

**DEMOGRAPHIC AND SOCIOECONOMIC FACTORS INFLUENCING ITNS USE
AMONG THE JAGGERY AND TEA WORKERS IN THE PREVENTION OF MALARIA
IN SOUTH MUGIRANGO SUB COUNTY, KISII COUNTY, KENYA**

^{1*}Masta Ondara Omwono, ²Justus O. S. Osero and ³Taratisio Ndwiga

¹Department of Public Health, Moi University, P.O. Box 3900-30100, Eldoret, Kenya.

²Department of Community Health and Epidemiology Kenyatta University, P.O. Box 43844-00100 Nairobi, Kenya.

³Department of public Health, Masinde Muliro University of Science and Technology, P.O. Box 190-50100 Kakamega, Kenya.

Received date: 01 November 2020

Revised date: 22 November 2020

Accepted date: 13 December 2020

*Corresponding author: Masta Ondara Omwono

Department of Public Health, Moi University, P.O. Box 3900-30100, Eldoret, Kenya.

ABSTRACT

Background; This study interviewed about 209 respondents working at the Jaggery and Tea farms. More than half of respondents under study were at risk of contracting malaria infection due to the demographic and socioeconomic factors influencing ITNs use. Published literature on demographic and socioeconomic factors that influence ITNs use among the Jaggery and tea workers in South Mugirango Sub County, Kisii County, Kenya is limited. **Purpose;** This study aims to establish the demographic and socio-economic factors influencing ITNs use among the Jaggery and tea workers. **Methods;** A descriptive cross sectional study design was used and South Mugirango was purposively selected. The study systematically and randomly selected and interviewed 209 Jaggery and tea workers on demographic and socioeconomic factors influencing ITNs use. Qualitative methods were used to investigate their demographic and socioeconomic factors on use of ITNs. Data was collected using structured questionnaire, focused group discussion and key informants interviews to obtain views. **Results;** A total of 209 Jaggery and tea workers were selected and interviewed; 116 (56%) males and 93 (44%) female. Over 100% of non users of ITNs were male aged between 18-28 years and singles with no formal education. Also 64.7% by occupation were tea workers and among the non users of ITNs who were found using them as tea carrying baskets. About 94.1% of non users lived in grass thatched houses this led to low level of ITNs use due to their low level of income. Education and gender were found to be positively related with ITNs use ($P < 0.001$) respectively. Accessibility, cost and house structure were significantly related with ITNs use. **Conclusion and recommendations;** the study concludes that demographic and socioeconomic factors influence use of ITNs among the Jaggery and Tea workers. Therefore, the study recommends; (a) Policy review on housing so that the government can give subsidies to low income earners to improve their living conditions within their communities. (b) Education as one of the socio pillar should be enhanced as this will impart knowledge to improve ITNs use among the Jaggery and Tea workers of various age groups with emphasis on proper use.

KEYWORDS: Demographic, cost, House Structure, Insecticide Treated Nets, Infection, Malaria, Risk.

INTRODUCTION

Globally and in Tropical Africa, malaria is the leading cause of morbidity and mortality with at least 90 percent deaths (UNICEF, 2009). Sub-Saharan Africa experiences more than three quarters of malaria deaths yearly. It is estimated that there were about 207 million cases of malaria with 627000 deaths in the year 2013 alone (WHO, 2013). Therefore, malaria continues to be a significant cause of morbidity and mortality among adults living in malaria endemic areas.

Some people develop a level of partial immunity to malaria as a result of repeated exposures. This naturally acquired partial immunity involves both cellular immune and humoral responses and appears protective against symptomatic disease, but not against malaria infection (WHO, 2008).

Almost one and half decades ago, about half of the African countries started scaling up free of charge and highly subsidized provision of mosquito nets due to

waived taxes and tariffs on netting materials and insecticides. As a result, there has been a substantial increase in mosquito net coverage in African countries (UNICEF, 2009).

In Kenya, malaria accounts for 25-40 percent of all outpatient visits at health care facilities. Up to 20 percent of all hospital admissions and 15 percent of in-patient deaths are due to malaria. About 30-40 percent of all fevers seen in health centers in Africa are due to malaria with huge seasonal variability between rainy and dry seasons. At the end of the rainy season, it is less than 10 percent and more than 80 percent as the rainy season winds up.

Therefore, on its part, Kenya Vision 2030 includes among its health sector objectives the intention to reduce the proportion of inpatient malaria fatality to 3 percent by ITNs as one of the most effective tools on malaria prevention (Republic of Kenya, 2010). Consistent use of ITNs can reduce malaria transmission by up to 90 percent (Gimning *et al.*; 2008) and overt as much as 44 percent of all causes mortality (Lengeler, 2010).

METHODOLOGY

The researcher employed descriptive cross sectional study design whereby both qualitative and quantitative data was collected. The study area was in South Mugirango Sub County, Kisii County Kenya which was purposively selected.

A total of 209 both male and female Jaggery and Tea workers were interviewed on the use of ITNs. Ten investigators were hired and administered the questionnaire to investigate how demographic and socioeconomic factors influenced the ITNs use among the group understudy. The same questionnaire were pretested by the ten research assistants with observation checklist.

The 14.5% prevalence of malaria in the study area among the in-patient and out -patient from Kisii Referral Hospital was used to determine the sample size.

The study participants were selected using systematic sampling from a list of sugar cane growers (Jaggery) and tea workers. The desired sample size of 209 Jaggery and Tea workers was obtained by the predetermined intervals from both lists.

The Jaggery and Tea workers aged 18-49 years were interviewed while those one below and above the age bracket and none response were excluded.

Quantitative data was collected by use of the interviewer administered structured questionnaire while qualitative data was obtained by use of interview schedule from Focused Group Discussion. Key Informants interviews were conducted and this included Jaggery and Tea field officers, Public Health Officers and an Administration

Officer In-Charge of the Sub County and Village Heads. The questionnaire sought the information on how demographic and socioeconomic factors influenced ITNs use in the prevention of malaria among the Jaggery and Tea workers.

The respondents data was cleaned and coded before being analyzed using SPSS Version 20 with 95% CI and statistical level of significance set at 5% ($P < 0.05$). Descriptive statistical test (means and standard deviation) were used. Chi-Square was used to determine the relationship between the variables understudy.

Ethical clearance was sought from Kenyatta University ethics research committee and research permit from National Commission for Science and Technology and Innovation (NACOSTI) prior to the commencement of the study. Informed consent and confidentiality was assured throughout the study.

RESULTS

In determining the demographic and socioeconomic factors influencing ITNs use among the Jaggery and tea workers in the prevention of malaria in South Mugirango sub county, Kisii, Kenya. A total of 209 Jaggery and Tea workers consented to be interviewed and their data was the analyzed as can be seen in (*Table.1*) below.

3.1 Gender of the Jaggery and Tea workers

In terms of gender it was found out that there were more males 116 (56%) than female workers 93 (44%) in both the Jaggery and Tea industry as also can be seen from demographic and socioeconomic characteristics in (*Table1*) below.

3.2 Age of the Jaggery and Tea workers

The average age of the Jaggery and Tea workers respondents was 34years. Their age ranged between 18years and 50 years. Most of the Jaggery and Tea workers were between the ages 29-39 years at 85 (41%) while those aged between 18-28years were 69 (33%) with 55 (26%) aged between 40-49 years as can be seen from demographic and socioeconomic characteristics in (*Table 1*) below.

3.3 Marital status of the Jaggery and Tea workers

From the demographic and socio economic characteristics, 95 (45%) were married with 42 (20%) being single while 29(14%) were divorced with 23 (11%) being widowed. A bout 11(5%) had no response as well as 9 (4%) were living together in their residence without any formal arrangement.

3.4 Level of education of the Jaggery and Tea workers

On level of education, 88(42%) percent had secondary education while 62(30%) had college education. About 29 (14%) had primary level education. 16(7%) had vocational training, with 14(7%) without education at all as can be seen from demographic and socioeconomic characteristics (*Table 1*) below.

3.5 Occupation of the Jaggery and Tea workers

About 116 (56%) percent were tea workers by occupation while 87 (42%) percent were working in the Jaggery industry with 6 (2%) percent did small scale work.

3.6 Income of the Jaggery and Tea workers

About 12.4% percent earned less than Shs 2,500 while 13.4% percent earned Shs 2,600-5,100. 30.6% percent earned between Shs 5,200 -7,700, while (62)29.7% percent earned also Shs7800-10300, 19 (9%) percent earned Shs10,400-12,900, with a few 10 (4.9%) earned.

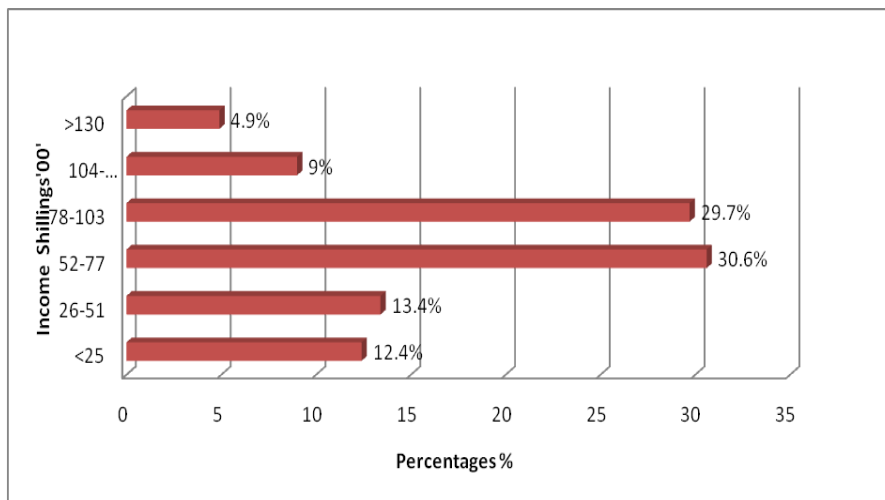


Figure 1: Income shillings'00' of the Jaggery and Tea worker.

3.7 Demographic factors among the Jaggery and Tea worker versus use of ITNs

Table 1: Demographic and use ITNs.

Demographic Variables	Use of ITNs	None use of ITNs	Chi-square P<values
	Yes n (%)	No n(%)	
Gender			<0.001
Male	99(51.6%)	17(100%)	
Female	93(48.4%)	0(0.0%)	
Age			0.130
18-28	52(27.1%)	17(100%)	
29-39	85(44.3%)	0(0.0%)	
40-50	55(28.6%)	0(0.0%)	
Marital status			0.362
Single	25(13%)	17(100%)	
Married	95(49.5%)	0(0.0%)	
Widowed	23(12.0%)	0(0.0%)	
Divorced	29(15.9%)	0(0.0%)	
Living together/ without formal arrangement	9(4.7%)	0(0.0%)	
No response	11(5.7%)	0(0.0%)	
Education			<0.001
No Formal Education	0(0.0%)	14(82.4%)	
Primary level	26(13.5%)	3(17.6%)	
Secondary level	88(45.5%)	0(0.0%)	
College level	62(32.3%)	0(0.0%)	
Vocational training level	16(8.3%)	0(0.0%)	
Occupation			
Jaggery worker	87(45.3%)	0(0.0%)	
Tea worker	105(54.7%)	11(64.7%)	
Others (occupation)	0(0.0%)	6(35.3%)	

The above demographics and use of ITNs (*Table 1*) shows that (51.6%) percent of gender were male, while (48.4%) percent were female. Among the non- users of

ITNs from the group (100%) were found to be male and by use of checklist had none in their households.

Those respondents between 29-39 years were (44.3%) percent and were user of ITNs, while (45.5%) percent had attained secondary level education. About (45.3%)

percent were Jaggery workers by occupation with a few (35.3%) percent practiced other occupation.

3.8 Economic factors among the Jaggery and Tea workers versus use of ITNs

Table 2: Economic factors versus use of ITNs.

Economic Variables	Use of ITNs	Not using an ITNs	P-Value
Economic factors	Yes (n) (%)	No (n) (%)	
Cost			0.010
High cost of ITNs	144(75.0%)	17(100.0%)	
Low cost of ITNs	48(25.0%)	0(0.0%)	
(ii) Accessibility			<0.001
Yes (did access)	192(100%)	0(0.0%)	
No (didn't access)	0(0.0%)	17(100%)	
Structure of the house			<0.001
Grass thatched house	8(4.2%)	16(94.1%)	
Mud house	58(30.2%)	1(5.90%)	
Semi-permanent house	79(41.1%)	0(0.0%)	
Permanent house	47(24.5%)	0(0.0%)	
Number of rooms			0.520
One room	31(16.1%)	12(70.6%)	
Two rooms	64(34.9%)	4(23.5%)	
Three rooms	45(23.4%)	1(5.9%)	
Four rooms	29(15.1%)	0(0.0%)	
More than four rooms	20(10.4%)	0(0.0%)	

From the above Table2 on economic factors among the users of ITNs (75%) percent that the cost was high while over 100% of users said that they did access the ITNs though the cost was as well high. About 41.1 %percent

lived in semi permanent house structures. Only 34.9% percent were living in two roomed house with 10.4% had house structures which had more than four rooms.

Table 3: Perceived beliefs and how malaria is transmitted.

Perceived beliefs and how malaria is transmitted	Responses	N	Percentages %
(unprompted) causes of malaria	Through anopheles mosquito	108	53.0
	By dirty environment	26	14.0
	Through stagnant water	34	17.2
	By eating sugar cane	14	10.3
	Being rained on	26	13.1
What are ways of preventing malaria infection?	Through any net	115	56.0
	Through malaria drugs	42	25.0
	Living in clean environment	19	9.2
	Use of ITNs	17	6
	Don't know	9	4.0
Reasons for not sleeping under mosquito bed net	Cause suffocation an breathing problems	66	31.5
	Cause irritation to skin	43	20.5
	Cause dreaming	53	25.3
	No mosquito presence	21	10.3
	Don't have	18	8.6
	Forgot	8	3.6

DISCUSSION

Demographic and socio economic factors were investigated to determine how they influenced ITNs use among the Jaggery and Tea workers in the prevention of malaria in South Mugarango sub county, Kisii, Kenya.

This study found out that there weremore males (56%)percent than females who were (44%)percent.

Most of respondents understudy who were aged between 29-39 years were (41%) percent. On marital status only 45% percent were married and this influenced use of ITNs as they the couple could remind each other to hang

the ITNs before they slept, while 17 (100%) of the singles were found to be non-users of ITNs in this study. Age and marital status were found not to be statistically significant.

On levels of education 42% percent of the respondent had attained secondary education as well as 32.3% percent had also attended college level. This study revealed that literacy play a role as a mechanism of social transformation among the Jaggery and tea workers in relation to the use of ITNs in the prevention of malaria in South Mugarango and this concurred with a study previously documented by (Rashed *et al*; 1999).

The findings showed that (32.3%) who attended college and 16 (8.3%) vocational training were found using ITNs than those with no education at all. However, among all the variables, only education found to influence knowledge the use of ITNs as can be seen in (Table1) above.

Therefore education and occupation were also found to be statistically significant with the $P < 0.001$ and $P < 0.003$ respectively. Most 88 (45.5%) of the Jaggery and tea workers had attained secondary education. On their occupation, it was revealed that 105 (54.5%) were tea workers and users of ITNs.

On income levels this study found out that most of the households accessed income with average of Shillings 103 to sustain their livelihood. Lack of financial resources was frequently mentioned.

"I don't have enough money to buy an ITN" One of the female key informants said. And this was a key barrier to obtaining or ownership net among the low income earners as this let them to prioritize their needs in comparison to ITNs. Gender was found to play a great role and was statistically significant $P < 0.001$ among the ITNs users.

"An ITN is bad as it deplete air in the room." key informant from focused group discussion said. This is the reason for not using the ITNs.

This study found that if (Table.2) an ITNs are readily affordable, accessible and available within the house structure then utilization is paramount. Therefore, it was found out that there are other factors within the household that could influence or deter the use of ITNs such as high cost, lack of access, house structure and the number of rooms. Therefore, this study found out that enabling factors within the community, such as economic empowerment; access and availability determined ITNs use the households.

This study therefore, concurs (Mac Cormack *et al*; 1989) which reported that households with low income would not consider purchasing any health items at the expense

of the basic needs hence the reasons why some household (Table 2) 17(8.1%) had none.

From this study (Table 2) it was revealed that house structure will always determine the ITNs use. House structure was found to be statistically significant with ITNs use with $P < 0.001$ (41.1%) percent lived in semi-permanent structures.

The majority 70.6% of non ITNs users lived in one room and grass thatched as these were related to their level of income. It was found out that both pregnant Jaggery and tea workers in the household were given preferences to sleep under the mosquito net. This showed that there is a relationship of mosquito nets ownership in the household and malaria episodes among those who had less than two as a result of disruption of sleeping arrangements especially when they had visitors.

The findings revealed a low likelihood of the Jaggery and tea workers on use of ITNs in the prevention of malaria and this concurred with (Somi MF, *et al*; 2007) who found a dual causation link between malaria socioeconomic in rural Tanzania.

Although the awareness level has improved over time, studies by (Osero *et al*, 2005) and (Adeneye *et al.*, 2007) have shown that a lot of factors militate against actual ownership and correct use of ITNs. This study found out that the number of rooms were not statistically significant $P < 0.521$ with the ITNs use.

CONCLUSION

This study concludes that there was a relationship between the demographic and socio-economic factors and ITNs use among the Jaggery and tea workers in terms of gender, education, housing and accessibility with the $P < 0.001$ respectively. Therefore, low levels of ITNs use were attributed by the demographic and socio economic characteristics among the Jaggery and tea workers in the prevention of malaria.

Recommendation for further study

A study on policy reviews on housing so that the government can give subsidies to low income earners to improve their living conditions and emphasis on proper use of ITNs.

ACKNOWLEDGEMENT

Firstly we thank the almighty God for the care during the development of this work. Our gratitude to all participants in South Mugarango Sub county Kisii County Kenya and lecturers in Department of community Health and Epidemiology Kenyatta University in ensuring publication of this work and all who ensured success in this work.

REFERENCES

1. Adedotun A. A., Salawu O. T., Morenikeji, O. A and Odaibo A. B: Plasmodial infection and hematological parameters in febrile patients in a hospital in Oyo town South Western Nigeria, 2012.
2. Africa Health: Malaria in complex emergencies, 2008; 22: 6. United Kingdom.
3. AL Adhroey, Nor ZM, AL Mekhlafi HM, Mahud R Malar J 2010 Effects of malaria in communities. MAY 24, 9 137. doi: -1186/1475-2875-9-137.
4. Alaii J, Hawley W, Kolczak M, TerKuile F, Gimnig J, Vulule J, Odhacha A, Oloo A, Nahlen B, Phillips-Howard P: Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya. *Am J Trop Med Hyg*, 2003; 68: 137-141. PubMedGoogle Sc
5. Andersen, R. A. (1968). Behavioral Model of Families' Use of Health Services. Chicago, IL: Center for Health Administration Studies, University of Chicago.
6. Armstrong, J., Minja, H., & Mponda, H. Retreatment of mosquito nets with insecticides *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 2002; 96: 368-369.
7. Bauch JA, GU JJ, Msellem M, Mårtensson A, Ali AS, Gosling, R, Baltzell KA: Perception of malaria risk in a setting of reduced malaria transmission: a qualitative study in Zanzibar.
8. Baume C, Marin M: Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia: Are nets being used? Who in the household uses them? *Am J Trop Med Hyg*, 2007; 77: 963- 971.
9. Baume C, Marin M: Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal and Zambia: Are nets being used? Who in the household uses them? *Am J Trop Med Hyg*, 2007; 77: 963-971.
10. Bull World Health Organ, 2002; 80:892-899.WHO, (2003); Scaling up Insecticide treated netting programmes in Africa. WHO/CDC/RBM/2002.43.
11. Chuma JM, Thiede M, Molyneux CS: Rethinking the economic costs of malaria at the household level: evidence from applying a new analytical framework in rural Kenya. *Malaria J.*, 2006; 5: 76. PubMed.
12. Deressa W, Ali A, Hailemariam D. Malaria-related health seeking behavior and challenges for care providers in rural Ethiopia: implications for control. *J Biosoc Sci.*, 2008; 40. <https://doi.org/10.1017/S0021932007002374>. [PubMed] Ref].
13. Erhun et al. Malaria prevention: Knowledge, attitudes and practice in south western Nigeria community, *African journal of biomedical research*, 2005; 8: 25-29. ISSN 1119-5096
14. Ettlting M, McFarland DA, Schultz LJ, Chitsulo L: Economic impact of malaria in Malawian households; *Trop Med Parasitol*, 1994; 45: 74-79.
15. Ettlting M, McFarland DA, Schultz LJ, Chitsulo L: Economic impact of malaria in Malawian households. *Trop Med Parasitol*, 1994; 45: 74-79.
16. Gimnig JE, Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya. *Am J Trop Med Hyg*, 2010; 68(4): 137–141.
17. Guyatt, H. and Ochola, S .Use of bed nets given free to pregnant women in Kenya, 2003; 1549-1550.
18. Koenker HM, Loll D, Rweyemamu D, Ali AS: A good night's sleep and the habit of net use: perceptions of risk and reasons for bed net use in Bukoba and Zanzibar. *Malar J.*, 2013; 12: 203-10. 1186/1475-2875-12-203. PubMed Central View Article Pub Med, Google Scholar.
19. Lengeler, C and Snow, R. From efficacy to effectiveness: insecticide-treated bed nets in Africa. *Bulletin of the World Health Organization*, 2010; 74(3): 325-328.
20. Mac Cormack: Costing the distribution of insecticide-treated nets: a review of the cost and cost-effectiveness studies to provide guidance on standardization of costing methodology, 1989.
21. Macintyre K, Keating J, Okbaldt YB, Zerom M, Sosler S, Ghebremeskel T, Eisele TP: Rolling out insecticide treated nets in Eritrea: examining the determinants of possession and use in malaria zones during the rainy season. *Trop Med Int Health*, 2006; 11: 824-233. 10.1111/j.1365-3156.2006.01637.x.View Article Pub-Med Google Scholar.
22. Macintyre K, Keating J, Okbaldt YB, Zerom M, Sosler S, Ghebremeskel T, Eisele TP: Rolling out insecticide treated nets in Eritrea: examining the determinants of possession and use in malaria zones during the rainy season. *Trop Med Int Health*, 2006; 11: 824-233. 10.1111/j. 1365-3156.2006.01637. x. View ArticlePubMedGoogle Scholar.
23. Malar J., 2013; 12: 75-10. 1186/1475-2875-12-75. PubMed Central View Article Pub Med, S Google Scholar.
24. Michael. T. White, Lesong Conteh, Richard Cibulkis and Azra C Ghani 2011. Costing the distribution of insecticide-treated nets: a review of the cost and cost-effectiveness studies to provide guidance on standardization of costing <https://doi.org/10.1186/1475-1475-10-337>.
25. Nganda RY, Drakeley C, Reyburn HMT. Knowledge of malaria influences the use of insecticide treated nets but not intermittent presumptive treatment by pregnant women in Tanzania. *Malar J.*, 2004; 3: 42. doi: 10.1186/1475-2875-3-42. [PMC free article] [Pub-Med].
26. Onwujekwe O, Hanson K, Fox-Rushby J: Inequalities in the purchase of mosquito nets and willingness to pay for insecticide-treated nets in Nigeria: challenges for malaria control interventions. *Malar J.*, 2004; 3: 6. <http://www.malariajournal.com/content/3/1/6>.PubMed CentralViewArticlePubMedGoogleSchola
27. Oresanya et al; Utilization of Insecticide treated nets by under-five children in Nigeria. Assessing

- progress towards the Abuja targets. Abuja, Nigeria., 2008.
28. Osero, J. S., Otieno, M. F. and Orago, A. S. S. Mother's knowledge of malaria and vector management strategies in Nyamira district, Kenya. *East Afr. Med. J.*, 2006; 83: 507-512.
 29. Pulford J, Hetzel MW, Bryant M, Siba PM, Mueller I: Reported reasons for not using a mosquito net when one is available: SA review of the published literature. *Malar J.*, 2011; 10: 83-10. 1186/1475-2875-10-83.PubMed Central View Article Pub Med Google Scholar.
 30. RBM (2001): Report on specifications for netting material, Geneva, Switzerland. Simon JL, Larson BA, Zusman A, Rosen S: How will the reduction of tariffs and taxes on insecticide treated bed nets affect household purchases?
 31. Republic of Kenya (2012): Households Surveys in Kenya.
 32. Republic of Kenya, Ministry of Health (MOH, 2012). Households Surveys in Kenya.
 33. Rhee, M. and Sissoko, M.: Malaria prevention practices in Mopti region, Mali. *East Afr. Med. J.*, 8 Aug, 2005; 82: 396-402.
 34. Rhee, M. and Sissoko, M.: Malaria prevention practices in Mopti region, Mali. *East Afr. Med. J.*, 8 Aug, 2005; 82: 396-402.
 35. Rowe AK, Rowe SY, Snow A. The burden of malaria mortality among African children in the year 2000. *Int J Epidemiol*, 2006; 35(3): 691–704. doi: 10.1093/ije/dyl027. [PMC free article] [PubMed] [Cross Ref]
 36. Simon K Kariuki et al (2013); Effect of malaria transmission reduction of insecticide-treated bed nets (ITNs) on the genetic diversity of Plasmodium falciparum merozoite surface protein (MSP-1) and circumsporozoite (CSP) in western Kenya.
 37. Somi MF, Butler JR, Vahid F, Njau J, Kachur SP, Abdulla S: Is there evidence for dual causation between malaria and socioeconomic status? Findings from rural Tanzania. *Am J Trop Med Hyg*, 2007; 77: 1020-1027.
 38. Somi MF, Butler JR, Vahid F, Njau JD, Kachur SP, Abdulla S: Economic burden of malaria in rural Tanzania: variations by socio-economic status and season. *Trop Med Int Health*, 2007; 12: 1139-1147.
 39. TerKuile Fo, Terlouw DJ, Kariuki SK, Impact of permethrin treated bed nets on malaria, anemia and growth in infants in an area of intense perennial malaria transmission in Western Kenya. *American Journal of Tropical Medicine and Hygiene*, 2010; 68(4): 68-77.
 40. UNICEF/WHO: World malaria Report RBM, 2005. (2009) Malaria: A major cause of child death and poverty in Africa.
 41. White NJ, Dondorp AM, Faiz A, Mishra S and Hien TT. New global estimates of malaria deaths *Lancet*, 2012; 380: 559-560.
 42. WHO, (2013): Malaria vector control and personal protection: report of a WHO study group, Geneva, (2006) www.who.int/malaria/wmr2008, WHO 2012, *lancet* 2012.
 43. WHO, 2011 WHO, (2011): Malaria vector control and personal protection: report of WHO study group, Geneva, (2011)
 44. WHO: World Malaria Report 2013. 2013, Geneva: World Health Organization Google Scholar.