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Original Research

Knowledge, Treatment and Prevention of Malaria by Students of Enugu State University College of Medicine

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Abstract:

Background: Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of an infected female anopheles' mosquito and is a major public health problem especially in Sub-Saharan Africa where 90% of the world's malaria occurs. The aim of this study was to ascertain the knowledge, treatment and prevention of malaria by students of Enugu State University College of Medicine (ESUCOM).

Materials and Methods: This is a cross sectional descriptive study that involves students of Enugu State University College of Medicine (ESUCOM) who answered questions through a questionnaire on malaria. The students in ESUCOM included medical students, anatomy students and medical laboratory science students. Stratified sampling method was used to divide the students into groups and simple random sampling method was used to distribute the questionnaires.

Results: Majority of the respondents were medical students (63%) with a slight greater percentage of females (54%) compared to males (46%) and the peak age range was 21-25yrs (56%). Responders opined that children aged, 1 – 5 years, were mostly susceptible to malaria. Majority of the respondents (69%) see high fever as the most common symptom of malaria. Most (77%) believe that people get infected by bite from infected mosquito while the least percentage believes infection is from bad air (1%). Majority of the respondents (74.5%) believe that mosquitoes breed in foul/polluted water while 22.3% believe they breed in clean or unpolluted open collections of water. A significant number (64.9%) believe that preventive anti malaria drugs should be taken by everybody followed by pregnant women (25.8%). Only 4.1% are not aware of those that should take preventive anti malaria drugs and the use of an insecticide treated net (63.3%) is the major way of preventing mosquito bites.

Conclusion: Our study revealed that majority of the students of ESUT College of Medicine (ESUCOM) was aware of the mode of transmission and the various manifestations of the malaria. It also showed that there is still a high level of self-medication among the students and therefore a poor health seeking behavior.

Keywords: Knowledge, malaria, prevention, treatment, university.

Introduction:

The name "Malaria" is derived from an Italian word mal-aria (bad air). Malaria is also known as Paludism which is derived from a Latin word "Palus" meaning a marsh[1]. These terms reflect the ancient opinion that the disease was spread from marshes. Malaria is one of the causes of absence from school, and hospital admission among students. This can affect the quality of education/information the student may receive and may have psychological effect on the student.

Malaria has been found to cause anaemia in children and pregnant women especially primigravidae resulting in small-for-date babies[2]. Ademowo and colleagues reported that malaria is more common in rural areas than in urban areas and usually more severe and prevalent among the low socio-economic group[3].

Malaria control strategies using anti-malaria drugs, as one of the basic components, has been hampered by the emergence and rapid spread of drug resistant malaria parasite.[4]

Malaria is regarded as the most important of the parasitic diseases that afflict mankind, and one of the most important issues in Public Health. Among pregnant women, malaria causes severe anaemia, miscarriages, stillbirths and deaths. It is an important contributor to maternal deaths and account for about 30% of low-birth weight in newborns. Cerebral malaria is one of the most important complications of *Plasmodium falciparum* malaria. It is a major cause of death in children and non-immune adults[5,6].

Current strategies for malaria control in Nigeria include prophylactic use of effective anti-malaria drugs especially during pregnancy, those suffering from sickle cell disease, and non- immune visitors. Early recognition and adequate treatment of cases reduce deaths and duration of illness; also community mobilization and health education activities to reduce human mosquito contact and encourage proper and prompt utilization of health facilities when having malaria.[7,8]

Preventive measures against mosquito bites commonly used include insecticides, bed nets and window curtains or nets. Modification to bed nets is the newly discovered innovation known as insecticide-treated nets (ITN's). This was introduced as a major component of current WHO initiatives in malaria control such as Roll Back Malaria (RBM) [9].

Most of the previous studies were based on the poor and the uneducated. But we studied the knowledge, treatment and prevention of malaria by students of Enugu State University College of Medicine (ESUCOM) and used the outcomes to create awareness on malaria prevention and treatment.

The aim of this study was to ascertain the knowledge, treatment and prevention of malaria by students of ESUCOM.

Materials and Methods:

This is a cross sectional descriptive study that involves students of Enugu State University College of Medicine (ESUCOM) answering questions from questionnaire on their own or with help from one of the researchers. Stratified sampling method was used to divide the students into the required homogenous strata for each department and level/year in school and simple random sampling method was used to distribute the questionnaires.

Students of ESUCOM (Medicine and Surgery, Medical Laboratory Science, and Anatomy) from 200 to 600 level, both male and female who willingly accepted were used for the study. Students of ESUCOM who were not willing were not recruited into the study.

The study area is ESUCOM, situated in ESUT Teaching Hospital, which is located in Parklane GRA, Enugu. Enugu is the capital of Enugu state. Enugu state has a population of 3.2 million people, according to 2006 census and it was estimated to be over 3.8 million people in 2012[10].

The city is located at latitude 62.6^{o} North of the equator and 72.8^{o} East of Greenwich Meridian, covering an area of 88 km^{2} and a diameter of 71.6km at an altitude of 223m above sea level.

ESUCOM has an approximate number of about 1061 students (285 Anatomy students, 121 Medical Laboratory Science students, and 655 Medicine and Surgery students).

Data Collection

Data was collected through semi-structured questionnaire, which was self-administered or with assistance where the need arose. Appropriate measures were taken to ensure that no student filled the form more than once.

Measurement of Variables

The outcome measures for this study were looking at the percentage of ESUCOM students with adequate knowledge, treatment and prevention of malaria.

Scores greater than or equal to (≥) 50% were considered good, while score less than (<) 50 were considered poor.

The completed questionnaires were sorted, arranged, coded and analyzed using the Statistical Package for Social sciences (SPSS) computing programme.

In analyzing the data, the following statistical principles were used: Frequency distribution, percentages, bar charts, pie charts and histogram.

Ethical Considerations

Permission to conduct the study was sought from Enugu State University of Science and Technology, College of Medicine, Ethical Committee. The respondents were also informed of the scope of this study and they were assured of the confidentiality of their data and subsequently, their informed oral consent was gotten.

Results:

Patients' demographics

Table 1: Socio Demographic Characteristics of Respondents

Variables	Number of Respondents	Percentage (%)
Department		
Med lab. science	30	10
Anatomy	81	27
Medicine	189	63
Sex		
Male	138	46.0
Female	162	54.0
Age		
15-20	81	27.0
21-25	168	56.0
26-30	42	14.0
31-35	9	3.0
Religion		
Christian	297	99.0
Others	3	1.0
Level in class		
200	93	31.0
300	84	28.0
400	36	12.0
500	75	25.0
600	12	4.0
Marital status		
Single	273	91.0
Married	21	7.0
Separated	6	2.0
Ethnic group		
Igbo	291	97.0
Hausa	3	1.0
Others	6	2.0

Majority of the respondents are medical students (63%) with a slight greater percentage of females (54%) compared to males (46%) and were within the age range of 21-25yrs (56%). The greatest percentage was Christians (99%). Most are single (91%) and are from the Igbo tribe (97%).

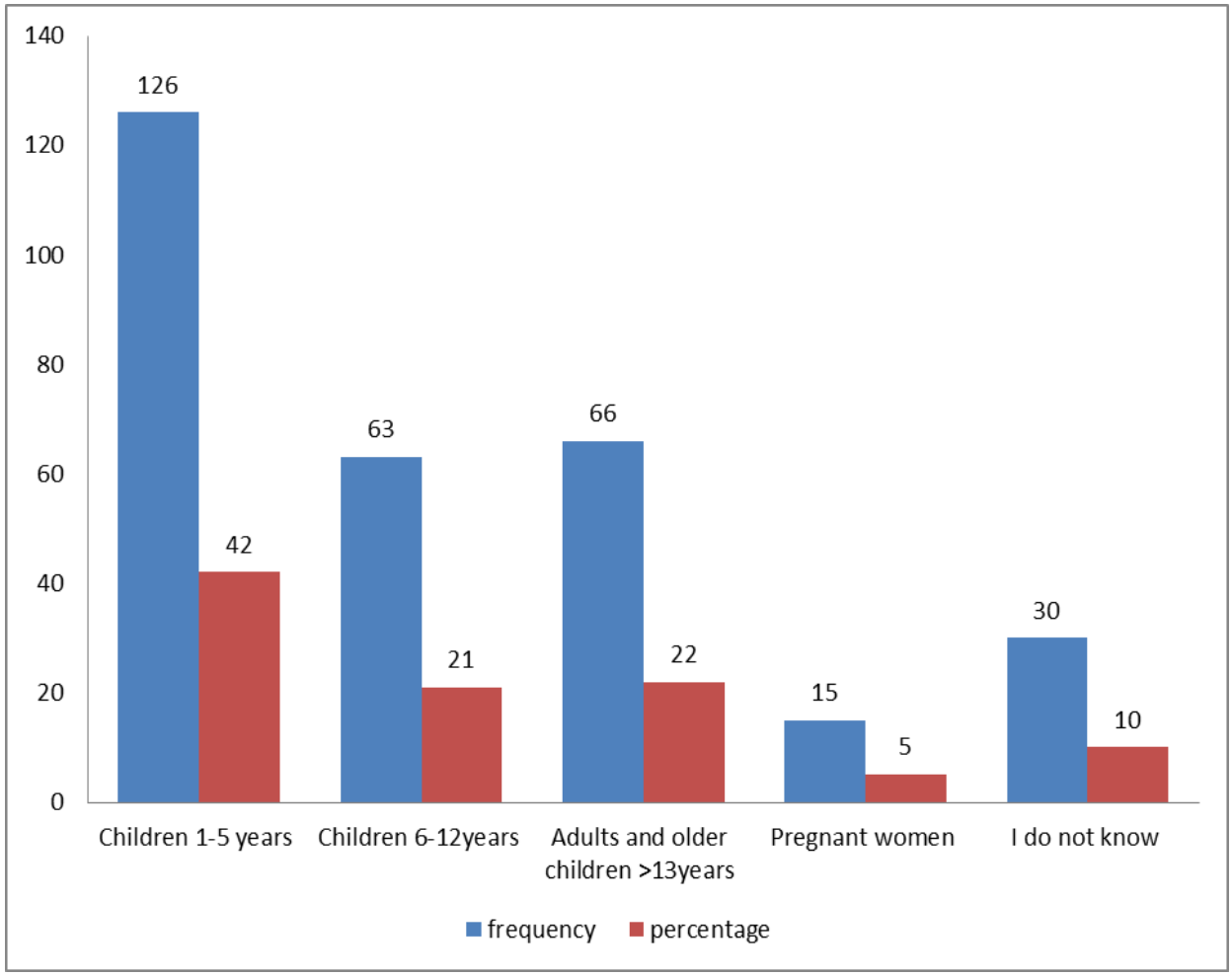

Figure 1. Susceptibility to malaria

From the above figure, majority of those who suffer malaria are children under 5 years (42%).

Table 2: Symptoms and Complications of Malaria

Variables	**Number of Respondents**	**Percentage (%)**
Symptoms suspected to be malaria		
High fever	207	69.0
Headache	78	26.0
Anaemia	9	3.0
Bad dreams	6	2.0
Serious manifestation of malaria in an individual (complications)		
Cerebral malaria	231	81.9
Pulmonary oedema	12	4.2
Kidney failure	3	1.1
Lethargy	36	12.8

Majority of the respondents (69%) see high fever as the most common symptom of malaria.
A greater percentage (81.9%) also sees cerebral malaria as a major complication of malaria.

Table 3: Health Seeking Behavior of Respondents to Malaria

Variables	Number of Respondents	Percentage (%)
What do you do when you (or a member of your family) have malaria		
Take drugs you have at home	27	9.0
Go to the patent medicine dealer	12	4.0
Go to pharmacy shop	144	48.5
Go to health center or your clinic	108	36.4
Go to herbalist	6	2.0
What do you do when you or your sibling have fever		
Remove his or her cloth and tepid sponge him/her	57	19.8
Keep him when warm with cardigan or blanket	21	7.3
Give him paracetamol only	30	10.4
Give him paracetaml and anti-malaria and tepid sponge	180	62.5

Majority (62.5%) take paracetamol, anti-malaria drugs and tepid sponge when they have fever while a few (7.3%) keep warm with cardigan or blanket.

Table 4: Mode of Transmission of Malaria

Variables	Number of Respondents	Percentage (%)
How do people get infected with malaria?		
From bite of infected mosquito	231	77
From unsanitary living condition or dirty environment or habit	16	5.4
From infected people	15	5.0
From bad air	3	1.0
From eating too much fruits	9	3.0
By cockroach	6	2.0
From too much stress	21	7.0
How do mosquitoes become infected with malaria- causing organism		
Biting an infected person	228	76.8
Biting animals and insects	6	2.0
From germs in dirty water	54	18.2
I do not know	9	3.0

Most people (77%) believe that people get infected by bite from infected mosquito while the least percentage believes infection is from bad air (1%).

Majority (76.8%) are of the opinion that mosquitoes become infected with malaria-causing organism by biting an in infected person.

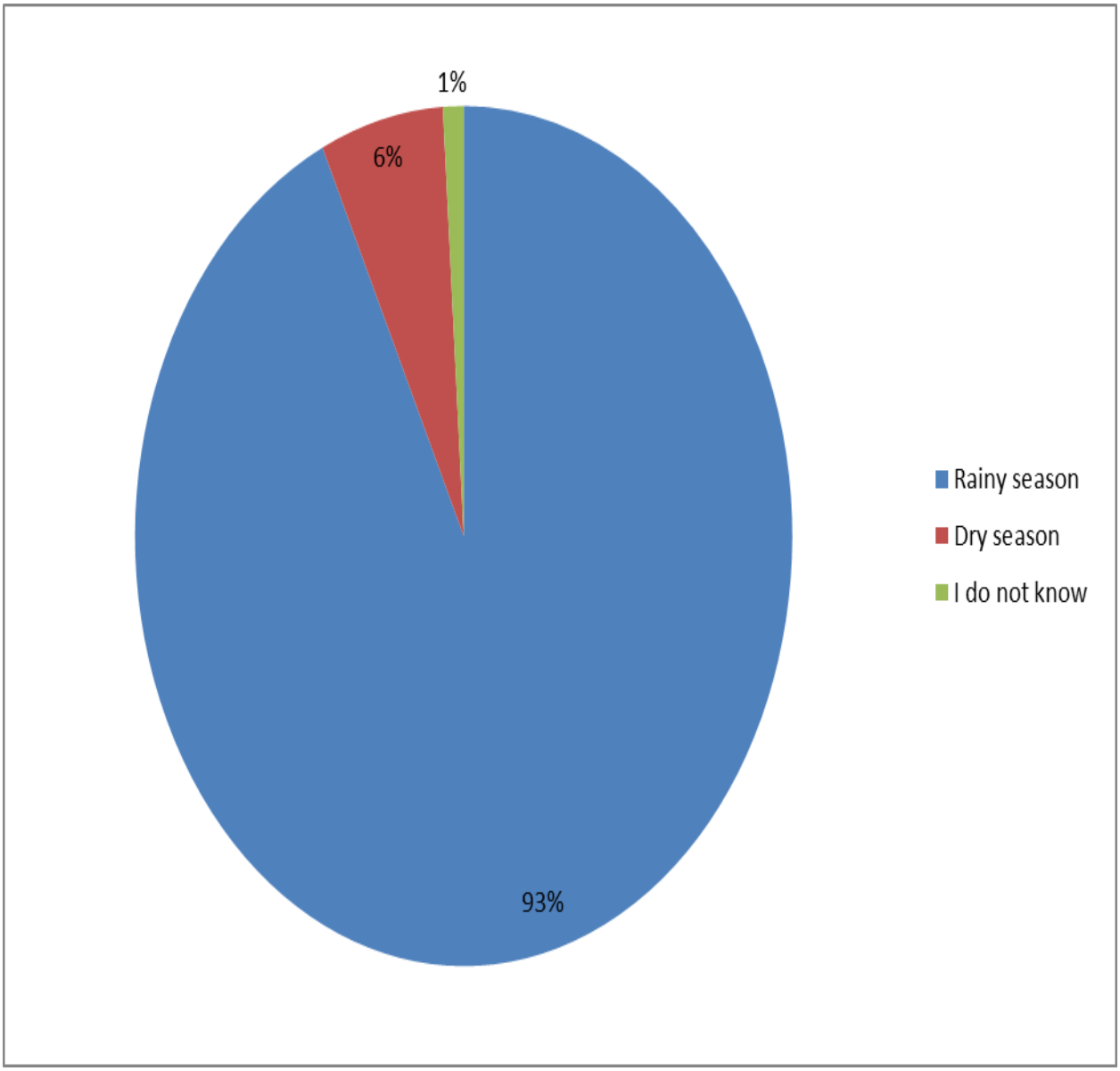

Figure 2. Seasonal Variation of Mosquitoes

From the figure above, mosquitoes are more numerous during the rainy season (92.9%).

Table 5: Breeding Sites of Mosquito

Mosquitoes that cause malaria breed in?	**Number of Respondents**	**Percentage (%)**
Clean or unpolluted open collections of water e.g ponds, swamps	63	22.3
Foul or polluted water such as drains blocked by rubbish or sewage	210	74.5
I do not know	9	3.2

Majority of the respondents (74.5%) believe that mosquitoes breed in foul/polluted water while 22.3% believe they breed in clean or unpolluted open collections of water.

Table 6: Treatment of Malaria by Respondents

Variables	Number of Respondents	Percentage (%)
What anti-malaria drugs do you most commonly use at home		
ACT	174	76.3
Chloroquine	24	10.5
Camoquine	3	1.3
Mefloquine	6	2.6
Fansidar	18	7.9
Herbal preparation or traditional medicine	3	1.3
What is your usual source of these drugs?		
Patent medicine stores	30	10.4
Pharmacy shops	219	76.0
Health centre or private hospital or your clinical	27	9.4
Open market	12	4.2
ACT injection is preferable to ACT tablets because		
It works faster than the tablet	156	62.7
It does not cause nausea and vomiting	36	14.5
It is better than the tablet	15	6.0
I prefer tablet because it works faster	21	8.4
I prefer tablet because I don't like injections	21	8.4

ACT: Artesunate combination therapy

Most (76.3%) commonly use ACT (Artesunate combination therapy) at home as anti-malaria drugs followed by chloroquine. (10.5%)

Seventy-six percent of our respondents purchase their anti-malaria drugs from pharmacy shops (76%).

About sixty-three percent of the respondents prefer ACT injection to ACT tablets because they work faster than the tablets whereas 14.5% prefer injections because it does not cause nausea and vomiting. On the other hand, 8.4% prefer tablets because they do not like injections

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Table 7: Accessibility of Anti-malaria Drugs

Variables	Always (frequency/ percentage)	Often (frequency/ percentage)	Occasionally (frequency/ percentage)	Rarely (frequency/ percentage)	Never (frequency/ percentage)
Are drugs prescribed in your clinic/hospital available for purchase?	132(47.3)	93(33.3)	21(7.5)	21(7.5)	12(4.3)
Do you use traditional medicine to treat malaria?	3(1.0)	12(4.2)	66(22.9)	168(58.3)	39(13.5)

Forty-seven percent of the respondents stated that drugs prescribed in clinic/hospitals are always available for purchase whereas only 4.3% stated that the drugs are never available for purchase. Fifty-eight percent rarely use traditional medicine to treat malaria.

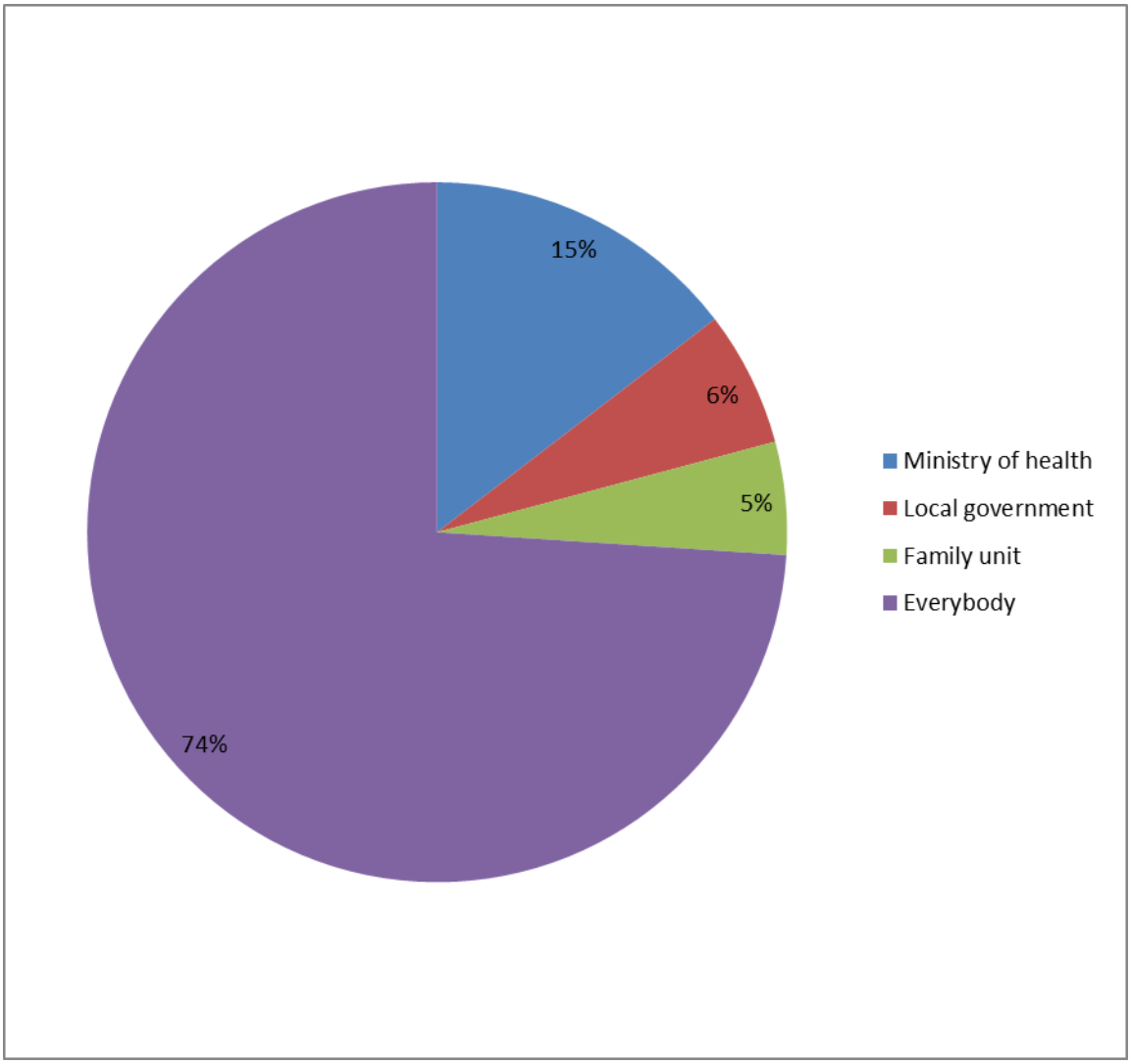

Figure 3: showing who is responsible for the prevention and control of malaria

From the figure above, majority (74%) believes that prevention and control of malaria is the responsibility of everybody.

Table 8: Measures of Eliminating Mosquitoes

Mosquitoes can eliminated by measure like	Frequency	Percentage (%)
Covering pools of water	12	4.2
Draining swamps, marshes, ponds and stagnant water	105	36.5
Cleaning drains, ditches, gutters blocked by rubbish	66	22.9
Clean living habit	84	29.2
Proper waste disposal	18	6.3
I do not know	3	1.0

Most of the respondents believe that mosquitoes can be eliminated by draining swamp, marshes, ponds and stagnant water (36.5%) followed by clean living habit (29.2%) and then cleaning drains, ditches, gutters blocked by rubbish (22.9%).

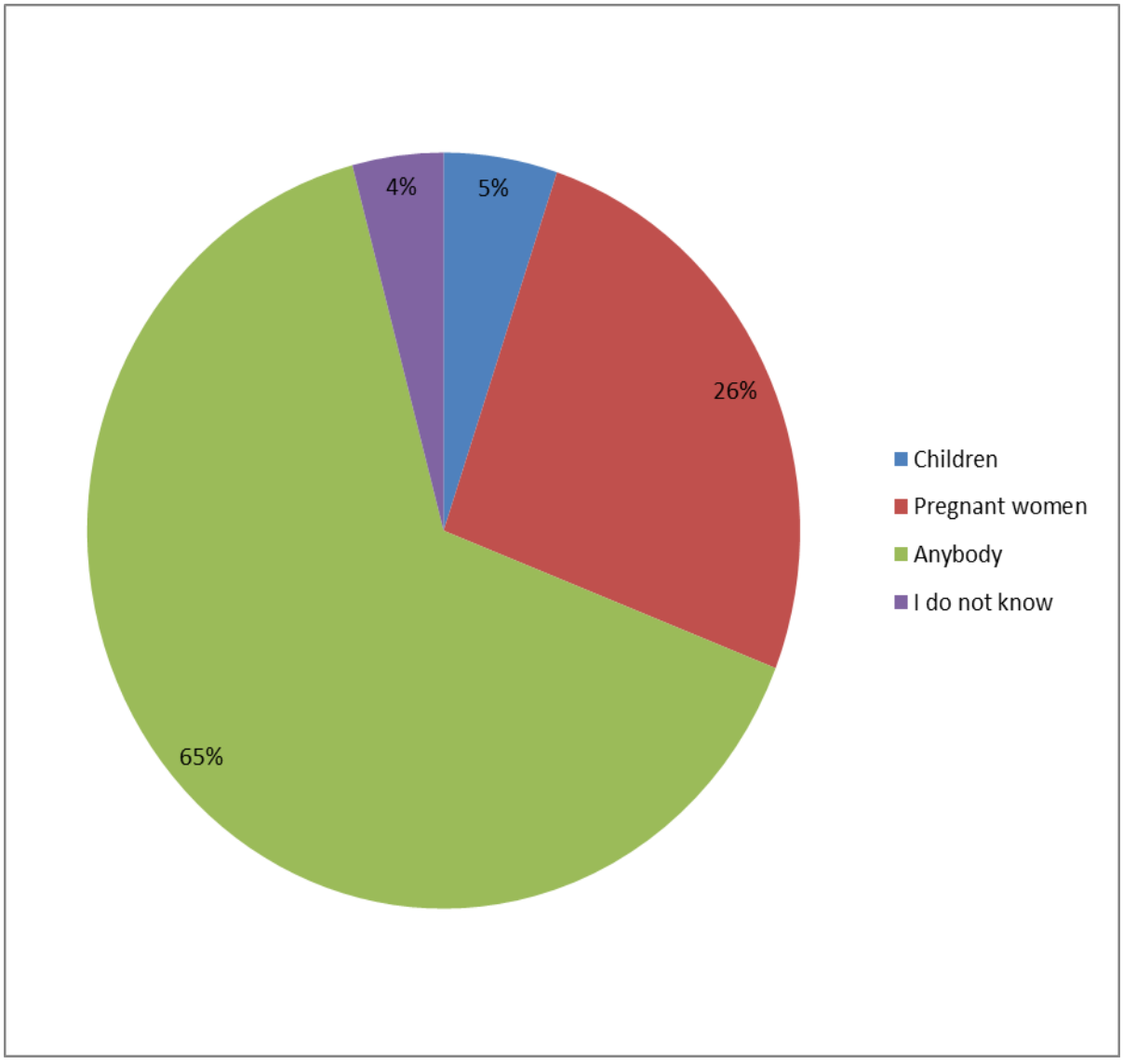

Figure 4: Showing who takes preventive anti malaria drugs

From the figure above, majority (64.9%) believe that preventive anti malaria drugs should be taken by everybody followed by pregnant women (25.8%). Only 4.1% are not aware of those that should take preventive anti malaria drugs.

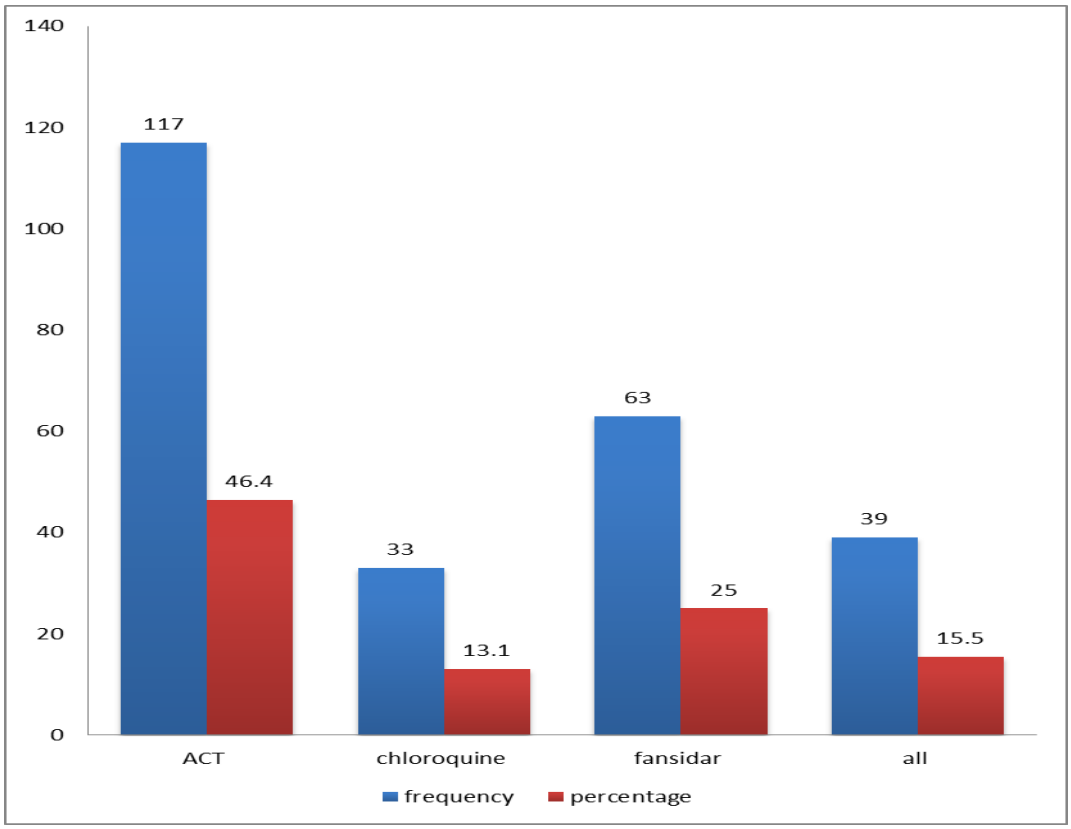

Figure 5: Types of Preventive Anti malaria Drugs.

Majority (46.4%) of the respondents recognize ACT as a type of preventive anti malaria drug followed by fansidar (25%) and then chloroquine (13.1%).

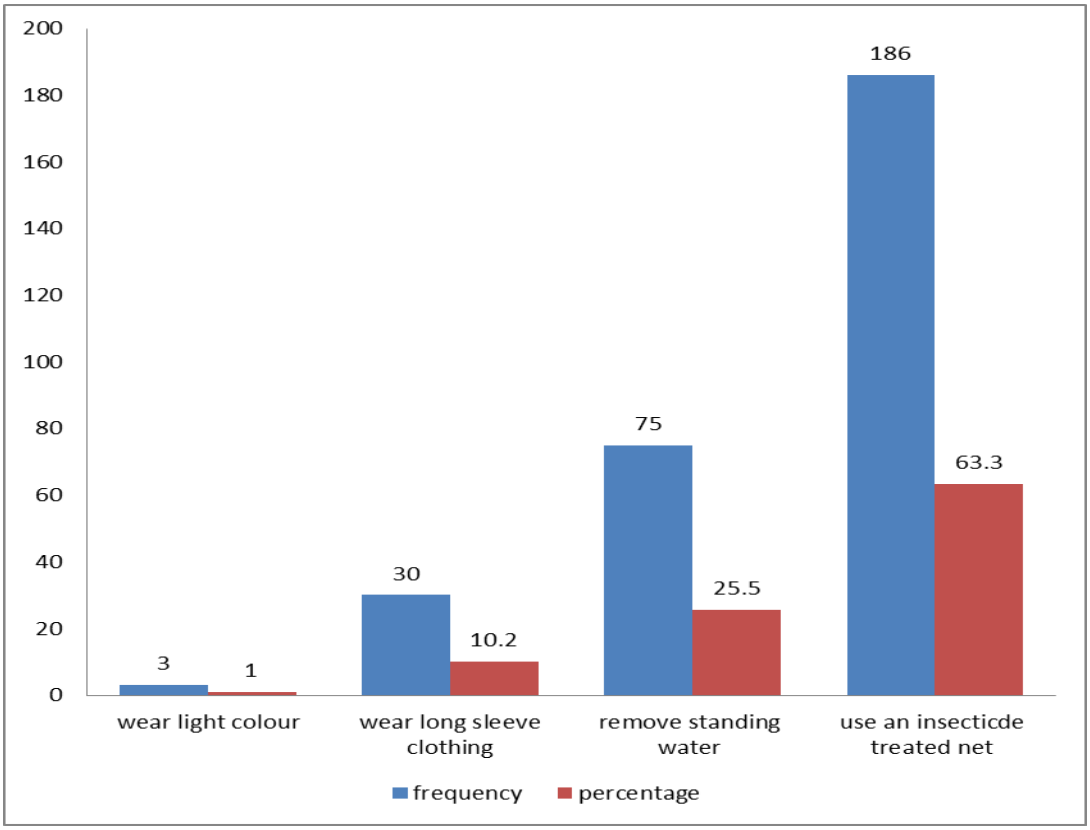

Figure 6: showing ways of preventing mosquito bite

From the figure above, use of an insecticide treated net (63.3%) is the major way of preventing mosquito.

Table 9: Use of Mosquito Nets by Respondents

Variables	Number of Respondents	Percentage (%)
Who uses mosquito nets in your home		
Children 0-1 year	9	3.1
Children 1-5year	27	9.3
Older children	9	3.1
All children	27	9.3
Everybody	189	64.9
Nobody	30	10.3
Do you like using mosquito nets		
Yes	134	44.7
No	164	54.7
If yes why?		
Because it gives me privacy	7	5.2
Because it protects me from mosquitoes	117	87.3
It protects me from cockroach	10	7.5
If no, why?		
Because I cannot afford it	3	1.7
Because it makes me hot	48	26.7
It makes me uncomfortable	111	61.7
It does not protect me from mosquitoes	18	10.0

Sixty-five percent of the respondents believe that everybody uses mosquito net.

There is no much difference between those that like using mosquito nets (44.7%) and those that do not (54.7%).

Eighty-seven percent of those that like using mosquito nets do so because it protects them from mosquito while 61.7% of those that do not like using it do not do so because it makes them uncomfortable.

Table 10: Use of Door and Window Nets by Respondents

Variables	Frequency	Percentage (%)
Are your windows and doors screened with mosquito nets?		
Yes	209	69.7
No	79	26.3
If yes, why?		
Because it gives me privacy	9	4.3
Because it protects me from mosquitoes	175	83.7
It protects me from other insects	25	12.0
If no, why?		
Because I cannot afford it	18	24.3
Because it makes me hot	17	23.0
It makes me uncomfortable	24	32.4
It does not protect me from mosquitoes	15	20.3

Majority of the respondents (69.7%) have their windows and doors screened with mosquito net and 83.7% of these do so because it protects them from mosquito. On the other hand, of the 26.3% that do not have their windows and doors screened with mosquito nets, a good percentage of about 32.4 attributes this to the opinion that it makes them uncomfortable.

Table 11: Use of Insecticide Sprays

Variables	**Frequency**	**Percentage (%)**
Do you use insecticide sprays?		
Yes	243	81.0
No	48	16.0
If Yes, why?		
It kills mosquitoes	240	80.0
If no, why?		
I do not like the odour	33	61.1
It is not safe/good for use	15	27.8
It does not kill much mosquitoes	6	11.1

Majority (81%) use insecticide sprays because it kills mosquitoes (80%).

Table 12: Preference to the Various Forms of Malaria Prevention

Which protection measure would you prefer to use if you could afford it?	**Frequency**	**Percentage (%)**
Mosquito coils and sticks	24	8.5
Mosquito bed nets	93	33.0
Mosquito window nets	84	29.8
Mosquito repellents	30	10.6
Insecticides sprays	51	18.1

A good number (33%) prefer mosquito bed nets if they could afford it followed by mosquito window nets. The least percentage (8.5%) prefers mosquito coils and sticks.

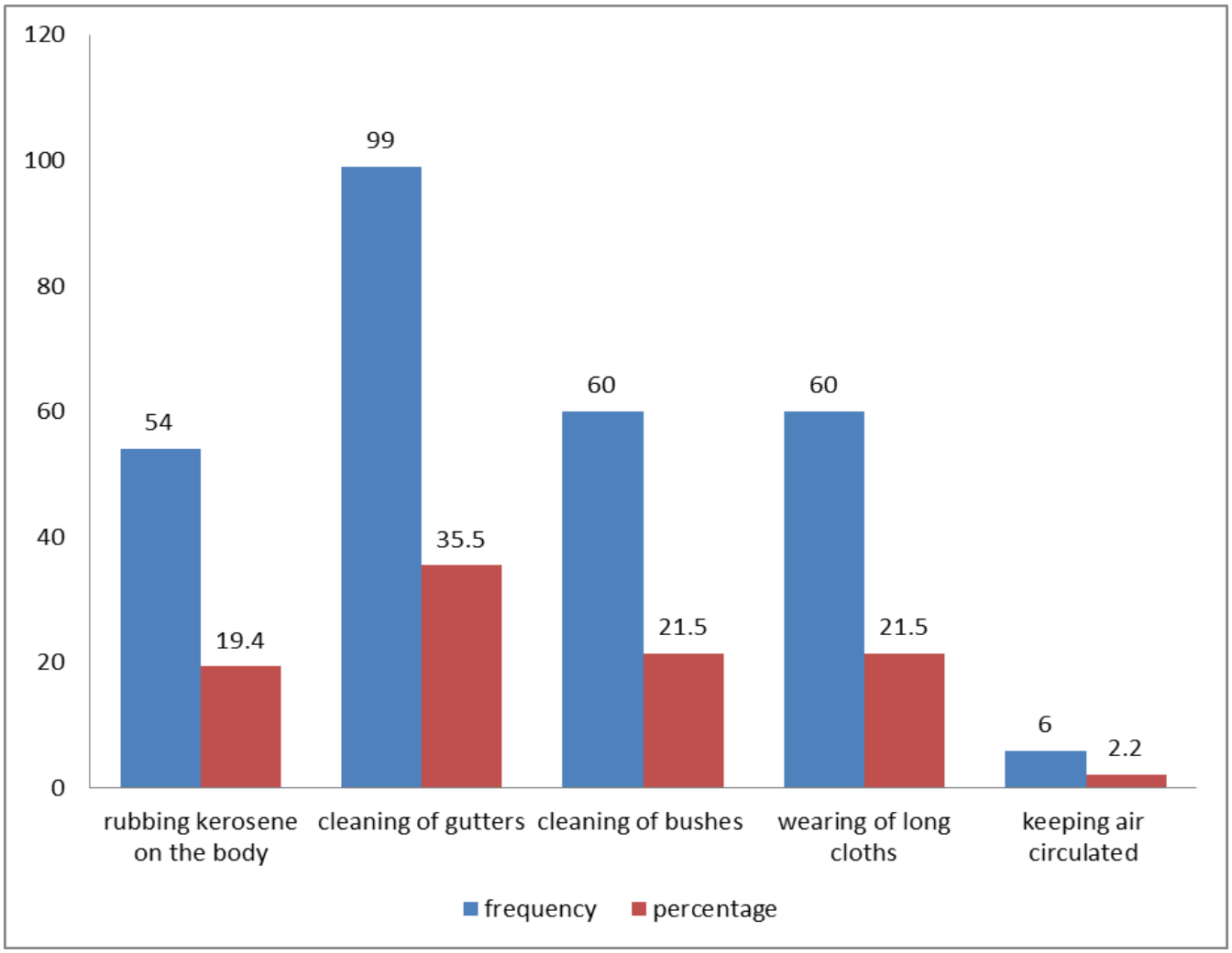

Figure 7: Traditional Methods of Preventing Mosquito Bites

Thirty-six percent of the respondents agreed that cleaning of gutters is the main traditional method of preventing mosquito bite.

Discussion:

Malaria is a life threatening disease caused by parasites that are transmitted to people through the bites of an infected female anopheles mosquito. It is one of the major public health problems in the world, particularly in Sub-Saharan Africa where 90% of the world's malaria occurs[11].

It is an infection by a sporozoa of the Plasmodium genus. Plasmodium was discovered in human blood by Laveran in Algeria in 1880. In 1889, Roland Ross in Calcutta India, worked out the role of mosquitoes in avian malaria (in sparrows) while Giovanni Battista Grassi in Italy discovered the cycle of human malaria and anopheles mosquitoes[12].

Four species of the parasite are known to cause malaria in man. They are: *P.falciparum*, *P.vivax*, *P.ovale* and *P.malariae*. *P.falciparum* is the most prevalent malaria parasite in the African continent. It is responsible for most malaria related deaths globally.

Malaria is essentially a tropical disease. It is found in the region between latitude 60^{o}N and 40^{o}S and is most commonly found throughout Africa[13], thus putting Nigeria in a malaria zone with varying degrees of endemicity extending throughout the country. Malaria is transmitted from one individual to another by the blood feeding of infected female Anopheles mosquitoes.

In the present study on the knowledge, treatment and prevention of malaria by the students of ESUT College of Medicine, there was 100% success rate as 300 respondents filled the questionnaires.

Majority of those who suffer malaria are under-5yr children (42%) and this corresponds with WHO 2016 estimate that children under-5 are particularly exposed to infection (malaria infection) [11].

The most common symptom of malaria is fever (69%) which is similar to that recorded by the National Health Service (NHS) England.[14]

Most of the respondents (81.9%) believe that cerebral malaria is a major complication of malaria, and this is similar to the result of study done by Adasthi S.H and Aggawas S.P (1986)[15].

Majority (62.5%) take paracetamol and anti-malaria drugs and tepid sponge when they have fever. This is in line with the WHO guideline on the treatment of malaria[16].

Most people (77%) get infected with malaria by bites from infected mosquito. This corresponds with that recorded by Leera S and Okere H C in Port Harcourt, Rivers state, Nigeria in the year 2014[12].

Majority (76.5%) believe that mosquitoes become infected with malaria causing organism by biting an infected person. This correlates with the recorded mode of infection as documented in Primary Health Care for Developing Countries by Obionu C.N [17].

Most of the responders believe mosquitoes are more numerous during the rainy season (92.9%) and this corresponds with the study done by Julvez J, Galter and Mouch in the year 1989 [18].

Most (76.3%) commonly use ACT at home as anti-malaria drugs followed by Chloroquine (10.5%). This is similar to the recommended treatment for malaria by WHO [16].

Majority (62.7%) of the respondents felt that ACT injection is preferable to ACT tablets because it works faster than the tablet while 14.5% prefer injection because it does not cause nausea and vomiting. This is in contrast with the WHO recommendation for the treatment of uncomplicated malaria where ACT tablets are rather used than ACT injections[16].

Majority (74%) believes that prevention and control of malaria is the responsibility of everybody and this is in keeping with the article written by Jamieson A in South Africa in the year 2006 [19].

Majority (64.9%) stated that preventive anti-malaria drugs can be taken by everybody, followed by pregnant women (25.8%). This does not fully correlate with the WHO recommendation which recommends that preventive anti malaria drugs should only be taken by special risk groups like pregnant women, children less than 6years of age and non-immune travelers [16].

Majority (46.4%) of the respondents recognized ACT as a type of preventive anti malaria drugs followed by fansider (25%) and chloroquine (13.1). There is a discrepancy between this and WHO's recommendation for chemo prevention of malaria which does not recognize ACT as a chemoprophylactic agent[16].

In addition, the use of insecticide treated nets (63.3%) is the major way of preventing mosquito bite which correlates with the article by Jamieson A.[19]

Also, everyone should be making use of mosquito nets irrespective of age as 64.9% of our respondents believe so, which is also in agreement with the article by Jamieson A[19].

Majority of the respondents (69.7%) have their windows and doors screened with mosquito net because it protects them from mosquitoes (83.7%). This is in keeping with the recommended preventive measures by Jamieson A [19].

Thirty-five percent of the respondents agreed that cleaning of gutters is a major traditional method of preventing mosquito bite. This is true as recorded by Jamieson A[19].

Conclusion:

Our study revealed that majority of the students of ESUT College of Medicine (ESUCOM) was aware of the mode of transmission and the various manifestations of the malaria. It also showed that there is still a high level of self-medication among

the students and therefore a poor health seeking behavior.

Acknowledgements

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Consent for Publication

Not applicable.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no conflicts of interest.

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