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Original Research Article

Effectiveness of a multidimensional health awareness programme on NCDs and communicable diseases, vaccination and environmental hazards: a community-based study in the Indian Sundarbans

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ABSTRACT

Background: A health awareness program is an essential tool for determining health outcomes, especially in rural communities like the Sundarban area, where access to healthcare and services is limited. The study aimed to assess the effectiveness of a health awareness program on knowledge regarding communicable and non-communicable diseases, vaccination, and environmental hazards among villagers in the Mathurapur area of Sundarban.
Methods: This study employed a pre-experimental research design, specifically the one-group pre-test and post-test design. Data were collected from 100 randomly selected participants using structured questionnaires and analysed via SPSS (version 27) software.
Results: Results showed a significant improvement in post-test knowledge scores as $p<0.001$ in the paired t-test. The study reflects that 76% of participants had poor knowledge regarding communicable diseases and NCDs, vaccination, environmental hazards in pre-test whereas changing in knowledge, 83% attained good knowledge in post-test.
Conclusions: The majority of respondents moved from poor knowledge to good knowledge regarding communicable diseases and NCDs, vaccination, environmental hazards in the post-test, from pre-test. The study showed that the elderly group, female participants, higher educational level, higher income level, and employment correlate with higher knowledge, whereas it is necessary to focus more on students, lower income levels, lower literacy individuals, and males to empower them about the importance of health awareness programs.

Keywords: Disease, Environmental health, Health awareness programme, Sundarban, Vaccination

INTRODUCTION

The Indian Sundarbans, one of the largest mangrove ecosystems in the world, is inhabited by communities that face multiple health challenges due to climate change, poverty, difficult occupations (such as fishing and honey collection), limited healthcare services, and low levels of literacy.[1,2] As a result, this region experiences a relatively high burden of infectious diseases (particularly water-borne diseases) along with malnutrition, anemia, occupational injuries, and diseases related to poor sanitation.[1,12,13]

The United Nations Children's Fund highlights behaviour change communication as a crucial public health strategy, particularly for rural and marginalized populations, to reduce under-five mortality and improve nutritional status.[14] In settings like the Sundarbans, where communities are frequently exposed to environmental hazards, unsafe water, poor sanitation, and limited health awareness, behaviour change communication plays a vital role in promoting preventive practices and healthy behaviours.[1,2] These unhygienic conditions and poor sanitation especially affect vulnerable groups such as women, children, and fishermen. In this situation, health

awareness programs can play an important role in encouraging people to adopt healthier lifestyles and preventive practices.

Non-communicable diseases such as hypertension, diabetes, chronic respiratory disorders, and musculoskeletal conditions and communicable diseases such as cholera, typhoid, dengue, malaria, tuberculosis etc. are increasingly reported among adults in Sundarban.[1,7,12] Lifestyle changes, unhealthy dietary patterns, tobacco use, and lack of regular health screening further aggravate the situation.[12,13] Vaccination plays a vital role in preventing childhood and maternal morbidity; however immunization coverage in this area remains consistent but communities are unaware about the immunization programme due to myths and phobia.[5,11,13] Environmental hazards such as cyclones, flooding, water contamination, salinity intrusion, snake bite, fishing, and other occupational risks among fishermen further increase health vulnerability.[1]

Several studies indicate that inadequate knowledge of basic health-promoting behaviours significantly contributes to preventable illness and mortality in rural India.[9,10] Community-based health awareness programmes have proven effective in improving knowledge and practices related to nutrition, hygiene, maternal and child health, and disease prevention.[12,13] The World Health Organization and the Government of India emphasize population-based health promotion as a key public health strategy.[7,8] Despite NGO-led initiatives in the Sundarbans, and government support, awareness remains uneven due to poverty, low literacy, and cultural myths.[3,4] Therefore, evaluating health awareness programmes is essential to strengthen community health outcomes.

Earlier studies carried out in the Indian Sundarbans have clearly indicated that poor health awareness, environmental threats, and socio-economic hardship are strongly linked with unsatisfactory health conditions. In a study, Roy et al found a substantial burden of preventable illnesses among fishermen and emphasized the significant contribution of occupational hazards to their health conditions.[1] Their findings indicated that fever accounted for the highest proportion of reported morbidity (31%), followed by ocular conditions (23%), musculoskeletal disorders (20%), skin-related diseases (17%), and respiratory ailments (9%), with fishermen being disproportionately affected. Furthermore, climate change–induced flooding and persistent livelihood insecurity have further limited access to healthcare services, thereby intensifying health vulnerabilities within the Sundarbans region.[2]

Studies from the Indian Sundarbans highlight the importance of community participation in addressing child health risks.[5,6] Gupta et al demonstrated that context-specific, community-led interventions significantly reduce child drowning, a major preventable cause of mortality.[5] Ghosh et al, using photovoice, showed that engaging mothers reveals critical health challenges and strengthens community awareness, supporting locally responsive health promotion strategies.[6]

In another study Panda et al and Khanna et al revealed a high prevalence of malnutrition and anemia among women and children living in the Sundarbans. These findings point towards the urgent requirement for focused nutrition-based and health education interventions.[12,13] Evidence further suggests that community-based programs that are long-term and culturally suitable are effective in improving nutritional awareness and related practices.[12]

Studies from other rural regions of India have consistently shown that health education plays an important role in improving health literacy and encouraging preventive health behaviors.[9,10] In the Sundarbans, non-governmental organizations have implemented rolling clinics and community volunteer training programs, which have contributed to reducing gaps in healthcare access and health awareness.[3,4] The World Health Organization has also highlighted the importance of population-based health promotion approaches for improving public health outcomes.[7]

Despite these efforts, there are relatively few quantitative studies that assess the effectiveness of health awareness programs in environmentally fragile regions such as the Sundarbans. The present study aims to address this gap by evaluating the impact of a structured health awareness intervention.

Aim

To assess the effectiveness of health awareness programme on knowledge level regarding communicable and non-communicable disease, vaccination, and environmental hazards among the villagers of Sunderban-Mathurapur rural areas in India.

Objectives

To assess the knowledge level regarding communicable and non-communicable disease, vaccination, and environmental hazards among the villagers. To assess the effectiveness of health awareness programs on knowledge regarding communicable and non-communicable disease, vaccination, and environmental hazards among villagers through pre-tests and post-tests. To find the association between personal variables and level of knowledge regarding communicable and non-communicable disease, vaccination, and environmental hazards among villagers in the Sundarban area.

Hypothesis

H_0 = There will be no significant improvement in the level of awareness (knowledge scores) regarding communicable and

non-communicable disease, vaccination, and environmental hazards among the villagers after the implementation of the health awareness program.

H_1 = There will be a significant improvement in the level of awareness (knowledge scores) regarding communicable and non-communicable disease, vaccination, and environmental hazards the villagers after the implementation of the health awareness program.

METHODS

Research approach

This study adopted a quantitative research approach, which focuses on the systematic collection and statistical analysis of numerical data.

Research design

The study employed a pre-experimental research design, specifically a one-group pre-test and post-test design.

Setting

The study was conducted in four selected villages of Mathurapur-II block in the Sundarban region. The Sundarbans is a rural, climate-vulnerable area with limited healthcare access, low literacy rates, and high exposure to environmental hazards such as flooding and saline water intrusion.

Sampling

Random sampling method was used. Sundarban in the district of South 24 parganas, West Bengal, from where four villages were selected in this study. These villages are separated into big areas having approximately 100-150 households in each village.

Field selected processes among all the major streets in these areas were covered to collect the data from maximum respondents. Among them willing 100 participants were selected for the study.

Sample size

The study included 100 participants, comprising villagers from the four selected villages. It was sufficient for descriptive and inferential analyses, such as paired t-tests, to evaluate the effectiveness of the health awareness programme.

Tool

A structured questionnaire consisting of 30 items was used to assess knowledge about health-promoting behaviours like communicable diseases and NCDs, vaccination, environmental hazards.

Time period

The study was held from August, 2025 to November, 2025, when the pre-test was conducted in August, health awareness programme was held in September and post-test was conducted in October.

Questioning techniques

The yes/no questioning technique was used for all 30 items. This binary response format simplifies the response process for participants, especially in rural settings with varying literacy levels. It allows straightforward scoring (2 point for correct, 0 for incorrect or unanswer) and makes statistical analysis easier. The medium of the questionnaire was Bengali and English.

Variables

Independent variable was health awareness programme.

Dependent variables

Knowledge regarding selected health-promoting behaviours like communicable diseases and NCDs, vaccination, environmental hazards.

Personal variables

Age, sex, religion, educational level, occupation, socio-economic status.

Inclusion criteria

Female, male, young adult, more than 18 years of age who were present at the time of visit to be interviewed in the selected households.

Exclusion criteria

Minor, less than 18 years old were excluded.

Data collection technique

A combination of personal variables of sample respondents and knowledge on health awareness. Socio-demographic details of 100 individuals from Mathurapur block II, Sundarban, who participated in the current health awareness programme were collected through self-structured questionnaires.

Procedure

Pre-intervention

The study was done under a group among villages of Sundarban who was able to give information about their current health status and knowledge about health

missions, vaccination, environmental hazards and preventive services. Pre-intervention survey was conducted through an interview using pre-test questionnaire-1.

Intervention

The health awareness campaign was conducted in this Sundarban area. Information was passed door-to-door in the whole village. Banners were placed in the villages to increase the awareness about the health knowledge about communicable diseases and NCDs, vaccination, environmental hazards and the role of the community for preventing the spread of communicable diseases by taking proper precautions. The information was expected to spread in the locality through respondents.

Post-intervention

Same awareness questions (questionnaire 1) used to assess the change in knowledge regarding selected health-promoting behaviours among villagers.

Statistical analysis

The collected data were entered in MS Excel and the analysis was done by using the statistical software IBM SPSS Statistics (version 27).

RESULTS

Section A: description of selected personal variables

Table 1 shows frequency and percentage distribution of villagers according to their selected personal variables.

Table 1: Frequency and percentage distribution of villagers according to their selected personal variables, n=100.

Personal variables	Categories	Percentage
Age (in years)	19-30	55
	31-45	29
	46-60	16
Sex	Male	70
	Female	30
Religion	Hindu	75
	Muslim	25
Education	Below 5th standard	45
	5-10th standard	19
	Above matriculation	36
Occupation	Student	33
	Employed	33
	Others	34
Income	Below 2 lakhs	50
	Between 2-3 lakhs	28
	Above 3 lakhs	22

Most of the individuals (55%) are between 19-30 years making this the dominant age group. 29% were between 31-45 years forming the second largest group, and 16% are in the age group between 46-60 years, making this the smallest group. The male 70% and female 30% participated as respondents in this study. 75% Hindus and 25% Muslims were categorized on the basis of religion. 45% Respondents were below fifth standard, 19% were between 5-10th standard, and 36% were above the matriculation level. In occupational demography, 33% were students, 33% are employed and 34% were others (house-wife, old-aged person, divorce, widow, etc.). 50% have family annual income below one lakh, 28% have family annual income between one lakh to two lakhs, rest of 22% have annual income above 2 lakhs rupees. These data suggest socioeconomic challenges such as low income (50% earn <1 lakh rupees), high unemployment (33%) and lower educational attainment (45% below class 5th standard) in this area.

Section B: Effectiveness of health awareness programme on knowledge regarding regarding communicable and non-communicable disease, vaccination, and environmental hazards among the villagers

A description of villagers' knowledge regarding communicable and non-communicable disease, vaccination, and environmental hazards.

Table 2: Frequency and percentage distribution of knowledge score of villagers according to the pre-test and post-test scores.

Knowledge score	Pre-test (%)	Post-test (%)
Poor knowledge (15-30)	76	0
Average knowledge (31-45)	19	17
Good knowledge (46-60)	5	83

There was a significant improvement in knowledge after the intervention as the majority of respondents (76%) moved from poor knowledge to good knowledge (83%).

The mean increases 21.34 from pre-test (27.37) to post-test (48.71) was statistically significant. The paired t-test value 29.997 indicates that the improvement is not due to chance. There was a clean and strong effect of intervention applied between tests. P<0.001- highly statistically significant. Cronbach's alpha ≈ 0.80-acceptable reliability (Table 4).

In pair 1, communicable diseases and NCDs knowledge (CNDK) improved from 4.39 to 8.39, and the test was highly significant as the p value was less than 0.001. In pair 2, vaccination knowledge (VK) increased from 2.29 to 4.06 with t-value -13.599 and p<0.000 indicating significant change in knowledge level after the intervention. In pair 3, the mean score of environmental hazards knowledge (EHK) increased from 21.5 to 37.09. The negative mean difference indicates post-test was higher.

Table 3: Mean, median, mean difference, standard deviation, SD difference, standard error and paired t' value of pre-test and post-test.

Knowledge score	Mean	Median	SD	Mean difference	SD Difference	Standard error	Paired t-test value
Pre-test	27.37	27	7.38				
Post-test	48.71	49	4.54	21.34	7.11	0.71	29.997

Table 4: Descriptive Statistics for each pair (1, 2, 3) before and after the intervention.

Pair	Measure	Mean	SD	Std. error mean	t value	P value (2-tailed)
1	Pre-CNDK	4.29	2.30	0.23	-20.054	0.001
	Post-CNDK	8.39	1.28	0.13		
2	Pre-VK	2.29	1.46	0.15	-13.599	0.000
	Post-VK	4.06	0.87	0.09		
3	Pre-EHK	21.50	6.78	0.68	-22.826	0.000
	Post-EHK	37.09	4.05	0.45		

Communicable and non-communicable diseases knowledge (CNDK), vaccination knowledge (VK), and environmental hazards knowledge (EHK).

Table 5: A comparative analysis between the personal variables of villagers and the mean of 3 variables.

Personal variables	Categories	CNDK (mean)	VK (mean)	EHK (mean)
Age (years)	19-30	4.93	2.05	20.55
	31-45	8.02	1.80	21.02
	46-60	8.24	2.62	22.50
Sex	Male	4.83	2.05	20.55
	Female	8.27	2.18	22.37
Religion	Hindu	4.87	2.06	20.55
	Muslim	8.32	2.16	23.55
Education	Below 5th standards	4.76	2.07	20.55
	5-10th standards	8.48	2.18	22.37
	Above 10th standards	8.32	2.54	22.50
Occupation	Student	4.48	2.32	20.55
	Employed	8.92	2.37	22.37
	Other	7.48	2.39	21.97
Annual Income	Below 2 Lakh	4.50	2.06	20.55
	2-3 Lakhs	8.83	2.33	22.32
	Above 3 Lakhs	7.50	2.64	21.97

Communicable and non-communicable diseases knowledge (CNDK), vaccination knowledge (VK), and environmental hazards knowledge (EHK).

Table 5 shows a comparative analysis between the personal variables of villagers and the mean of 3 variables.

It shows clear variations in knowledge levels across personal variables. Higher age groups (46-60 years) demonstrated better mean scores in communicable and non-communicable diseases knowledge (CNDK), vaccination knowledge (VK), and environmental hazards knowledge (EHK) compared to younger villagers (12,13). Females consistently showed higher mean knowledge scores than males across all three domains. Muslim respondents exhibited higher mean scores than Hindu respondents. Educational status strongly influenced knowledge, with respondents educated above the 10th standard scoring higher than those below the 5th standard. Employed villagers showed better knowledge levels compared to students and others. Similarly, higher annual income groups demonstrated better mean knowledge scores. Overall, education, income, age, and occupation appear to be important determinants of health awareness among villagers.

DISCUSSION

It shows that the majority 55% were aged between 19-30 years; 70% were male and 30% were female; 75% identified as Hindu and 25% were Muslim; 45% had education below fifth standard. It reflects a population that previously had low access to health knowledge particularly due to low literacy and income constraints (Table 1).

It reflects that 76% of participants had poor knowledge regarding selected health-promoting behaviours in pre-test whereas changing in knowledge, 83% attained good knowledge in post-test. The intervention has a great impact on the community and can bridge the knowledge gap as the majority shift from poor knowledge to good knowledge. It also promotes positive behavioural changes, especially in rural settings (Table 2).

It shows the mean score increased from 27.37 to 48.71 with a mean difference of 21.34. The paired t-test value of 29.997 indicates a highly significant improvement in knowledge after the intervention (where $p<0.001$) (Table 3).

It reflects that a paired-sample comparison of three variables- communicable and non-communicable diseases knowledge (CNDK), vaccination knowledge (VK), and environmental hazards knowledge (EHK)- before and after the intervention shows that substantial increase in CNDK after intervention, $p<0.001$ and negative t-value confirms improvement post-intervention. For VK, the scores nearly doubled after intervention and consistency of data was higher in post-test as SD was lower. For EHK, the knowledge score jumped from 21.50 to 37.09 with lowest p value that indicates knowledge gained about communicable diseases. A paired-samples t-test revealed a significant improvement in total awareness scores, with a mean decrease of 4 points (95% CI: -4.40 to -3.60), $t(99) = -22.83$, $p<0.001$ for the variable of communicable and non-communicable diseases knowledge (CNDK). Similar strong gains were found in vaccination knowledge (VK) ($\Delta=-1.77$; 95% CI: -2.03 to -1.51; $t(99) = -13.60$, $p<0.001$) and environmental hazards knowledge (EHK) ($\Delta=-15.59$; 95% CI: -16.94 to -14.23; $t(99) = -20.05$, $p<0.001$) (Table-4).

It shows that a comparative analysis between personal variables of villagers and mean of 3 variables, where the study shows that in case of age wise analysis, CNDK and VK increase with age, indicating older are more concerned and aware about their current health status, so it is necessary to target younger groups for health education as they have poor knowledge. In sex wise analysis, females show higher scores in all domains that reflect greater health awareness as they have participated in other health programmes (like breastfeeding, child nutrition, personal hygiene).[11,13] Religion wise analysis shows cultural, educational outreach differences may play a role. In education -wise analysis higher education corresponds with higher health knowledge and score, so it is necessary to focus more on low-literacy people. In the case of occupation wise analysis, employed persons have higher knowledge than students which indicates to encourage the students to participate in health awareness programmes.[1] In Income wise analysis, it indicated economic empowerment improves health awareness (Table 5).

The study was conducted in only four villages of Mathurapur-II block, which may not represent the diversity of the entire Sundarbans region. Despite using bilingual questionnaires, low literacy levels among participants may have affected accurate understanding and responses. Other factors such as media exposure, prior knowledge, or NGO activities may have influenced the results.

CONCLUSION

The study revealed that prior to the intervention, majority (76%) had poor knowledge regarding communicable and non-communicable diseases knowledge (CNDK), vaccination knowledge (VK) in pre-test whereas changing in knowledge score, 83% of them shifted to good knowledge in post-test, showing significant improvement in knowledge after the intervention.

The study also indicated that age, sex, education, occupation, and income significantly influence health knowledge and behaviours among young adults in rural areas. While higher education and income generally lead to better awareness, disparities still exist, especially among students and other individuals. Gender differences, with females showing better awareness, highlight a positive shift toward female empowerment in rural settings. These findings emphasized the need for targeted health education programs, especially for unemployed youth and students from lower socioeconomic backgrounds. Engagement through schools, colleges, and community platforms was identified as an effective strategy for bridging these knowledge gaps. Public health interventions must be inclusive, culturally sensitive, and easily accessible to promote holistic health development among rural youth.

The present study concluded that the health awareness programme on communicable diseases and NCDs, vaccination, environmental hazards was effective in increasing the knowledge of villagers as proved by a computed paired t-test where the p value was less than 0.001.

Recommendations

Future studies should include a control group to better establish the effectiveness of health awareness programmes. A larger sample size should be used to improve generalizability and statistical power. Studies should include multiple blocks or districts of the Sundarbans to ensure broader representation. Conduct follow-up assessments to evaluate sustainability of knowledge and behavioural change over time. Replace or supplement yes/no questions with multiple-choice or Likert scale questions for better evaluation.

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