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# Assessment of Malaria Infection Rate in Gambella University and Risk Factors that Favors Transmission

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**Abstract:- Malaria is the cause of mortality and morbidity around the world especially in sub-Saharan Africa. Gambella is one of the endemic places of malaria. The present study has been conducted to assess malaria infection rate in Gambella University and factors that favor the transmission. Retrospective study was conducted by using recorded patient registration book from the university's clinic and descriptive survey was carried out through questionnaires that participated 385 respondent students. Within in 2019 academic year, 1,189 (61.5%) malaria cases has been reported and 99.24% of the infection was caused by P. falciparum. Repeated infection is also common with in the students. The presence of suitable environmental conditions like swamps and stagnant water has been confirmed by 94% of the students. This study also discovered less use of ITN and long sleeve closes by the students to protect their body parts from the mosquito bite. Generally there is a high rate of malaria infection in the university. The environmental conditions also create a suitable reproduction site for mosquitos which increases the infection rate.**

***Keywords:-*** *Malaria, Gambella University, Infection.*

## I. INTRODUCTION

Malaria is accountable for many cases of illness and deaths worldwide. According to WHO's report, in the year 2017 there were 219 million malaria cases throughout the world and 92% (200 million) of those cases were reported from Africa [1].

Malaria is one of the main health problem in Ethiopia which is responsible for many cases of mortality and morbidity. More than 54 million peoples which live in low land areas of Ethiopia are in higher risk of malaria. *Plasmodium falciparum* and *Plasmodium vivax* are the two main causative agents of malaria in the country accounting for 60 & 40% cases respectively. *Anopheles arabiansis* is the major vector for the transmission of malaria in Ethiopia [2] [3]

Malaria transmission is seasonal in Ethiopia. The major and minor transmission seasons takes place from September to December and from April to May respectively. Additionally there is various distribution of malaria from place to place depending on altitude. Areas with low altitude (<1500m) has a higher malaria distribution. Therefore areas such as low land of Oromia, Amhara, Tigray, Benishangule Gumuz and Gambella has a higher risk of malaria. From these all Endemic areas, the infection rate of malaria in Gambella has been reported to be the worst [2] [4].

Environmental condition like the existence of bushes, garbage, swamps and stagnant water increase malaria transmission by favoring the breading of mosquito. In other way, the use of insecticide treated nets (ITN) and covering body parts by wearing long sleeve closes are a good way to prevent malaria infection by avoiding exposure to mosquito bite [5].

This study has been conducted to assess the infection rate of malaria in Gambella University and the risk factors that increase transmission. The study could be used to fill the gap related to malaria infection rate of the university.

## II. MATERIAL AND METHODS

- *Study Area*

The study was conducted in Gambella University. Gambella National Regional State is located in the south-western part of Ethiopia. The region is about 777 km away from Addis Ababa (the capital city of Ethiopia). It is known by it's flat land scape and hot and humid climate .the averages Annual rainfall of the area is 600 mm and the average temperatures ranges between 21.10 $^0$C and 35.90 $^0$C. The region has mostly lowland (kolla) with a few midlands (weynadega) agro-ecology. The population size of the region is about 259,000 [6]. There is a diversity of ethnic group found in the region. The capital town of Gambella region is Gambella. Gambella University is found to the east of Gambella town and near to Baro River. The elevation of the university area is about 450 m above sea level.

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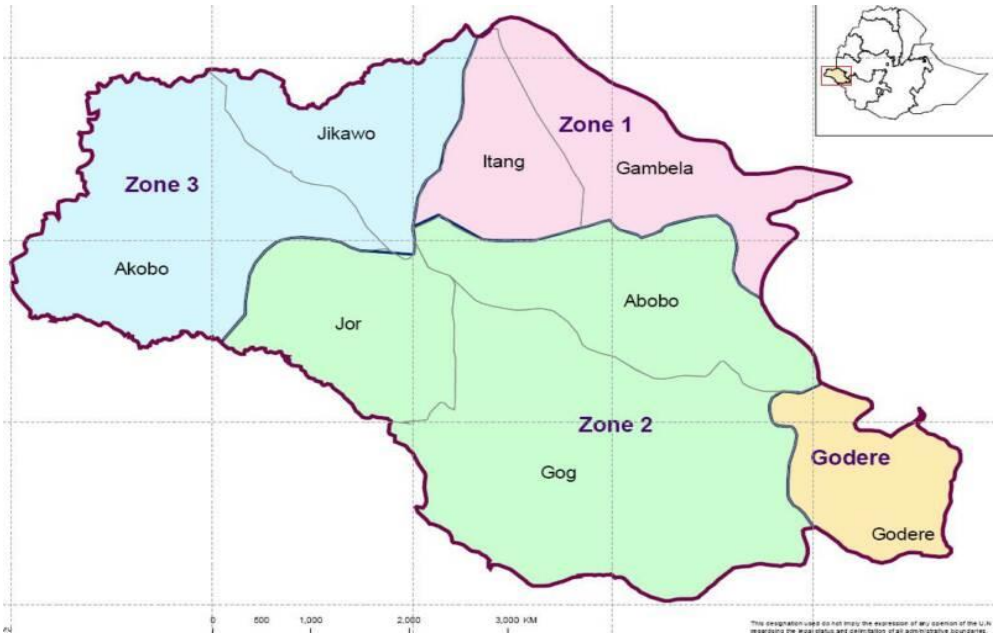


Fig 1:- Map of Gambella Region [6].

Gambella University is one of the higher institutions recently established in April, 2014 in the country. The university has set its vision to produce caliber professionals and high quality researchers in order to be recognized in 2030 as one of the center of academic excellence in Africa and excel in communities services provision.


Fig 2:- Satellite image of the study area (Gambella University) (Google map).

➢ *Study Design*

Retrospective study has been conducted by using blood film results record in Gambella university clinic to determine malaria infection rate in the University in 2019 academic year. The data doesn't include the students vacation time (includes only from October- July). Descriptive survey was conducted by using questionaries' to assess the reoccurrence rate of malaria episode and factors that increase the risk of infection.

➢ *Study Population*

Every student who had febrile illness and admitted for malaria blood test has been participated in the study. The patient's information and malaria status data were collected from the documented registration book. The questioners has been collected from the undergraduate students of the university. The sample size has been determined by using cochrance formula. A total of 385 students has been participated in responding the questionnaires.

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$$n_0 = Z^2 pq/e^2$$

Where: **e** is the desired level of precision, **p** is the (estimated) proportion of the population which has the attribution in the question, **q** is 1- p.

➢ *Data Analysis*

- *Ethical Consideration*

The students who participated in the present study got a brief explanation on the objective of the study. Additionally the question has been described for them by trained facilitators to make sure that they understood. Written permission was given by Gambella University and the university's clinic to collect the documented data.

## III. RESULT AND DISCUSSION

Out of 1,933 blood film screened during the academic year, 1,189 (61.5%) were positive for plasmodium parasite. This could be a display for high prevalence of malaria among students who are attending in Gambella University. This result shows lower prevalence compared with the study by Ezenwaka and Ivoh, 2018 who had reported 80% prevalence of malaria among the students Attending Federal University Otuoke Health Centre, Bayelsa State, Nigeria [7]. (Table 1)

Malaria infection was higher in male students compared with female students. Other studies also reported higher infection rate in males [7] [8]. The possible reason for this could be the releasing of more mosquito attractant chemicals from the body of males which make them exposed for bite. In other way the releasing of testosterone hormone have reducing effect on the plasmodium suppressive effect of liver which favors the parasite to multiply and establish infection [9] [10] (Table 1).

| | | Examined | Positive (%) |
|---|---|---|---|
| **SEX** | Female | 659 | 382 (58) |
| | Male | 1274 | 807 (63.3) |
| **Total** | | **1933** | **1189 (61.5)** |
| **Age** | 19-24 | 1361 | 947 (69.6) |
| | 25-30 | 558 | 239 (42.8) |
| | 31 and above | 14 | 3 (21.4) |
| **Total** | | **1933** | **1189 (61.5)** |

Table 1:- Malaria infection rate in respect to sex and age

*Plasmodium falciparum* were responsible for 99.24% (1,180) of reported cases of malaria followed by *P. vivax* which is only responsible for 0.67% (8) infection. A single mixed infection of *P. falciparum* and *P. vivax* was recorded during the study. This is in agreement with other previous studies which reported *P. falciparum* as the main causative agent of malaria infection [7] [11]. (Table 2)

| Species | Nº | Percent (%) |
|---|---|---|
| P. falciparum | 1180 | 99.24 |
| P. vivax | 8 | 0.67 |
| Mixed | 1 | 0.08 |
| **Total** | **1189** | **100** |

Table 2:- Plasmodium species frequency in malaria infection.

On October and November higher number of malaria infection was observed (285 and 222 respectively). This may happened because of the increasing of suitable mosquito reproduction sites in these months following the main rainy season which is on July and August. Similar study by Ferede *et al*., 2013 has reported higher transmission of malaria during this season in Metema Hospital, Northwest Ethiopia [11]. (Table 3)

| Month | Nº of examined | Positive (%) |
|---|---|---|
| October | 349 | 285 (81.7) |
| November | 473 | 222 (46.9) |
| December | 119 | 72 (60.5) |
| January | 124 | 93 (75) |
| February | 91 | 67 (73.6) |
| March | 98 | 47 (48) |
| April | 155 | 106 (63.4) |
| May | 290 | 196 (67.6) |
| June | 234 | 101 (43.2) |
| **Total** | **1933** | **1189 (61.5)** |

Table 3:- Malaria infection rate in each months of the academic year.

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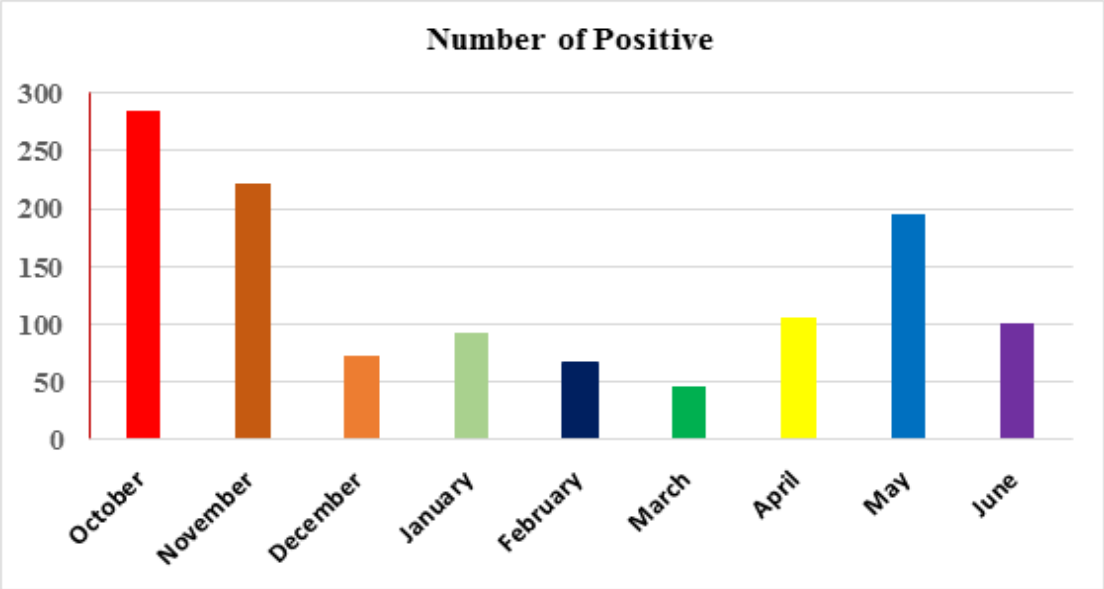


Fig 3:- Malaria infection rate in each months of the academic year.

During the data collection through questioner, male respondents (61.4%) were more represented than females (38.4%). This could be because of the presence of more male students in the compound or because of their willingness to participate in the study. The largest number of respondents (75.1%) were between the ages of 19-24 which is the most available age range in the undergraduate schools. Age of 31 and above were the least represented (0.5%) age range. (Table 4)

| | | |
|---|---|---|
| **Sex** | **Male** | 237 (61.6%) |
| | **Female** | 148 (38.4%) |
| **Age** | **19-24** | 289 (75.1%) |
| | **25-30** | 94 (24.4%) |
| | **31 and above** | 2 (0.5%) |

Table 4:- The demographic information of respondents.

Table 5 shows the malaria infection states of the respondents and the frequency of infection with in 2019 academic year. This studies result reveled 279 (72.5%) respondent students had reported case of malaria and among those of infected, 13.6% has been infected above 3 times. The rest 28% and 21.1% has been infected 2 and 3 times respectively. The reoccurrence could happen because of the repeated inoculation of plasmodium parasite through mosquito bite or by reoccurrence of the parasite weather when it is not totally eradicated from the blood or relapse by the reactivation of dormant liver stage hapnozoits [12].

| **Have you been infected in 2019?** | **Yes=** 279 (72.5%) **No=** 106 (27.5%) | | | |
|---|---|---|---|---|
| **How many times?** | **1** | **2** | **3** | **Above 3** |
| **Total = 279** | 104 (37.3%) | 78 (28%) | 59 (21.1) | 38 (13.6%) |

Table 5:- Reoccurrence of malaria episode.

Most of the students don't have the trend of using ITN during their sleeping time. Out of the total respondent students, only 16% of them always use ITN while they sleep. Those who have never used ITN accounts for 43.9% of the total respondents. Additionally 69.1% of the students don't wear long sleeve closes throughout the day. This could be because of the hot temperature triggered by the low altitude (450m above sea level) of the study area. However, this two reason (less use of ITN and not wearing long sleeve closes) could increase the exposure of the body part of the students for mosquito bite and it might be one of the causes for the higher infection rate in the university [13]. (Table 6)

| **Statement** | **Always** | **Most of the times** | **Sometimes** | **Never** |
|---|---|---|---|---|
| **Do you use of ITN while you sleep?** | 62 (16%) | 16 (4.2%) | 138 (35.9%) | 169 (43.9%) |
| **How often you wearing long sleeve do closes?** | 19 (4.9%) | 23 (6%) | 77 (20%) | 266 (69.1%) |

Table 6:- Body part exposure factors

Among the total respondents, 331 (86%) of them stays out door most of the time at night which is a suitable biting time for the nocturnal anopheles mosquito and could be the possible contributor for the increased infection rate [14].

Additionally 362 (94%) and 108 (28%) respondents have agreed on the presence of bushes or garbage and Swamp or stagnant water respectively. These situation creates a suitable breading site for the mosquito around the dormitory of the students. Similar study by Florence *et al*., 2014 is also parallel with the present study [8]. (Table 7 and 8)

| | | |
|---|---|---|
| | **Yes** | **No** |
| **Do you stay outdoor most of the time?** | 331 (86%) | 54 (14%) |
| **If yes, How long?** | **8-10 pm** | 185 (55.9%) |
| | **11-1 pm** | 87 (26.3%) |
| | **Above 1 pm** | 59 (17.8%) |

Table 7:- Reoccurrence of malaria episode.

| **Statement** | **Present** | **Absents** |
|---|---|---|
| **Swamp or stagnant water** | 108 (28%) | 277 (72%) |
| **Bushes or garbage** | 362 (94) | 23 (6%) |

Table 8:- The environmental condition

## IV. CONCLUSION AND RECOMMENDATION

There is a high rate of malaria infection (61.51%) in Gambella University. This shows the endemicity of the disease in the study area. *Plasmodium falciparum* is the main malaria causative agent in the compound. The presence of garbage, bushes and swamps around the students' dormitory contributes for the higher infection rate. Additionally the students wearing style and less use of ITN make their body exposed for mosquito bite during the day and sleeping time. Therefore of malaria control programs should be planned and implemented by the managements of the university in order to minimize the infection rate.

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