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Research Article

THE EFFECTS OF MALARIA ON CROP PRODUCTION IN YOBE STATE, NIGERIA

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ABSTRACT

Malaria is one of the most common tropical diseases affecting both the rural and urban areas in Nigeria. The disease has posed a serious threat to agricultural production and little has been done in terms of general understanding of the effects of malaria on agricultural production. This study therefore attempts to fill this gap by examining the effect of malaria on agricultural production in Yobe State. A Multi-stage sampling technique was employed to select 400 each of malaria infected and uninfected respondents. Descriptive statistics such as frequency and percentage, and inferential statistics such as multiple regression and economic loss model were employed for the analysis. The result showed that malaria infected households had 20% less agricultural output in relation to the uninfected households. The analysis showed that the average days of incapacitation for 2011 was 16.16days, which translated to 9, 696.00 and 12, 928.00 based on the national daily minimum wage of N600.00 and the local average daily labour wage of N800.00, respectively. The analysis further showed that the average cost of malaria treatmentper person per year was 2, 583.08. The result of the regression showed that the coefficients of family labour and house size were positive and significant (P<0.01 and P<0.05, respectively). Furthermore, the coefficients of days of incapacitation, cost of treatment, frequency of and distance to source for malaria treatment were all negative and significant (P<0.01, P<0.001, P<0.001 and P<0.001, respectively), implying that a unit increase in these variables will lead to a decrease in crop output. Among others, the study recommends that malaria control awareness in relation to the impact on agricultural production should be integrated into agricultural extension services in the State.

INTRODUCTION

Malaria remains one of the devastating parasite diseases in the world and contributes considerable to the poor health situation in Africa (WHO, 2001). The global incidence of the disease is estimated at about 300 million clinical cases annually resulting in over one million deaths, about 90% of the malarial deaths occur in Africa where 45 of 53 countries are endemic for the diseases with young children especially those under the age of five suffering the mortality (WHO, 2008). Malaria also account for a high number of adult morbidity in endemic areas (Asiamah *et al*. 2013). It attacks an individual on average of four bouts in a year, with an average of 10 to 14 days of incapacitation (Alaba and Alaba, 2002) Ajani and Ashagidigbi (2009) reported an average of 22 days of incapacitation per year. The disease imposed substantive social and economic cost and impedes economic development through several channels, including loss of labour productivity, depletion of human capital premature deaths, medical cost and reduction in saving and investment (Sachs and Malany 2002; Lucas 2005).

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The disease cost Africa more than US 12 million annually and it slows economic growth in many African countries by as much as 1.3 percent per year (WHO, 2008, 2010). Country specific, evidence shows that Nigeria has the largest population of risk of malaria in Africa. Malaria is responsible for more illness and death than any other single diseases and still a major public health problem in Nigeria (Jimoh *et al*, 2007). It accounts for about 50 percent of outpatients consultation, 15 percent hospital admission, and also prime among the top three causes of death in the country (WHO, 2005). The yearly economic loss due to Malaria in Nigeria has been put at 132 billion naira due to cost of treatment and transport to source of treatment, loss of man hours, and absenteeism from school and other indirect cost (FMoH, 2010). Malaria imposes a heavy cost not only in the country's income, but also on its rate of economic growth and invariable, on its level of economic development. Malaria and agriculture are intimately related this is because agricultural environment provide suitable conditions for breeding and survival of the mosquito which transmit the disease and on the other hand, malaria advisedly affect agriculture through decreasing the productive time (labour time) loss of farming knowledge and skills in case of death of a farmer and reduction in investment in agriculture due to high expenditures on malaria treatment and prevention (Asante, 2009; Oluwatayo, 2014). According to Oluwatayo (2014), Malaria's effect on agricultural production can be devastating. Taking ill at planting season, a farmer may not be able to cultivate as much as land and engage in intensive farming practices. He may then plant less labour – intensive crops and change cropping patterns raising crop with a lower return and fewer of them. Malaria incidence throughout Nigeria had been on the increase over the years ranging between 2.47 million in 2000 to 4.2 million in 2009, with a decline in 2007 and 2008. Similarly, in Yobe state malaria incidence had been on the increase over the years ranging from 34,734 in 2004 to 131,105 in 2010 with a decline in 2007.This implies that malaria is still a challenge to people's health and is the leading cause of ill-health and death in Nigeria. Nigeria is an agricultural labour intensive economy and the protection and utilization of the labour force to guarantee a higher production is of immense importance to the growth of agricultural sector. Despite the importance of labour to the sector, it is being negatively affected by malaria.

In Nigeria, research efforts on malaria have been centered mainly on the studies design to evaluate efficacy and safety of anti-malaria drugs, and even then, on a low scale (FMoH, 2010). Little have been done to quantify the general understanding of malaria's impact on agricultural production. Hence there is little scientific evidence on the nature and extent of the effects of malaria on agricultural production to enable health and agricultural policy makers to make informed decisions. In view of the above, this study examined the effects of malaria on agricultural crop production specifically on annual crops in the agricultural sector for the period of April to December of 2011 cropping seasons in Yobe State.

MATERIALS AND METHODS

Yobe State is situated between longitude 10^0 55'and 13 ^{0} East, and latitude 9^0 and 12^0 15' North (MHAIC, 2010). The state has a population of 2.55 million people (NPC, 2006), of which about 70 percent live in rural agricultural communities (Iliya *et al*., 2008). The traditional crops grown in the state include millet, sorghum, cowpea, groundnuts and rice, (Iliya *et al*., 2008). The sampling procedure used the geo-political "ward s" created by the Yobe Agricultural Development Program, which also adopted the "wards" as its enumeration units. Accordingly, the 176 wards constituted the 17 local council areas of the state. The 17 local councils were divided into two Agricultural Zones, namely; Zone I and Zone II, comprising 9 and 8 local council areas, respectively. Two local council areas were purposively selected from each of the two agricultural zones based on the availability of hospital facilities for diagnosis and treatment of malaria illnesses. Four of the geo-political wards were randomly selected in each of the 4 local council areas. A sampling frame for crop farmers diagnosed to have contracted malaria during the cropping seasons of 2011 was compiled from the records at the hospitals in the respective geo-political wards. From the sampling frame, 25 people who were farmers were randomly selected from each geo-political ward for a total of 400 respondents. A corresponding number of farmers who did not experience malaria attack during the cropping season in the same area were also selected at random. Chances of misclassification were reduced by removing the names of malaria infected respondents from the list of farm families obtained from Yobe State ADP. Out of the total samples of malaria infected and non-infected persons, only 386 and 383 questionnaires were considered for the analysis respectively, the rest were rejected for inconsistencies. The main instrument for collection of the data was a structured questionnaire. The primary data collected included quantities of crop produced by the malaria infected households, days of incapacitation, frequency of malaria attack, out-of-pocket expenditure (OPE) on malaria treatment, farm area cultivated, family labor supply, and distance covered to access medical treatment.

Data for this study were analyzed using the Statistical Package for Social Science (SPSS) version 20. The ordinary least square (OLS) method was employed to find the effect of malaria on crop production. Similar studies used the OLS to find the effect of diseases in general, and malaria on family welfare (Mwabu and Fosu (2007); Rwaharu (2011); Ajani *et al*. (2013). Four functional forms of regression models were fitted to the data, namely; linear, semi-log, log-inverse, and double log. On the basis of the *a priori* expectations, double log model was retained as a lead model. The regression model for estimation of the effect of malaria on the households' crop production was specified in terms of double-log function as:

$\text{Log}Y = \log\alpha + \beta_1\log X_1+\beta_2\log X_2+ \beta_3\log X_3+ \beta_4\log X_4+ ... +\beta_9\log X_9 + \varepsilon i$ ... (1) where, Y is the crop output, β_1- β_9 are the

respective coefficients of the independent variables X_1-X_9 α and ε_i are the intercept and error terms, respectively. The X_1 is days of incapacitation, X_2 is frequency of malaria attack, X_3 is OPE on malaria treatment, X_4 is distance to source of treatment, X_5 is farm size, X_6 is family labor supply, X_7 is education attainment, X_8 is household size and X_9 is age of the household head.

The theoretical constructs supporting the findings of the cause and effect relationship in this study were based on the followings:

- Days of incapacitation (due to malaria illness), Frequency of malaria illness, Out-of-pocket expenditure (OPE) on malaria treatment, Distance to the source of malaria treatment were expected to translate to reduction of crop production, *ceteris paribus.*
- Farm size, Household labor, Education attainment and Household size were expected to contribute positively to crop production; *ceteris paribus.*
- Age of the household head may have a negative effect on crop production based on the fact that advanced age is inversely proportional to agricultural production. On the other hand, age of household head can have a positive effect on the household's agricultural production, considering that agricultural experience, skills and knowledge, which are important for increased production, tend to increase with age. The monetary value, as a function (f) of days of in capacitation and the labor wage rate per day was computed using the *Economic Los*s formula

$= f(F_t.A_t)$ ... (2) Where, F_t = average number of days lost due to malaria infection, A_t = average labor wage/man-day. Two benchmarks used for purpose of standardizing the value of the average days of incapacitation (ADI) in this study were the national minimum wage (NMW) of ₦600.00/day and the average daily labor wage (ADLW) rate in the state of ₦800/day. The daily labor wage rate differed in time and space across the state on the basis of demand and supply of labor.

RESULTS

The distribution of days of incapacitation is presented in Table 1 the table shows that in 2011 cropping season, a high number of the respondents (39.6%) lost 10 days and below. The table also shows that 23.9% lost 11-20 days, 33.1% lost 21-30 days, 1.8% lost 31 – 40 days, and only 1.6% lost 40 days and above. The mean days of incapacitation were 16.16 days.

The monetary value of days of incapacitation of 16.16 days lost by the individual respondents, stood atN9, 696.00 and N12, 928.00 based on the national daily minimum wage (600.00) and average daily labour wage in the study area (N800.00), respectively. The farm output distribution of malaria infected farmers is presented in Table 2. The Table shows that in 2011 cropping season, a high number of the farmers (42.7%) had farm output of between1000 to 2000 kg grain equivalent followed by those farmers (38.9%) who had farm output of less than 1000 kg grain equivalent. Those respondents who had farm outputs in the range of 2001-3000 kg grain equivalent accounted for 17.9%. Only 0.5% had between 3001-4000 kg grain equivalents as their farm output.

Table 1. Days of farmers' incapacitation due to malaria illness in Yobe State, Nigeria

Days of Incapacitation	Frequency	Percentage
	153	39.6
≤10	92	23.9
21-30	128	33.1
31-40	7	1.8
>40	6	1.6
Total	386	100
Mean	16.16	
S.D	9.001	

Source: Field Survey, 2011

Table 2. Crop production distribution among malaria infected and uninfected farmers in Yobe State, Nigeria

Crops Output (Grain Equivalent)	Infected Frequency	Percentage	Uninfected Frequency	Percentage
< 1000	150	38.9	105	29.4
1000 – 2000	165	42.7	198	51.7
2001 – 3000	69	17.9	46	12.0
3001 – 4000	2	0.5	30	7.9
> 4000	-		4	1.0
Total	386	100	383	100
Mean	1306.61		1567.29	
S.D	642.915		661.595	

Source: Field Survey, 2011

Table 3. Cost of malaria treatment among farm households in Yobe State, Nigeria

Cost of Treatments (₦)	Freq.	%	%
≤2000	160	42.5	32.9
2001-4000	153	40.9	43.2
4001-6000	48	12.7	17.3
6001-8000	12	3.1	5.0
>8000	3	0.8	1.7
Total	386	100	100
Mean	2,583.08		
S.D	32.52		

Source: Field Survey, 2011

Table 4. Effect of Malaria Illness in Crop Production in Yobe State, Nigeria.

Variables	Double Leg Co Efficient	Standard Error	T-Values
Constant	5.698***		
Days of incapacitation (X_1)	- 0.223**	0.044	-2.524
Cost of materials (X_2)	- 0.722***	0.028	-14.323
Frequency of malaria (*X_2)	- 0.066***	0.019	- 3.471
Distance (X_4)	- 0.312***	0.045	- 4.517
Household labour (X_5)	0.019**	0.009	1.985
Farm size (X_6)	0.006 NS	0.008	0.686
Education (X_7)	0.005 NS	0.006	0.767
Family size (X_8)	0.038*	0.010	2.621
Age (X_9)	- 0.008 NS	0.019	0.432
R2	0.925		
F statistics	45.63***		

*** - Significant at 0.1% probability level
** - Significant at 1% probability level
* - Significant at 5% probability level
NS - Not significant

The average farm output for 2011 was 1306.61 kg grain equivalent. For the uninfected farmers, the Table shows that in 2011 majority of the farmers (51.7%) had farm output of between 1000 to 2000 kg grain equivalents followed by those farmers (27.4%) who had farm output of less than 1000 kg grain equivalent. Those respondents who had grain equivalent of between 2001 – 3000 kg grain equivalent accounted for 12.0% and 7.9% of the respondents had farm output of 3001 – 4000 kg grain equivalent. Only 1.0% of the respondents had farm output of more than 4000 kg grain equivalent. The average farm output of the uninfected farmers in 2011 was 1567.29. The t-test statistics of the mean difference in crops output was significant at $P<0.001$. The distribution of cost of malaria treatment is presented in Table 3. The Table shows that in 2011, 42.5% of the respondents spent N2, 000 andbelow, 40.9% spent between N2, 001 and N4, 000, 12.7% spent between N4, 001 and N6, 000. Those respondents who spent between N6, 001 to N8, 000 on malaria treatment accounted for 3.1% of the total respondents and 0.8% spent above N8, 000 on malaria treatment. Table 4 shows the estimated effects of malaria indices on crop production in the selected rural communities of Yobe State. The coefficients of days of incapacitation, cost of malaria treatment, frequency of malaria attack and distance to source for malaria treatment were significant ($P<0.01$, $P<0.001$, $P<0.001$ $P<0.001$) and negative. Conversely, coefficients of household labor and household size were significant and positive ($P<0.01$) and ($P<0.05$), respectively. The coefficient of multiple determination (R^2) was 92.5 percent, implying that the model accounted for about 93 percent of the total variation in crop production of malaria infected households in Yobe State.

DISCUSSION

During this period of illness, a typical farmer may stop work completely or partially due to debility arising from malaria. Consequently, both labor availability and productivity may suffer setback; under severe malaria attack labor may not be available at all during the period while in a situation of mild attack, the "intensity" of labor – measured by work done per unit time – may be reduced. The period of incapacitation in this study referred only to complete absence of farm labor and zero productivity. Many similar studies did not differentiate as to whether the average days of incapacitation were due to complete or partial absence as a result of malaria illness (Adewumi *et al*., 2007; Ajani and Ashagidigbi, 2008; Alaba and Alaba, 2009, and Oluyole *et al*., 2011). The loss of workdays as a result of malaria illness had accounted for decline in farm outputs reported (Alaba and Alaba, 2009; Rwaheru, 2011). The ultimate effect of the 16.16 ADI in this study may have direct implication for food insecurity in Yobe State, as this might have resulted in actual output reduction of 1306.61 kg grain-equivalent for malaria infected households compared to 1567.29 kg grain-equivalent of households not infected (Table 2). The cost of time is the opportunity cost of wages forgone by the sick person due to illness (Asenso-Okyere *et al*., 2009). The result shows that the respondents lost substantial number of days, which when the days lost due to malaria attack were valued at the minimum national wage and average labour wage per day in the study area, it translated to substantial income lost. The implication of this finding is that poor health status closely affects the productive capacity and economic well-being of households.

The finding is in agreement with the works of Oluyole *et al*. (2011) and Abiodun and Abayomi (2013) who reported the value of man-days loss of N18, 400.00 and N15, 537.17, respectively. The OPE on malaria treatment constituted a deprivation of the households from carrying out their other obligations and activities such as investment in physical assets, agriculture, paying of schooling costs, and adequate feeding. The reported costs of malaria treatment in this study compared well with the findings of Awoniyi *et al*. (2011) and Abiodun and Abayomi (2013) who reported average treatment costs of malaria to be N1448 and N3453.67, respectively According to Asante (2009), expenditure on malaria like any other disease reduces funds to hire casual laborers and to buy inputs like fertilizers, improved seeds and payment of school fees. Furthermore, the use of personal savings for treatment of malaria illness causes dissaving and dislocation in the household future plans (Chuma2005). Therefore, the use of savings to finance cost of treatment would require adjusting the household's daily needs. In other word, the use of cash savings for medical treatment is not an indication of cash availability, but some form of opportunity foregone.

The expected effects of days of incapacitation, cost of malaria, frequency of malaria attack and distance on crop production were supported by the *a priori* expectations; in other word, 1 unit increase in the days of incapacitation, cost of malaria, frequency of malaria illness and distance to source for malaria treatment, holding other factors constant, would decrease crop production by about 0.223%, 0.722%, 0.066% and 0.312%, respectively. The modeled (causal) relationship between crop production and household labor and household size were also supported by the *a priori* expectation, which suggested that a unit increase in household labor supply and household size in the state, holding other factors constant, would always bring about increase in crop production, and vice versa. Malaria's effect on crops is serious because Nigeria's agriculture is labour intensive. The fact that Nigerian agriculture requires farmers to timely prepare land, plant, weed and harvest to ensure that the crops growth stages coincide with the most favourable growth conditions. Therefore, since malaria illness negatively affects the availability of labour and its productivity, it adversely affects the possibility and timeliness of implementing these critical operations and thus affects agricultural production.Asenso-Okyere *et al*. (2009) observed that the cost of treating and preventing malaria could lead household to reduce farm area, planting of less labor intensive crops, changing cropping pattern, adoption of labor-scarce innovations that may be less productive.

Conclusion

This study attempted to analyze the farm-level direct effects of malaria on crop production; cost of treatment (or OPE), and the effect on food security through loss of labor time in households, and by implication, on the economy. The analysis revealed crop output of malaria uninfected households to be higher by 20 percent than crop output of the infected households. Similarly, result of the regression analysis revealed significant negative effects on crop production of DI, frequency of malaria attack, and the cost of malaria treatment, suggesting that malaria would always bring about decline in crop production because of loss of labor time and the frequency of malaria occurrence.

Recommendation

The preceding analysis has brought out some findings that have important implications for policy. Based on these findings, the following recommendations are made to reduce the effect of malaria on crop production:

- In order to reduce the number of days lost due to malaria illness, there is a need to integrate malaria control intervention messages in agricultural extension services.
- Government should consider offering of malaria treatment free of charge for farmers just like that of Polio disease. This will reduce the economic burden of the disease on households.
- Government should intensify offering rural farmers free mosquito treated nets and preventive drugs at the beginning of every rainy season.
- Farmers should be encouraged to keep their environment clean.

REFERENCES

Abiodun, O. O. and Abayomi, S. O. 2013. Effect of Malaria on Farming Households'Welfare in Ido Local Government of Oyo State, Nigeria.*Journal of HumanEcology*, 44(2): 189-194

Adewumi, M. O., Ayinde, M. S. and Eyitayo, O. 2007. Economic Analysis of Farming Household Health on Crop Output in Kwara State, Nigeria.*Agricultural Journal*, 2(4): 478-482

Ajadi, K. O., Olaniran, D. H., Alabi, F. M. and Adejunobi, D. O. 2012. Incidence ofMalaria among Various Rural Socio-Economic Households.*Greener Journal of Medical Science*, 2(3): 51-63

Ajani, O. I. Y. and Ashagidigbi 2008. Effect of Malaria on Rural Households Farm Incomein Oyo State Nigeria. *African Journal of Biomedical Research*, 2(3): 259-266

Alaba, O. A. and Alaba, O. B. 2002. Malaria in Children. Implication for the Productivity of Female Caregivers in Nigeria. *International Food Policy Research Institute (IFPRI) Washington DC*, 3(2): 106-123

Alaba, O. A. and Alaba, O. B. 2009. Malaria in Rural Nigeria: Implication for theMillennium Development Goals. *African Development Review*, 21(7): 73-85

Asante, F. A. 2009. The Links between Malaria and Agricultural Production in EndemicCountries.Presented at a Conference on Improving Vector Control Measures for the Integrated Fight against Malaria.From Research to Implementation. Paris France:Retrieved November, 2012 from www.afmeurope.org/mg.pdf/felix_asante.pdf

Asante, F. A. and Asenso-Okyere, K. 2003. Economic Burden of Malaria in Ghana: ATechnical Report Submitted to the World Health Organization (WHO). AfricanRegional Office (AFRD). Pp. 25-28

Asenso-Okyere, K., Asante, F. A., Tarekegn, J. and Andam, K. S. 2009. Linkages between Agriculture and Malaria: Issues for Policy Research and Capacity BuildingStrengthening, International Food Policy Research Institute. Discussion Paper 0086100861.Washington DC, 2006-1002. USA

Asiamah, M. T., Patrick, D. and Bertha, G. 2014. The Effect of Malaria on Staple Food Crop Production in the Ejisu-Juaben Municipality of the Ashanti Region of Ghana.*Journal of Agricultural Extension and Rural Development*, 6(3): 87 – 89

Chuma, J. 2005. The Impact of Malaria among the Poor and Vulnerable: The Role ofLivelihood and Coping Strategies in Rural Kenya. Unpublished PhD Thesis.University of Cape Town

Federal Ministry of Health 2010. National Policy on Malaria Diagnosis and Treatment:National Malaria and Vector Control Division, Abuja, Nigeria. Pp. 33

Iliya, A. G., Dada, Y. M., Grema, A. K., Usman, S., Mejo, I. and Bila, B. 2008. Transforming Agriculture in Yobe State.Ngama, Y. L., Bunu, J. and Saidu, A. S. Eds.Proceedings of the Yobe State Economic Summit, 6th-7th July, 2008. Pp. 37-64

Jimoh, A., Sofola, O., Petu, A. and Okorosobo, T. 2007. Quantifying the Economic Burdenof Malaria in Nigeria using the Willingness to Pay Approach.*Journal of Biomedical*,5(6)

Lucas, A. M. 2005. 'Economic Effects of Malaria Eradication: Evidence from the Malaria Periphery', Brown University.

Ministry of Home Affairs, Information and Culture 2010.The New Era of Transformation. Yobe State 2010 Diary

Mwabu, G. and Fosu, A. 2007. Malaria and Poverty in Africa.African Books Collective.The University of Nairobi Kenya Press Kenya. Pp. 200

National Population Commission 2006. Population Facts. Federal Republic of Nigeria,Abuja, Nigeria

Oluwatayo, I. B. 2014. Socio-Economic Burden of Malaria on Productivity of Rice Farmers in Rural Southwest, Nigeria.*Mediterranean Journal of Social Sciences*, 5(15): 175 – 188

Oluyole, K. A., Ogunlade, M. O. and Agbeniyi, S. O. 2011. Socio-Economic Burden ofMalaria Disease on Farm Income Among Cocoa Farming Households in Nigeria. *American-Eurasian Journal of Agriculture and Environmental Science*, 10(4): 696-701

Rwaheru, A. A. 2011. The Effect of Malaria on Agricultural Production in Uganda.Unpublished M.Sc.Thesis, Makerere University, Uganda.

World Health Organization 2001. 'A Framework for Estimating the Economic Burden of Malaria in the African Region', Harare, Zimbabwe.

World Health Organization 2008. World Malaria Report. Geneva: WHO

World Health Organization 2010. Economic Costs of Malaria. 200 United Nations Decade to Roll Back Malaria.

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