Original Article

A comparative study on knowledge and practice against malaria among Accredited Social Health Activists (ASHAs) of low and high endemic regions of Tripura, Northeast India

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Abstract

Introduction: This study was conducted to compare and evaluate the knowledge as well as the practice of community health volunteers, Accredited social health activists (ASHAs) in low and high malaria-endemic regions of Tripura, Northeast India. **Materials and Methods:** In this descriptive cross-sectional study, all ASHAs working in the randomly selected two blocks of each low and high malaria-endemic areas were included in the study. While ASHAs with less than 1-year experience were excluded from the study. The ASHAs were interviewed and information was gathered on knowledge and practice against malaria management. Chi-square test was used to identify differences in responses among the ASHAs. **Results:** Significant differences in knowledge of mixed malarial infection ($P < 0.001$) and early symptoms of malaria ($P = 0.005$) were observed when responses of high malaria-endemic ASHAs (HMEA) were compared to low endemic ASHAs (LMEA). With respect to malaria testing skills, 83.16% HMEA affirmed that they could perform Rapid diagnostic (RD) kit tests as opposed to 57.24% LMEA, ($P < 0.001$). Disturbingly only two HMEA could correctly describe the duration for Pf and Pv treatment. **Conclusion:** The study identifies major lacunae in the balance of knowledge and practices of ASHAs in both study areas of Tripura. Therefore,for a successful projected malaria elimination program, community-level ASHA volunteers need to have accurate malaria knowledge and management approaches irrespective of the endemicity. This study will help to understand the operational constraints and plan educational training for ASHA volunteers in malaria-endemic regions.

Keywords: ASHA, indigenous population, knowledge and practice, malaria endemic

Introduction

Periodic outbreaks and epidemics with high morbidity and mortality have indicated malaria as one of the major communicable diseases in developing countries. Globally, around 4% of the malaria burden is contributed by India and Tripura, a north-eastern state of India, accounts for around 6% of the country's total malaria cases.[1] India along with 17 other Asia Pacific countries agreed upon a plan to eliminate malaria by 2030, and in 2016, India launched the National Framework for Malaria Elimination (NFME) program to move from malaria control to elimination.[2] However, malaria elimination is a dynamic process that primarily requires regular surveillance, diagnosis, and case management.

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Tripura comprises of around 60% forest and hilly terrains with 31% indigenous tribal population. Besides tropical environmental conditions conducive for malaria vector breeding, multiple factors like socio-political situations, migrations, inaccessible remote terrains, outdoor sleeping habits, forest-based economy, and low healthcare seeking behavior, have been associated with malaria incidence.[2,3] Such vulnerable issues can only be addressed by involving first-line healthcare delivery providers belonging to that indigenous society. Therefore, the National Rural Health Mission (NRHM), Govt. of India, has implemented the involvement of existing female volunteers named Accredited Social Health Activist (ASHA) for early diagnosis and management of malaria in an endemic vulnerable population. Since then, ASHAs have played a major role as fever diagnosis and treatment repositories in endemic communities and substantially lowered malaria disease burden.[4]

Malaria incidence is heterogeneous in Tripura and based on the annual parasitic index (API), districts of Tripura have been stratified under three categories: category 1: API <1 (2 districts); category 2: API 2-5 (2 districts); category 3: API >5 (4 districts).[2] Although relentless efforts from the Govt. have been made to curtail the disease burden, tribal areas seem to be continuously affected by the disease. Moreover, the knowledge and practices by ASHAs for malaria management are crucial in regions where indigenous population constantly need the motivation to augment their health-seeking behaviors. This may, in turn, affect the malaria elimination strategies at large. No data are yet available on the crucial role of ASHAs in malaria-endemic regions of Tripura. This study aims to understand the barriers for malaria management by exploring the determinants, which shape the ASHAs' role among malaria-endemic and low-endemic regions of Tripura.

Subjects and Methods

Study design: This study is a descriptive cross-sectional study conducted from April 2019 to June 2019. The ethical clearance for the study was not obtained because the study falls under the exempt category of the National Ethical guidelines for biomedical and health research involving human participants, Indian Council of Medical Research, India, 2017. The sole purpose of the present study is the evaluation of the ASHAs and help in improvement of the healthcare delivery system. Our study followed these guidelines and the participants were informed in advanced that the collected information would be used for research purposes and improvement of the program. However, written consent prior to the initiation of the study was taken from all the participants.

Study settings: According to the NFME guidelines, one district from category 1 (API <1) and another district from category 3 (API >5) were randomly selected for the study—West Tripura and Dhalai, respectively. Two blocks from each of the areas were selected randomly in the study, which included both tribal and non-tribal populations.

Study participants: All the deputed ASHAs of the selected study blocks were recruited as the study sample. ASHAs with an experience of less than 1 year were excluded from the study.

Data collection: A semi-structured questionnaire was pretested, and data were collected by interviewing individual ASHAs by the study team. The questionnaire included the personal information of the ASHAs along with knowledge and practices for malaria diagnosis, treatment, and prevention. Prior to the interview, the details of the study were explained to the participants and consent was obtained from each of them. We also informed that they could withdraw from the study at any point in time and the information was solely collected for research purposes.

Statistical analysis: The data were entered in a spreadsheet (Microsoft Excel, Microsoft Corp., WA, USA) and cleaned before analyzing in Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp, NY, USA). The demographic variables were represented as mean ± standard deviation (SD). Chi-square test was used to evaluate the significant differences between

Table 1: Socio-demographicc features of the study participants

Variable	High Endemic (Dhalai) *n* (%)	Low endemic (West Tripura) *n* (%)	*P*
Total (*n*)	**196**	**145**	
Age			
20-35 years	73 (37.2%)	58 (40.0%)	0.935
36-45 years	76 (38.7%)	70 (48.2%)	0.486
> 45 years	33 (16.8%)	15 (10.3%)	0.053
Education			
No education	14 (7.14%)	0 (0%)	0.0008
Primary (up to 5th standard)	20 (10.2%)	4 (2.7%)	0.006
Middle (std 6-8)	80 (40.8%)	41 (28.2%)	0.010
High school (std 9-10)	74 (37.7%)	96 (66.2%)	0.00005
> high school	2 (1.0%)	3 (2.0%)	0.442
Duration of service as ASHA			
1-5 years	28 (15.1%)	21 (15.0%)	0.989
6-10 years	74 (39.7%)	38 (27.1%)	0.017
>10 years	84 (45.1%)	81 (57.8%)	0.023

responses of high malaria endemic ASHA (HMEA) with low malaria endemic ASHA (LMEA). A *P* value of <0.05 was considered statistically significant.

Results

ASHAs from two blocks each of malaria low endemic and high endemic districts were interviewed personally. A total of 341 ASHAs (low endemic = 145 and high endemic = 196) participated in the study and the demographic features are shown in Table 1. More than half of the ASHAs (HMEA: 62.8% and LMEA: 57.2%) belonged to the indigenous ethnic population. The mean age of the ASHAs were 38 ± 7.99 (±SD) and 14.1% were above 45 years. Each ASHA has designated locality of "para (s)" or hamlets, which cover a mean population of 474.21 ± 307.22 (± SD). Of the total study participants, around 5% (n = 17) catered to more than the rural 1000 population. Around 49.8% of the ASHAs interviewed had middle school level education. However, 7.14% of the HMEA were illiterate and could merely sign. In low malaria-endemic areas, 82.06% had >5 years of experience as ASHA volunteers in comparison to 80.61% in high endemic regions.

Almost all participants (93.54%) indicated mosquitoes as a source of transmission of malaria and 49% of the HMEA correctly named the mosquito vector (*P* = 0.0001). As shown in Table 2, a higher proportion of LMEA reported unhygienic living conditions as a plausible breeding site for mosquitoes (59.3% vs. 48%, *P* = 0.03). Only 16.6% of LMEA answered that jungle or Jhums could be putative mosquito breeding sites as opposed to 24.5% of HMEA (*P* = 0.076). For effective control of mosquito breeding, practicing hygiene was named by 65.98% of the total participants. However, only 13.8% of the HMEA and 36% of LMEA stressed on eliminating and draining stagnant water for the control of mosquito breeding sites (*P* = 001). When enquired about preventive measures for malaria, the majority of participants stated the use of mosquito nets while sleeping. Only 11.7% of LMEA and 42.3% HMEA correctly answered about the possibility of a patient acquiring mixed infection (both Pf and Pv infection) (*P* < 0.001). As shown in Table 2, a higher proportion of HMEA correctly indicated chills as early symptoms of malaria as compared to LMEA (40.8% vs. 26.2%, *P* = 0.005).

The majority of the ASHAs (80.6%) visited their designated areas at least twice weekly to check for fever cases. On asking about the immediate actions taken for suspected malaria cases, most participants (95.01%) replied "blood test" as their first course of action. However, varied answers were obtained when the question was reversed and asked on which type of patients, they performed blood tests. Most of the participants (HMEA 51.5% vs. LMEA 46.7%) delayed for 2–3 days for the fever to recede. However, if fever persisted, they conducted blood tests. The ability to perform blood tests varied significantly among LMEA and HMEA. Around 87.76% of HMEA and 97.93% of LMEA responded that they could prepare blood smears. In contrast, compared to 57.24% LMEA, 83.16% HMEA affirmed that they could perform Rapid diagnostic (RD) kit tests (*P* < 0.001). The availability of RD kits was reported to be 60% by LMEA as opposed to 67.3% by HMEA. On the detection of a malaria positive case, only 27.04% of the HMEA confirmed that they provided anti-malarial drugs (*P* = 0.001). However, only two HMEA could correctly describe the duration of Pf and Pv treatment. Discouragingly, around 5% (n = 17) of the total participants confused the period of Pf treatment with the treatment of Pf in pregnant women. Mostly participants from both the regions either referred the malaria positive patients to the nearest hospital (98.5%) or to the Multi Purpose Worker (MPW) (1.2%). Interestingly, irrespective of their ability to make blood smears, 95% of the participants were aware of the available Government incentives provided per smear preparation. Malaria register as per the National Vector Borne Disease Control Programme (NVBDCP) format was correctly maintained by only a handful of participants, mostly by HMEA. However, around 80.61% of HMEA and 66.9% of LMEA did maintain a register for smears preparation in self-designed formats for personal records. The reasons for non-maintenance of M-register were "did not know how to maintain" (14.1%) and "Other reason" like no malaria cases in the designated area (11.7%). Only around 37.75% (n = 74) of HMEA reported exclusive malaria Information Education Communication (IEC)activity in their area in the last 12 months from the time of the interview. The reported IEC activities within the past 12 months varied significantly (*P* = 0.001) among HMEA and LMEA [Table 2].

Discussion

It has been reported that there are pockets of high malaria incidence in Tripura and endemicity is not uniform throughout the state.[5] Although geographically small and surrounded by international borders on its three sides, the risk of malaria outbreaks in the state cannot be ruled out as asymptomatic carriers may equally transmit the disease.[6] Being one of the largest community health workers system globally, ASHA volunteers are the keystone of the Indian public health system who represent an interface between the community and the health facilities.[7] They form the primary care delivery system of outreach programs and schemes implemented by the Indian Govt. to the local community at the grass-root level. In the context of malaria elimination and prevention, knowledge and management skills are the essential requisites for the frontline ASHA volunteers. Our study establishes the differences in knowledge and practices of ASHAs working in high malaria and low malaria-endemic regions of Tripura, India.

The demographic features of the study participants revealed that almost 17% of the HMEA were aged above 45 years . As per the National Health Mission guidelines, ASHA volunteers appointed should be in 25-45 years age group with the minimum formal education of middle school (8th Standard).[8] However, as observed from our study, around 42.5% (n = 145) of the participants did not comply with the educational eligibility set by the Government. Similar observations have been reported

Table 2: ASHA's responses on knowledge and practices regarding malaria control and prevention

Variable	High Endemic (Dhalai) *n* (%)	Low endemic (West Tripura) *n* (%)	*P*
1. Mode of malaria transmission			
Mosquito bite	89 (45.4%)	109 (75.2%)	<0.001
Female Anopheles mosquito	96 (49%)	25 (17.2%)	<0.001
Dirty water/unhygienic condition	3 (1.5)	7 (4.8%)	0.074
Dengue mosquito	2 (1%)	1 (0.7%)	0.746
Don't know	5 (2.6%)	2 (1.4%)	0.451
2. Breeding sites of mosquitoes			
Water bodies	80 (40.8%)	68 (46.9%)	0.263
Unhygienic condition	94 (48%)	86 (59.3%)	0.038
Open water containers (natural/artificial)	47 (24%)	37 (25.5%)	0.745
Jungles/Jhum	48 (24.5%)	24 (16.6%)	0.076
Others (home corners & pigs)	16 (8.2%)	13 (9%)	0.793
3. Measures for control of mosquito breeding			
i. Cleanliness/clean surroundings	128 (65.3%)	97 (66.9%)	0.759
ii. Chemical agents (Bleaching powder/kerosene/oil)	7 (3.6%)	9 (6.2%)	0.255
iii. DDT spray	111 (56.6%)	49 (33.8%)	0.001
iv. Destroy/clean stored water	27 (13.8%)	52 (35.9%)	0.001
v. Others	30 (15.3%)	38 (26.2%)	0.013
4. Prevention of malaria			
Mosquito net	174 (88.8%)	122 (84.1%)	0.211
Full length clothes	35 (17.9%)	31 (21.4%)	0.416
5. Early symptoms of malaria			
Fever	178 (90.8%)	137 (94.5%)	0.207
Headache	54 (27.6%)	46 (31.7%)	0.403
Shiver/chills	80 (40.8%)	38 (26.2%)	0.005
Myalgia/joint pain	41 (20.9%)	21 (14.5%)	0.128
Nausea/vomiting	44 (22.4%)	32 (22.1%)	0.934
Loss of appetite	0(0)	3 (2.1%)	0.043
Diarrhea	5 (2.6%)	1 (0.7%)	0.196
Anemia	2 (1%)	0	0.222
Yellow eyes	1 (0.5%)	0	0.389
Other irrelevant symptoms	74 (37.8%)	31 (21.4%)	0.001
6. Knowledge of treatment for Pf			
Yes	37 (19.2%)	2 (1.4%)	0.001
7. Knowledge of treatment for Pv			
Yes	29 (15%)	1 (0.7%)	0.001
8. Possibility of mixed (Pf and Pv) infection from a single patient			
Yes	83 (42.35%)	17 (11.72%)	<0.001
No	26 (13.27%)	49 (33.29%)	<0.001
Don't know	87 (44.39%)	79 (54.48%)	0.065
9. Practice followed by ASHA			
Visit door to door to find fever cases	58 (29.6%)	51 (35.17%)	0.351
Register when cases report to you	12 (6.12%)	4 (2.16%)	0.132
Both	121 (61.73%)	90 (62.07%)	0.809
10. Measures taken on observing symptoms of malaria			
Blood test (slide/kit)	183 (93.4%)	141 (97.2%)	0.104
Refer to hospital	10 (5.1%)	2 (1.4%)	0.065
Give paracetamol	2 (1.0%)	3 (2.1%)	0.426
11. Can prepare Blood slide	172 (87.76%)	142 (97.93%)	<0.001
12. Can perform RDT	163 (83.16%)	83 (57.24%)	<0.001
13. Provide treatment to malaria positive patients			
Yes	53 (27.04%)	18 (12.41%)	0.001
No	143 (72.96%)	127 (87.6%)	
14. Maintain M-register	158 (80.61%)	97 (66.90%)	0.003
15. Conducted IEC exclusively for malaria in last 12 months			
Yes	74 (37.75%)	88 (56.55%)	0.001

from studies conducted in Orissa, Jharkhand, and Bihar.[9] Although there is a provision to relax the educational bar when suitable candidates are not available, a disturbing 7.14% of the HMEA were illiterate with no formal education as opposed to LMEA ($P = 0.0008$) [Table 1]. Of note, the HMEA serves and belongs to the indigenous ethnic population, which indicates

that the vulnerable population is still struggling in respect of education and healthcare. Nevertheless, the shortage of human resources and the possibility of the reluctance of working in the community by eligible educated females in the vulnerable population cannot be ignored. These factors may cause a major hindrance in the service deliverability and affect the healthcare program.[10,11] As per the guidelines, ASHAs cover a rural population of 1000 people which may be relaxed in geographically tough terrains. In contrast to the data available from Assam, Nagaland, and Orissa, only 5% of the ASHAs from our study had a population coverage of more than 1000.[9]

The ASHAs participating in our study were mostly aware of the basic knowledge about malaria-like a study conducted in Cameroon among community health workers.[12] On comparing the knowledge on malaria, the majority of HMEA and LMEA were aware that the disease is transmitted by mosquitoes [Table 2]. However, it is concerning that knowledge of forests and Jhum cultivation as mosquito breeding sites for malaria was considerably low among the study participants, especially the LMEA. The Jhum cultivation sites and its adjoining forests have been implicated as one of the major malaria vector breeding habitats in Tripura.[5] Therefore, in a state where the majority of the indigenous population depends on Jhum and forest-based economy, knowledge of its vector breeding habitat is crucial for prevention. Although fever was stated as the most common symptom of malaria, there was a significantly low proportion of LMEA stating "chills" as one of the symptoms. A plausible explanation for the low response among the LMEA could be the less frequency of handling malaria patients as opposed to HMEA.

Knowledge of the disease, however, did not equate with the practices for malaria control among the participants. There were significant differences among HMEA and LMEA on the preference of performing blood tests. Proportionately barely half of the LMEA could personally perform RD tests in contrast to 83.16% HMEA. This difference among the ASHAs could be due to the controlled receipt of RD kits in low endemic regions resulting in their lacking confidence for test performance. Moreover, it was found that most of the HMEA who could not perform RD tests relied on MPWs to conduct the test. RD tests are malaria antigen detection kits that do not require technical proficiency or specialized equipments and are cost-effective.[13] On the other hand, around 12% of HMEA and 2% of LMEA were not confident in preparing blood smears. As per the Centers for Disease Control and Prevention (CDC, USA), microscopic examination using blood smears is the gold standard and ideally, RD tests should be followed with blood smears irrespective of positive or negative RD results.[14] Missed training was one of the major causes of their diffident blood test skills. Previous studies have stressed on the importance of rapid diagnosis for lowering the disease burden in geographically remote regions.[15] Apart from malaria screening, appropriate documentation of the tested patients is important. However, almost half of the study participants in our study were unaware of the prescribed format for reporting in the M register and barriers in reporting may hamper the surveillance system.[16] An earlier study has reported that the exhaustive malaria register was recorded by educated and trained community health workers.[17] Therefore, conducting special training for ASHAs with missed training, low skills on diagnosis, and register maintenance is the need of the hour regardless of high or low endemic areas in Tripura. With more than 30% indigenous population, inconsistencies in understanding and practicing correct malaria management by ASHAs may be overcome by periodic refresher training in local dialects.

It is alarming that the majority of the ASHAs in the study were uncertain about the period of anti-malarial administration and corroborates with an earlier study conducted in Nigeria.[18] Only two ASHAs from the high endemic area could correctly describe the proper period for Pf and Pv treatment as per the NVBDCP guidelines. The observations may indicate that HMEA is mostly involved in the screening of malaria cases and rely extensively on MPWs and health facilities for administering treatment. Previous studies have associated factors like ethnicity, poor connectivity, and economic constraints on the delayed treatment and may be correlated with our study.[19,20] The treatment trend observed in our study area may have devastating fatal outcomes due to delay in treatment as MPWs may not necessarily reside in the same village in contrast to ASHAs. To overcome this issue, a strategy may be developed for diagrammatic, in-hand comprehensive drug dosage charts for the ASHA and provide available anti-malarials with at least HMEA to avoid delay in treatment. Irregular IEC may be one of the major challenges for malaria elimination. Around 56.8% ASHAs reported exclusive IEC in their areas while the importance of malaria prevention and control was dealt with during Village Health Nutrition Day (VHND) or Antenatal check-up programs. However, it is prudent that the entire community is involved in prevention and control measures through IEC and Behaviour Change Communication (BCC) activities in the local dialect.[21,22]

As the interviews were conducted in Bengali and translated to local dialects for tribal ASHAs by translators, errors cannot be ignored as language nuances may have arisen. Moreover, due to the inherent shyness of the indigenous tribes, ASHAs may have refrained from answering causing negative responses. Therefore, our study highlights the importance of conjunction of correct malaria knowledge with management among ASHAs for a successful projected elimination program by 2030 in India. This study will be helpful for public health policymakers to address the operational aspects and educational trainings for the ASHA volunteers.

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Ethical approval

Prior to conducting the study, written informed consent was obtained from every participants included in the study.

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Conflicts of interest

There are no conflicts of interest.

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