores (*n*=60)

| *Assessment* | *Mean±SD* | *Mean difference* | *Paired t* | *P-value* |
|---|---|---|---|---|
| Pre-test | 11.70±3.40 | 7.20 | 14.60 | <0.001 |
| Post-test | 18.90±2.70 | | | |

The mean preventive-practice score increased by 7.20 points, representing an approximate 61.5% increase relative to the pre-test mean. The improvement was statistically significant ($t$=14.60, $P$<0.001). SD: Standard deviation

**Table 5:** Summary of changes in knowledge, risk perception, and preventive practices (*n*=60)

| *Outcome* | *Pre-test Mean±SD* | *Post-test Mean±SD* | *Mean difference* | *P-value* |
|---|---|---|---|---|
| Knowledge | 10.80±3.10 | 17.20±2.40 | 6.40 | <0.001 |
| Risk perception | 24.60±5.20 | 34.80±4.10 | 10.20 | <0.001 |
| Preventive practices | 11.70±3.40 | 18.90±2.70 | 7.20 | <0.001 |

Statistically significant improvements were observed across all three outcome domains following the intervention. SD: Standard deviation

measures were used during the post-test assessment to evaluate changes following the intervention.

All study procedures were completed within the 20-day study period.

### Ethical Considerations

Prior approval was obtained from the competent authorities. Written informed consent was obtained from all participants after providing information regarding the purpose and procedures of the study. Participation was voluntary. Confidentiality and anonymity were maintained, and participants were informed of their right to withdraw from the study at any time without penalty.

### Statistical Analysis

Data were coded, entered, and analyzed using appropriate statistical software. Categorical variables were summarized using frequencies and percentages, whereas continuous variables were summarized using means and standard deviations.

Paired *t*-tests were used to compare pre-test and post-test scores for knowledge, risk perception, and preventive practices. A two-sided $P < 0.05$ was considered statistically significant.

## Results

### Demographic Characteristics

A total of 60 adults participated in the study. The largest proportion of participants belonged to the 28–37-year age group. Females constituted a slightly higher proportion of the sample. Regarding educational status, participants were distributed across primary/secondary, higher-secondary, and graduate-and-above categories [Tables 2-4].

### Effect of the Intervention on Knowledge

The mean knowledge score increased from 10.80 ± 3.10 at pre-test to 17.20 ± 2.40 at post-test [Table 5].

### Effect of the Intervention on Risk Perception

The mean risk-perception score increased from 24.60 ± 5.20 at pre-test to 34.80 ± 4.10 at post-test.

### Effect of the Intervention on Preventive Practices

The mean preventive-practice score increased from 11.70 ± 3.40 at pre-test to 18.90 ± 2.70 at post-test.

### Overall Effect of the Intervention

Across all three outcome domains, post-test scores were higher than corresponding pre-test scores.

## Discussion

The present study evaluated the effect of a community-based health-literacy intervention on knowledge, risk perception, and preventive practices regarding JE among adults. Significant improvements were observed across all three outcome domains following the intervention.

Knowledge scores increased from 10.80 ± 3.10 at pre-test to 17.20 ± 2.40 at post-test, with a mean difference of 6.40 points ($t = 15.20$, $P < 0.001$). This finding suggests that structured community-based education may improve understanding of JE transmission, symptoms, risk factors, and preventive measures. Such education is relevant because JE prevention depends on vaccination together with measures that reduce exposure to infected mosquitoes.[1,3]

The improvement in knowledge is consistent with community-based evidence demonstrating gaps in public understanding of JE. The Yangon study reported inadequate knowledge despite high vaccination coverage, supporting the importance of health education alongside immunization programs.[5]

Risk perception also improved significantly, from 24.60 ± 5.20 to 34.80 ± 4.10 ($t = 13.80$, $P < 0.001$). The observed improvement may reflect increased awareness of individual susceptibility, disease severity, possible complications, and the importance of preventive actions. Because JE can affect individuals of different age groups, adult-oriented education remains relevant even though children account for most clinical cases.[1]

Preventive practices demonstrated the largest relative increase, with the mean score rising from 11.70 ± 3.40 to 18.90 ± 2.70 ($t = 14.60$, $P < 0.001$). This finding suggests that practical health-literacy education may help participants translate information into protective behaviors. Personal protection against mosquito bites, environmental management, vaccination, and timely healthcare seeking are important components of comprehensive JE prevention.[1,3]

Evidence from India also supports the importance of vaccination as a component of JE prevention. Khan *et al*. reported 77% effectiveness of a single dose of JE vaccine among adults in Assam over a 7-year period, while adult vaccination coverage remained relatively low.[4] This highlights the need for community-level awareness and engagement to complement vaccination programs.

The findings also have implications for community health nursing. Nurses and community health workers can contribute to JE prevention by providing structured health education, promoting mosquito-bite prevention, encouraging environmental sanitation, increasing awareness regarding vaccination services, identifying warning signs, and promoting timely healthcare seeking. Community participation is particularly important in settings where environmental and household practices influence mosquito breeding and exposure. Research from Odisha has similarly highlighted the importance of health-system preparedness and community participation in JE/AES prevention.[14]

However, the findings must be interpreted in light of the study design. Because the study used a one-group pre-test–post-test design without a control group, the observed improvements cannot be attributed exclusively to the intervention. Other factors, including exposure to outside information or testing effects, may have contributed to the changes. Furthermore, the short follow-up period does not establish whether improvements in preventive practices were sustained over time.

## Conclusion

The community-based health-literacy intervention was associated with statistically significant improvements in knowledge, risk perception, and preventive practices regarding JE among adults.

The findings indicate that structured community-based health

education may be a useful nursing strategy for strengthening awareness and preventive behaviors related to JE. Health education addressing mosquito-bite prevention, environmental sanitation, vaccination awareness, early recognition of illness, and timely healthcare seeking may complement existing JE prevention and control strategies.

Due to the absence of a control group, the findings should be interpreted as an association rather than definitive evidence of causal effectiveness. Further controlled studies involving larger samples, multiple settings, and longer follow-up periods are recommended.

## Implications for Nursing Practice

1. JE health education should be integrated into routine community health-nursing and health-promotion activities
2. Nurses should address misconceptions regarding JE transmission, susceptibility, severity, prevention, and vaccination
3. Health education should emphasize practical measures for mosquito-bite prevention and environmental sanitation
4. Community members should be educated regarding early recognition of warning signs and the importance of timely healthcare seeking
5. Simple, culturally appropriate, and visually supported educational materials should be used to strengthen health literacy
6. Community health workers should reinforce JE-prevention messages during household and community outreach
7. Community participation should be encouraged to reduce mosquito-breeding sites and improve environmental hygiene.

## Limitations

The study has several limitations. First, the one-group pre-test–post-test design without a control group limits causal inference. Second, the sample size was relatively small and participants were selected using a non-probability sampling technique, which may limit generalizability. Third, the study was conducted in a single urban community, limiting transferability of the findings to other populations and settings. Fourth, the 20-day study period did not permit assessment of long-term retention of knowledge or sustained preventive practices. Finally, self-reported preventive practices may have been affected by social-desirability and reporting bias.

## Recommendations

- Future studies should use randomized or controlled quasi-experimental designs with larger and more diverse samples. Multi-center studies involving urban and rural communities should be conducted to improve generalizability.
- Longer follow-up periods are recommended to determine whether improvements in knowledge, risk perception, and preventive practices are sustained.
- Future research may also evaluate the effect of community-based health-literacy interventions on measurable outcomes such as vaccination uptake, mosquito-control behaviors, environmental sanitation, and healthcare-seeking practices.
- Digital health education, mobile-based interventions, community health-worker-led programs, and integration of JE education with broader vector-borne disease prevention programs may also be explored.

## Acknowledgments

The authors acknowledge the cooperation of the study participants and the support provided by the community authorities and healthcare personnel during the conduct of the study.

## Authors' Contributions

Diptimayee Routray, and Kalidasi Gain: Conceptualization; Kalidasi Gain, and Anita Sahoo: Methodology; Anita Sahoo, Punam Kujur, and Debabrata Joshi: Data collection; Diptimayee Routray, Kalidasi Gain, and Debabrata Joshi: Data analysis; Diptimayee Routray, Kalidasi Gain, and Anita Sahoo: Interpretation of findings; Punam Kujur, and Kalidasi Gain: Manuscript drafting; Diptimayee Routray: Critical revision; all authors: Final approval.

## Ethical Approval and Informed Consent

Ethical approval was obtained from the competent authority/ Institutional Ethics Committee before commencement of the study. Written informed consent was obtained from all participants after providing information regarding the purpose, procedures, potential benefits, and voluntary nature of participation. Confidentiality and anonymity were maintained throughout the study. Participants were informed of their right to withdraw from the study at any time without penalty.

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