

A Comprehensive Study of Malaria Awareness among College & University Students in the Jammu Region

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Abstract

Background: Malaria is a highly infectious disease responsible for the significant mortality and is caused by Plasmodium, a protozoan parasite of the genus Plasmodium. Different developed and developing nations have launched various initiatives to prevent diseases and eradicate them from society and for this understanding the disease and its various manifestations is crucial to achieving the goal of prevention and eradication. **Aim:** As a result, the current study was designed to investigate malaria knowledge or understanding among college/university students in the Jammu region in terms of their attitudes and practices toward malaria and its various dimensions. **Method:** For the current study, 400 students (undergraduate and graduate) were recruited, with an equal number of males and females in the age range of 18-23 years. **Result:** According to the study's findings, young students' general awareness of malaria is below average, and no significant difference in knowledge of the diseases was observed between males and females. As a consequence, it was concluded that health education should be made mandatory in all educational institutions to promote student awareness, which may be enhanced through media such as television, newspapers, and social networks. **Conclusion:** The current study revealed that effective tactics and new methods are required for people to maintain proper awareness.

Keywords: Malaria, *Plasmodium*, awareness, protozoan parasite, Jammu district.

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1. INTRODUCTION

Malaria is one of the most prevalent parasitic diseases affecting people that is spread by mosquitoes and has afflicted individuals since ancient times [1]. This potentially fatal condition is brought on by a protozoan parasite from the genus Plasmodium which is consisted of four species as *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium ovale* and *Plasmodium vivax*. The *P. falciparum* and *P. vivax* are the two important species of concern that increased the morbidity and mortality in humans [2].

In tropical and subtropical nations around the world, malaria is the main cause of public health issues

[3]. It has a dramatic presence in Africa, according to the global burden disorder-2019 (GBD, 2019) (Figure 1A). It was also found that the majority of cases in India were discovered in Chhattisgarh (Figure 1B) ([Healthdata](#)).

Over the past few decades, South Asia has had significant mortality rises (Figure 2), followed by the Middle East and North Africa, Europe, and Central Asia ([Ourworldindata](#)). As "cause of death data" from the GBD, 2019, higher mortality has been seen in the 1990-2000 periods and among the 15-30 age groups (Figure 3) ([Healthdata](#)).

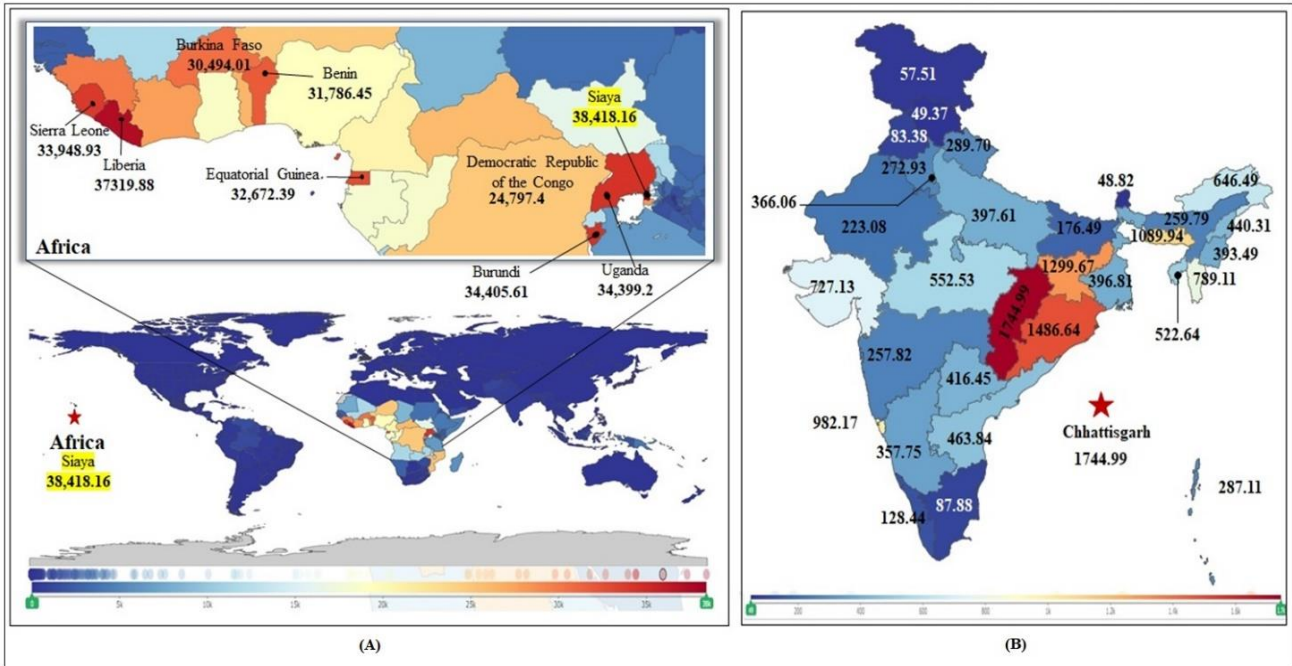


Figure 1: Malaria prevalence graph based on GBD-2019, adjusted for both genders and all ages per 100,000(A) Worldwide Prevalence of malaria with increased prevalence in African regions including Siaya (38,415.16 cases/100,000). (B) According to GBD-2019, Chhattisgarh has the highest prevalence of malaria cases with an approximately of 1744.99 cases/100, 000 (<https://vizhub.healthdata.org/gbd-compare/>).

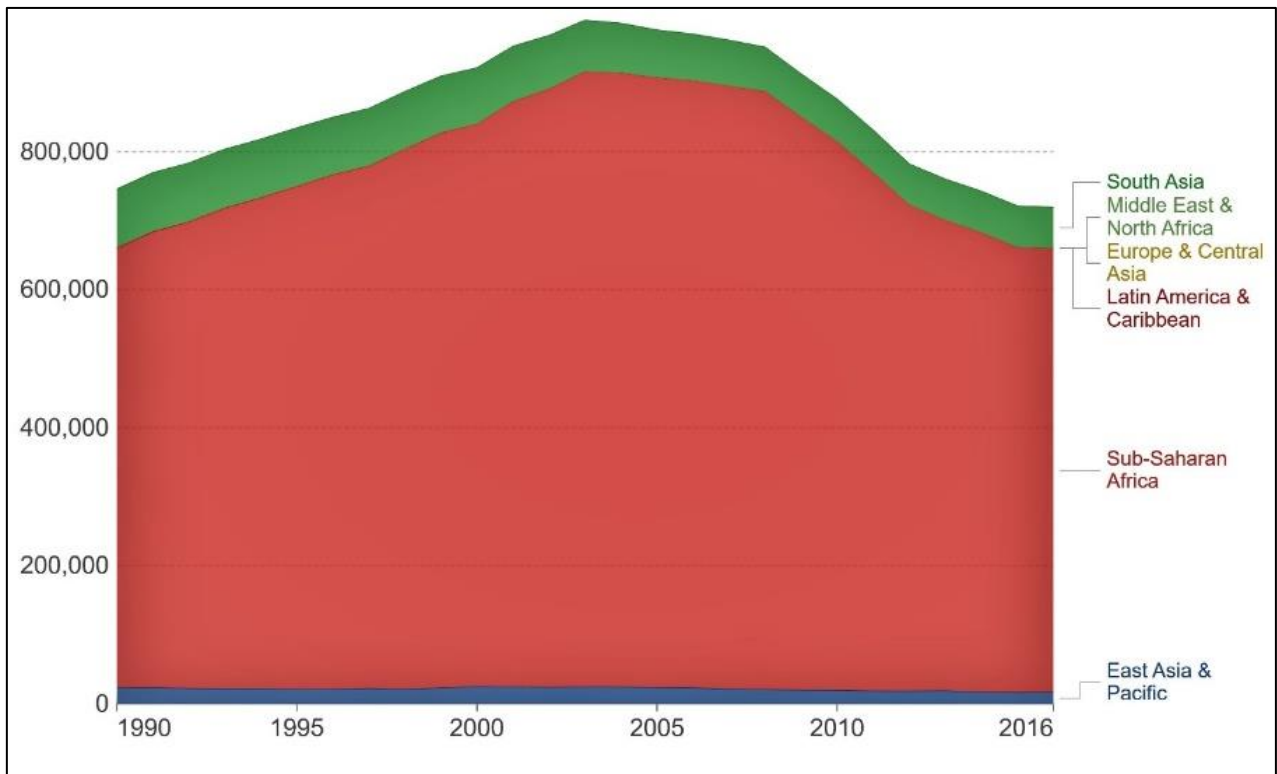


Figure 2: Mortality cases have been increased since from 1990 to 2010 and majority of incidence found in the region of South Asia, Middle East & North Africa, Europe and central Asia (<https://ourworldindata.org/>)

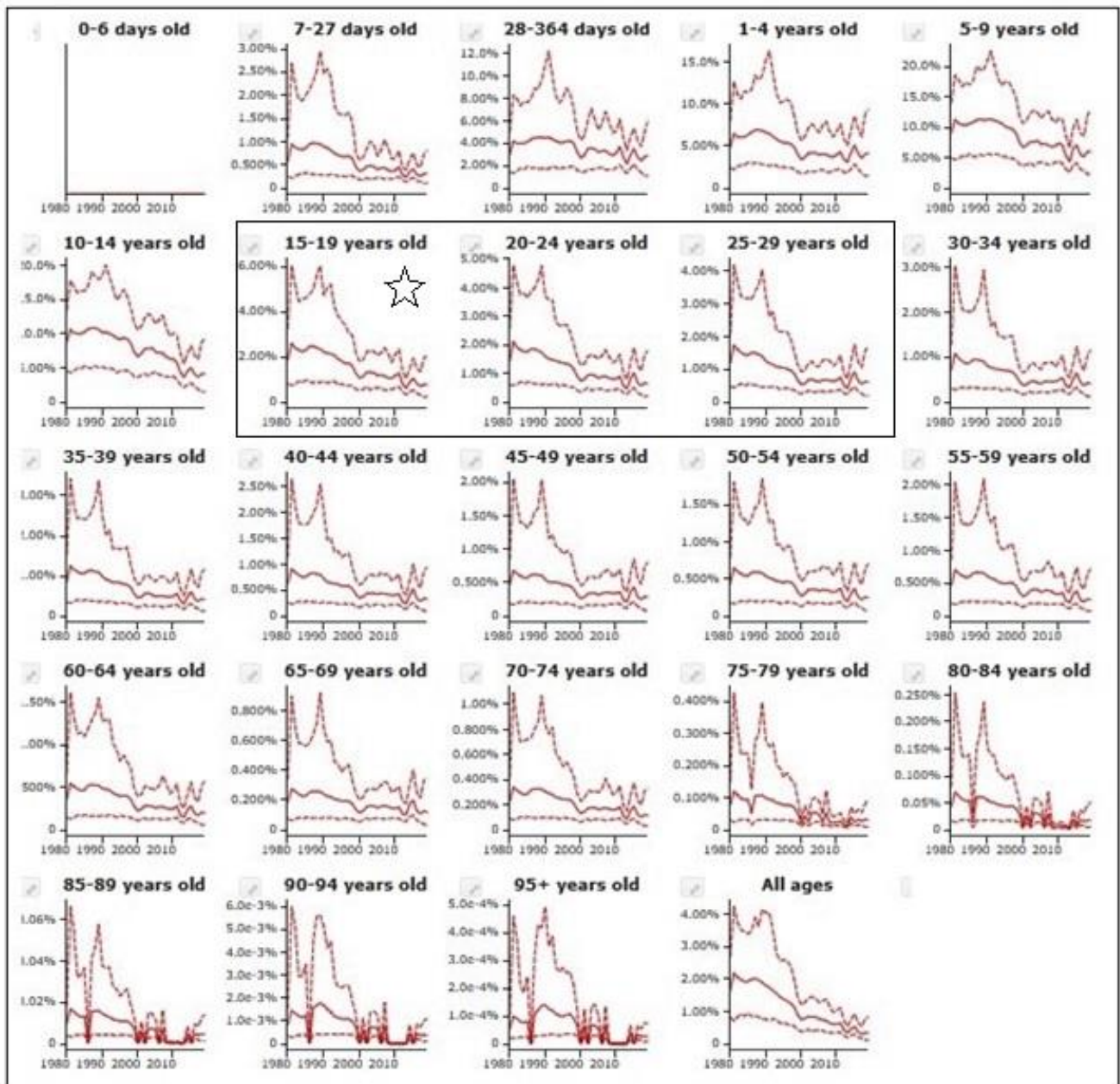


Figure 3: Graph of mortality by age group within different years: The graph shows that the greatest mortality has occurred between the ages of 15 and 20 (<https://vizhub.healthdata.org/gbd-compare/>)

Some critical modes of infection transmission include blood transfusions, sharing needles, and transmission from an infected mother to her child. The most common, affordable, and widely accepted approach for determining whether a person has malaria is by a clinical diagnosis, which mostly relies on symptoms including fever, weakness, chills, stomach discomfort, nausea, and disorientation [4].

However, due to overlapping signs and symptoms with other illnesses the accuracy of malaria diagnosis can be considerably increase by combining clinical and parasite-based data [5]. There are a few examples of such clinical sound techniques which includes Quantitative buffy coat method (QBC), Rapid

diagnostic tests (RDTs), Serological Tests (Immunofluorescence assay (IFA), Enzyme-linked immunosorbent assay (ELISA), and various Molecular Diagnostic Methods such as Polymerase chain reaction technique (PCR), Loop-mediated isothermal amplification (LAMP) technique, Microarrays, Flow cytometry (FCM) and Automated blood cell counters (ACC) [6].

As it is the mosquito-borne disease therefore many strategies have made to control at the level of both humans and mosquitoes [7]. Recent discoveries have resulted in a major increase in information about the biology, ecology, genetics, and responsiveness to treatments, necessitating stratification for cost-effective

and long-term malaria control. Various methods include Insecticide residual spray (IRS) [8], Insecticide-treated nets (ITNs) [9], Mosquito repellents (allethrin, N-N-diethyl-m-toluamide, dimethyl phthalate (DMP), N, N-diethyl phenylacetamide, and N, N-diethyl mendelic acid amide) [10], Biological control i.e., the introduction of organisms to repress vector populations kill the larva without polluting the environment [11].

Despite the existence of numerous national and international control programmes, there have been notable successes, which include the elimination of malaria in the United States and Europe as well as notable decreases in certain parts of Asia and South America, but still many countries elimination has not been seriously attempted [12]. It is critical to remove

infections from the community and to do so; we must protect ourselves from the vector. As a consequence, to avoid infection, we must first become aware of the many features of the infection; from this, a full understanding of the disease would be beneficial in terms of prevention; hence, knowing malaria and its various components is essential.

For the past two decades, several surveys have been carried out in different regions of the world, including the ones listed in (Table 1), and have found diverse result which signals about the awareness necessity. As a result, we aim in this analytic cross-sectional study was conducted to assess public knowledge of malaria and personal health in youth in the Jammu region.

Table 1: Cross sectional study with no significant knowledge

Region	Respondents	Comments	Reference
Nigeria, Nsukka.	800	Significant Knowledge but not translated into practice.	Anene-okeke <i>et al.</i> , 2018
Karnataka (India)	900	No Significant knowledge	Dayanand <i>et al.</i> , 2017
Buea Health District, Cameroon	443	No Significant knowledge	Kimbi <i>et al.</i> , 2014
Mumbai (India)	119	Significant Knowledge but not translated into practice.	Dhawan <i>et al.</i> , 2014
Assam (India)	71	No Significant knowledge	Yadav <i>et al.</i> , 2014
China	43299	No Significant knowledge	Yin <i>et al.</i> , 2013
Bihar & Jharkhand (India)	426	No Significant knowledge	Haq <i>et al.</i> , 2013
Arunachal Pradesh (India)	437	No Significant knowledge	Das <i>et al.</i> , 2007
China	1321	No Significant knowledge	Tang <i>et al.</i> , 2016
Nigeria	267	No Significant knowledge	Olasehinde <i>et al.</i> , 2010

2. MATERIALS AND METHODS

The planned study was conducted in the Jammu area of UT Jammu and Kashmir, which is located at 32.73° N 74.87° E and is 300 meters above sea level on average (980 ft) (Figure 4). Purposive samples of 400 participants comprising an equal number of males and females were recruited. Participants were college/universities students (UG and PG) from different streams viz. arts, commerce, and science, in the age group 18-23 years, belonging to both rural as well as urban areas of Jammu division.

A questionnaire-based survey was conducted among participants, with basic questions regarding the malaria disease as well as general practices leading to a healthy life to check their general awareness about Malaria and personal health. The participants were informed of the study's nature and goals and their written consent was taken. Responses of participants on the questionnaire were collected and analyzed statistically. The subjects were included and excluded systematically, as shown in the flow chart (Figure 5).

3. RESULTS

Many health awareness programs are being conducted by many organizations, yet awareness about the disease among students is not enough as evidenced by various studies carried out nationally on malaria [13, 14].

3.1. Demographic Profile

The N=400 respondents' (respondents') demographic profile is displayed in Table-2. The sample included an equal number of male and female students. Maximum participants (30%) were from the age group of 21 years and minimum (8%) were from the age group of 23 years (Figure 6). Undergraduate participants (70%) were more than postgraduates (30%). Students were from Arts, Commerce, and science stream with the highest respondents from the science stream (40%) and the lowest from the commerce stream (26.5%). Participants were from rural (35%) as well as urban (65%) areas.

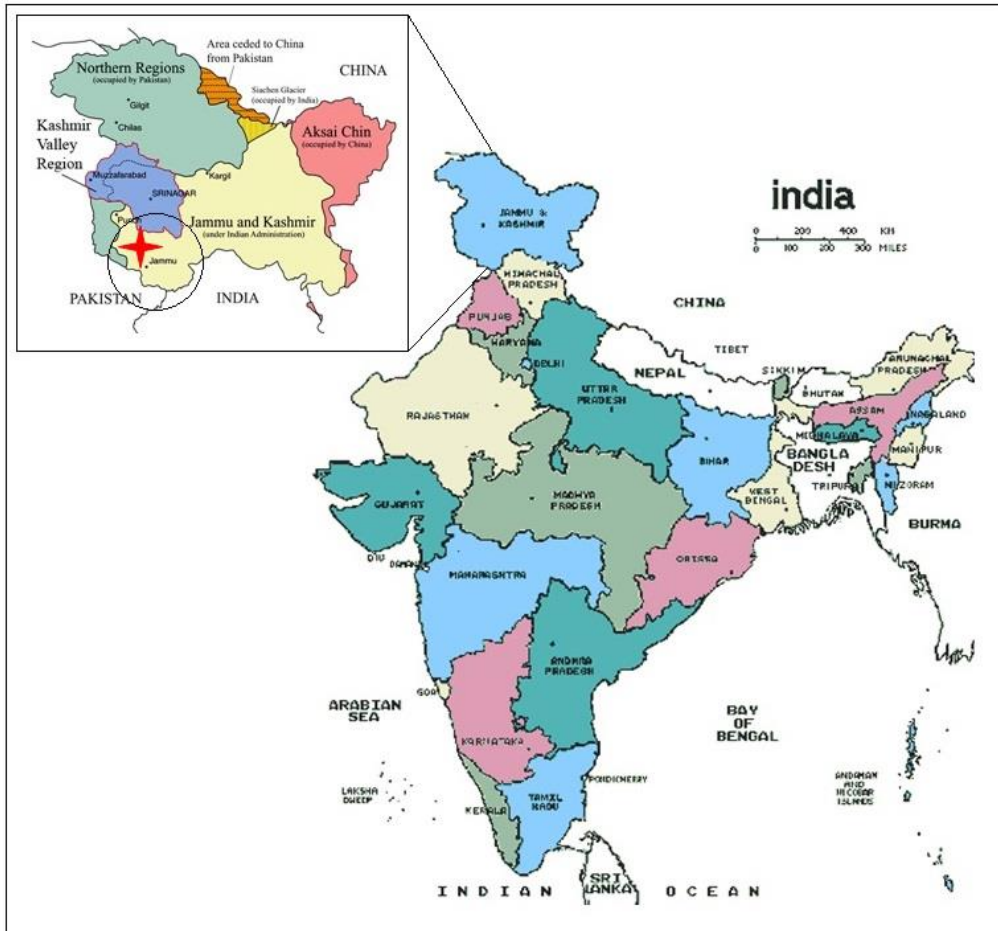


Figure 4: Study area used for the current study: The study was conducted in the Jammu region of UT Jammu and Kashmir, which is located at 32.73° N 74.87° E and averages 300 meters above sea level (980 ft)

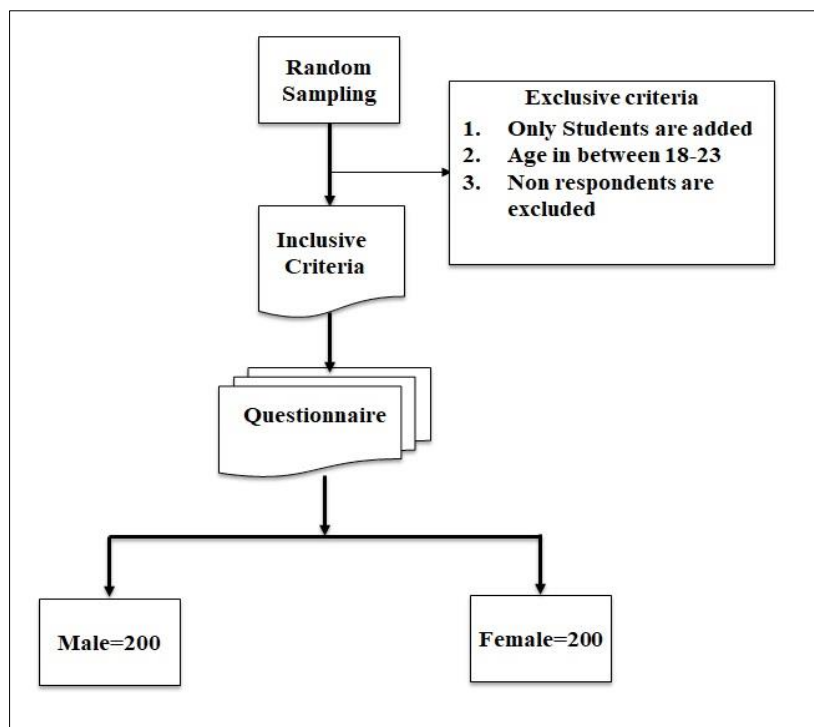


Figure 5: Flow chart depicts a systematic approach for the inclusion and exclusion of the subjects

Table 2: Demographic variable studied

DEMOGRAPHIC VARIABLE	CLASSIFICATION	NUMBER (N)	PERCENTAGE
Gender	Male	200	50
	Female	200	50
Age (in Years)	18	100	25
	19	48	12
	20	52	13
	21	120	30
	22	48	12
	23	32	8
Education (year of study) Undergraduate	1st	72	18
	2nd	64	16
	3rd	144	36
Education (year of study) Postgraduate	1st	64	16
	2nd	42	14
Education (stream)	Arts	134	33.5
	Commerce	106	26.5
	Science	160	40
Native Place of Living	Rural	140	35
	Urban	260	65

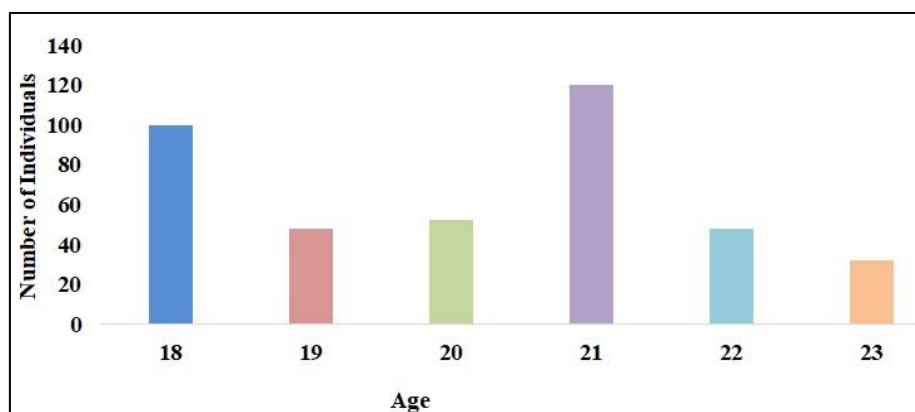


Figure 6: The graph depicts the various age groups that were presented in the study, with the greatest number of individuals being between the ages of 21 and 18

3.2. Knowledge about Malaria

The current study demonstrated that although respondents have heard about malaria most of them were not aware of the causative agent i.e., Plasmodium parasite. Only 63.75±5.3% of participants were aware of the potentially serious complications of cerebral malaria. Males (67.5%) and females (60%) were familiar with the term 'cerebral malaria which is caused by *P. falciparum*.

Cerebral malaria is responsible for about 90% of all deaths due to malaria worldwide. One should have the basic knowledge of malaria symptoms viz. chills, high fever, sweating, headache, nausea, and vomiting so that medical advice can be taken as soon as possible.

Only 42.25±7.4% of respondents knew about symptoms of malaria, as female students as compared to males seemed to be more familiar with malaria symptoms. Surprisingly, most of the students

(67.25±1.8%) revealed malaria as an ordinary disease; whereas, a few participants (21.5±1.4%) were in favor of its deadly nature as if not treated properly may prove fatal (Figure 7).

The female *Anopheles* mosquito, which serves as the main host of Plasmodium, is the carrier of malaria. The fact that mosquitoes transmit malaria was known to 96.52.1% of respondents and 3.5±2.1% of respondents opined that malaria spreads by contaminated food and water. According to 9% of males and 13.5% of female's malaria is a communicable disease (Fig. 2). Plasmodium being a parasite needs both humans and mosquitoes to reproduce. The malaria infection can last for years, so an infected person can keep infecting new mosquitoes for a long time.

3.3. Knowledge about Mosquito Vector

The study has revealed that respondents (56.25±14.5%) correctly identified female *Anopheles*

mosquito as the vector of malaria, with a high percentage (66.5%) from females and low from male participants (46%). Apart for this, some respondents (38.75±17.3%) opined as Aedes mosquito as the vector of malaria. Only a handful of participants (30.5±1.4%) were aware of the breeding site of mosquitoes (stagnant water) with a high percentage (31.5%) from females and low from male participants (29.5%). On the other

hand, 14.5±2.1% of students considered plants and vegetation as their breeding sites. Although there is no fixed time for mosquito bites and it has been observed that they are most active during the night (53.0±1.45%), with a high percentage (54%) from males and low from female participants (52%) and evening hours (33.25±2.5%) (Figure 8).

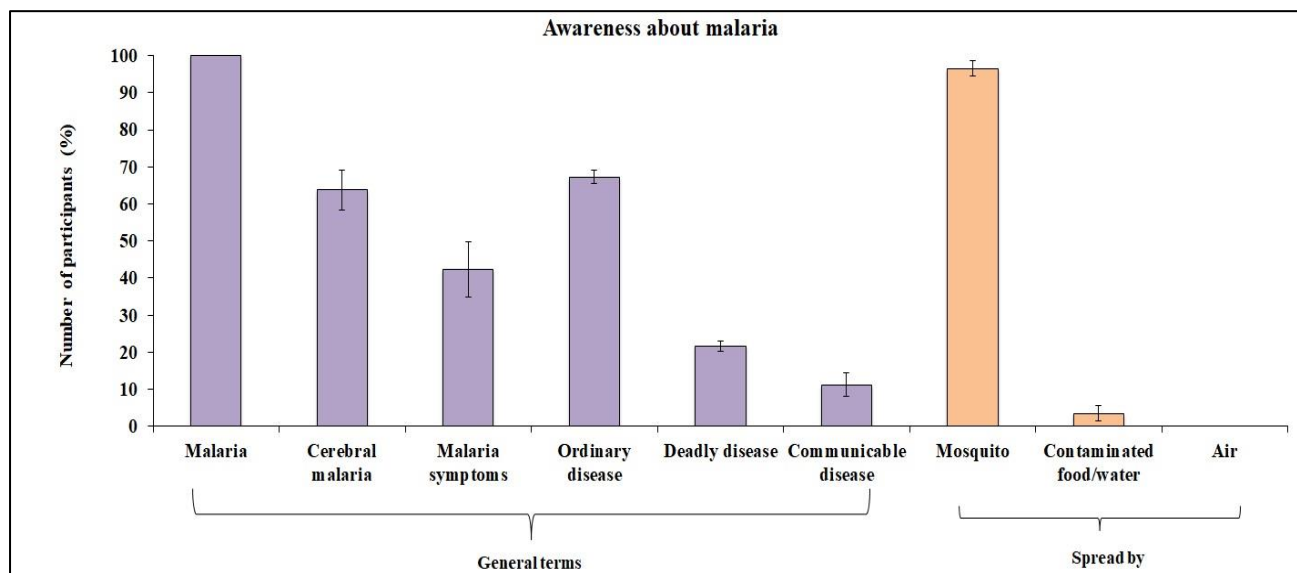


Figure 7: The number of participants having general awareness about malaria. The data expressed is the Mean±S.D. of the percent number of males and females giving a particular response

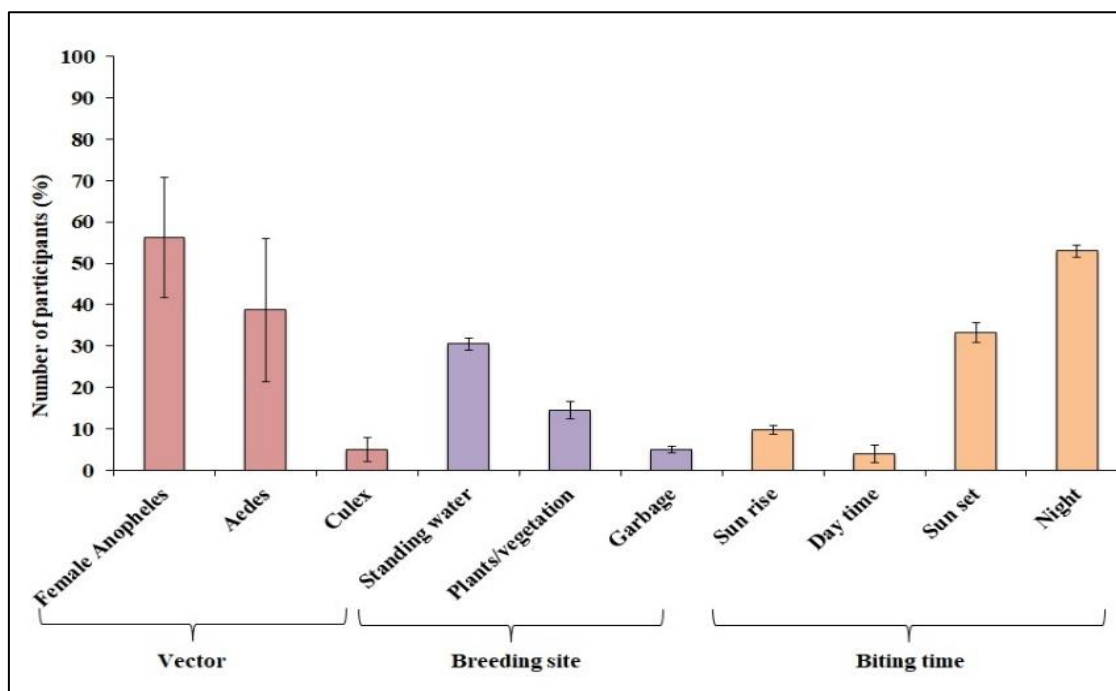


Figure 8: The number of participants having general awareness about malaria vector. The data expressed is the Mean±S.D. of the percent number of males and females giving a particular response.

3.4. Preventive Measures

The greatest way to avoid malaria is to prevent it in the first place. This is because fast diagnosis, appropriate treatment, and unchecked mosquito vector

proliferation are all lacking. The main preventive measures are the using bed nets, mosquito repellants, and smoke. The smoke released by the burning of dried leaves of many plants like eucalyptus and azadirachta

has been used for protection against mosquitoes [10]. Unfortunately, about $37.5 \pm 10.6\%$ of participants are not using any kind of preventive measure. Most of the people were aware of the fact that bed nets work well to curb the problem of malaria, but the usage of bed nets in their houses was very low ($11.25 \pm 1.76\%$). According to this study, most people use mosquito repellants ($45 \pm 7\%$). As per gender difference, 40% male and 50%

female participants prefer mosquito repellants. In addition to this, also only 5% of males and 7.5% of females use smoke to avoid mosquitoes. The most common reason given for the non-use of mosquito bed nets and other preventive measures was their belief that there were no mosquitoes in their houses and therefore there was a low risk of contracting malaria (Figure 9).

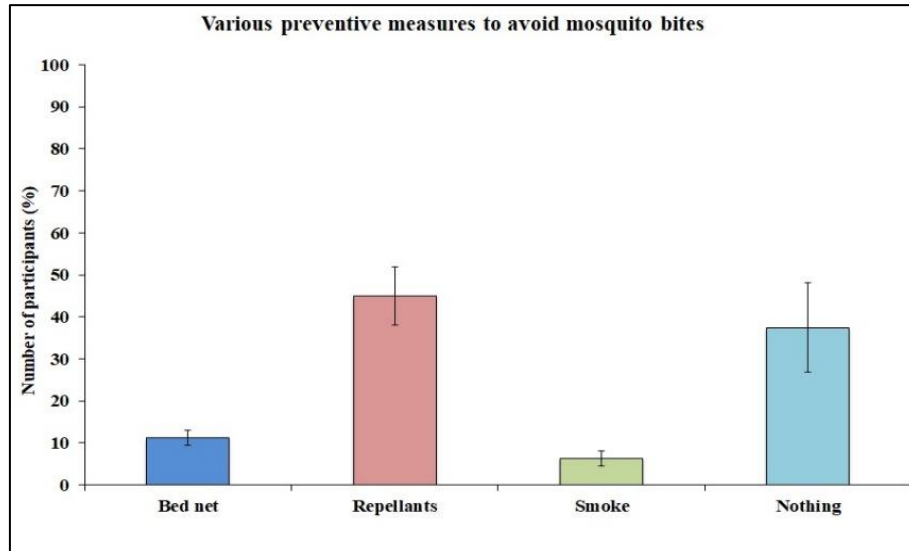


Figure 9: The number of participants using various preventive measures to avoid mosquito bites. The data expressed is the Mean ± S.D. of the percent number of males and females giving a particular response

3.5. Knowledge Source

A variety of media are there in society, which disseminate information about various diseases and health-related issues. In the current study, it was found that students had access to information regarding malaria from a number of sources. The majority of the respondents had received disease information from health professionals ($34.5 \pm 6.36\%$) and television

($30.5 \pm 0.70\%$). Among a variety of interpersonal sources of knowledge, (22.82%) respondents said they had learned about malaria via friends and relatives. Among media sources, newspapers and magazines were also the sources of malaria information for respondents ($25.5 \pm 14.84\%$). The newspaper was a more popular source of information among males as compared to females (Figure 10).

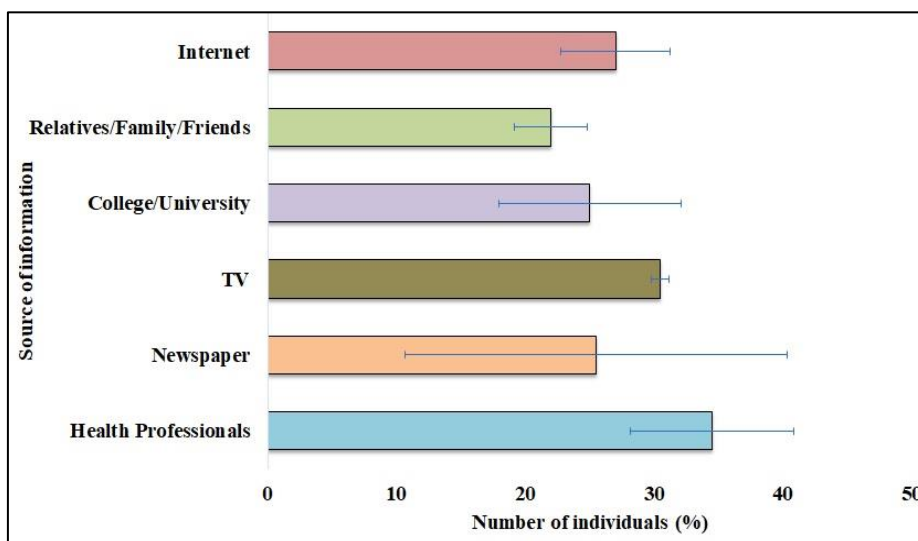


Figure 10: The number of participants using various types of information media to obtain knowledge about malaria. The data expressed is the Mean ± S.D. of the percent number of males and females giving a particular response

3.6. Personal Health Awareness

General awareness about the health issues and practice of the methods leading to a healthy lifestyle is the key to avoiding common infections. People should be aware of newspapers, advertisements, radio, and other programs. Although illness confusion and health-seeking behaviour may enhance or interfere with the effectiveness of control measures, prevention of the disease through increased knowledge and awareness is the proper strategy to prevent it and maintain health (Klein *et al.*, 1995). In this study, general health awareness was checked among young students by taking information on different issues such as their feeding habits, physical workout, and medical advice (Figure 11).

i) **Consult Physician:** During the present study, it was found that only a very small number of students take any medical advice on issues of mild fever ($12.5\pm 3.5\%$), headache ($20.0\pm 7.0\%$), and vomiting (10%). Surprisingly, very few males (4%) and females (5%) consulted a physician in case of

loss of appetite. It was found that most of the students not visited a doctor. The data showed that only in case of serious illness/mild fever and headache participants preferred to consult a physician ($12.5\pm 3.5\%$) and ($20.0\pm 7.0\%$) respectively (Figure 11).

ii) **Feeding Habits:** Eating habits have been a major concern among students. Most of the respondents ($51\pm 12.02\%$) skipped their breakfast regularly but the regular breakfast is important for good health and energy. According to the study, $62.5\pm 10.6\%$ of participants preferred junk food due to its availability, convenience, and taste, however, mostly females as compared to males preferred junk food. However ($23.0\pm 16.97\%$) participants consume alcohol which is injurious to health and can weaken our immune system and cause many problems (Figure 11). Nutritional education among students should also be encouraged. It is of great importance as it would dictate health behavior and prevent the spreading of disease.

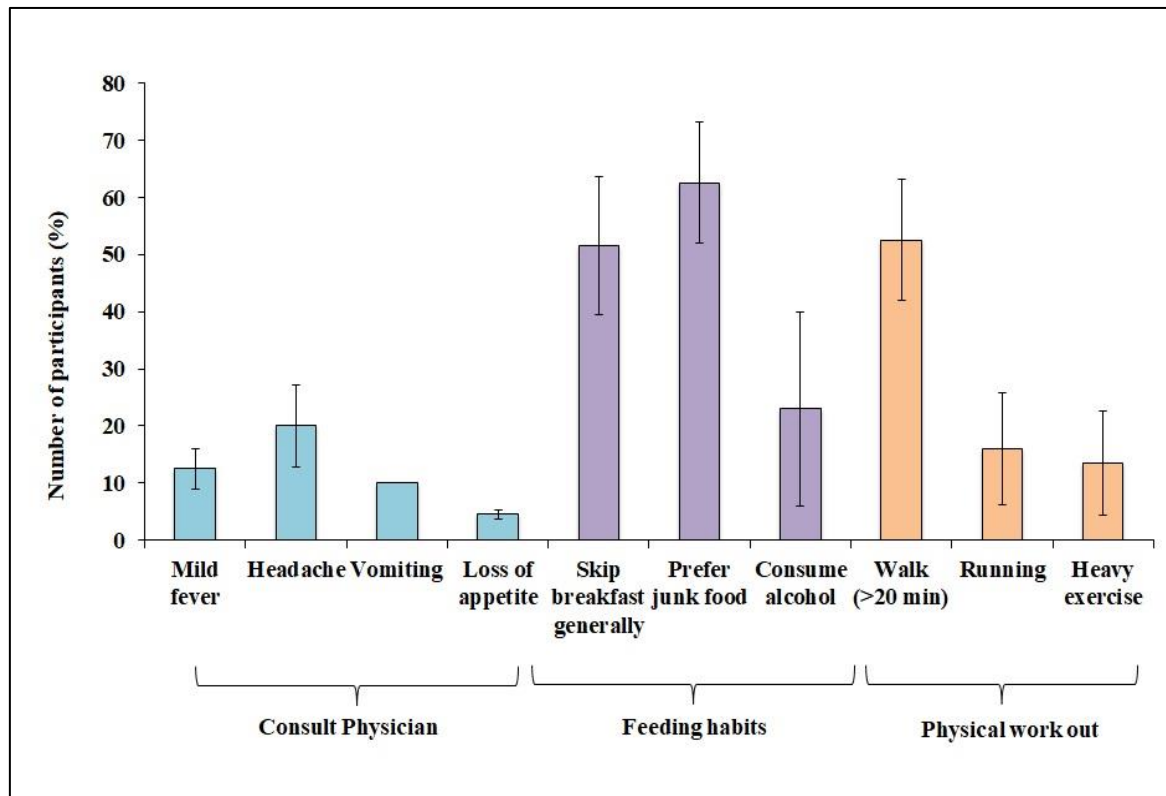


Figure 11: Various health practices exhibited by study participants. The data expressed is the Mean \pm S.D. of the percent number of males and females giving a particular response

iii) **Physical Exercise:** The role of regular physical exercise cannot be ignored when we talk about health issues. Regarding physical exercise, $52.5\pm 10.6\%$ of participants preferred walking, whereas, only $16.0\pm 9.8\%$ preferred regular running, and responses regarding heavy exercise were low (Figure 11).

4. DISCUSSION

Malaria is a serious public health issue that is contagious and can be fatal caused by *P. falciparum* and *P. vivax* which increased morbidity and mortality in humans. This mosquito-borne illness primarily spreads via blood transfusion, sharing of needles, or from mother to child. Malaria is diagnosed by looking for parasites or antigens in the patient's blood. Between

2015 (214 million cases) and 2017 (219 million cases), the number of malaria cases decreased, and the burden of malaria also decreased significantly (239 million cases). This deadly illness must be eradicated, and many nations are working hard to do it. The leader's East Asian nations have stated their desire to eradicate malaria from their regions by 2030.

A comprehensive understanding of the condition will be beneficial in terms of prevention therefore, it is essential to be knowledgeable about Malaria and its many elements. Infectious disease awareness among the general public can be crucial for disease control and prevention. Low diagnosis rates, interruptions in treatment, and discrimination are all caused by a lack of adequate understanding about infectious diseases [15]. Also, persons who are afflicted or fear they may be suffering from malaria must have a thorough understanding of its diagnosis, treatment, and prevention [16]. Malaria can be controlled by the adoption of practicable long-term programs. Therefore, the awareness about Malaria and personal health in youth among Jammu students.

5. Limitation of the Study

The small number of participants was the main research constraint; also, study participants were only between the ages of 18 and 23 as a result, we did not examine the pre-18 and post-23 age groups, and the study duration was also limited. As a result, significantly larger sample size is required, as well as the inclusion of people of various ages, which will strengthen the study.

6. CONCLUSION

Conclusively, the overall knowledge about malaria among young students is below optimum. There was no significant difference in knowledge between males and females. Health education should be compulsory in all educational institutes to improve student awareness. Strengthening of malaria awareness through media such as television, newspaper, and social networks are needed. Also, the search for better strategies and novel methods is needed for the maintenance of accurate awareness among people.

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Ethics Approval: Not Applicable.

Consent to Participate: Applicable.

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