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Original Research Article

Behavioural change communication (BCC) as a tool in control of mosquito-borne diseases among a community in an indian naval station: An observational study

[1]Dr. Anand Neelakantan, [2]Dr. Jishnu S Lalu, [3]Dr. M Ilankumaran

[1]DMPO (A), Senior Advisor Community Medicine, HQSWAC, Indian Air Force, Gandhinagar, Gujarat, India
[2]Officer in Charge, Station Health Organization, ANC, Indian Navy, Port Blair, Andaman & Nicobar Islands, India
[3]PMO, Naval Dockyard Dispensary, WNC, Indian Navy, Mumbai, Maharashtra, India
Corresponding Author:
Dr. Jishnu S Lalu (jishnudivya@hotmail.com)

Abstract

Background: Mosquito borne diseases accounts for about 17% of all infections globally and is a major public health concern in India. The vector-borne diseases reduced the fighting capacity of armies. Vector control and personal protection measures therefore continue to ensure the operational readiness of Armed Forces. The Behavioural Change Communication strategy is part of the control and prevention measures.

Methods: A community based cross-sectional study was conducted in a large Naval station in Mumbai during pre and post monsoon period in 2017. Data was collected using a pretested semi-structured questionnaire by directly administering the questionnaire to the sample population. Details on socio-demographic parameters, knowledge about mosquito breeding sites, awareness on mosquito borne diseases, expenses on mosquito control measures and PPM were recorded during the interview.

Results: A total of 750 individuals were interviewed in this study. The mean age of the respondents were 32.79 years (95%CI 32.2-33.4). Majority of the respondents were males (75.69%) and most of the families belonged to nuclear (75.4%) type. About 78% of the participants were exposed to mosquito bite at some point in the recent past. However, after BCC intervention about 28% reduction in exposure to mosquito bite was reported. There was significant change in knowledge, attitude and practice towards mosquito borne diseases after Behavioural Change Communication activities.

Conclusion: There was a fair level of knowledge, attitude and practice in the community. Imparting education on methods of prevention of mosquito bites and it showed improvement in choices of preventive behaviours in the study population.

Keywords: Mosquito borne diseases, personal protective measures, behavioural Change Communication, Naval Station

Introduction

Mosquito borne diseases (MBD) including Dengue, Malaria, Chickungunya, Japanese Encephalitis, Filariasis accounts for about 17% of all infections globally and is a major public health concern in India. According to WHO, about 50% of the world's population and 80% of the Indian population resides in MBD endemic region. More than 40 million cases are being reported from India every year causing catastrophic expenses and an increasing number of years lost as DALY [1]. Given the unique and ever-changing nature of terrain in which Armed Forces operate, the challenge posed by arthropod borne infections and vector-borne diseases

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on the health are immense and merit their units mission accomplishment. From time immemorial, vector-borne diseases have severely reduced the fighting capacity of armies and caused suspension or cancellation of military operations [2]. However, the risk of vector-borne disease for the soldiers and the main diseases affecting them is different for each service, and at different times, depending on various factors. The threat of vector-borne disease has changed with the progress in hygiene and disease control within the military: some diseases have lost their significance (e.g. plague, yellow fever, and epidemic typhus); others though showed a declining trend still remain as a cause of concern (e.g. malaria and dengue fever). Vector control and personal protection measures (PPM) therefore continue to be major requirement in ensuring the operational readiness of Armed Forces. Scientific progress has allowed a reduction in the impact of arthropod-borne diseases on military forces, but the threat is always present, and a failure in the context of vector control or in the application of PPM could allow these diseases to have the same devastating impact on human health and military readiness as they did in the past [3]. Studies have highlighted the fact that preventing an outbreak is much cheaper than the cost inquired towards paying for the consequences of an outbreak [4].

Behaviour change communication (BCC) is a process of any intervention with individuals, communities and/or societies to develop communication strategies to promote positive behaviors which are appropriate to their settings. This in turn provides a supportive environment which will enable people to initiate and sustain positive and desirable behavioral outcome [5]. The BCC strategy is part of the control and prevention measures laid down as part of Information Education Communication (IEC) both by the National Vector Borne Disease Control Programme of Government of India, and the Indian Armed Forces. Studies across the world have shown superior result of health education in reducing mosquito menace as compared to spraying or other interventions [6-8]. In order to refine the existing vector borne disease control measures being implemented in Armed Forces setting and for further optimizing the gains thereof, it is essential to assess the impact of BCC strategies in an Armed Forces setting. This study is an attempt to provide body of research evidence in achieving this objective. Therefore, the present study was undertaken with an aim to understand the knowledge and practices about mosquito borne diseases and its control among the study population and to assess the role of BCC as an element in control of MBD amongst Naval personnel and families in a large Naval station.

Materials and Methods

This community based cross-sectional study was conducted in a large Naval station in Mumbai during pre and post monsoon period in 2017. The Naval station is located adjacent to the civil area of the Municipal Corporation of Greater Mumbai which is a metropolitan City with a population of 12.5 million [9]. The sample size for the study was calculated using prevalence as 51.6%, which is the proportion of knowledge that dengue is transmitted by mosquitoes as reported by a Delhi based study [10]; with 95% confidence and a power of 90%, a minimum sample of 375 was calculated using the formula $n=z^2p(1-p)/d^2$. Considering a design effect of 1.5 as reported by S K Yadlapalli *et al*. in the study conducted in Delhi, the final sample size required for the study was estimated to be 562. Data was collected using a pretested semi-structured questionnaire which was validated by pilot testing. The data was then collected in two stages; baseline data was collected in the first stage which was followed by community-based intervention using BCC activities which included distribution of handouts on mosquito borne diseases and a series of health lectures on mosquitoes & mosquito borne diseases in the study setting for a period of 6 months. The same questionnaire was administered to the study population after 6 months. The data was collected by directly administering the questionnaire to the sample population. Our study population included individuals (Officers, Sailors and Defence civilians) who are on permanent duty at the station and has resided in the station for at least 06 months. Details on socio-demographic parameters, knowledge about mosquito breeding sites, awareness on mosquito borne diseases, expenses on mosquito control measures and PPM were recorded during the interview. Data

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was entered in MS Excel and analyzed using Statistical Package for Social Science version 19. Descriptive statistics were expressed as mean and proportions. Categorical variables were analyzed using Chi square test to find statistical significance of association. Written informed consent was obtained from the respondents prior to the interview. The study was conducted as part of AFMRC project (4318/2012) and was ethically approved by the Institutional Ethical Committee of INHS Asvini, Mumbai.

Results

A total of 750 individuals were interviewed in this study. The mean age of the respondents were 32.79 years (95%CI 32.2-33.4). Majority of the respondents were males (75.69%) and most of the families belonged to nuclear (75.4%) type and lived in residential accommodation provided by Central Government (88.1%). The socio demographic characteristics of the study population is shown in Table 1.

About 78% of the participants were exposed to mosquito bite at some point in the recent past. However, after BCC intervention about 28% reduction in exposure to mosquito bite was reported. Table 2 and Table 3 shows the proportion of knowledge, Attitude and Practices among the study population along with p- value of each variable at baseline and after BCC activities. As Table 4 shows the mean monthly expense incurred towards buying various types of PPM. A bar diagram on the pattern of use of PPM has been depicted as figure 1. Monthly expenditure inquired towards each type of PPM as per each household is shown in figure 2.

Table 1: Socio-Demographic Characteristics of Study Population

Sr. No.	Variable	Frequency (%)
1	Total number of members (no.)	750
2	Mean family size	3.50 (±0.9)
3	**Gender**	
	Male	573 (75.7%)
	Female	177 (24.3%)
4	**House Location**	
	Service/ Military Areas	663 (88.1%)
	Civil areas	87 (11.9%)
	Family type	
5	Nuclear	566 (75.6%)
	Joint	19 (02.6%)
	Three Generation	165(21.8%)

Table 2: Knowledge Regarding Mosquito Borne Diseases and Practice of Protective Measures: Pre & Post BCC [#]

Sr.No.	Variable	Baseline (%, 95% CI)	Post BCC (%, 95% CI)	p- value
1	**Diseases transmitted by mosquito**			
	Dengue, Malaria & Chikungunya	549 (73.2, 70-76.4)	580(77.3, 74.3-80.3)	0.06
	>3 diseases	201 (26.8, 23.6-30)	170 (22.6, 19.7-25.6)	
2	**Mosquito breeding sources**			
	Artificial containers	587(78.3,75.3-81.2)	647(86.3, 83.8-88.7)	<0.001
	Natural water collections	452(60.3, 56.8-63.8)	641(88, 83-88)	<0.001
3	**Reduction of mosquito menace**			
	Remove artificial containers	513(68.4, 65.1-71.1)	668(89.1, 86.8-91.3)	<0.001
	Insecticide spraying	713(95.1, 93.5-96.6)	750 (100%)	-
4	**Symptoms of Mosquito borne diseases**			
	Fever only	673(89.7, 87.6-92)	717(95.6, 94.1-97.1)	<0.001
	Fever and other symptoms*	633(84.4, 81.8-87)	677(90.3, 88.1-92.4)	<0.001
5	Knowledge that mosquito borne diseases can be fatal	488(65.1, 61.6-68.5)	670(89.3, 87.1-91.5)	<0.001

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*Other symptoms included chills, tiredness, chills, headache, vomiting
Total numbers in each cell may not be sum of all sub-values, since each sub-point has been assessed independently; thus these are not mutually exclusive values.

Table 3: Attitude and Practices to Reduce Mosquito Bites: Pre & Post-BCC[#]

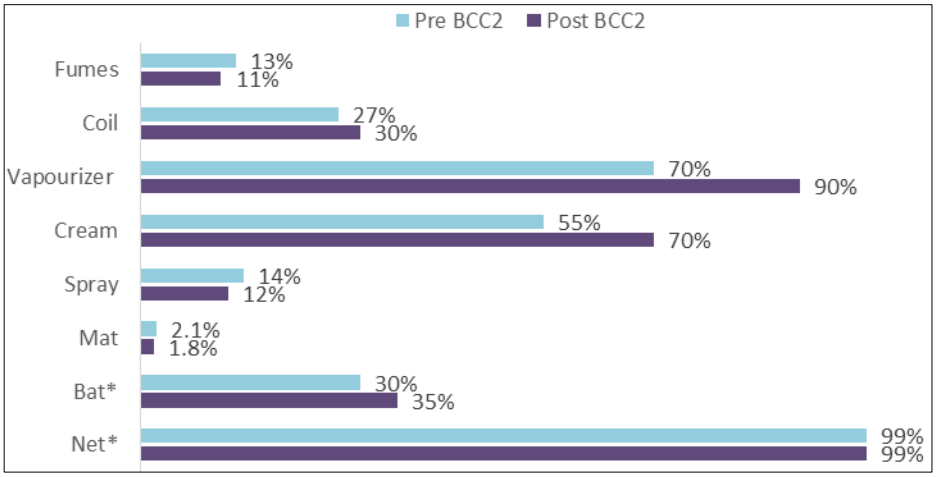
Sr. No.	Variable	Baseline (%, 95% CI)	Post BCC (%, 95% CI)	p-value
1	**Frequency of use of PPM**			
	Daily	431 (57.5, 54-61)	592 (79, 76-82)	<0.001
	During monsoon	349 (46.5, 43-50.1)	501 (67, 63.4-70.2)	<0.001
	Occasionally	413 (55.1, 51.5-58.6)	557 (74.3, 71-77.4)	<0.001
2	**Preferred time of use of PPM**			
	Whole day	70 (09.3, 7.2-11.4)	113 (15, 12.5-17.6)	<0.001
	Only at bed time	491 (65.5, 62.68.9)	564(75.2, 72-78.3)	<0.001
	Occasionally	264 (35.2, 31.8-38.6)	374 (50, 46.3-53.4)	<0.001
3	Switching on fans	675 (90, 87.8-92)	712 (95, 93.3-96.5)	<0.001
4	Willingness to purchase PPM	625 (83.3, 80.6-86)	741 (98.8, 98-99.6)	<0.001
5	**Clearing of drains**			
	Self	49 (06.5, 4.7-8.3)	53 (7.1, 5.2-9)	0.09
	By internal agency	476 (63.5, 60-67)	510 (68, 64.6-71.3)	
	Never done	225 (30, 26.7-33.3)	187 (25, 21.8-28)	

Total numbers in each cell may not be sum of all sub-values, since each sub-point has been assessed independently; thus these are not mutually exclusive values.

Table 4: Level of Satisfaction and Mean Monthly Expense on PPM

Sr. No.	Type of PPM	Mean Monthly Expense in Rs (95% CI)
1	Fumes	8.1(4.5-11.7)
2	Coil	8.4(3.7-12.1)
3	Vaporizers	58.6 (52.2-65)
4	Cream	46(40.8-51.2)
5	Spray	70 (64.7-75.3)
6	Mat	4.5 (2.5-6.4)
7	Bat*	69.87 (59.4-80.5)
8	Bed Net**	Nil
9	Window/door net screens#	Nil

*Fixed investment ** issued from respective units
#All houses had pre-installed net screens on windows and doors



*Fixed investment ** issues from respective units
#All houses had pre-installed net screens on windows and doors

Fig 1: Distribution of the Pattern of PPM Used

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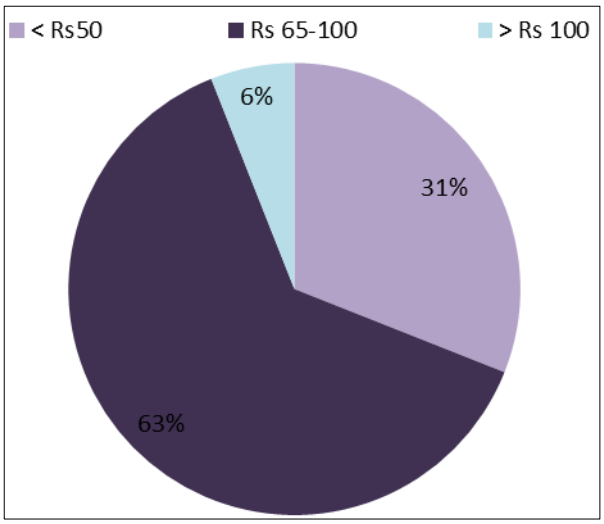

Fig 2: Distribution of Households Based on Expenses Incurred Towards PPM per Month

Discussion

About 75% of the study population reported exposure to mosquito bite. Greater Mumbai is endemic for Dengue and Malaria. Vectors such as Anopheles Stephensi, Anopheles Culicifacies, Culex quinquefasciatus, Aedes aegypti and Aedes albopictus was reported in a study conducted in Armed Forces Cantonment in Pune [11]. These are principal vectors transmitting diseases such as Dengue, Malaria and Filariasis in India. The awareness about mosquito borne diseases, breeding sources, methods to reduce mosquito menace and symptoms of mosquito borne diseases at baseline were 75%, 69%, 82% & 87% respectively. Similar level of knowledge was reported in studies conducted in Delhi, Maharashtra and Kerala [12-14]. However, a study conducted among urban dwellers with majority having low literacy and living in low middle class Socioeconomic status in Madhya Pradesh, showed level of awareness about dengue as 44% and use of personal protective measures was about 50% [15].

The present study reported usage of PPM repellants of about 70% where majority had permanent fixture mosquito net screens on doors/windows followed by usage of vaporizer and mosquito repellant creams. Similar level of usage was reported in a study conducted in Chennai, Nadiad & Raurkela and also in a study conducted in Maharashtra [14-16]. Majority of the study participants in the present study used PPM daily during bed time. The study population preferred to switch on fan to prevent mosquito bite and majority were willing to purchase PPM. A multicentric study by van Eijk *et al*. reported that the pattern of use of PPM such as vaporizer is more in higher Socio-economic strata and with higher education [16]. The mean expense incurred towards purchase of vaporizer, cream and bat in this study were Rs.58.6, Rs.46 and Rs.69.8 respectively. A study conducted in Mangalore, Karnataka reported median expenditure of Rs.100 [17]. Similarly, the mean monthly expenditure on PPM was Rs.101 in an urban setting in Orissa and Rs.62.17 in an urban dwelling in Pondicherry [18, 19].

We found that BCC intervention lead to 18% reduction in exposure to mosquito bite and statistically significant improvement in knowledge, attitude and practice among the study participants. Similarly, a systematic review conducted by Lachyan *et al*. and in a community based international study conducted by Kusuma *et al*. in Delhi found that implementing community health education for awareness and focusing efforts towards community participation as key factors for sustainable behavioural change [5, 10]. BCC activities and extensive source reduction drive conducted pre-monsoon resulted in reduction in mosquito menace and incidence of Dengue and Malaria in a Naval station located in Goa. The present study findings highlight the availability of various resources in preventing mosquito menace and mosquito bites. Further, it is also learned that efforts are required to be intensified towards optimizing the usage and disseminating awareness on ideal PPM in specific

environment. A study conducted in Gujarat reported significant impact of health education among Multi-purpose health workers [20, 21]. Similarly, The link workers in the Armed Forces may also be empowered by periodic education so as to have a sustained and fair quality of awareness level in the Armed Forces community.

Conclusion

There was a fair level of knowledge, attitude and practice in the Armed Forces community. However, imparting education on methods of prevention of mosquito bites and disease transmitted by it showed improvement in choices of preventive behaviours in the study population. The present study reiterated the impact of various modes of BCC in convincing the community in adopting protective behaviours. However, BCC should be planned targeting the communities, link workers and effective vector control measures through community participation.

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ISSN 2515-8260 Volume 10, Issue 02, 2023

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