

# Knowledge and Practices Regarding Malaria Control and its Treatment among Patients Visiting Outpatient Clinics of Civil Hospital Khairpur

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## Abstract

**Objective:** To assess the knowledge and practices regarding malaria prevention and control among patients visiting tertiary care hospital of Khairpur.

**Methods:** A hospital-based cross-sectional survey was conducted for the period of three months from October 2015 to January 2016. About 138 adult people who were advised Malarial Parasite test on the basis of clinical manifestations were included in the study by using consecutive sampling technique. A semi-structured questionnaire focused on knowledge, attitude and practices regarding Malaria control and its management. Data was entered and analyzed by SPSS version 21. Frequencies and percentages were calculated. Scoring and grading for knowledge and practices was done.

**Results:** Out of 138 participants 55.5% were males and majority were below 40 years of age. Overall 56% of the respondents had adequate knowledge regarding malaria but only 16% had good practices for malaria control and prevention. About 80% of the respondents knew that fever is the major symptom and malaria is transmitted through the mosquito bite, 47% study participants reported that health workers were the major source of information regarding malaria control and its treatment. About 82% of the respondents reported the use of self-medication. Nearly 50% of the study participants were not using any preventive measure for malaria control and prevention.

**Conclusion:** People living in Khairpur and its peripheral areas had good knowledge regarding malaria symptoms and signs and its mode of transmission but knowledge regarding its control and treatment was inadequate. Hence, adequate knowledge and appropriate practices are necessary to strengthen the Malaria Control Program in interior of Sindh. There is urgent need to develop personal skills and community active participation in reducing the burden of malaria.

**Keywords:** Malaria, prevention and control, knowledge.

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## Introduction

Malaria is the leading public health problem across the globe. Approximately 40% of the world's population is at risk of malaria<sup>1</sup>. The disease is re-

sponsible for about one-third of deaths in children less than 5 years of age and one-fifth among pregnant women<sup>2</sup>. Malaria endemics and epidemics are linked to several environmental factors, behavioral patterns of vectors and human populations<sup>3</sup>.

Malaria is endemic in Pakistan, Plasmodium Vivax found to be the most common species which can be transmitted by female Anopheles mosquito<sup>4</sup>. DOT program was launched in Pakistan in 1995, with the efforts of Government of Pakistan and WHO with the goal of reducing the burden of malaria by half by the year 2010 through prompt and effective case management, selective vector control,

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and epidemic management, environmental and personal protection through the use of insecticide treated nets<sup>5</sup>.

In Pakistan, majority of cases are reported from interior of Sindh<sup>6</sup>. A study conducted in Sindh reports 10% smear positive cases<sup>7</sup>. A recent malaria report from Pakistan, published in 2015, evidenced sustained decrease in the number of cases. However, we are unable to achieve the global targets of malaria eradication from the world<sup>8</sup>.

Previous data suggests that malaria predominantly occurs in rural areas due to poor drainage system, poor housing and lack of proper sanitation<sup>9</sup>. Khairpur district is one of the biggest districts of Sindh where malaria epidemic attacks in every rainy season, with highest rate of hospital admissions and under-five mortality due to Malaria epidemics<sup>10</sup>. In this district, mixed population of urban-rural living together who are primarily dependent on the agriculture and livestock. Majority of the population is illiterate or having low educational profile<sup>11</sup>.

Knowledge and practices about transmission, prevention and treatment of malaria are important preceding factors for its control at the national level. Better understanding of the mode of transmission and people perception regarding adoption of preventive measures may have larger impact to fight against malaria. The preventive and control measures vary from community to community and among individual households<sup>12</sup>. Several studies has been conducted worldwide to assess the knowledge and practices regarding malaria control, studies from Ghana and Myanmar reported reasonable knowledge, but attitude and practices were not appropriate to control malaria transmission<sup>13-14</sup>.

Several previous studies have linked socioeconomic and behavioral factors, community perceptions and practices for malaria across the globe<sup>15-16</sup>. To the best of our knowledge, no such study has been carried out in the district of Khairpur. This study would provide evidence based information to strengthen the educational activities conducted by the malaria control program. The current study aimed to determine the knowledge and practices regarding malaria transmission, symptoms, prevention and treatment among patients visiting outpatient clinics of tertiary care hospital, Khairpur.

## Material and Methods

A cross-sectional hospital-based survey was carried out from October 2015 to January 2016. This survey was carried out at outpatient clinics of Medicine department at Civil Hospital, Khairpur, which caters more than 150 patients daily. The approval of the study was taken from the Research Committee of Dow University of Health Sciences. In this study, cohort has been selected from the previously published study titled "Frequency of smear positive malaria cases from Civil Hospital Khairpur<sup>17</sup>", this was the original data which was collected from Civil hospital, Khairpur and further analysis has been performed with different objective to determine the knowledge and practices of the study participants regarding malaria control and prevention. About 138 adult patients ( $\geq 18$  years of age) who were advised Malarial Parasite (MP) test on the basis of their physical and clinical examination, having fever of 101°F with splenomegaly were included in the study after taking written consent by consecutive sampling. Those who did not give consent and had chronic illness like tuberculosis, HIV and any other autoimmune disease were excluded from the study. The sample size was calculated by the WHO sample size calculator by using 10% prevalence of malaria in Pakistan<sup>7</sup> with 95% confidence interval and 5% margin of error. Information regarding socio-demographic characteristics, knowledge, attitude and practices regarding malaria transmission, sign and symptoms, prevention, control, treatment seeking behavior and insecticide treated nets usage and coverage was obtained through pre-designed questionnaire adopted from Pakistan Demographic and Health Survey 2013<sup>18</sup>. Data was entered and analyzed by SPSS version 21. Mean and standard deviation were calculated for quantitative data. Frequencies and percentages were calculated for categorical data. Scoring and grading of responses was done to assess the knowledge and practices regarding malaria. There were ten questions on knowledge of malaria with 26 possible responses and only 15 were correct. One point was given for each correct response and zero point was given for wrong response or I do not know response. A total of 15 maximum attainable scores were used for the assessment of knowledge of malaria. A score 0-8 was graded as inadequate knowledge and score of 9-15 was graded as adequate knowledge. Similarly scoring of practices was also done. There were eight questions regarding practices of malaria with 21 possible responses,

amongst them only 12 were correct. Scoring was done on the similar pattern as mentioned above and maximum attainable score was 12. A score of 0-6 was graded as bad practices and score of 7-12 was graded as good practices for malaria control and prevention and healthcare seeking behavior.

## Results

Table 1 shows that out of 138 participants 76 (55.5%) were males and 62 (44.5 %) were females, with mean age of years 26.78 years ± 3.71 S.D. The response rate was 100%. About 54.3% of study participants were not educated. About 71 (51%) had total monthly household income less than 10000 rupees monthly. About 61 (44%) of the study participants were residing in the peripheral or nearby rural areas of the Khairpur district. About 80% of the study participants were using bore water for drinking.

Table 2 shows the knowledge of the study participants regarding Malaria transmission, sign and symptoms, treatment, prevention and control. About 109 (79%) respondent knew that fever is the major symptom of Malaria, 116 (84%) knew that malaria is transmitted through mosquito bite. Among all, 45 (32.6%) respondents knew that mosquitoes breed in shrubs and bushes, 99 (71.7%) respondents knows that the recurrent cause of malaria in their family is ponds, 65 (47%) of the study participants reported that health workers were the major source of information regarding malaria. About 58% respondents did not know that Malarial Parasite test (MP) is the diagnostic test for Malaria. About 113 (82%) respondents knew that MP test facility was available in the laboratories while rest of the individuals (17%) did not know about it.

Table 3 shows the practices about malaria treatment, control and prevention of the study participants. About 121 (87%) of the study participants go for direct treatment prior to Malaria Parasite test and 114 (82%) reported that they start self-medication when they develop symptoms like malaria. Out of the total, 16 (12%) respondents were using insecticide treated nets, 115 (83%) reported that they had complete compliance with anti-malarial drugs. However 65 (47%) of the respondents reported that they do nothing for the prevention of mosquito bite.

Among all of the participants, 77 (56%) study participants had adequate knowledge regarding malaria transmission, sign and symptoms, control and

prevention, while only 22 (16%) respondents had good practices for malaria control and prevention.

## Discussion

In this study we observed that majority of the patients who were suspected (with clinical manifestation) to have malaria were young people and were living in the rural or sub-urban areas of the District Khairpur and belonged to low socio-economic background. Furthermore, it was found that knowledge regarding malaria transmission and its clinical features was satisfactory but the practices for malaria control and prevention were inappropriate.

Table 1. Socio-demographic characteristics of the study participants (n=138)

Characteristics	Frequency (N=138)	Percentage (%)
<b>Age in years</b>		
18-30 years	69	50
31-40 years	41	29.7
>40 years	28	20.3
<b>Gender</b>		
Male	77	55.8
Female	61	44.2
<b>Marital status</b>		
Single	62	44.9
Married	76	55.1
<b>Educational status</b>		
Illiterate	75	54.3
Primary	33	23.9
Intermediate	17	12.3
Graduation/post-graduation	13	9.5
<b>Total household income in Rs.</b>		
<10,000	71	51.4
10,000-20,000	49	35.5
21,000-35,000	18	13.1
<b>Area of residence</b>		
Khairpur city	61	44.2
Luqman	7	5.1
Rural area	61	44.2
Outside Khairpur	9	6.5
<b>Source of drinking water</b>		
Bore	113	90
Water supply	22	16.1
Unsafe open water	3	2.1
<b>Type of water</b>		
Boiled	3	2.2
Unboiled	135	97.8

Table 2. Frequency distribution of knowledge regarding malaria among study participants

Questions	Frequency (N=138)	Percentage (%)
<b>Do you know that fever is the major symptom of malaria?</b>		
Yes	109	79
No	29	21
<b>Do you know any other symptoms of malaria?</b>		
Pain	15	10.9
Body ache/chills	62	44.9
Feel mosquito attack	61	44.2
<b>Do you know that malaria is transmitted by mosquito bite?</b>		
Yes	116	84.1
No	22	15.9
<b>Do you know where does mosquito breed?</b>		
Dirty water	56	40.6
Shrubs and Bushes	45	32.6
Animal feces	37	26.8
<b>Do you know how malaria can be controlled?</b>		
Cleaning ponds	120	87
Fumigation	15	10.8
Do not know	3	2.2
<b>Do you know that malaria can be controlled through insecticide treated nets?</b>		
Yes	90	65
No	48	35
<b>Do you know the cause of recurrent malaria in your family?</b>		
Due to ponds	99	71.7
Improper treatment	36	26.1
Other	3	2.2
<b>What is the source of your information regarding malaria?</b>		
Media	40	29.0
Health workers	65	47.1
Others	33	23.9
<b>Do you know that malaria parasite (MP) test is diagnostic test for malaria?</b>		
Yes	58	42.03
No	80	57.97
<b>Do you know from where you can get MP test done in Khairpur?</b>		
Civil hospital microscopy lab	52	37.68
Other laboratories	63	45.65
Do not know	23	16.66

It was found that majority of the study participants were residing in the peripheral or rural areas of district Khairpur. Similar findings have been reported by the previous literature from Zimbabwe<sup>19</sup> and rural Africa<sup>20</sup>. It is probably due to the fact that people living in rural areas are at high risk of mosquito bite as they sleep in open areas and work in the agricultural fields where they are exposed to mosquitoes and in rural areas the open ponds are also in close vicinity of the residents.

We observed that knowledge regarding clinical manifestations and mode of transmission of malaria was adequate among study participants, majority of the respondents knew that malaria transmitted by the mosquito bite. A study from Nigeria<sup>21</sup> and Western Ethiopia<sup>22</sup> reported similar results. Furthermore the studies from India<sup>23</sup> and Mexico<sup>24</sup> reported awareness levels among individuals up to 93% which is higher than the current study. This ad-

equated level of knowledge could be attributed to positive role of mass media and health education campaigns which are conducted annually during the epidemics.

In this current study we observed that the knowledge regarding preventive measures and vector control was not satisfactory. Majority of the respondents were not aware from insecticide treated nets usage and its availability. Similar findings have been reported by the studies from Iran<sup>25</sup> and Tanzania<sup>26</sup> where people who were well-educated and socioeconomically stable had good knowledge regarding malaria preventive strategies. This may be due to the fact that access to the malaria prevention information differed by educational and socioeconomic background as majority of the participants of our study belonged to low socioeconomic class and educationally deprived.

Table 3. Practices regarding malaria control and prevention among study participants

Questions	Frequency	Percentage
<b>What do you do when someone in family develops malaria?</b>		
Go for MP test	16	11.6
Direct treatment	121	87.7
Nothing	1	0.7
<b>What treatment you take if you develop malaria?</b>		
Self-medication	19	13.8
Anti-malarial drugs prescribed by the physician	114	82.6
Homeopathy treatment	4	2.6
<b>Do you use bed nets regularly for sleeping?</b>		
Yes	30	21.73
No	108	78.26
<b>Do you use insecticide treated nets regularly?</b>		
Yes	16	11.59
No	122	88.41
<b>What do you do if a pregnant female of your family develops symptoms of malaria?</b>		
Go for Malaria test	44	31.9
Do not go for Malaria test	94	68.1
<b>Complete compliance with anti-malarial drug</b>		
Yes	23	16.1
No	115	83.9
<b>What do you do for eliminating breeding places of mosquitoes?</b>		
Cleaning ponds	132	95.7
Fumigation	06	4.3
<b>What do you do for the prevention of malaria?</b>		
Chemoprophylaxis	4	2.89
Bed nets	25	18.14
Indoor sprays	10	7.24
Cover body with clothes	34	24.63
Nothing	65	47.10

Almost all participants reported that they knew regarding the availability of the antimalarial drugs and doctor in the public sector hospital of Khairpur. It is interesting to know although respondents had enough knowledge for the availability of healthcare facilities but majority of them reported use of self-medication. These findings are consistent with the findings of the studies from Kenya<sup>27</sup> and Nigeria<sup>28</sup>. Such gap between the adequate knowledge and inappropriate practices contribute to failure in achieving sustainable control. However there is potential to bring behavioral modification in the community through educational interventions.

Self-medication was the common practice among study participants and few of them were using homeopathic medicines for the treatment. People prefer to go to pharmaceutical shops directly and buy the medicines on the advice of pharmacist. Similar findings have been reported from Uganda<sup>29</sup> and Nigeria<sup>30</sup> where majority of the

people reported self-medication as the first line of management in the form of household remedies and herbal medicines. It has been observed that self-medication delays in seeking the appropriate health care and ultimately reduces the compliance and exacerbates the risk of drug resistance, malaria complications and mortality.

Despite adequate knowledge regarding malaria transmission majority of the respondents believed that the best method of eliminating breeding places of mosquitoes was by cleaning ponds, however, only few respondents reported fumigation or indoor sprays as the preferred method and most of the respondents were not practicing any preventive measures for malaria control and prevention while only few reported the utilization of indoor sprays, ITNs or chemoprophylaxis. Similar findings have been reported by the study from Africa<sup>31</sup>. This negative attitude and inappropriate practices can be attributed to lack of active community participation in health promotional campaigns for the control of malaria.

There were several limitations in the study. Firstly, it was a hospital-based survey so findings of this study cannot be generalized over the entire population of Khairpur. It was a cross sectional survey so temporal association cannot be established secondly the information was gathered through questionnaire so there would be chances of information bias in the study

Despite good knowledge regarding malaria transmission, clinical manifestation and availability of health care facilities, we observed poor attitude and practices regarding malaria prevention and control there is urgent need to educate people regarding the insecticide treated nets availability and its utilization and emphasis should be more towards designing and implementation of effective interventions for healthy and malaria-free state. This study has provided baseline information which will further help in community based surveys and interventional studies. Further large community-based studies of malaria and its vector in interior Sindh are recommended to develop the health promotion campaigns for community to eliminate malaria.

## Conclusion

Malaria is endemic in the district of Khairpur. People had adequate knowledge but inappropriate practices regarding malaria control. Thus behavioral change and adoption of the preventive strategies must be promoted to fill the gap between knowledge and practices. Hence adequate knowledge and appropriate practices are necessary to strengthen the Malaria Control Program in interior of Sindh. There is urgent need to develop personal skills and community active participation in reducing the burden of malaria.

## Conflict of Interest

Authors have no conflict of interests and no grant/ funding from any organization for this study.

## References

- Murray CJ, Rosenfeld LC, Lim SS, Andrews KG, Foreman KJ, Haring D, et al. Global malaria mortality between 1980 and 2010: a systematic analysis. *Lancet* 2012;379:413-31.
- Crawley J. Reducing the burden of anemia in infants and young children in malaria-endemic countries of Africa: from evidence to action. *Am J Trop Med Hyg* 2004;71:25-34.
- Bamaga OA, Mahdy MA, Mahmud R, Lim YA. Malaria in Hadhramout, a southeast province of Yemen: prevalence, risk factors, knowledge, attitude and practices (KAPs). *Parasit Vectors* 2014;7:351.
- Khattak AA, Venkatesan M, Nadeem MF, Satti HS, Yaqoob A, Strauss K, et al. Prevalence and distribution of human Plasmodium infection in Pakistan. *Malar J* 2013;12:297.
- Directorate of Malaria Control Pakistan. Malaria Control Program Pakistan (2015-2020) [Internet]. World Health Organization; 2014. Available from: <http://dmc.gov.pk/documents/pdfs/1National%20Malaria-Strategic%20Plan-Pakistan.pdf>. Accessed in January, 2016.
- Nizamani A, Kalar N, Khushk I. Burden of malaria in Sindh, Pakistan: a two years surveillance report [Internet]. *JLUMHS* 2006;5:76-83. Available from: <http://www.lumhs.edu.pk/jlumhs/Vol05No02/pdfs/v5n2oa07.pdf>. Accessed in January, 2016.
- Murtaza G, Memon IA, Memon AR, Lal MN, Kallar NA. Malaria morbidity in Sindh and the Plasmodium species distribution [Internet]. *Pak J Med Sci* 2009;25:646-9. Available from: <http://www.pjms.com.pk/issues/julsep09/article/article23.html>. Accessed in January, 2016.
- Khan AR, Khan N, Khan H. Frequency of slide positivity in clinically suspected malaria cases [Internet]. *Gomal J Med Sci* 2014;12:118-20. Available from: <http://www.gjms.com.pk/ojs2x/index.php/gjms/article/view/1067/645>. Accessed in January, 2016.
- World Health Organization. Malaria eradication back on the Table [Internet] Geneva: World Health Organization; 2013. Available from: <http://www.who.int/bulletin/volumes/86/2/07-050633/en/>. Accessed in September, 2015.
- Tang S, Ji L, Hu T, Wang R, Fu H, Shao T, et al. Public awareness of malaria in the middle stage of national malaria elimination programme. A cross-sectional survey in rural areas of malaria-endemic counties, China. *Malar J* 2016;15:373.
- Ghanchi NK, Shakoor S, Thaver AM, Khan MS, Janjua A, Beg MA. Current situation and challenges in implementing Malaria control strategies in Pakistan. *Crit Rev Microbiol* 2016;42:588-93.
- Ahmed S. Economic and Social Change in Khairpur (1947-1980). Royal Holloway University of London; 2012. Available from: [http://pure.rhul.ac.uk/portal/files/8843656/2012\\_Ahmeds\\_phd.pdf](http://pure.rhul.ac.uk/portal/files/8843656/2012_Ahmeds_phd.pdf). Accessed on November 10, 2016.
- Adongo PB, Kirkwood B, Kendall C. How local community knowledge about malaria affects insecticide-treated net use in northern Ghana. *Trop Med Int Health* 2005;10:366-78.
- Hlaing T, Wai KT, Oo T, Sint N, Min T, Myar S, et al. Mobility dynamics of migrant workers and their socio-behavioral parameters related to malaria in Tier II, Artemisinin Resistance Containment Zone, Myanmar. *BMC Public Health* 2015;15:886.

15. Sharma RK, Singh MP, Saha KB, Bharti PK, Jain V, Singh PP, et al. Socio-economic & household risk factors of malaria in tribal areas of Madhya Pradesh, central India. *Indian J Med Res* 2015;141:567.
16. Dlamini SV, Liao CW, Dlamini ZH, Siphepho JS, Cheng PC, Chuang TW, et al. Knowledge of human social and behavioral factors essential for the success of community malaria control intervention programs: The case of Lomahasha in Swaziland. *J Microbiol Immunol Infect* 2015;s11684-1182:749-5.
17. Imtiaz F, Nisar N, Shafi K, Nawab F. Frequency of smear positive malaria and socio-demographics factors of patients visiting the microscopy centre of a tertiary care civil hospital Khairpur. *Annals Abbasi Shaheed Hospital and Karachi Medical and Dental College* 2016;21:154-9.
18. National Institute of Population Studies [Pakistan] and ICF International. Pakistan 2013-13 Demographic and Health Survey Key Findings. Calverton: National Institute of Population Studies and ICF International. Available from: [http://www.nips.org.pk/abstract\\_files/PDHS%20Key%20Findings%20FINAL%201.24.14.pdf](http://www.nips.org.pk/abstract_files/PDHS%20Key%20Findings%20FINAL%201.24.14.pdf) Accessed on October 2016.
19. Midzi N, Mtapuri-Zinyowera S, Mapingure MP, Paul NH, Sangweme D, Hlerema G, et al. Knowledge attitudes and practices of grade three primary school children in relation to schistosomiasis, soil transmitted helminthiasis and malaria in Zimbabwe. *BMC Infect Dis* 2011;11:169.
20. Huho B, Briët O, Seyoum A, Sikaala C, Bayoh N, Gimnig J, et al. Consistently high estimates for the proportion of human exposure to malaria vector populations occurring indoors in rural Africa. *Int J Epidemiol* 2013;42:235-47.
21. Iwueze MO, Ezugbo-Nwobi IK, Umeanaeto PU, Egbuche CM, Anaso CI. Knowledge, attitude and management practices on malaria: A case study of Amansea, Awka North Local Government Area of Anambra State, Nigeria [Internet]. *Bioscientist* 2013;1:32-8. Available from: [http://www.bioscientistjournal.com/publication/first\\_publication\\_Jun\\_2013/Knowledge,%20Attitude%20and%20Management%20Practices%20on%20Malaria%20A%20Case%20Study%20of%20Amansea,%20Awka%20North%20Local%20Government%20Area%20of%20Anambra%20State,%20Nigeria.pdf](http://www.bioscientistjournal.com/publication/first_publication_Jun_2013/Knowledge,%20Attitude%20and%20Management%20Practices%20on%20Malaria%20A%20Case%20Study%20of%20Amansea,%20Awka%20North%20Local%20Government%20Area%20of%20Anambra%20State,%20Nigeria.pdf). Accessed in January, 2016.
22. Abate A, Degarege A, Erko B. Community knowledge, attitude and practice about malaria in a low endemic setting of Shewa Robit Town, northeastern Ethiopia. *BMC Public Health* 2013;13:312.
23. Singh RK, Haq S, Dhiman RC. Studies on knowledge, attitude and practices in malaria endemic tribal areas of Bihar and Jharkhand, India [Internet]. *J Trop Dis* 2013;1. Available from: <http://www.esciencecentral.org/journals/studies-on-knowledge-attitude-and-practices-in-malaria-endemic-tribal-areas-of-bihar-and-jharkhand-india-2329-891X.1000110.pdf>. Accessed in January, 2016.
24. Rosecrans K, Cruz-Martin G, King A, Dumonteil E. Opportunities for improved chagas disease vector control based on knowledge, attitudes and practices of communities in the yucatan peninsula, Mexico. *PLoS Negl Trop Dis* 2014;8:2763.
25. Fekri S, Vatandoost H, Daryanavard A, Shahi M, Safari R, Raeisi A, et al. Malaria situation in an endemic area, southeastern Iran. *J Arthropod Borne Dis* 2014;8:82-90.
26. Sambo M, Lembo T, Cleaveland S, Ferguson HM, Sikana L, Simon C, et al. Knowledge, attitudes and practices (KAP) about rabies prevention and control: a community survey in Tanzania. *PLoS Negl Trop Dis* 2014;8:3310.
27. Diggle E, Asgary R, Gore-Langton G, Nahashon E, Mungai J, Harrison R, et al. Perceptions of malaria and acceptance of rapid diagnostic tests and related treatment practises among community members and health care providers in Greater Garissa, North Eastern Province, Kenya. *Malar J* 2014;13:502.
28. Afolaranmi TO, Hassan ZI, Amaike C, Miner CA, Oyebode T. Effect of health education on knowledge of malaria and long lasting insecticide-treated nets among clients accessing care in the out-patient Department of a Secondary Health Facility in Plateau State, Nigeria [Internet]. *J Med Trop* 2015;17:65-70. Available from: <http://www.jmedtropics.org/article.asp?issn=2276-7096;year=2015;volume=17;issue=2;spage=65;epage=70;aulast=Afolaranmi>. Accessed in January, 2016.
29. NabyongaOrem J, Mugisha F, Okui AP, Musango L, Kirigia JM. Health care seeking patterns and determinants of out-of-pocket expenditure for malaria for the children under-five in Uganda. *Malar J* 2013;12:175.
30. Millar KR, McCutcheon J, Coakley EH, Brieger W, Ibrahim MA, Mohammed Z, et al. Patterns and predictors of malaria care-seeking, diagnostic testing, and artemisinin-based combination therapy for children under five with fever in Northern Nigeria: a cross-sectional study. *Malar J* 2014;13:447.
31. Mbago T. Factors associated with utilization of insecticide treated nets among pregnant women in northern regions of Namibia. University of the Witwatersrand; 2014. Available from: <http://wiredspace.wits.ac.za/bitstream/handle/10539/15422/Final%20Submission%20Research%20Report%20Feb%202014.pdf> sequence=1&isAllowed=y. Accessed in January, 2016.