

Malaria Prevalence and Knowledge, Attitude and Practice about Malaria among Febrile Patients Attending Chagni Health Center, Northwest Ethiopia: A Cross-Sectional Study

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Research

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Abstract

Background: Ethiopia has achieved remarkable progresses in the prevention and control of malaria in the past decades, yet it is a formidable health concern and socio-economic impediment. This study aimed at assessing the magnitude and knowledge, attitudes and practices towards malaria among febrile patients attending Chagni health center, northwest Ethiopia.

Methods: In the health facility based cross-sectional study, patients attending health center with suspicion of malaria symptoms and signs, were enlisted. To determine the magnitude of malaria, finger prick blood samples were collected from malaria suspected patients visiting health center between September 2017 and February 2018. A pre-tested semi-structured questionnaire was also applied to assess KAP of suspected malaria patients attending the health center. Data were analyzed using SPSS version 20.0.

Results: Prevalence of malaria among febrile patients attending at the sampled health facility was 7.3%. Of these, *Plasmodium falciparum*, *P. vivax*, and mixed infection accounted for 55, 44.3 and 0.7% of the cases, respectively. This study also revealed that 97% of the respondents had ever heard about malaria and recognized it as a serious health problem. Mosquito bite was identified as the main malaria transmission. Taking drug (86.3%), use of mosquito nets (73.3%), drain stagnated water (68%), and house spay with insecticides (66%) were mentioned as the main malaria prevention methods. Mosquito net coverage and its utilization in the previous night were 98% and 75%, respectively. Indoor residual spraying (IRS) coverage was 99%, of which 77.5% of houses of participants were get sprayed in the last six months.

Conclusions: The current study revealed that prevalence of malaria among febrile illnesses in the study area was relatively low (7.3%) with a high proportion of *P. falciparum*. Besides, participants had adequate knowledge, encouraging attitudes, and good practices about prevention and control of malaria. However, some misconceptions on malaria disease, its transmission, and prevention have been noted that actually require due attention by the concerned stakeholders. We believe that findings of this study would make inroads into the implementation effective malaria interventions in the area and beyond focusing on enhancing community awareness and scaling up coverage of evidence-based interventions.

Background

Malaria is considered one of the most important mosquito-borne diseases in Ethiopia, causing formidable health concern and socio-economic impediment. This protozoan infection was the most important cause of outpatient visits and health facility admissions, accounting for 14% of outpatient visits and 9% of admissions in the country in 2009/2010 [1]. However, these figures are likely an underestimate of the true burden of malaria as a large proportion of the population in the country does not have access to health care services.

Varying topographical and climatic features contribute to the seasonal and unstable malaria transmission pattern in Ethiopia, which is usually characterized by frequent focal and cyclic, widespread epidemics. Malaria transmission peaks bi-annually from September to December and April to May, coinciding with the major harvesting seasons [2]. Roughly, 75% of the landmass and around 68% of the population in Ethiopia is considered at risk of malaria, which corresponds to areas below 2,000 m altitude [3]. *Plasmodium falciparum* and *P. vivax*, which are distributed all over the endemic regions of the country, account for about 60 and 40% of malaria cases, respectively. *Anopheles arabiensis* is the primary malaria vector in Ethiopia, while *An. funestus*, *An. pharoensis*, and *An. nili* are secondary ones.

In the past decade, considerable scale-up and implementation of key malaria interventions, including early diagnosis, prompt treatment, selective vector control (insecticide-treated nets-ITNs and indoor residual spraying (IRS)), and epidemic prevention throughout the country, resulted in a significant reduction in the prevalence of the malarial infection and illness and its consequences [4, 5]. However, such remarkable achievements have been faced with many challenges such as ever increasing insecticide resistance of vectors, drug resistance of parasites, under-utilization of intervention, increased migration of people from malarious areas to urban areas, increased number of man-made mosquito breeding sites; gaps in service delivery and health system weaknesses [2, 6, 7, 8]. Moreover, poor community awareness toward malaria and control intervention practices were indicated [9].

Considerable numbers of community-based studies were carried out in several parts of Ethiopia regarding the level of awareness about malaria and associated risk factors to its transmission and control measures [6, 10–13]. Such reports evidenced the presence of misconceptions about the cause and transmission of malaria among communities, in particular within rural areas and that practices for the control of the disease are inadequate, suggesting the need for health education to raise the community's awareness about the disease. Prominently, attitudes towards malaria interventions, structural factors affecting delivery and uptake, and other related factors govern the success of malaria control efforts [11]. In view of this, health facility records are important sources of malaria data, as they are readily available and can provide useful indicators on the situation of malaria at a lower cost. In addition, fostering community knowledge, attitude and practices (KAP) that help to gauge the implementation and effectiveness of proven control interventions of malaria in a given locality is vital to issue early warnings concerning outbreaks as well as scale-up of control interventions to sustainably prevent and control the disease. Therefore, this institution based cross-sectional study was designed to determine to assess the prevalence and KAP of malaria among febrile patients attending Chagni health center from September 2017 to February 2018.

Methods

Study area

The study took place in Chagni Town in Amhara Regional State, northwest Ethiopia. The town is located 505 km from Addis Ababa. The study area is located at latitude of 10°57'N and longitude of 36°30'E and

an elevation of an elevation of 1583 meters above sea level. The mean annual temperature and rainfall in the town are 21.6 °C and 1896.6 mill liters, respectively (Ethiopian Meteorology Agency, unpublished data). The town is divided into five *kebeles* (lowest administrative centers) and several villages (sub-units of *kebeles*). The town has a total population of 39,292 of whom 19,165 were men and 20,127 women [14]. Two public health institutions (one hospital and one health center) and four medium private clinics are found in the town that provides healthcare service to the society. According to the report of the zonal health bureau, malaria is one of the leading causes of morbidity among outpatient and inpatient departments of all health facilities.

Study design and population

The study employed a health facility-based cross-sectional design. All malaria suspected individuals who had complains of febrile illness in the health center from September 2017 to February 2018 were considered to determine the current malaria prevalence. Whilst, individual permanently residing in the five *kebeles* of the town and who visited the health centre for any kind of healthcare service, constituted the sampling population to assess the knowledge of the study participants about malaria and its control.

Sample Size and Sampling techniques

All of the 4,077 malaria suspected patients registered in the health centre from September 2017 to February 2018 were the sample size to determine the current prevalence of malaria. In the meantime, the sample size for assessing the knowledge of participants on malaria and its control practices was calculated using a single population proportion formula ($n = z^2p(1-p)/d^2$ [11]; where n = the sample size, $z = 1.96$ at 95% confidence interval (CI), d = margin of error at 5%, $P = 0.78$ (78% proportion of population who had good knowledge towards malaria and its prevention was taken from a study done in Amhara region [3]. After adding 5% non-response rate, the final sample size became 274.

A simple random sampling method was used to enroll the study participants. First, the total sample size was proportionally allocated to each *Kebele*. Thereafter, individual participants from each *kebele* who came to health centre were selected randomly by taking every third attendant from random start on the health centre up to the sample size of the population is reached.

Data collection

Malaria slides

Using blood film examination format, blood slide samples were taken from compliance of febrile patients at Chagni health centre and socio-demographic data of patients were collected on patient registration book from September 2017 to February 2018. In this health centre, thick and thin blood smears were prepared to observe the presence of malaria parasite by direct microscopy techniques. The blood smears were prepared on microscope slides and stained using 10% Giemsa to be examined under 100x microscopes for the presence of malaria parasites using the standard operating procedure of WHO protocol. The blood slides were read and then classified qualitatively as either negative, *P. falciparum*

positive, *P. vivax* positive, or mixed infection. Ten percent of the slides were randomly selected and then blindly checked for consistency by experienced medical laboratory technologist. All individuals who had fever on physical examination and were positive for malaria parasites during blood film examination were offered anti-malarial treatment as per national guidelines [4].

Measurement of KAP

A structured questionnaire was designed to collect information regarding socio-demographics and knowledge of the study participants about malaria and its control practices. The questionnaire was first developed in English and translated into Amharic (the local language), and then pre-tested in non-selected patients for assessing content validity, appropriateness, and question comprehensibility. Data were checked for completeness, and incomplete questionnaires were returned to data collectors for correction by revisiting the concerned households. Five percent of the interviewed households were randomly selected and re-interviewed by the first author to further assure data quality.

Data analysis

Data were checked for completeness and consistency and entered in to Microsoft Excel data sheets and exported in to Statistical Package for Social Science (SPSS) version 20 software (IBM Corporation, Chicago) for statistical data analysis. Descriptive statistics were carried out to measure relative frequencies, percentages, averages, and relative frequencies of the variables. The chi-squared test was used for prospective malaria prevalence data to determine differences between age, sex and seasons and malaria parasite distribution. Statistical significance was defined at $P < 0.05$. The analyzed data was presented using tables and figures.

Results

Malaria prevalence at health facility survey

In this study, a total of 4,077 malaria suspected patients were microscopically diagnosed at Chagni Health Center from September 2017 to February 2018 (Table 1). Of these, 296 (7.3%) were slide positive for malaria with mean malaria cases of 49.3. The mean monthly slide positivity rate was 6.95%, though the number of malaria suspected patients who visited the health center showed fluctuating trend each month. Malaria case distribution by months had significant fluctuating trend ($P = 0.004$, Table 1). Transmission of malaria from September to November was higher, 194 (65.5%) whilst the dry season of the year from December to January April had lower case, 102 (34.5%).

Table 1
Monthly profile of malaria positive patients at Chagni health center
(September 2017- February 2018)

Month	Examined number	Confirmed. No (%)	P-Value
September	718	37 (5.2)	0.004
October	986	97 (9.8)	
November	773	60 (7.8)	
December	662	46 (6.9)	
January	547	32 (5.9)	
February	391	24 (6.1)	
Total	4077	296 (7.3)	

Plasmodium parasite distribution with socio-demographic variables

Plasmodium falciparum and *P. vivax* were the only species in study area, where *P. falciparum* accounted for 163 (55%), *P. vivax* was 131 (44.3%), and the rest 2 (0.7%) were mixed infections of both species (Table 2). Of the total patients examined, 2,103 were males and 1,974 were females (Table 2). The infection rates among males were 164 (55.4%) and females were 132 (44.6%), although this association of malaria cases with sex was not statistically significant ($P = 0.172$; Table 2).

Table 2
Distribution of malaria cases by sex at Chagni health centre from September 2017-February 2018

Sex	Total cases examined	Slide positive No. (%)	<i>P. falciparum</i> No. (%)	<i>P. vivax</i> No. (%)	Mixed infection No. (%)	P-value
Male	2,103	164 (55.4)	89 (54.3)	74 (45.1)	1 (0.6)	0.172
Female	1,974	132 (44.6)	74 (56)	57 (43.2)	1 (0.8)	
Total	4077	296 (100)	163 (55)	131 (44.3)	2 (0.7)	

The distribution of parasite species in relation to age is presented in Fig. 1. Malaria prevalence varied among different age groups, ranging from 4.7–8.5% ($\chi^2 = 133.0$, $d.f. = 2$, $P = 0.001$). Adults (≥ 15 years)

were the most affected group 185 (8.5%), followed by 5–14 and under 5 age categories, with prevalence rates 63 (7.1%) and 48 (4.7%), respectively. With regard to *Plasmodium* species, *P. falciparum* was higher in the ≥ 15 years, followed by 5–14 and under 5 age groups with a prevalence rate of 104 (56.2%), 36 (57.1%), and 23 (47.9%), respectively (Fig. 1). Similarly the age group ≥ 15 was more affected by *P. vivax* 79 (42.7%) compared to 5–14, 27 (30.7%) and below 5 year, 25 (52.1%) age categories. There were two mixed cases detected in both male and female individuals of age groups ≥ 15 years of age.

Socio-demographic characteristics

We enrolled a total of 274 individuals with a 100% response rate (Table 3). Out of the total respondents, 154 (56.2%) and 120 (43.8%) were males and females, respectively. The age of the respondents ranged from 18 to 74 years, with the median age of 32.4 years. Most of study participants 128 (46.7%) were married. The majority of respondents [118 (43.1%)] had no formal education. The average family size of the respondents was 3.84. The main economic activities by study respondents were daily labor 95 (34.7%), government employment 64 (23.4%), trading 48 (17.5%), agriculture 33 (12%), and other 34 (12.4%) (Table 3).

Table 3
 Socio-demographic characteristics of respondents Chagni town, 2018
 (n = 274)

Variable	Category	Frequency (%)
Sex	Male	154 (56.2)
	Female	120 (43.8)
Age	18–24	90 (32.8)
	25–34	73 (26.6)
	≥ 35	111 (40.5)
Marital status	Single	86 (31.4)
	Married	128 (46.7)
	Divorced	14 (5.1)
	Widowed	46 (16.8)
Family size/HH	1–4	120 (43.8)
	5–7	115 (42)
	8 and above	39 (14.2)
Educational status	Illiterate	118 (43.1)
	Read and write	96 (35)
	Primary school	29 (10.6)
	Secondary school and above	31 (11.3)
Occupation	Civil servant	64 (23.4)
	Farmer	33 (12)
	Merchant	48 (17.5)
	Daily laborer	95 (34.7)
	Other	34 (12.4)
Family income	< 500	46 (16.8)
	500–1000	121 (44.2)
	> 1000	107 (39)
Religion	Orthodox	183 (66.8)

Variable	Category	Frequency (%)
	Muslim	78 (28.5)
	Protestant	9 (3.2)
	Catholic	4 (1.5)
Mass media	Radio	24 (8.8)
	Television	213 (77.7)
	No	37 (13.5)

Knowledge and attitudes of respondents towards malaria and mosquitoes

Malaria related knowledge of the participants is summarized in Table 4. The majority of the respondents [266 (97%)] had ever heard about malaria and the same number of respondents believed that malaria is one of serious and life-threatening diseases of the community. The most common sources of malaria related information were mass media 229 (86.1%) and health facility 37 (13.9%). One hundred sixty two (60.9%) of the respondents mentioned that malaria is a transmittable from person to person, of whom 156 (96.3%) and 6 (3.7%) associated the transmission with the bite of mosquitoes and drinking contaminated water, respectively (Table 4).

Table 4

Knowledge of respondents related to symptoms and transmission of malaria, and mosquito behaviors, Chagni town, 2018

Variables	Category	Frequency (%)
Ever heard about malaria	Yes	266 (97)
	No	8 (3)
Malaria a health problem	Yes	266 (97)
	No	8 (3)
Source of information	Health facility	37 (14)
	Mass media	229 (86)
Malaria transmissible	Yes	162 (60.9)
	No	104 (39.1)
Ways of malaria transmission	Through mosquito bite	156 (96.3)
	Drinking contaminated water	6 (3.7)
Signs/symptoms of malaria	Fever	258 (97)
	Chills and shivering	257 (96.6)
	Headache	254 (95.4)
	Loss of appetite	248 (93.2)
	Joint pain	242 (90.9)
	vomiting	235 (88.3)
When mosquitoes bite mostly	Day	6 (2.3)
	Night	245 (92.1)
	Anytime	5 (1.9)
	Don't know	10 (3.8)
Mosquito breeding sites	Stagnant water	228 (85.7)
	Waste material	25 (9.4)
	Houses	8 (3)
	Don't know	5 (1.9)
Note: Percentages do not add up to 100 because of multiple responses		

Fever, chills and shivering, and headache were the most frequently mentioned malaria symptoms reported by 97%, 96.6%, and 95.4% of the respondents, respectively. Other recognized symptoms were loss of appetite (93.2%), joint pain (90.9%), and vomiting (88.3%). (Table 4). The study further assessed the knowledge of participants on different mosquito behaviors. The majority (92.1) of the respondents believed that mosquitoes bite humans during the night time. The respondents of the study also identified that mosquitoes mainly breed in stagnant water (85.7), followed waste material (9.4%), and houses (3% 7%) (Table 4).

Of the respondents, the majority (97%) stated malaria as a preventable and curable disease, while 2.6% considered the opposite and 0.4% did not know. Taking drug 226 (85%), using mosquito nets 192 (72.2%), draining stagnant water 178 (67%), and IRS 173 (65%) were the most commonly mentioned preventive strategies. Most of the respondents 218 (82%) believed that sleeping under mosquito net protect from mosquito bites (Table 5).

Table 5

Knowledge and attitude of respondents regarding preventive methods of malaria, Chagni town, 2018

Variables	Category	Frequency (%)
Malaria is preventable and curable	Yes	258 (97)
	No	7 (2.6)
	I don't know	1 (0.4)
Preventive methods	Drug	226 (85)
	Use of mosquito net	192 (72.2)
	Drain stagnant water	178 (67)
	Indoor residual spray (IRS)	173 (65)
Advantage of mosquito nets	Protect from mosquito bite	218 (82)
	Sleep better	24 (9)
	Protect from the bite of other insects	24 (9)

Malaria prevention practices

Regarding treatment seeking behavior, 243 (91.4%) of the respondents had sought treatment within the first 24 hours of symptom onset while the rest, 23 (8.8%) had delayed treatment seeking behavior. Of the respondents, 243 (91.4%) responded that they sought treatment from health center/clinic, 15 (5.6%) and 8 (3%) of them purchase drugs from pharmacy by themselves and use traditional medicines such as garlic and leaf of neem tree, respectively.

The majority (98%) the interviewees reported that they possessed at least one insecticide-treated mosquito net (ITN) in their houses. Out of which, 167 (62%), 81 (30%), and 20 (8%) had two, more than, and one ITN per household, respectively. The majority (75%) of the ITN owners claimed that they slept under a bed net the previous night while the rest of 25% did not. A similar figure (74%) replied that pregnant mother and children were given priority to sleep under bed net, followed by father and mother (22%) and the remaining family members (4%). It was also indicated that three fourth of the individuals who owned ITN reported that they utilize bed net regularly /every night while 25% of respondents stated they use it during the malaria season. Of those who are not currently using bed net, 192 (77%) mentioned lack of access, 20 (8%), and 37 (15%) mentioned other reasons. The reasons for not using bed net were that fear of burning sensation (64%), and 36% lack of awareness. Prominently, the reason mentioned for lack of ITN during the study period, by all the participants that lacked the ITN, was the problem of getting substitutes for worn out ones (Table 6).

The study also revealed that IRS is one of the most important malaria prevention methods practiced in the locality with the overall coverage of 99%. Out of the respondents, 77.5% and 22.5% of them stated that their house was sprayed with chemicals in the last 6 and 12 months, respectively (Table 6).

Table 6

Practices of respondents towards malaria prevention and control in Chagni town, 2018

Variable	Category	Frequency (%)
Seek treatment in 24 hrs of onset of symptoms	Yes	243 (91.4)
	No	23 (8.8)
Seek treatment from	Health center/clinic	243 (91.4)
	Drug shop/Pharmacy	15 (5.6)
	Look for traditional medicine	8 (3)
ITN possessed (N = 274)	Yes	268 (98)
	No	6 (2)
ITNs per family	One	20 (8)
	Two	167 (62)
	More than two	83 (30)
ITN used previous night	Yes	201 (75)
	No	67 (25)
Who uses ITN	Husband and wife	44 (22)
	Pregnant mother and children	149 (74)
	All family	8 (4)
Seasonal use of ITNs	All year	201 (75)
	During malaria season	67 (25)
Reason for not using ITN	Do not prevent malaria	24 (36)
	Burning sensation	43 (64)
Lack of ITN	Damage (worn-out)	6 (100)
House spray with insecticide (IRS) (n = 274)	Yes	271 (99)
	No	3 (1)
IRS usage	Last 6 months	210 (77.5)
	Last 12 month	61 (22.5)

Discussion

An overall malaria positivity rate of 7.3% was recorded in the current study area. This figure is comparable with the result of the study done in Kombolcha health facility, north-central Ethiopia that reported a prevalence of 7.52% [15]. Similarly, a study conducted in Nigeria among pregnant women in an antenatal care program reported a prevalence of 7.7% [16]. However, the finding of this study contradicts with previous studies from southern and northern Ethiopia, reported overall malaria positivity rates between 11.5% and 28.1% among patients visited health facilities [17–19]. Possible factors for observed variations might be differences in the time of studies, microclimate, altitude, community awareness about malaria bed net application, its transmission, and health seeking behavior, and malaria intervention practices.

The predominant *Plasmodium* species detected among the current study participants was *P. falciparum*. This finding is congruent with national figures and other similar studies in parts of Ethiopia that reported preponderance of *P. falciparum* than *P. vivax* [2, 20–21]. However, this is in disagreement with the previous report from Jimma Town which reported a higher prevalence of *P. vivax* than *P. falciparum* [23]. The reason why *P. falciparum* dominated over *P. vivax* in the study area could be due to the severity of disease, drug resistance, and gap of program performance.

In the present study, more males (55.4%) were affected by malaria than females (44.6%). This finding is concurrent with studies from several localities in Ethiopia that reported higher malaria burden among males than females [15, 21–22]. The higher prevalence rate in males might be due to the fact that males are usually engaged in outdoor activities at dusks and dawns, coinciding with the peak biting hours of the exophagic mosquito species [24]. In addition, males often travel as seasonal migrant laborers to different malarious parts of Ethiopia to perform agricultural activities, thereby exposing them to the higher risk of contracting malaria infection. Conversely, this was not similar with a study conducted in Amhara region where the prevalence of malaria was relatively higher among females (60%) than males (40%) [25].

Regarding the age groups, the burden of malaria morbidity was more concentrated in the adults of age 15 and above. Studies in Ethiopia have also shown that the risk of malaria infection varied by sex with some reporting males at higher risk than females [15, 21–22, 26–27]. The contributing factors for such higher burden of disease among adults might be due to their frequent engagement in different activities like agriculture, trade and other occupational risks that increase the exposure to infective mosquito bites. Lower cases of malaria in children under 5 years of age was detected, which could be linked to their reduced exposure to infected mosquito bite due to good malaria awareness and control and prevention practices by their guardians.

The results revealed that most of the respondents (97%) had ever heard about malaria and similar number of respondents believed that malaria is one of the serious diseases of the community, affecting both sex and all age groups, which is in line with previous reports on Ethiopia and elsewhere [13, 28]. Respondents also mentioned that the most common source of information about malaria was mass media (86.1%) followed by health facility (13.9%), suggesting that they are essential channels to deliver malaria-related information to the community. This is congruent with those previously reported results

from Africa, in which over 90% of individuals in malaria endemic areas are aware of malaria and that media (television and radio) and health education by health facilities are the most commonly cited source of malaria information sources [29, 30].

Mosquito bite has been identified as the principal malaria transmission as shown in some studies in Ethiopia and elsewhere in Africa [11, 13, 29, 31–32]. In Ethiopia, regular practice of awareness creation in the communities about health issues through health extension workers and mass media has brought remarkable behavioral change in the control and prevention of communicable diseases. We also presume that this factor has contributed to the high level of awareness observed in the study participants regarding the causes and transmission of malaria in the area.

Fever, head ache, chills and shivering, loss of appetite and vomiting were mentioned as sign and symptoms of malaria. Similar results were found from different KAP studies in other regions of Ethiopia [11, 13, 31, 33]. Interestingly, large majority of subjects linked mosquito biting time during night time and their main breed sites to stagnant water, which is comparable with previous studies in Ethiopia and elsewhere [29, 33–34]. This correct understanding of mosquito behavior among participants of the present study is encouraging to implement appropriate malaria preventive measures and for the proper utilization of ITNs.

Similar to other studies in Amhara region and other parts of Ethiopia [11–13, 35], great majority (97%) of participants believed that malaria is preventable and curable disease. Taking drug, use of mosquito nets, drain stagnated water (mosquito breeding sites), and house spray with insecticides were the main types of malaria preventive measures frequently reported by the present study participants. This is in line with previous reports from Tanzania [30] and Iran [36].

Around 91.4% of participants go to the nearest health service within the 24 h upon the occurrence of the first malaria symptoms. This was further substantiated by the observation that about 91.4% of participants sought treatment at health facilities, suggestive of a good practice of treatment-seeking behavior at health structures. The same has been reported in Ethiopia and elsewhere [29, 37, 38], with majority of studies relating high malaria treatment-seeking behavior at health facilities. Yet, few subjects responded that they rely on the use of self-administered drugs and traditional medicines, common practices in parts of Africa [11, 30, 39]. Treatment seeking behavior is important for early case detection and management so that transmission would be reduced. Therefore, awareness creation is very crucial to direct the wider community to seek timely treatments at the health structures earlier upon the occurrence of malaria symptoms.

This study also demonstrated that around 98% of participants had least one ITN, of which 75% of them claimed that they slept under a bed net the previous night, which is consistent with previous studies elsewhere in Ethiopia [12, 14, 33, 40]. About 90% of responders also associated benefits of ITNs with the reduction of the bite of mosquitoes and other insect pests. Meanwhile, quarter of the respondents did not use bed net the previous night, suggesting the necessity of health education to raise awareness of the community about proper and consistent use of ITNs. Prominently, some of the reasons mentioned for not

properly using bed net were fear of burning sensation, and lack of awareness about its benefit and getting substitutes for worn out ones. The study further showed that most of the communities give priority for pregnant mother and children to sleep under bed net, which is comparable with results reported from other studies elsewhere in Ethiopia [13, 31].

Our data also showed that IRS is one of the most important malaria prevention methods practiced in the locality with the overall coverage of 99%. Houses of more than 77% of the respondents get sprayed during spraying campaign, result that is comparable with the reports from Jiga area and Shewa Robit district of north-western Ethiopia [11, 42]. This result asserts the demand to expand the coverage and frequency of IRS in malaria endemic areas in order to achieve an already targeted plan of 100% spraying of households before and throughout the transmission for effective prevention and control of malaria [43].

As institutional based cross-sectional study design was employed, the results may not be generalized to the general population. In addition, we have not recruited the required sample size so that it might have compromised the power of our study. Finally, lack of direct observation of ITNs usage among the study subjects may preclude generalizing this trend to the general community in the area. Thus, these could constitute the limitations of the study.

Conclusions

In conclusion, the current study illustrated that prevalence of malaria among febrile illnesses in the study area was relatively low (7.3%) with a dominance of *P. falciparum*. It has also been indicated that study subjects had adequate knowledge, encouraging attitudes, and good practices on malaria prevention and control. Nonetheless, some misconceptions on malaria disease, its transmission, and prevention persist as reported in this study, which essentially require due attention before launching malaria control program in the area. We believe that findings of this study would make inroads into the implementation effective malaria interventions in the area and beyond focusing on enhancing community awareness and scaling up coverage of evidence-based interventions.

Abbreviations

IRS

Indoor residual spray; ITNs: Insecticide-treated nets; SPSS: Statistical Package for the Social Science; WHO: World Health Organization

Declarations

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collectors.

Authors' Contributions

BB and TG conceived the study and involved in the data collection. BB, TG and AG were involved in the data analysis, preparation and critically reviewing the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

All data underlying the findings are available from corresponding author on reasonable request. All relevant data are within the manuscript.

Ethics approval and consent to participate

The study was approved by the College of Natural Sciences Institutional Ethics Review Board, Addis Ababa University. Supportive letter was obtained from the district health office before data collection, and written informed consent was obtained from study participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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43. Legends.

Figures

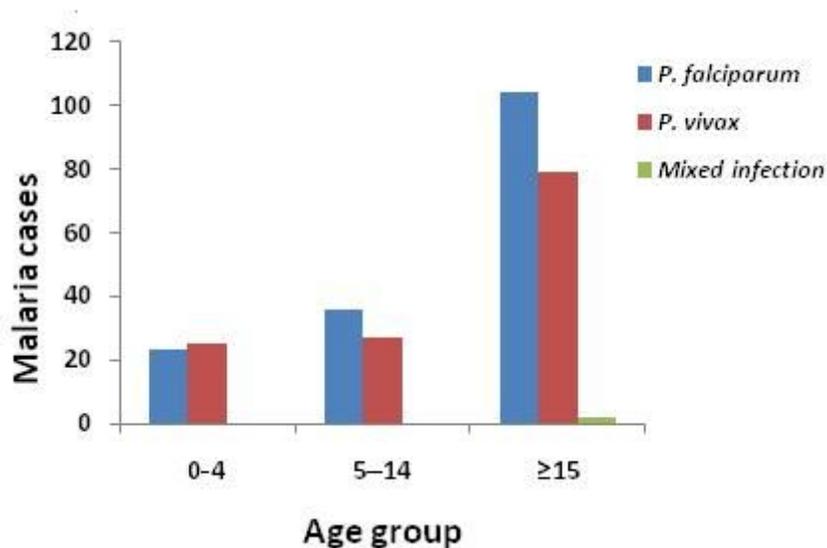


Figure 1

Prevalence of Plasmodium spp. in different age groups in Chagni Health Centre from September 2017-February 2018