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Effects of malaria on rural farming household labour supply: the case of Ikenne Local Government, Ogun State, Nigeria

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ABSTRACT

Health capital is affected by several preventable diseases, a situation which make farmers unable to utilize their human capital resources on farming activities efficiently. The study assessed the effect of malaria on rural farming household labour supply in Ikenne Local Government Area of Ogun state, Nigeria. The data for this study were obtained for a cropping season from one hundred farmers by simple random sampling techniques. The data were analyzed using descriptive statistics and regression techniques. The result showed that the factors, which influence farmer's susceptibility to malaria, include age of farmers, farmer's educational level, the use of mosquito repellant, number of farmer's working days per week and the distance of household to healthcare centers. Factors, which influence workday loss as a result of malaria, were level of education of the household head and use of mosquito repellant. Factors which influence farmers' healthy days with consequent effect on the supply of labour were level of education, use of mosquito repellant, number of working days per week and distance of household from healthcare centers. Factors, which influence farm size cultivated, werer technology employed in farming and farmer's years of experience. Among the coping strategies employed by farming households against malaria include use of mosquito repellant, environmental sanitation and a combined use of orthodox medicine with local herbs.

Keywords: Malaria, Farming Household and Productivity.

INTRODUCTION

Farming household is the most important component of labour supply in small scale farming in Nigeria (Ojo and Akanji, 1996). Farming household comprises of all males, females and children who partake in the cultivation of land and rearing of household animals (Ojo and Akanji, 1996). The farming households are noted to be operating at low level of production with labour intensive production technology. The major source of farm labour supply is the family labour contributing about 75 percent of farm labour requirements (Olayemi, 1980). The sector is further characterized by low fixed capital investments. This is as result of dependence on simple tools and equipment. Large proportion of the farming households are also characterized by low level of literacy (Olayemi, 1980). Brinkmann and Brinkmann, (1991) reported that Malaria ranks among the major health and development challenges facing some of the poorest economies. They further asserted that in sub-Sahara Africa, the most affected region, malaria related illness claim the life of one out of every twenty children below the age of five. For adults, mortality rates are lower but frequent debilitating attacks reduces the quality of life chronic suffers.

Malaria became a killer in human history starting in about 5000BC after the birth and expansion of agriculture. Malaria caused by a microscopic blood parasite transmitted in a mosquito bite;

infect about 500 million people each year, killing about 2 million (Berman et al, 1999). The human malaria exposure rate is determined by the fraction of the mosquito population carrying the parasite. A typical bout of malaria lasts from about 10 to 14 days with 4 to 6 days of near complete incapacitation and recuperation periods of 4 to 8 days characterized by fatigues and weakness (Berman et al, 1999).

The most proximate cost of illness to individuals and their households include cost of treatment and loss of work time arising from established effect of malaria illness on production activities and productivity among households (Schultz and Tansel, 1996).

Malaria accounts for ten percent of Africa disease burden (Okenu, 1999). It ranks among the major health and development challenges facing some of the poorest economies in the world (McCarthy et al 2000). Nigeria is one of the countries in the sub-Saharan Africa that has its rural and even urban settlements suffering from the different mix of malaria illness (McCarthy et al 2000).

Bob, (2002), stated that the situation of endemic Malaria in West and Central Africa is one of the most potent influences on poor agricultural production. Consensus estimates suggest that attacks, depending on severity, typically entail a loss of four or more working days, followed by additional days with reduced work capacity (Shepherd et al 1991; Picard and Mills, 1992). Okoruwa and Agulana (2004) reported that malaria is found to have the highest prevalence level among the rural household, in Oyo and Osun state in Nigeria. Furthermore, in both states, sickness (especially caused by malaria) affects the productivity of farms due to reduction in their working capacity.

The motivation for this study is derived primarily from the fact that mosquito eradication programs has failed largely in Nigeria and other sub-Saharan countries with more wet seasons than dry season, partly due to the fact that intensity of transmission is higher in the wet season. Therefore, this study examines the consequence of malaria illness on the farm labour supply of farming households. This has policy relevance owing to its effect on food production and overall food sufficiency for the locality and the nation at large. More specifically, the objectives of this study are to:

(i) Estimate the factors that predispose farmers to malaria attack.

(ii) Examine frequency of malaria attack and socio-economic characteristics of farmers.

(iii) Examine household coping strategies against malaria.

METHODOLOGY

The study was carried out in Ikenne Local Government Area of Ogun State. Ikenne is located along the transitional forest zone of Southern Nigeria and guinea savannah, thus the vegetation lies within the rain forest belt of Nigeria. The climate is hot and humid which favours the proliferation of the mosquito vector. The vegetation and climate of Ikenne places it in the malaria belt (Hamoudi and Sachs, 1999) The local government is semi-urban in nature and made up of Ikenne-Remo as headquarters, Iperu, Ilishan, Irolu, Ilara Ogere Remo with their satellite villages.

The study made use of primary data. A total of 100 respondents were interviewed with the use of well structured questionnaires. The farming house-holds in the study area were randomly selected through simple random sampling technique from the sample frame of farming households in the zone provided by the Agricultural Development Project of the study area. Information collected from farmers (such as age, hours worked on farm, gender, household size, number of farmer's healthy days e.t.c) was based on one year production activities.

The empirical models used in this study consist of various regression models (three as health capital equation and one for frequency of malaria attack and socio-economic variables). The various models are described as follows:

Health Capital Equations

SL = F (ES, H, N, E, G, MR) ---------- (1)

HD = F (E, G, LW LH, OT, D, H, MR, ES, N)-----(2)

A= F (NS, LW, G, DT, Ex) ----------(3)

Where:

SL = Total number of work day lost by farmers due to malaria attack.

HD = Number of farmers healthy days.

A= Size of farm cultivated (ha)

ES= Environmental Sanitation (if done = 1, otherwise = 0)

N = Use of Mosquito netting (if used = 1, otherwise = 0)

MR = Use of mosquito repellant (if used = 1, otherwise =0)

H = Access to healthcare service = (Access = 1, otherwise = 0)

E = Level of Education of farmers (years)

G = Age of farmers (years)

LW = Average number of days farmers work per week

LH = Use of Local herbs to treat malaria (Use = 1, otherwise=0)

OT = Use of orthodox medicine to treat malaria (use = 1, otherwise =0)

D= Distance from Healthcare centre (km)
NS = Number of times farmers fell sick during cropping season.
DT = Technology dummy (improved = 1, otherwise = 0)
EX = Years of Experience in farming (years)

Frequency of malaria attack and socio-Economic variables:

$Y = b_o + b_1X_1 + b_2X_2 + b_3x_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7$ ---------- (4)

Where:
Y = Frequency of malaria attack (Dependent variable)
b_o = Constant
X_1 = Age of farmers (years)
X_2 = Marital Status of farmers (married = 1, single = 0)
X_3 = Household size
X_4 = Educational level (years)
X_5 = Gender of farmers (male = 1, female = 0)
X_6 = Years of Experience in farming (years)
X_7 = Income of farmers from farming and non-farming activities if any (₦)

The models were fitted into four functional forms in order to obtain the best fit. These are:

Linear: $Y = b_o + b_1X_1 + b_2X_2 + b_3x_3 \ldots bnXn + e$ -----(5)

Semi-log: $Y = \log b_o + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 \ldots bn \log Xn + \log e$----------(6)

Exponential: $\log Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 \ldots bnXn + e$ ----------(7)

Double log: $\log Y = \log b_o + \text{bilog}X_1 + b_2\log X_2 + b_3\log X_3 \ldots bn\log Xn + \log e$ ----------(8)

The lead equation is chosen using the values of coefficient of variation (R^{-2}), and F-statistics, standard error of estimates, number of significant variables as judged by t- value, appropriate sign of the coefficient and *a priori* expectation.

RESULTS AND DISCUSSION

Table 1 show that the highest proportion of the population of the household heads is above 60 years old. On the average, household heads are not likely to be highly productive and may probably have higher susceptibility to malaria attack. 73 percent of the farming households are male headed, while females head 27 percent. The prevalence of male-headed farming households can be attributed to the gender specific work in farming activities in the South Western area of Nigeria. Also, women are denied the right of ownership of land (especially in rural areas) thus; they do not regard themselves as true farmers. 62 percent of the farming households have family size within the range 5-8 people. This distribution shows that farmers still belief in having a considerably large family size to help with farm labour. However, Farmer, (1999) and Gunawardena et al, (1998) revealed that crowded households or large sized household facilitate the spread of malaria illness. Sixty three percent of the household head had six or more years of formal education. The implication of this is that household heads are likely to be fairly responsive to modern and effective methods of malaria treatment.

Table1: **Socio-Economic and Income distribution of Household.**

Variables	Category	No. of Household
Gender:	Male	73
	Female	27
Age (years)	30-39	11
	40-49	24
	50-59	30
	60-69	32
	70 and above	3
Educational Level (years)	No Education	37
	1-6	35
	7-12	17
	13-18	11
Household Size	1-4	8
	5-8	62
	9-12	28
	13-16	2
Income Group (N'000)	≤100	18
	101-150	15
	151-200	34
	201-250	19
	251-300	10
	>300	4

Source: *Field Survey, 2005*

There is a close relationship between malaria and poverty. Poor household (very low income earners) are sicker than the non-poor because poverty restricts access to medical care and healthy living conditions (Farmer, 1999; Gumawardena et al 1998). Table 1 further reveal that 67 percent of the farming house hold earns less than or equal to 200,000 naira with an average household size of approximately 8 persons and the present inflationary trend in the country, farming household income in the study area is relatively low.

Among the farming household interviewed, 60% of the respondents were seriously affected by malaria as shown in Table 2 and this affects their working days on the farm and efficiency in food production.

Table 3 shows that very few household in the study area (39%) use mosquito netting which seems to be the best control measure. The relatively high percentage of the household using repellant, irrespective of the health hazard it imposes and the

fact that environmental sanitation is done by the majority, is an indicator that mosquito population is very high in the study area.

Table 4 shows that 57 percent of the farming household falls sick between seven to nine times in one cropping season (usually one year). This implies that majority of the farmers falls sick or suffers from a relapsing sickness almost every month, as a result of malaria

Table 2: Distribution of Household based on Malaria Attack

Group	Frequency	Percentage
Transient	15	15
Mild	25	25
Severe	38	38
Acute	22	22
Total	100	100

Source: Field survey, 2005.

Table 3: Distribution of Household based on the control measure employed against malaria.

Control Measure	Frequency
Use of Mosquito net	39
Use of Repellant	59
Environmental Sanitation	77

Source: *Field survey, 2005*

Table 4: Distribution of household based on Sick times per Season

Sick times	Frequency	Percentage
1-3	3	3
4-6	40	40
7-9	57	57
Total	100	100

Source: *Field survey, 2005*

Table 5 shows that most farmers (67%) spend less than or equal to five days to work on the farm in a week. This implies that farmers do not regularly visit their farms. This may be due to sickness among other factors.

Table 6 reveals a higher reliance on local herbs (25%) over orthodox medicine (22%) and majority of the respondent (53%) complements their use of orthodox with local herbs for the treatment of malaria fever. This can be as a result of increasing resistance of many malaria strains to orthodox medicines, high cost of malaria drugs and or high rate of self treatment due to high level illiteracy.

Table 5: Distribution of households based on number of days farmers work per week.

Days worked per week	Frequency	Percentage
≤3	13	13
4	36	36
5	18	18
6	19	19
7	14	14
Total	100	100

Source: *Field survey, 2005*

Table 6: Distribution of household based on the method used in treating malaria

Treatment Method	Frequency	Percentage
Use of orthodox medicine	22	22
Use of local herbs	25	25
Use of both methods	53	53
Total	100	100

Source: *Field survey, 2005*

Results of Regression Analysis

Based on econometric criteria of F- value, number of significant variables, sign of the coefficient and *a priori* expectation, semi-log was chosen as the lead equation for the regression of number of work days lost by farmers due to malaria attack, double- log for the number of farmers healthy days and exponential for the size of farm cultivated by farmers.

The results according to Table 7 show that level of education (E) and use of mosquito repellant (MR) are the most significant factors that affect the total number of work days lost by farmers due to malaria attack both being significant at 5 percent ($p<0.05$) levels of significance.

Table 7: Regression Analysis of Health Capital Equations.

Variables	Coefficient	t-value	F-value	R^{-2}
Total No. of work days lost:				
Constant	-	-0.165	2.234**	0.700
ES	0.012	0.119		
H	0.041	0.402		
N	0.098	0.983		
E	-0.248	-2.116**		
G	0.071	0.608		
MR	-0.232	-2.361**		
Farmer's Healthy days:				
Constant	-	14.445*	94.406*	0.904
E	0.082	2.174**		
G	0.001	0.023		
LW	0.987	28.390*		
LH	0.023	0.611		
OT	-0.037	-1.026		
D	-0.101	-1.026		
H	0.001	-2.896		
MR	0.014	2.255**		
ES	-0.028	0.855		
N	-0.08	-0.243		
Size of Farm Cultivated;				
Constant	-	-0.891	5.156*	0.273
NS	0.040	0.397		
LW	0.19	0.200		
G	-0.111	-0.756		
DT	0.469	4.87*		
EX	0.279	1.920***		

* Significant at 1%; ** Significant at 5%; *** Significant at 10%

Source: *Computer printout*

Thus a 1% increase in the use of mosquito repellant by households will lead to 0.23% decrease in total number of work days lost. Also, a 1% increase in level of education will lead to a 0.25% decrease in total number of workdays lost.

The negative relationship between level of education and number of workdays lost by farmer due to malaria attack is most probably due to the fact that with increase in education, farmers will employ more measures to control malaria. An increase in education is likely to improve the standard of living of farmers and facilitate control of malaria, hence reduction in workdays lost. Increased use of mosquito repellant precludes high mosquito population which cannot be sufficiently controlled by environmental sanitation and use of mosquito netting. Thus, the use of mosquito repellant expectantly reduces the incidence of mosquito bite and number of workdays lost due to malaria attack. All the farmers in the study area have access to healthcare service and majority of the farming households do not use mosquito nets (Table 3). This explains the reason why these variables are not significant. Furthermore, level of education (E) and use of mosquito repellant (MR) (both significant at 5% level of significance i.e $p<0.05$), number of working days (LW) and distance from Health care centre (D) (both significant at 1% level of significance i.e $p<0.01$), are the factors which significantly affect the number of farmers' healthy days (with respect to malaria as the predominant cause of illness). Thus, a 1% increase in level of education will lead to 0.08% increase in number of farmers healthy days, while, a 1% increase in use of mosquito repellant will lead to 0.07% increase in number of farmers healthy days. Also, 1% increase in number of working days and distance from health care centre will lead to 0.02% increase and 0.1% decrease in number of farmers' healthy days respectively. The positive relationship between level of education (E) and the number of farmers' healthy days can be traced to increased hygiene, better nutrition and improved standard of living associated with high level of education. The number of days a farmer put to work per week is an indication of his number of healthy days.

For the size of farm cultivated, the regression result in Table 7 show that technology employed in farming (DT) and farmer's years of experience in farming (EX) are the significant factors which affects the size of farm cultivated by farmers ($p<0.01$ and $P<0.10$ respectively). The parameters have positive signs. This show direct relationship between these factors and size of farm cultivated. Thus, 1% increase in the use of modern technology in farming and farmers' farming experience will lead to 0.47% and 0.28% increase in the size of farm cultivated respectively. While the number of farmers' sick days per season can affect total number of days he is available to work, hence his productivity, it may not necessarily determine the size of land cultivated since sickness is spontaneous and can occur after farmland acquisition and or establishment. The effect of the number of days worked on size of farm cultivated will depend on the type of technology used. This explains the non significance of these variables.

The result from Table 8 show that of all the socio-economic factors considered, only the age of farmers (X_1) is the significant factor affecting the frequency of malaria attack ($p< 0.01$). This can be explained for by the fact that advancement in age may ceteris paribus reduce immunity against diseases, thus, increasing frequency of sickness.

Table8: Result of Regression analysis for linear function for frequency of malaria attack.

Variables	coefficient	t-value	F-value	R^{-2}
Constant	-	0.476	2.185**	0.77
X1	0.423	2.679*		
X2	-0.034	-0.328		
X3	-0.063	-0.490		
X4	0.106	0.843		
X5	0.074	0.736		
X6	-0.035	-0.211		
X7	-0.112	-1.134		

*sig at 1%; ** sig at 5%

Source: *Computer printout*

Conclusion And Recommendations

Illness in all its forms constitutes a major depression to labour supply (i.e labour availability in man days and work output or productivity). Malaria being a predominant cause of illness among rural farming households therefore causes a major drawback in labour supply and agriculture. The number of workday lost as a result of malaria illness poses a very serious threat farmers efficiency. Based on the findings of this study, the following recommendations are made for policy actions:

1. The malaria preventive programme which encourages environmental sanitation and discourages practices that will promote immunosuppression should be embarked upon and intensified so that more of the farming households will be able to prevent malaria attack.
2. Use of mosquito netting (especially the newly introduced treated mosquito nets by the federal government of Nigeria) should be encouraged especially with majority of the households that are severely affected by malaria.

Public enlightenment programs on the appropriate use of malaria drugs (be it local or orthodox) and the ills of self medication should be encouraged.

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