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ARE WE BEATING MALARIA? A FIVE-YEAR RETROSPECTIVE STUDY FROM A HOSPITAL IN ENUGU, NIGERIA DISAGREES?

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ABSTRACT

In endemic regions of malaria, the actual incidence and mortality rates are unknown due to incomplete reporting. Major factor against this is the irritating sampling technique (finger prick, etc) which are repulsing to the volunteers - that then becomes reluctant - necessitating need for a more accurate estimate through clinical malaria. A total of 27100 medical records of in- and out-patients for laboratory investigations (January 2005 - December 2009) were critically studied. Ages, sexes, occupations, locations, monthly plus yearly incidences of diagnosed cases of malaria were analyzed. Result revealed a yearly statistically significant steady increase in number of diagnosed cases of malaria from 2005 to 2009 (38%, 39%, 42%, 43% and 42%, in ascending order, respectively). An average of 41% (11,119) incidence over the 5 years, as against 19.1% (mere 489) for all the other parasitic diseases, was also recorded. Prevalence was highest during the drier periods of the years. $\geq$ 35 years age-group has the highest incidence. Females (52.17%) were diagnosed more of malaria than males (47.83%). Likewise, farmers and cattle herdsmen were most diagnosed of the disease. In conclusion, there was still a big, serious lag in the efforts in combating malaria. It is recommended that patients should be quarantine as is done for some diseases, until they are *Plasmodium*-parasitaemia-negative and not only when they are physically fit.

Keywords: Control; Incidence; Malaria; *Plasmodium* sp.; Prevalence.

INTRODUCTION

Since the turn of the millennium, up to the end of 2009, it is alarming and shocking when one listens to the radio and television jingles stating that: for every minute in the Africa, which includes Nigeria, two children die of malaria; it is even more chilling if one put the mathematic figure at 1,781,200 in a year (Amadi, 2008) This enormous loss of life brought about by malaria, besides absenteeism in offices and schools, apart from days or weeks of agonies while in sickness, plus cost of treatment of patients and large expenditures by government and individuals on prevention and control measures, makes it a major social and economic burden in the world.

Breman et al (2004) and WHO (1992) estimated that there are 300-500 million new cases every year, with 1.5 to 2.7 million deaths worldwide, particularly in Africa where about 90% of the global cases are recorded. The most affected are children under five years and pregnant women (WHO, 2008). In 2000, UNICEF noted that in affected areas, children suffer an average of six episodes of malaria each year, indicating malaria as the most common infirmary cause of absenteeism in schools – and probably offices too. Likewise, in some parts of tropical Africa 10% of all deaths in children under the age of 5 years are due to malaria. UNICEF (2000) stated that malaria costs countries in Africa more than one percent of their gross domestic product (GDP) and about ten percent of their expenditure on health. Also, age has been implicated as a yardstick in malaria pathology since epidemiological studies have shown that malaria in pregnancy is more prevalent in younger than older age groups (Bouyou-Akotet et al, 2003; Nwagha et al, 2009). Amadi (2008) as well indicated that in endemic areas, the elderlies are less affected with malaria

due to development of immunity. Oesterholt et al (2006) indicated that it is mostly seasonal with its major incidence occurring in the rainy season. Whether this is true, and whether sex is a factor was also part of the subjects of investigation in this literature.

In Nigeria, besides these impacts on children and pregnant women, it affects the general population (RBM, 2005; FHM, 2005). The country's entire landmass is an endemic region, such that more than 90% of the total population is at risk of malaria, with at least 50% suffering from at least one episode (and up to six episodes) each year, apart from being a major cause of morbidity and mortality, resulting in 25% infant and 30% childhood mortality (FMH, 2011). It is the greatest cause of outpatient visits across all age groups (FMH, 2000), further strongly pointing out its magnitude as a social or economic burden on the economy that cannot be over-emphasized. Ikekpeazu et al (2010) as well indicated that diabetics with severe malaria parasitaemia may be at higher risk of liver dysfunction; just as it is an end-point for the immunocompromised.

Indeed, malaria remains the most important public health parasitic disease in both tropical and subtropical countries in Africa. This is in spite of centuries of prevention and control efforts, commencing with the adventures of Europeans into the tropics, including West Africa that was nicknamed the "Whiteman's Grave" because of it. Various control measures and techniques have been advocated and practiced, yet we are not appearing to be winning the war, plus the fact that in Nigeria the actual incidence and mortality rates are unknown due to incomplete reporting (Ogbodo et al 2009). One of the factors militating against this is the displeasing nature of the sampling technique; which is the inevitable uncomfortable means of specimen collection (finger prick, vein puncture with hypodermic syringe, etc) which are repulsing to the immoderately enlightened volunteers - that then becomes reluctant despite the greater importance of the research need. And the necessity of this data is even important on yearly and monthly basis in order to monitor more closely the progress on malaria control of measures, but that has not been the case. There is then the need for a more accurate estimate of the parasite's prevalence or the incidence through clinical malaria. In this study, we assessed the laboratory reports and the cases attendance of patients in a hospital in Enugu, Eastern Nigeria for a span of five years (January 2005 to December 2009) to review this picture of the war on malaria from that angle, as well as advocated for a more collective approach towards the battle.

MATERIALS AND METHODS

Study area setting

The hospital is located in Enugu, Enugu State, Nigeria. Enugu is an ancient city of Igbo ethnicity, with high density of coal deposit; it is the present capital of Enugu State and former capital of the then Eastern Region, both of Nigeria, with a population of more than one million people, and located approximately at $6^0$27' north of latitude and $7^0$32' east of longitude on the geographical map. Together with two teaching hospitals (University of Nigeria Teaching Hospital and Enugu State University Teaching Hospital) and few other private hospitals located in the same city, are the major sources of medical care to the city, state and neighboring environs. The concept of the study was explained, consents sought, and permission obtained from the Medical Director of the institution about ethics and strict confidentiality.

Method of data collection

The material used was a total of 27,100 medical records of in- and out-patients sent to the laboratory for investigations between January 2005 and December 2009. The classification was based on doctor's provisional diagnosis and laboratory confirmations of malaria; the population is the total number of the above medical records of patients studied, most of whom resides in Enugu North Local Government Area of the Enugu city. Names were ignored, while proper ages, sexes, occupations, dates and locations were noted; records without proper documentations (age, sex, occupation, location, etc) were discarded. This was reviewed month-to-month and year-to-year for the period studied

RESULTS

The result revealed a statistically significant upward increase in number of cases diagnosed with malaria from 2005 through the years up to 2009, the final period of study. Fig. 1 is the number diagnosed with malaria among patients attending the hospital from January to December of 2005-2009. The Chi square test (2,126) and p-values (0.0000) support the claim that the differences in proportion of patients diagnosed with malaria over the study period is true. Table 1 show the number and percentage of patients diagnosed of malaria in the hospital from January to December of 2005-2009**.** 2007 has the greatest number (but 2008 has the highest percentage) of patients diagnosed with malaria across the study period. The Chi square test (2,126) and p-values (0.0000) also support the claim that the differences in proportion of patients diagnosed with malaria over the study period is true. Table 2 shows the yearly and overall percentages of positively diagnosed cases. The trend also increases from 38.5% in 2005, steadily to 42.1% in 2009. The overall percent as well show similar trend from 17.8% in 2005 to 21.325 in 2009. The monthly percentage of patients diagnosed with malaria is lowest in April 2006 and highest in Feb 2008.

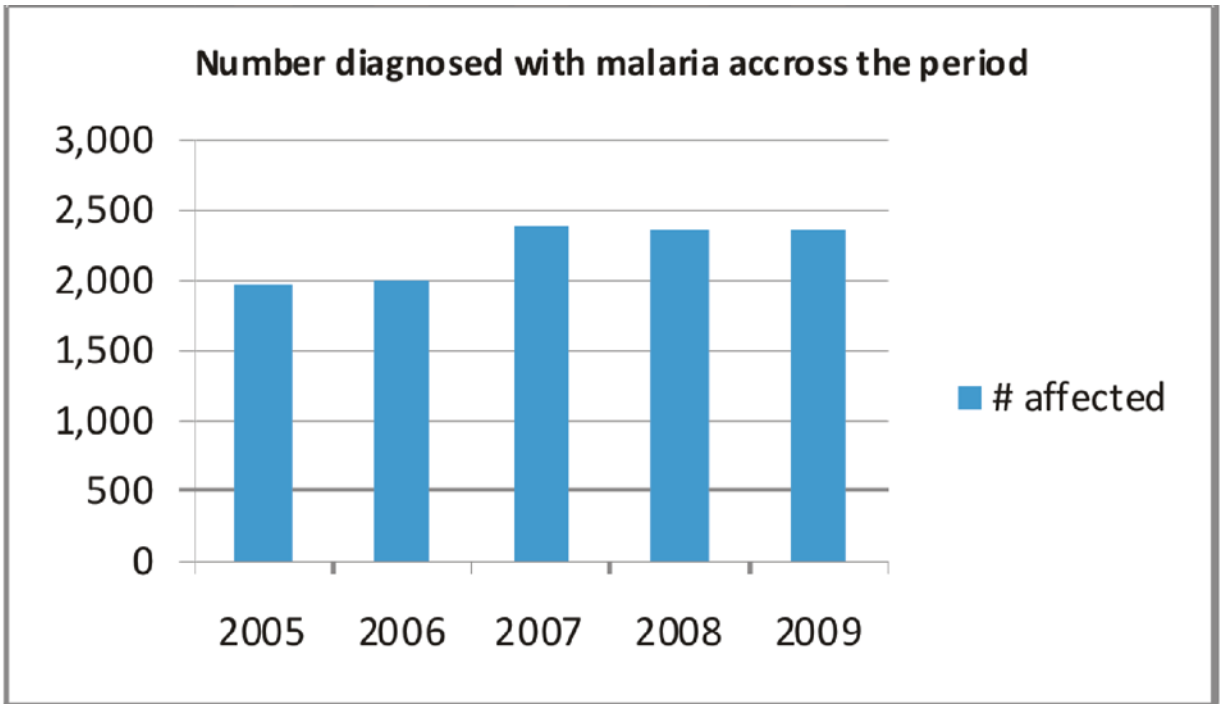

Fig. 1. The number diagnosed with malaria among patients attending a hospital in Enugu, Eastern Nigeria from January to December of 2008-2009.

The result also revealed that the highest incidence of malaria is not during the rainy season, but during the drier periods of the year .i.e. February to April and October to November, plus a slight rise during the months of August. There is as well a slight drop in incidence in December (Fig. 2 and 3). The Chi square test supports the claim that the differences in proportion of patients diagnosed with malaria over the study period is true.

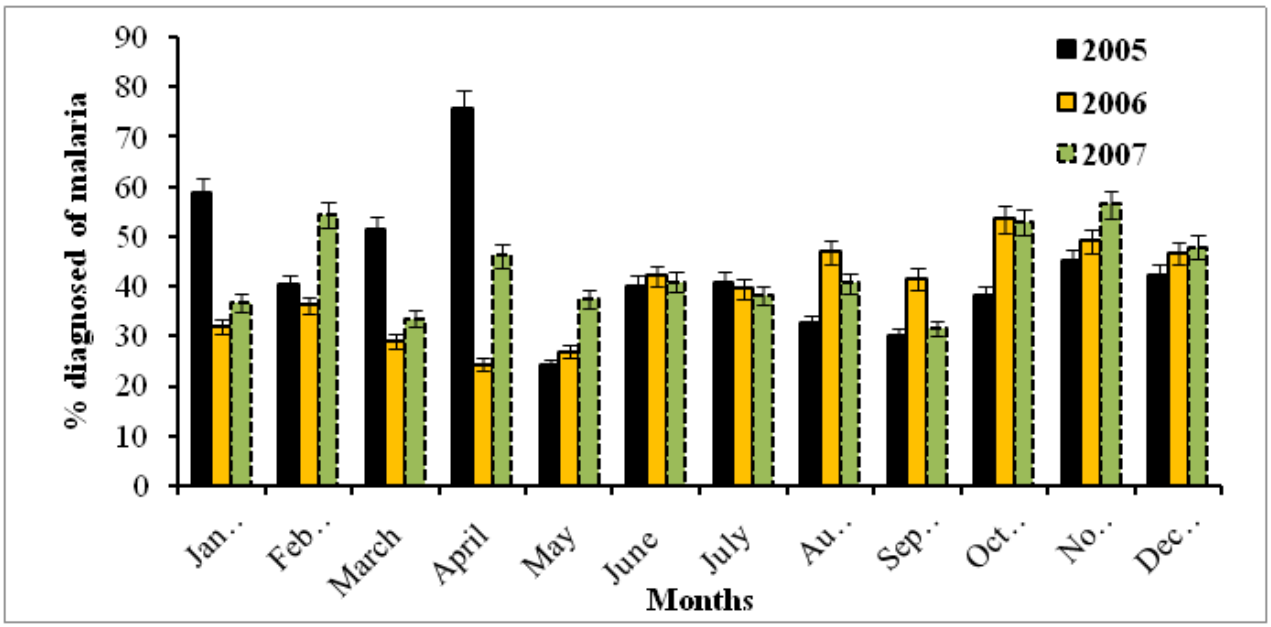

Fig. 2 Percentage diagnosed of malaria among patients attending a hospital in Enugu, Nigeria across the period of study .

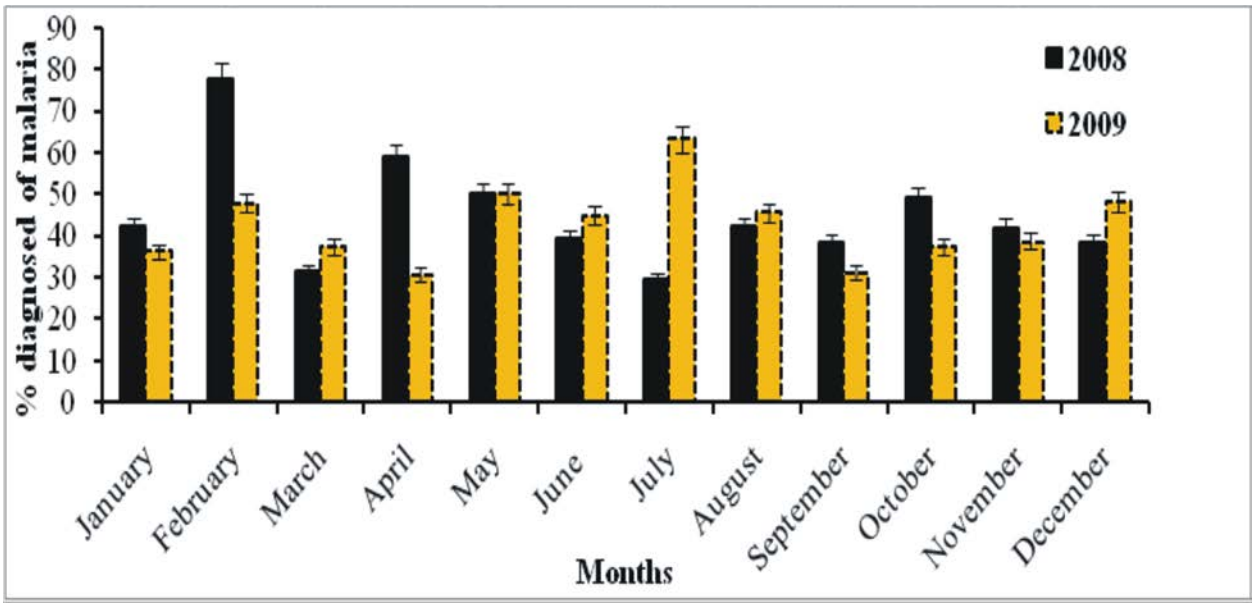

Fig. 3 Percentage diagnosed of malaria among patients attending the hospital in Enugu, Nigeria across the period of study.

Age-group result also contradicted some literatures to indicate that the age-group mostly affected is 35 years and above (56.25%) and lowest incidence in 1-14 years (8.75%). The result actually indicated that the rate of infection increases with age (Fig 4). The P-value (= 0.0000) of the Chi square test (= 45.8) supports the research finding that adults 35years and above are mostly affected.

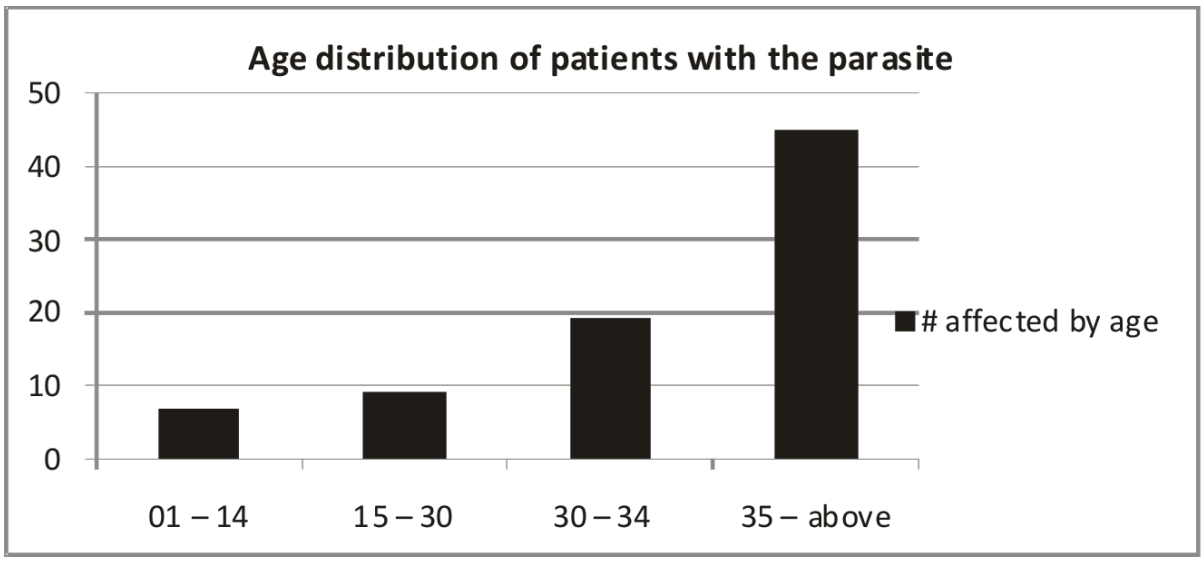

Fig. 4. Age distribution (percent) of patients diagnosed with parasites across the period of study (January to December of 2005-2009)

Fig. 5 showed that females (52.17%) are more prone to malaria than males (47.8%). This was reflected in the year to year finding as indicated in the figure. The p-value of the Chi square test also affirms the claim that more female patients are prone to malaria than the male across the period covered, except for 2006 where they have no significant difference (p = 0.071).

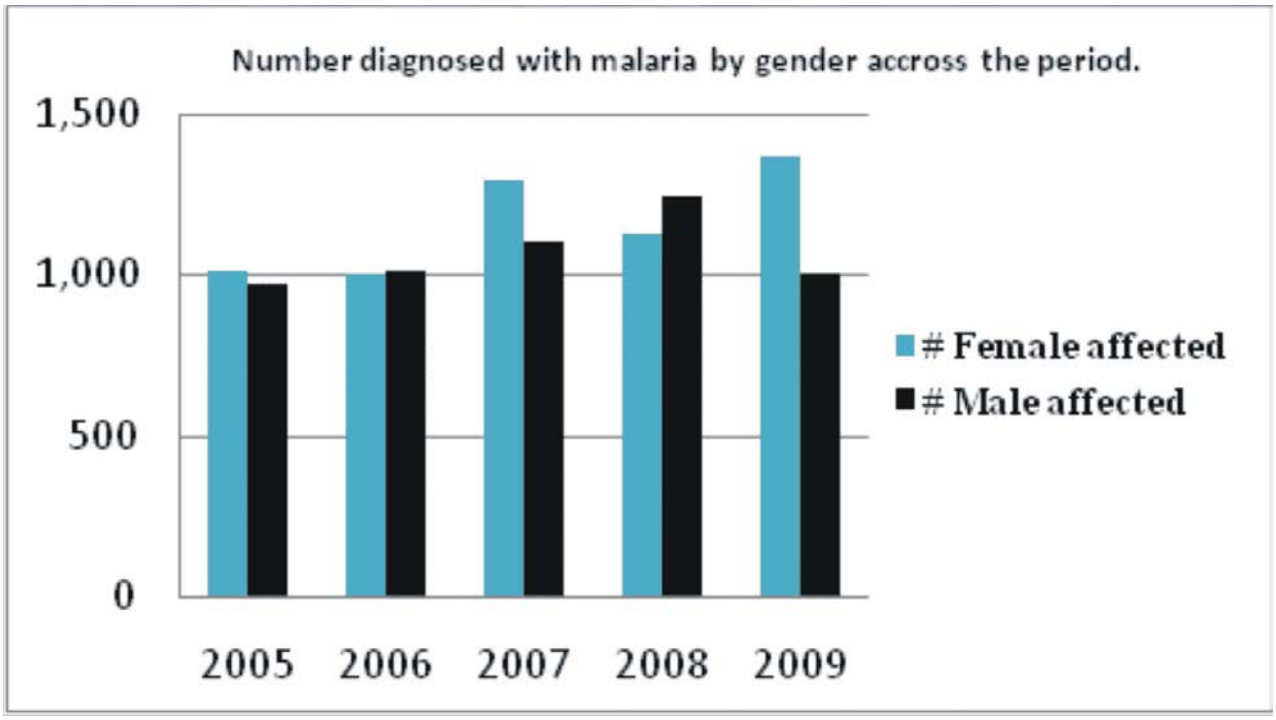

Fig. 5. Number diagnosed with malaria by gender (females and males) across the period of study.

The investigation also indicated that the incidence of malaria could as well be an occupational hazard as farmers and cattle herdsmen (30% and 25% respectively) were shown to have the highest rate, while students and office workers (11.25% and 12.5%, respectively) has the lowest incidence (Fig. 6). The p-value (0.0002) of the Chi square test supports the research finding that farmers are mostly affected.

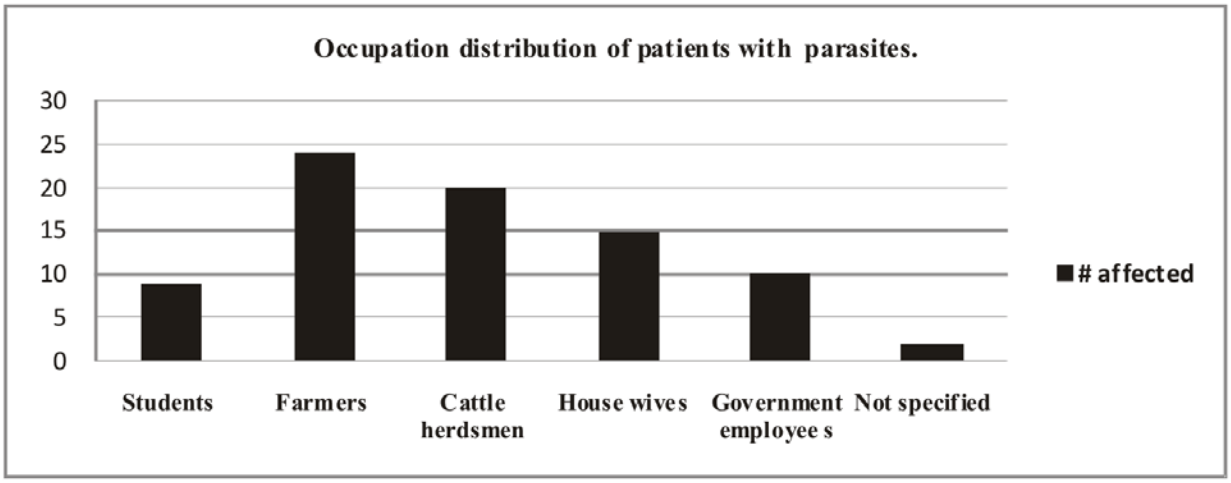

Fig.. 6. Occupational distributions (frequency) of patients diagnosed with parasites across the period of study.

Lastly, during the 5 years period of study, result also showed that out of the 27,100 patients blood laboratory results analyzed 11,119 (41%) were diagnosed with malaria, while on the other hand, out of 2560 stool sample results along the same investigation, 489 (19.10%) were positive for intestinal parasites of various kinds. This further emphasized malaria parasites as the leading parasitic disease in this region.

DISCUSSION

The result revealed a statistically significant steady upward increase in number of cases diagnosed with malaria from 2005 through the years up to 2009, the initial period of study. The year to year steady increase in the number and percentages of those diagnosed with malaria indicated that we were really not beating malaria from 2005, through the years, up to 2009, the period of study – and probably to the present day (as an ongoing update of this work is tending to indicate). This is in spite of the huge amount of money and efforts by Nigeria and the international community towards combating this menace. Have we then been beating about the bush in our combat with *Plasmodium* species, the deadly agents of malaria?

It is difficult to decipher precisely what should be an answer to the question, or what have been hampering these efforts. But the ill-cooperation of the populace cannot be ruled out as one of the main causative factor. The unhygienic and poor sanitation of the unenlightened community is one of the largest hindrances. Disused materials are carelessly discarded all about. These ultimately constitute into refuses that block gutters and drainages which create stagnant water that corollary encourage breeding of the mosquitoes-vectors. The facts that higher incidence rates over five years were during the drier periods of mild- and early rains, strongly support this line of thought (Fig. 2 and 3).

Further, although there have been many sporadic reports of the incidence of malaria in many parts of Nigeria, but there has not been any collation on monthly or yearly basis to view success or failure assessment of those general efforts put in. A statement that also came in conformity with this assertion was that by Ogbodo et al (2009) who pointed out that the actual incidence and mortality rates are unknown due to incomplete reporting. Sporadic reports are not enough to assess success or failure, but a spread out investigation over years such as this work. And this work showed rather steady increase in incidence, indicating failure of efforts, which should send a signal to the local and international health bodies. Besides, Breman et al (2004) too estimated that there has been 300-500 million new cases every year, worldwide,

Likewise, the average high percentage (41%) incidence found in this work is really a serious cause for alarm. Although this may be

considered low when compared to 67% prevalence recorded by Ike (2000) for adults in Abakaliki, 59.4% detected in post primary students in Umunede and Asaba by Ajakoro and Enuma (1999), 61% recorded for students in Abuja by Mature et al in (2001), 58% prevalence recorded in Awka by Mbanugo and Ejims (2000) in children between the aged 0-5 years, and 59.9% found by Ogbodo et al (2009) among pregnant women in a rural setting in Ebonyi State of Nigeria, it should no doubt be a worrisome prevalence rate.

The lower prevalence recorded in this work may be due to the fact that Enugu is a hilly, undulating city with better efficient drainage and lesser likelihood of stagnant waters where mosquitoes can breed, and probably with a little more enlightened community.

Although the findings agree that the incidence is seasonal, but the higher prevalent rates found during the drier periods of the years is in disagreement with Oesterholt et al (2006) who indicated that major incidences occur in the rainy season. The explanation might be that during the drier periods of the years, stagnant water are found more in gutters, but these are flushed away by floods from rain waters into nearby stream and rivers where biological factors and small fishes deal with the breeding mosquitoes larvae from the sewerages. Same factors account for the slight rise during the August breaks in rainfall.

Further to that, the prevalence among age-groups agreed with some literatures and researched work, and as well as disagreed with others. It is particularly in disagreement with Amadi (2008) who indicated that in endemic areas, the elderlies are less affected with malaria due to development of immunity. This assertion, however, can be explained by what Thomas et al (2004) described as "Stable Endemic Malaria," which is a situation where members of a holo-endemic population remain asymptomatic even with considerably high levels of malaria parasitaemia. Methodology of this our investigation did not measure "stable endemic malaria," and may account for the difference in opinion. Some other literatures has different opinion too, though: the work of Umeanaeto et al, 2008 recorded higher prevalence among the younger age group in Nnewi, Anambra State; also, Abdullahi et al, (2009) in a similar research in Sokoto, North-East Nigeria recorded highest prevalence of malaria in the age groups 0-5 and 5-10 years. However, our work is in agreement with those of Onyido et al (2011) whereby the age group 61 has the highest malaria prevalence (64.7%), their malaria prevalence in relation to age was as well significant ($p<0.05$).

The fact that females are more prone to malaria than males is in agreement with some other authors too. Onyido et al (2011) reported too that the malaria prevalence among the sexes showed that females were affected more than the males, although the difference in prevalence among sexes in their case was not statistically significant ($P>0.05$). The higher prevalence in females may be due to the genetical, physiological and hormonal differences between them and the males: childbirth, pregnancy and ovulation tend to lower the female immunity, thus predisposing them to establishment of malaria infections and other diseases. Other researchers however disagree: Mature et al (2001) recorded higher prevalence in males (65%) than the females (38%); higher prevalence in males (87%) than in females (83%) was equally recorded in Okigwe and Owerri both in Imo State, Nigeria by Ukpa and Ajoku (2001), so also did Mbanugo and Ejims (2000) in Awka and Onyido et al (2012). But unlike our work, the difference in male and female prevalence is not statistically significant in those studies. Though the differences in their work may, therefore, be due to chances; the controversy however calls for further investigation on this assertion..

It was not a surprise that this work showed that the incidence of malaria could as well be an occupational hazard, as farmers and cattle herdsmen have highest incidence rate, while students and office workers have the lowest rate, both statistically significant. Reason must be due to the fact that farmers and cattle herdsmen are more exposed to outdoor life where they receive higher bites from mosquitoes, unlike students and office worker, who are not only more enlighten on prevention and control measure, but are lesser exposed to bites from mosquitoes.

Lastly, in the five year analysis, the finding along the same line of investigation that request for malaria laboratory diagnosis was 27,100 of which 11,110 (41%) were positive, as compared a mere 2560 request for other parasites of all kinds of which only 489 (19.1%) were positive, indicated beyond doubt that *Plasmodium* species (the deadly agent of malaria) is the leading parasitic disease.

In conclusion, there is a big, serious lag in the efforts to combat malaria by many indications. When compare to so many other diseases like smallpox, measles, cholera, etc that have almost zero percent incidence these days, it is clear that lot of efforts still need to be put in place against this tropical menace called malaria. Since bad habits of the semi-enlightened communities is one of the suggested factor tating militating against this war, the custodians of national health should put up more efforts, even sanctions and penalties against offenders, in order to discourage these negative attitudes. Machineries should also be put in place to protect those at higher risk, who might even be the reservoir of the disease. And, if need be, patients should be quarantine as is done in some countries and as for some diseases, until they are *Plasmodium*-parasitaemia-negative and not only when they are physically fit. Most of the efforts had been over-concentrated on only the mosquitoes-vectors control; it is high time these battles be focused squarely on the *Plasmodium* etiologic agents too. Then, and only then, these authors are sure the world can put a full-stop to malaria.

ACKNOWLEDGEMENT

Table 1. Number and percentage of patients diagnosed of malaria in a hospital in Enugu from January to December of 2005-2009

Year	#AFFECTED (%)		#NOT AFFECT	Chi sq	P value
2005	1976	(38%)	3, 159	11,918	0.0000
2006	2013	(39%)	3,184	11,952	0.0000
2007	2390	(42%)	3,253	13,089	0.0000
2008	2369	(43%)	3,125	13,699	0.0000
2009	2371	(42%)	3,260	12,984	0.0000
Total	**11,119**	**(41%)**	**15,981**	**2,126**	**0.0000**

Table 2. Number and percentage of patients diagnosed of malaria in a hospital in Enugu from January 2005 to December 2009.

Periods (Jan-Dec)	No. of samples examined	No. of positive samples	Percentage	
			Yearly	Overall
2005	5,1355	1,976	38.5%	17.8%
2006	5,197	2,013	38.7%	18.1%
2007	5,643	2,390	42.3%	21.5%
2008	5,494	2,369	43.1%	21.30%
2009	5,631	2,371	42.1%	21.32%
Total	**27,100**	**11,119**	**41.0%**	**100%**

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