The Perception of the Causes and Modes of Transmission of Malaria Parasite among residents in Nasarawa State

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***Abstract*: - This study examined the perception of the causes and modes of transmission of malaria parasite among residents in Nasarawa State, with the aim of determining the perception of people between climatic factors and clinically confirmed cases of malaria. Adopting the questionnaire method for analysis, it was realised that, 52.1% i.e., over half the population thinks climatic factor affects the incidences malaria, while 20.8% said no and about 27% were not too sure.– hence the analyses proved that over 74% of the sample population thinks that mosquito bites is only means through which malaria can be transmitted, 17.5% said malaria is air bone, while the remaining proportion choose between body content (2.1%) and flies perching on food (5.8%). In conclusion, poor sanitation, dirty environment have adverse impact in the breeding, growth and development of mosquitoes and affects the incidence of malaria in Nasarawa State. Therefore, it was recommended that government and its partners should involve the people from all levels when designing strategies to combat the pandemic – since most of these people are also knowledgeable of the important facts about the disease.**

Key words: **Pandemic, Strategies, malaria parasite, perception, causes and mode.**

I. INTRODUCTION

The impact of rising temperatures is steadily increasing the variety of health risks to the human populace. It has become clear that a major health risk is the extreme weather variation and increased transmission of vector-borne diseases (Espino *et al*, 1997). Climate change over recent decades has already had numerous damaging effects on human health. Spreading infectious diseases, longer and hotter heat waves, and extreme weather will all claim thousands of additional lives nationwide each year. The warming of climate is also creating the ideal conditions for spread of infectious disease, putting millions of people at risks. In addition, climate change has led to increased outbreak and the spread of dengue hemorrhagic fever (DHF), malaria, cholera, encephalitis and other diseases all over the world, not only in the Third World countries but also in developed countries (Patil and Deepa, 2007).

Bhathacharya *et al*. (2006) reported that the adversities of malaria are felt by more than 40 percent of the global population within 92 countries. The disease has proved to be a relentless impediment for developing countries, directly causing countless deaths and indirectly many other public health problems. Currently, there are more than 2 billion people at risk around the world (Sharma, 2006). The world's foremost vector-borne disease is malaria. World Health Organisation (WHO, 2006) reported that in 2004 there were 177,440 reported cases of malaria in India alone. The major vector of malaria is the mosquito and as humidity and precipitation increase as a result of global warming, the more favourable the environment becomes for abundant mosquito growth. The Global Humanitarian Panel (GHP) published a report that 315,000 people die due to climate change every year, and they predict that this will rise to half a million by the year 2030 (GHP, 2009). While such estimates of direct deaths remain low relative to the size of the global populations, about 310 million people are expected to have suffered ill health because of climate change by 2030. Climate change will also worsen air pollution. Both temperature and humidity influence air pollutants and fine particulates form, and evidence suggests that fine particulates contribute to respiratory diseases (such as pneumonia, asthma, and chronic obstructive pulmonary disease), especially in children (IPCC, 2007). WHO estimates that 800,000 people already die each year because of outdoor or air pollution.

Ye *et al*.(2007) stated that temperature, rainfall and humidity have been associated with the dynamics of malaria vector population and, therefore, with the spread of the disease. Ambient temperature plays a major role in the life cycle of malaria vector. The development of the parasite within the mosquito (sporogonic cycle) is dependent on temperature. Environmental variables such as temperature, humidity, rainfall and wind affect the incidence of malaria, either through changes in the durations of mosquito and parasite life cycles or influences on human, vector or parasite behaviour (Koenraadt *et al*., 2004). Despite the sensitivity of transmission to changes in environmental variables, and in spite of being one of the biggest causes of worldwide mortality due to infectious diseases (WHO, 2008), there is still substantial debate as to the exact role that climate plays in driving malaria epidemics (Zhou *et al.*, 2004; Pascual *et al*., 2008). This uncertainty derives, in part, from the fact that although there is a considerable body of work using empirical–statistical models to investigate the link between environmental variables and transmitting intensity of vector-borne diseases (Rogers and Randolph, 2000), only limited or

no attempts have been made in the study area in particular to identify the influence of climate on malaria disease as climate variables (temperature, rainfall and humidity) affect the vector and disease transmission as related to clinically laboratory tested malaria cases. Researches currently focused much of their attention on dengue fever and malaria, partly because the diseases are so prevalent but also because outbreaks seem linked to climate.

Temperature

The average temperature of Nasarawa throughout the year is about 26^0C which is considerably high perhaps because of its location in the tropical sub-humid climate belt. The high radiation income in this part of the globe, which is also evenly distributed throughout the year, also account for the high temperature recorded in the state. However, there is a marked seasonal variation in temperature in the state. There is a gradual increase in temperature from January to March. The onset of rains in April ushers in a noticeable decline in temperature. This is made possible by the blanket effect of cloud cover over the region.

Rainfall

Nassarawa is characterised by a tropical subhumid climate with two distinct seasons. The wet season lasts from about the beginning of May and ends in October. The dry season is experienced between November and April. Annual rainfall figures range from 1100 mm to about 2000mm.About ninety per cent of the rain falls between May and September, with the wettest months being July and August. The rain comes in thunder-storms of high intensity, particularly at the beginning and towards the end of the rainy season.

Relative Humidity

The temporal variation in the relative humidity figures for the month of January in Nasarawa can be quite low sometimes (less than 40%). Relative humidity is a measure of the dampness of the atmosphere such varies greatly from place at place at different times of a day. The actual amount of water vapour present in the air which is expressed in grammes per cubic meter is called the absolute humidity. But more important from the point of view of weather studies is the relative humidity. This is the ratio between the actual amount of water vapour and the total amount the air can hold at a given temperature expresses as percentage.

The study area experiences low relative humidity of about 40 percent during the dry season and a relative humidity of more than 70 percent during the rainy season. It is also higher in the morning and low in the afternoon (Binbol, 2007).

Environmental sciences have traditionally focused on the links between distal environmental changes and their effects on proximal environmental characteristics, whereas public health scholarship has focused on the link between transmission cycles and disease burden. One of the most common concepts in this regard is the Environmental Change and Infectious Disease (EnvID) framework. This uses a systems theory structure to integrate and analyze disparate information from a variety of disciplines (Joseph *et al*, 2007). The EnvID framework as formulated by Joseph *et al* (2007) in America encompasses three interlocking components: environment, transmission, and disease. There has been a tendency to delineate environmental changes into those that are social, such as urbanization, and those that are ecologic, such as deforestation, but in actuality any process affecting human health has both social and ecologic components that are inextricably linked. These changing environmental processes may affect the transmission cycles of infectious pathogens. Although the environment represents the first component of the systems-level EnvID framework, it is itself a system of interacting components. The list of environmental changes includes anthropogenic changes that affect landscape ecology, human ecology, and human-created environments as well as natural perturbations and natural disasters. There are clear interactions among these distal factors and their effects.

II. METHODOLOGY

Sampling Techniques

The research employed the use of random sampling technique to select five out of the 13 LGAs in Nasarawa State for the study.

Population of the Study Area

The target population refers to the entire group of individuals or objects to which researchers are interested in generalizing the conclusions. In this study, the target population was the entire human population of the selected five LGAs estimated in the 2006 NPC as: 329922, 111902, 92660, 187220, and 216230 for Lafia, Akwanga, Keffi, Nasarawa, and Karu LGAs respectively. Thus, the total of these figures is 937,934 which is the target population. Accessible population on the other hand is the research population to which the researchers can apply their conclusions. It is a subset of the target population and is also known as the study population.

In selecting sample size for the study, Yamani (1964) formula for determining sample size was used. The population of the study area is 937,934 (NPC, 2006).

$$n = \frac{N}{1 + N(e)^2}$$

$$n = Samplesize.$$

$$n = Population.$$

$$e = Levelofsignificance.$$

$$\therefore n = \frac{937934}{1 + 937934(0.05)^2}$$

$$n = \frac{937934}{1+937934\,(0.0025\,)}$$

$$n = \frac{937934}{2345.835}$$

$n = 399.829$

n= 400

Sample(n) size is 400.

Data Collection

In order to evaluate people's perception on the causes and transmission of malaria fever in the community, a total of 400 questionnaires were distributed across the 26 hospitals, in the study area. The target population was people (patients) who visited the health centres for consultancy. With the help of medical record staff of the various health centre's selected respondents was purposely sampled to respond to the issues raised in the questionnaire-based on their ability to read and write.

III. RESULT AND DISCUSSIONS

The Perceived Causes and Modes of Transmission of Malaria Parasite Among residents in the study area

In line with the fifth objective of this study which is to find out and evaluate what residents of Nasarawa State perceived is responsible for the cause and modes of transmission of malaria fever, and how it should be treated, the primary source of data is presented in this section. And with the simple percentage method, analysis are made therein. However, before this presentation it is important to note at this juncture that out of the 400 total number of questionnaires that were issued out, only 480 were returned (i.e. 96 percent returned). Their responses are presented in the following figures:

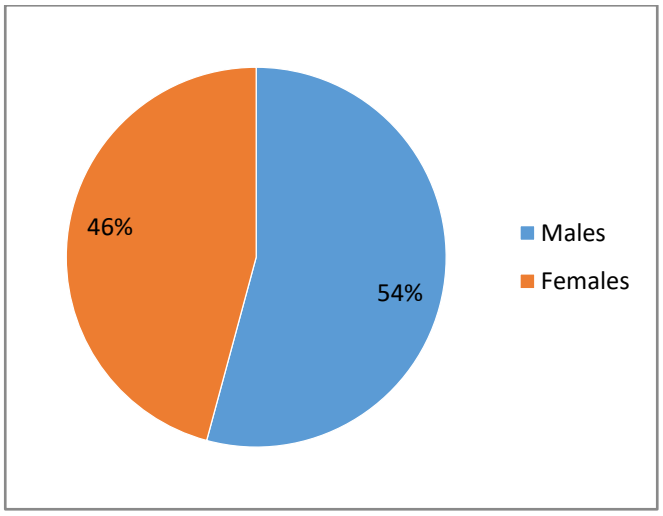

Figure 1 Data on Sex of Respondent

Source: (Fieldwork 2018)

Figure 1 shows that 54.2% of respondents are males and the remaining 45.8% are females, which show that the sample population of this study is made up of largely males.

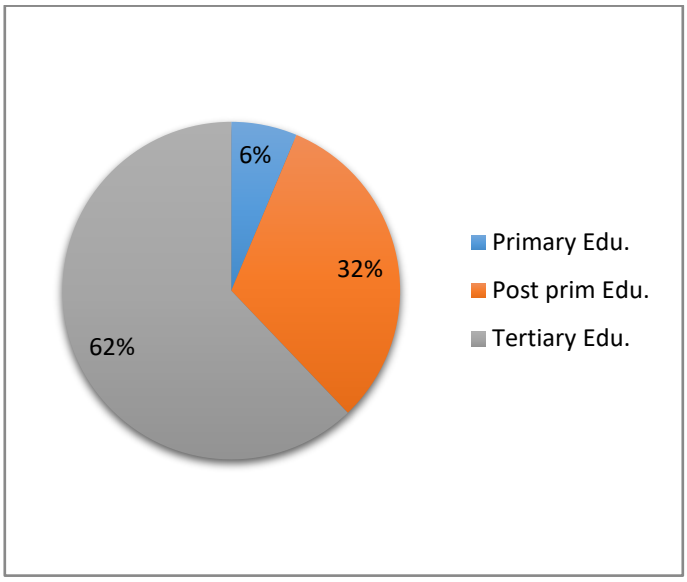

Figure 2 Data on the Educational Background of Respondents

Source: (Fieldwork 2018)

Figure2 shows the distribution or the educational background of the sample population (respondents). In the data, 6% of respondents have acquired primary education, 31.25% went beyond primary school over 60% have acquired tertiary education.

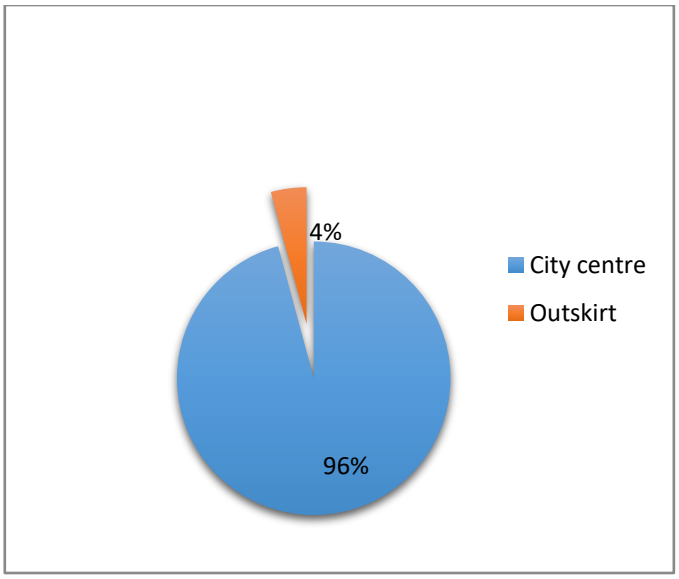

Figure 3 Data on Respondent's Place of Residence

Having observed that distance-between respondents and health facilities could be a hindrance to patients seeking treatment for malaria related cases, the researcher decided to enquire how far or close respondents lives from the city centers, and from the data in figure 3 it can be seen that over 95% of respondents live within the city centres of the study area, while only 4.2% reside on the outskirt of the cities in the study area.

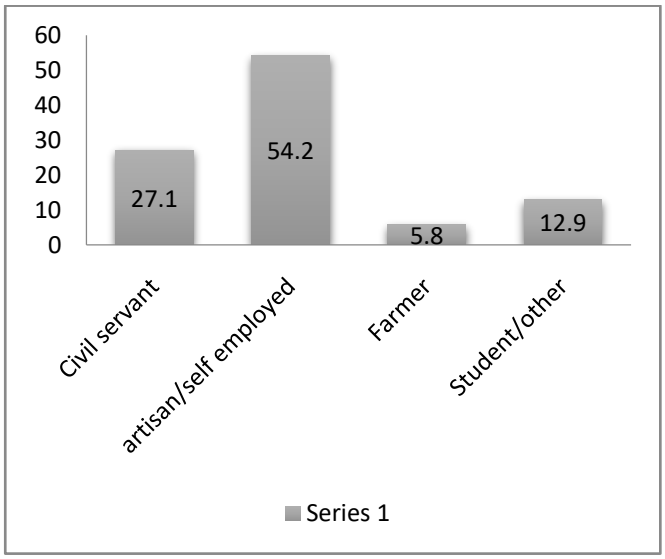

Figure 4 Data on Respondent's Occupation

Figure 4 shows that 54.2% of respondents are either self employed or artisans, 27.1% are civil servants, 12.9% are either schooling or doing something else and only 5.8% are farmer.

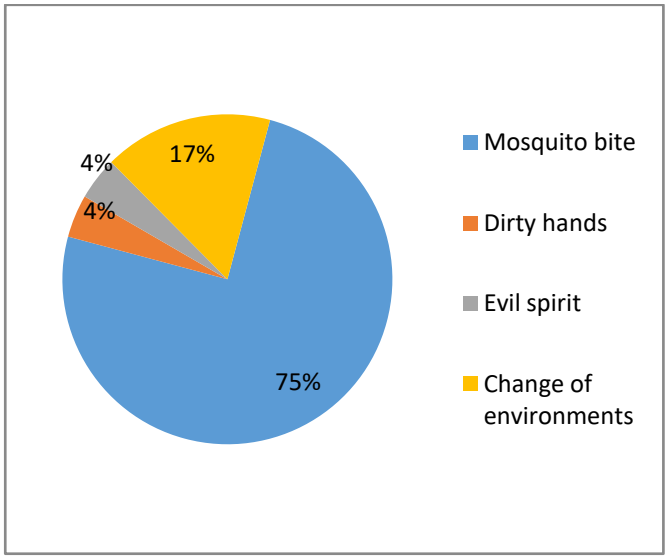

Figure 5 Data on the Perceived Cause of Malaria Fever Among Residents

Figure 5 above shows data on respondents opinion on the causes of malaria; 75% of the responses chose mosquito bites as the cause s of malaria, only 4.2% went for either dirty hands or evil spirit, while 16.6% chose changes of environment. However, the above responses dependents largely on the respondents educational as well as spiritual background, and as shown in the analysis in figure 1 where the entire target population is fairly educated with over 60% having tertiary qualification, which shows why in table 2, over 70% knows the exact causes of malaria fever in patients.

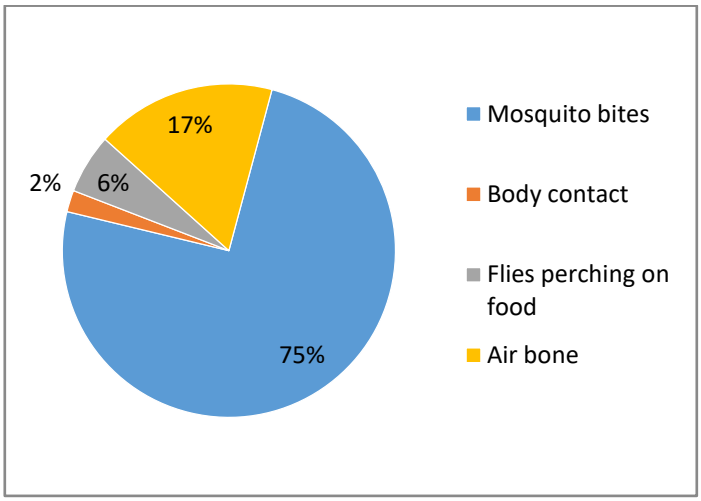

Figure 6 Data on Mode of Transmission of Malaria Fever

The data presented in figure 6 shows that over 74% of the sample population thinks that mosquito bites is only means through which malaria can be transmitted, 17.5% said malaria is air bone, while the remaining proportion choose between body content (2.1%) and flies perching on food (5.8%).

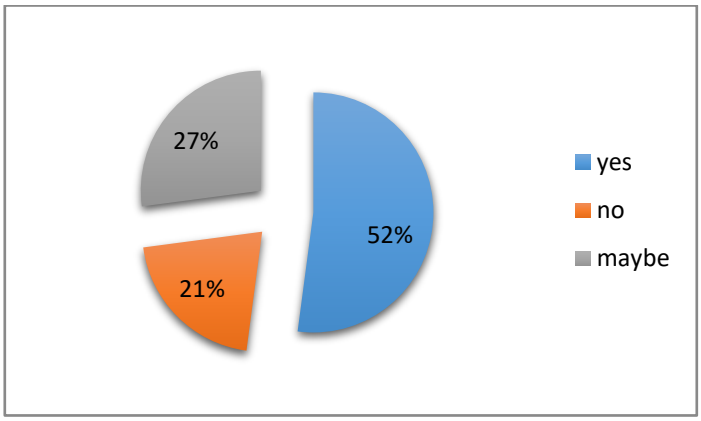

Figure 7 data on people's perception on whether climate affects malaria incidence

In figure 7, 52.1% i.e., over half the population thinks climatic factor affects the incidences malaria, while 20.8% said no and about 27% were not too sure.

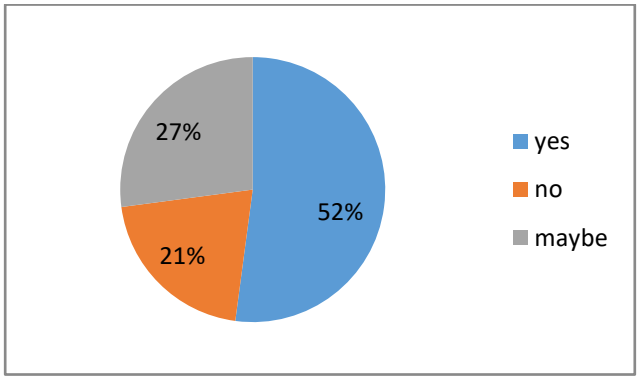

Figure 8 Data on opinion on the mode of treatment

In Figure 8 the result shows that over 60% of respondents visit a physician when they notice the symptoms of malaria in them, about 31% result to self medication while about 2% use herbal medicine. These also buttress the standard of living of the sampled population that is being dealt with in this study- in which are majority are either self employed or living by their skills.

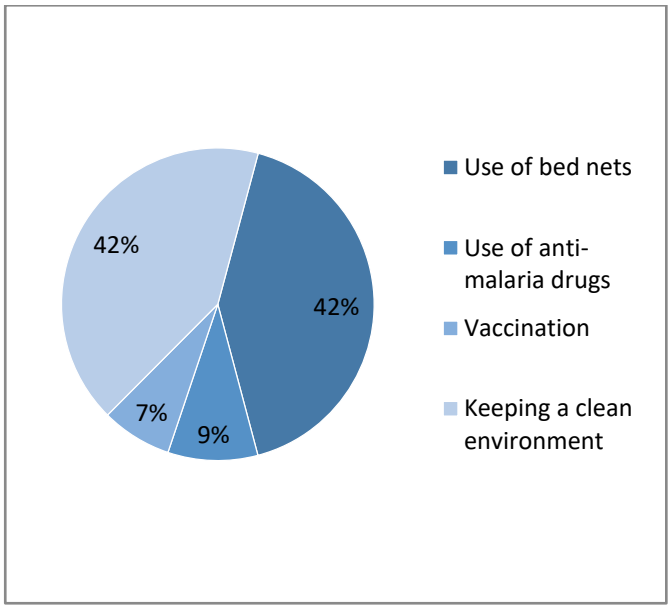

Figure 9 Data on the Mode malaria treatment among respondents

In figure 9, the peoples' opinion seems divided on the most effective way of controlling malaria- between using bed nets and keeping the environment clean as each of these options have the same proportion of percentage(41.7%) each, while the use of anti-malaria drugs have 9.3% and vaccination 7.3%.

A Comparison of Malaria Incidence in the Five Local Government Areas Of Nasarawa State

A comparison of malaria incidence in the selected five LGAs of Lafia, Akwanga, Keffi, Nasarawa and Karu shows that Karu has the highest recorded cases of malaria in the state followed by Nasarawa and Keffi Local governments respectively as presented in Table 1. This can be traced to the trend towards urbanization and the population explosion in these local governments which leads to increased concentration of the human host.

Table 1 Percentages, Comparing the Incidence of Malaria in the 5 LGAs in Nasarawa State from 2004-2018.

		Lafia	Keffi	Nasarawa	Akwanga	Karu
N	Valid	12	12	12	12	12
	Average total	188.03	182.75	172.75	172.75	174.25
Percentiles	100	27.02	77.00	79.00	68.00	82.00

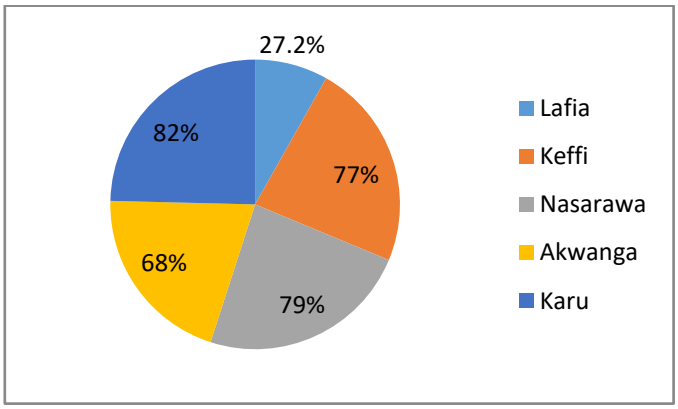

Figure 10 A pie chart of malaria incidence in percentages %

Therefore, the above outcome can only help call to mind the impact of other determinant of malaria incidence i.e. the socio-demographic and environmental factors, as highlighted earlier in chapter two of this research. These socio-demographic factors as observed by Patz et al (2003) include, but not limited to: patterns of human migration and travel, effectiveness of the public health and medical infrastructure in controlling and treating the disease, the extend of anti-malarial drug resistance and the underlying health status of the population at hand ans so on. The results confirm some of these assertion as Table 1 shows the advantage men have over women in households in terms of who receives the more attention, as the sample population slightly tipped in favour of the males. Secondly the result also shows that despite been educated and residing within the city centres where health facilities are abound, over 30%(a significant proportion) of the sample population still embark on self medication which may mean their lack of trust in the health facilities or due to their financial constraints.

Apart from the socio-demographic factors there is also the issue of environmental factors which includes changes in land-use (for example deforestation), expansion of agricultural and water development projects (which increases mosquito breeding habitats), and the overall trend towards urbanization (that is increased concentration of the human host). The poor handling of drainage as well as waste management system in this part of the world are some of the major environmental issues militating against the effective control of malaria parasite especially in Nigeria. These open gutters and other poor sanitary practices in the urban centres (including those selected for this study) are a source of concern. Thus, that explain why the opinion of respondents on the possible ways of controlling the vector is divided as shown in Table 1

IV. CONCLUSION

In conclusion, In conclusion, poor sanitation, dirty environment have adverse impact in the breeding, growth and development of mosquitoes and affects the incidence of malaria in Nasarawa. But then, although the impact of weather on malaria incidence generally is enormous, other factors (socio-demographic as well as environmental factors) also

play an important role in the development, growth and spread of mosquitoes in the study area and thus, malaria incidence.

V. RECOMMENDATION

The government and its partners should involve the people from all levels when designing strategies to combat the pandemic – since most of these people are also knowledgeable of the important facts about the disease.

REFERENCES

[1]. Bhattacharya, Sumana, Sharma, C. Dhiman, R. C. and Muttra, A. P. (2006). Climate change andmalaria in India. *Current Science*, **90(3):** 375.

[2]. Clinton, B. (2006), Climate Change Future and Global Warming: The World Economic Forum in Davos. Retrieved from http//www.madison.com1

[3]. Binbol, N.L (2007). 'Climate' in Akwa V.L; Binbol N.L; Samuila K. I; Marcus N.D (Eds)

[4]. Geographical Perspective on Nasarawa State: Keffi Onaivi Printing & Pub Co. Ltd.

[5]. Craig MH, Snow RW, Sueur D: (1999)**A climate-based distribution model of malaria transmission in sub-Saharan Africa.** *Parasitol Today*, **15:**105-11. Confalonierl, U. **"**Human health**".** pp. 291 - 431. http://www.ipcc.ch/publicationsanddata/ar4/wg2/en/ch8.html.

[6]. Donald P, J.A, Bouma K.J Chaves LF (2003): The need for linking health care seeking behavior and health policy in rural Nepal. South America Journal of medicine and public health 2006; 24: 480 – 522.

[7]. Espino F, Manderson L. Acuin C. Domingo F, Ventura E (1997): Perceptions of malaria in a low endemic area in the Philippines: transmission and prevention of disease. *Acta Trop* 1997, 63:221-239.

[8]. IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Solomon, S., D. Qin, M.Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

[9]. Joseph N.S. E, Manish A. D, Karen L, Sarah J. B, Song L, Kyra N and James C. S. (2007). Environmental Determinants of Infectious Disease: A Framework forTracking Causal Links and Guiding Public Health Research. Enviromental Health Perspective. Retrieved fromhttp://dx.doi.org on 18th March, 2014

[10]. Koenraadt, C. J. M Gitteko A. K. Takken W. (2004). The effects of rainfall and evapotranspiration on the temporal dynamics of Anopheles ganbrae S. S. and anophelesarabiensis in a Kenyan Village. *Acta Tropica*90(27):141 - 153.

[11]. Marcus N.D 'Climate' in Akwa V.L; Binbol N.L; Samuila K. I; Marcus N.D (Eds) (2007)

[12]. Geographical Perspective on Nasarawa State: Keffi Onaivi Printing & Pub Co. Ltd

[13]. Patil R.R; Deepa T.M. (2007). Climate change: The challenges for public health preparedness and response- An Indian case study. *Indian J Occup Eniron Med;*11:113 - 115.

[14]. Pascual M. Cazelles B. Bouma K.J. Chaves L.F; Koelle K. (2008). Shifting patterns: malaria dynamics and rainfall variability in an African highland. *Proc Bio/Sci*,275(1631):123 - 132.

[15]. Robert, J T (2002), Ahuman disease indicator for effects of recent global climate change. Proc Nat 1 Acad Sci USA **99:** 12506 - 12508 *Pubmed Abstract/Publisher full text/pubmed central full text.*

[16]. Rogers and Randolph (2000). «A 1951-1980 Global Land Precipitation Climatology for the Evaluation of General Circulation Models». *Climate Dynamics*, 7: 57 - 72.

[17]. Sharma, Surya K; Tyagi P; Padhan k; Pathway A; Haque M; Nanda N; Joshi H; Biswas S; Adak T; Das B; Chauhan V. Chitnis; C. and Subbarao Sley (2006). Epidemiology of malaria transmission in forest and plain ecotype villages in Sundargarh District, Orissa, India. Transactions of the Royal Society of Tropical Medicine and Hygiene, **100(10):** 917 - 925.

[18]. Valicer & Fava (2003). Climate Change Impacts in Different Agro-ecological Zones of WestAfrica" Paper presented at the International Workshop on Adaptation to ClimateChange in West African Agriculture at Ouagadougou, Burkina Faso from 27 – 30, April 2009.

[19]. World Health Organization, 2008. World Malaria report (2008). Geneva world Health organization. Available: http//whglibdoc.who.int/publications/20089789241563697engpdf(accessed1.mach2010).

[20]. World Health Organization. "Malaria Situation in SEAR Countries". (2006). <http://w3.

[21]. Yé Y. Kyobutungic; Louis R.V; Saureborn R; (2007). Micro-epidemiology of plasmodium falciparum malaria; is there any difference in transmission risk between neighbouring village? *Malaria J,* , **6:** 46

[22]. Zhou G, Minakawa N; Githeko A. K. Yan G. (2004). Association between climate variability and malaria epidemics in the east African highlands. *Proc Nat. Acad. Sci.* USA **101(8):** 2375 - 2380.