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A Study of the Effect of *Plasmodium Falciparum* - Infection on Liver Function in Pregnant Women in Owerri, Imo State, Nigeria

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Abstract

The serum amino transferases and alkaline phosphates levels in 50 selected pregnant women infected with *Plasmodium falciparum* were studied. The infection did not cause appreciable changes in the serum level of aspartate aminotransferase (AST): $X_t = 15.03$ and $X_c = 14.00$. IU/L ($P > 0.01$); alanine aminotransferase (ALT): $X_t = 11.07$ and $X_c = 11.00$ IU/L ($P > 0.01$) for the tests and controls(14.00IU/L & 11.00IU/L) respectively. There was transient rise in the level of alkaline phosphatase(ALP) ($X_t = 102.66$ and $X_c = 94.60$ IU/L), which was not related to the infection. In all three {AST, ALT, & ALP) studies, there were no relationship between the enzyme levels, the age of the women and the parasite counts. At the level of parasitaemia in this study, the *Plasmodium falciparum* infection did not really alter the serum levels of AST, ALT and ALP in the infected pregnant women respectively. Lack of distinct relationship between parasite count and enzyme levels may be attributed to the low degree of parasitaemia. This study suggests that liver function was not compromised in the pregnant women as a result of the *P. falciparum* infection.

Keywords: Liver function, pregnancy, *plasmodium falciparum.*

1.0 Introduction

A number of vital biochemical indices are altered during pregnancy. These may include hormonal and metabolic functions of some organs. Ozegbe (2001) showed that erythrocyte metabolism is affected by the state of pregnancy. The effect of infection on hepatocellular enzymes has also been established (Laifei *et. al,* 2001, Conchilo *et. al,* 2002). Some studies have shown that the serum concentration of marker enzymes such as aspartate aminotransferase (AST), and alanine aminotransferase (ALT), and sometimes alkaline phosphatase (ALP) may increase in the course of some infections during pegnancy (Thomasson, 1979, Ozegbe, 2001); for instance, in acute viral hepatitis A or B (Daas and Shah, 2000). These enzymes are known to leak into general circulation in the course of injury or cellular damage. This explains why they are used as markers to predict cellular injury or damage. White *et. al.,* (1978) suggested that AST, ALT, and ALP could be used as preliminary indices for damage associated with the liver or muscles. However, studies have shown that ALT is more specific for damage arising from the liver cells (Daas and Shah, 2000).

Plasmodium falciparum infection is common in the tropics. There appears to be no studies on the influence of this parasite on the serum concentration of the liver marker enzymes in pregnant women. This study will attempt to answer some of the questions associated with *Plasmodium falciparum* infection in relation to serum concentrations of these enzymes.

2.0 Materials and Method

The methods of Reitman and Frankels (1957) as cited by Cheesbrough (1998) were employed for the estimation of serum AST and ALT. Serum ALP was estimated using the procedure described by King and King (1954). Fifty pregnant women with clinically established Plasmodium falciparum infection, randomly selected from the Federal Medical Centre, and General Hospital, Umuguma, Owerri,were assayed.

(a) Improvement in farmer's management skills,
(b) Species diversity
(c) Resource recycling,
(d) Improvement in income and
(e) Improvement in nutrition.

The capacity of aquaculture development projects or new technologies to give positive results as outlined in the above indices depends on how it was formulated at the design stage. It is widely accepted (Puddle, 1993) that conventional methods of socio-economic rural diagnosis or surveys have not been very effective in determining the real needs and aspirations of the people when development projects are formulated. In the context of this paper, new diagnostic methods suggested by FAO (1997) are recommended for Nigerian small-scale rural aquaculture. These include the Rapid Rural Appraisal (RRA) and the Participatory Rural Appraisal (PRA) techniques which incorporate community members in the identification, analysis and evaluation of their limitations and possibilities according to their own perceptions so that together with institutional facilitators, priorities are established.

FAO (1997) defines RRA as "An activity carried out by a group of people from different professional disciplines with the aim to learn about a particular topic, area group of people or whatever else is of concern to those organizing the RRA". It uses a set of guidelines and tools to involve local people in the collection of information, organizing it so that it is easier understood by a wide range of people, and quickly analyzing and reporting findings as well as suggesting appropriate action. RRA is flexible and responsive. It achieves an understanding of processes is dynamic and because analysis is carried out during the appraisal, it provides its own opportunities for cross-checking (Polson and Spercer, 1991, Mandima. 1995). However RRA has been criticized for providing findings which are not statistically sound.

On the other hand (Mandima, 1995) "Participatory Rural Appraisal" (PRA) ideally responds to the needs of communities and target groups rather than those of development workers and agencies. Thus RRA is more "abstractive" than PRA. The tools used help outsiders to learn rather than to help local people analyzes their own conditions and communicate to outsiders. Relatively, the focus of PRA should be decided by the communities and the end product used by them rather than "outsiders". According to FAO (1997), while it is possible to use RRA purely for research, PRA is closely linked to action and intervention.

3.0 Merits and Demerits of PRA

The advantages of PRA have been identified by Polson and Spencer (1991). It provides means of identification of genuine priorities that assist mobilization of community resources, leading eventually to more sustainable development activities. However, FAO (1997) is of the view that there are the dangers of raising expectations which cannot be realized, and of proposing development plans to which agencies are incapable of responding and of failing to take into account, stratification within communities.

3.1 Small-Scale Rural Aquaculture Development Planning: Relevance of RRA and PRA

The relative appropriateness of RRA and PRA for the planning process in aquaculture depends on the type of planning framework in place. Within a sectoral planning framework, the use of RRA is essential. There is also the scope for the use of PRA in certain contexts. For example, Mandima (1995) suggests that PRA might be used for participatory planning for resource conflict resolution. In rural communities dimidiated by small- scale rural aquaculture, for example, water can be a very scarce resource.

It would be a serious mistake for policy makers to build a dam on the river, diverting the water for electricity generation without involving the people (the resource- poor users) at the level of decision making process for joint appraisal of the consequences of the dam on their means of livelihood. In participatory planning

framework, PRA would form an integral part of any analysis of resource management activities. In projects involving restocking of community fish ponds for example, it would be difficult to determine which species of fish the people delight if the resource users were not involved in a kind of "participatory planning" for the project. Factors affecting the sustainability of small- scale aquaculture such as seed production, fish feed, fish species; fishing gear etc are analyzed within the framework of the above diagnostic methods.

3.2 Participatory Approach to Problem Diagnosis- Detailed Instrument and Justification

The development of participatory approaches to research and intervention in farmer's existing practiee constitutes a positive response to aspects of the problems confronting aquaculture promotion and rural developments. Since the early eighties, (Chambers, 1986, Noble, 1994) **"top-down"** approaches have been criticized for their refusal to see all stakeholders as active participants in development. Technologies are developed in isolation from those who are expected to benefit from them and are imposed from outside without due consideration of existing knowledge and practices. The acknowledged development is "farmer-first". The justification for the shift is both moral and instrumental. If people are allowed to define their own objectives and agendas, development projects are likely to be more sustainable and effective.

The moral aspect of the shift involves a call for **"reversals"**- in attitudes, in professionalism, and in the top-down biases of development practice. It reflects disenchantment with conventional approaches to development which clearly failed in its major goal-the alleviation of poverty.

The instrumental aspect is concerned with a search for ways to make development more effective. This has included the development of a diverse range of approaches. Some of the most popular are the agro-ecosystem analysis (AEA), Farmer Participatory Research (FPR), Participatory action research (PAR), Farming Systems Research (FSR) Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA).

FRS sees the Farm as an integral whole. The aim is to facilitate a process whereby farmers are able to select and develop new technologies. There is explicit recognition of the value of the existing knowledge (Present Practice). The FRS is the extension method currently used in Nigeria by the State Agricultural Development Programmes (ADP's). In the On- Farm Adaptive Research (OFAR), using the Split Plot Adoption Technique (SPAT), the farmer participates in every stage of the experimentation concerning the new farming technique, from site selection, to land preparation through cultivation harvesting and comparative analysis of results. This is illustrated in figure 1 which presents a generalized farming system – based participatory research and development methodology based on CIMMYT (1986) model.

3.3 The Significance of Small- Holder Aquaculture in Rural Development

Sub- Saharan Africa (including Nigeria) is characterized by rapid population growth, declining food production, stagnating per capita calorie consumption and environmental degradation (FAO, 1997). This has affected productivity and resource sustainability.

Small-scale aquaculture is a relatively new technology in Nigeria. As with many other new agricultural technologies, it is characterized by low rates of adoption, less than optimal productivity, and poor sustainability of projects. Small- scale aquaculture and agriculture compete with each other in specific ways: With horticulture for land and water and with other on- farm activities for feeds and fertilizers. With regards to labour and capital, small- scale aquaculture does not compete with other on- farm activities. (Kent, 1995, Williams, 995). This is so because small- scale aquaculture is non- capital intensive.

Structural Adjustment Program (SAP) in Sub-Saharan Africa has led to a reduction in government extension budgets, rationalization of extension services, privatization of extension services and privatization of imput supplies, including the supply of fingerlings, for fish farming. Changes in credit availability are unlikely to

directly affect the development of small- scale aquaculture as little capital is required (Mohnar *et al*, 1991).

Small- scale aquaculture offers good potential for income generation. Fish from small- scale aquaculture can contribute to improved food security, especially, transitory food insecurity. This is because, fish is consumed not only when the pond is completely harvested, but also throughout the year through intermittent harvesting. Small- scale aquaculture can therefore contribute to the alleviation of poverty among the rural poor. Studies (FAO. 1997) have shown that, it is not always the better-off farmers who adopt fish farming, provided the extension approach and message are appropriate (Vander Mheen- Sluijer, 1995).

It is clear that aquaculture integrated with agriculture can contribute to rural development, but experience has shown that the most important critical factor is the extension approach, particularly whether adequate and appropriate information is made available to farmers. FAO (1997) describes the existing extension approaches as characterized by "**top- down**" approaches, such as the Training and Visit (T & V) system found in parts of East and West Africa. Although integrating aquaculture into existing agricultural extension services is considered a good idea, the practical aspects of this integration are difficult. There may be problems of system overload, institutional barriers and a requirement to reverse the roles of current extension personnel. For example, participatory approach is to extension service require significant changes in current extension methods, such as:

(a) Improvement of the capacity of small- scale rural farming households to analyze problems and identify opportunities
(b) Encouragement of the development of local networks to disseminate information
(c) Monitoring the quality of knowledge transferred in order to avoid significant distortion of information
(d) Need for training of field workers in communication and motivation skills in addition to technical knowledge
(e) Current indicators to monitor staff performance are not well suited to the implementation of a participatory extension approach.

Despite the inherent advantages, it is difficult to implement these additional demands of the new extension system given budgetary reductions by the government. There is an increased awareness that conventional approaches to research and extension are inadequate and that participatory extension approaches require significant changes in current extension services. These include improvement of the capacity of small-scale rural farming household to analyze problems and identify opportunities and encouragement of the employment of local networks to disseminate information combined with monitoring the quality of knowledge transferred in order to avoid significant distortion of information. Also there is the need to train field workers in communication and motivation skills in addition to technical knowledge. Current indicators to monitor staff performance are not well suited to the implementation of participatory extension approaches to extension (Vander Mheen- Sluijer, 1995).

In conclusion, aquaculture extension should be integrated with agriculture extension and should be part of the overall rural development. The extension approach should change and become participatory. In rural development, the challenge is not to ensure that farmers adopt certain activities, or techniques, but to ensure that they are aware of the specific opportunities that exist in their situation.

4.0 The Application of Geographic Information System (GIS) in Small-Scale Rural Aquaculture - A New Development

Geographic Information System (GIS) technology has recently been adapted to assess the potential for aquaculture development (FAO, 1997). A Geographic Information System is a computerized way of storing manipulating, and analyzing data. In the case of aquaculture, the potential of a particular area can be assessed according to a number of different criteria. These include the availability of surface water, the

suitability of the topography for pond construction, the suitability of the soil texture, the appropriate temperature, the availability of agricultural by- products, infrastructure and marketing potentials.

For example, using GIS, the FAO has carried out a study of the potential for warm water aquaculture in Africa (Kapetsky, 1994), and early results indicate that there are 29 countries in Africa with suitable optimum conditions for fish farming. A detailed study of potential in Ghana has been followed by an assessment of potential throughout the African continent and the compilation of a database of about 1000 small water bodies. This is made possible through the use of GIS. The idea is to compare potential with actual performance in order to be able to focus assistance on areas which are not living up to expectation.

GIS has the capacity for simplifying planning and decision making for aquaculture. A large number of variables can be stored and analyzed using one system. However, FAO (1997) suggests that potential for aquaculture is obviously determined by a wider range of criteria than currently manipulated using GIS. Although economic and marketing criteria, for example, are considered using GIS, political and administrative contexts are currently not part of the analysis. The usefulness of GIS is therefore limited by the extent to which these factors intervene in the process of aquaculture development.

Geographic Information System (GIS) is based on synthesis of spatial and non-spatial data obtained from different sources, highlighted in Table 1. These include cartographic information, such as location of main streams formation, such as location of main streams roads, towns and political divisions. Data from other sources, such as aerial photography, remote sensing and census (demography) are also used. GIS covers such aspects as the physical, biotic and socio-economic situations of the study as related to aquaculture. Transects are established for a detailed characterization of the vegetation, biodiversity, aquatic fauna and flora, alternative uses of soil, management zones, project situations, actual use of soil, erosion, geomorphology, hydrology, litology, placement of towns, etc, all of which have relevance to aquaculture.

In developing countries such as Nigeria, GIS is relatively new and its efficiency is limited by the lack of dependable and reliable data to feed the system. It is however hoped that in the future, these methodologies will become important tools for planning sustainable rural development activities.

5.0 Recommendation

The need for alternative options for a sustainable rural development has been emphasized in recent times across the world. The unhealthy socio-economic characteristics of the countries of sub-Saharan African such as Nigeria calls for even more concerted effort in this direction. There is rapid population growth, declining food production, stagnating per capita calorie consumption, environmental degradation and natural resource depletion. The situation is further worsened by institutional problems such as the introduction of structural adjustment programmes (SAP) resulting in reduced government budgets, rationalization of work force and privatization of essential services and inputs.

Small-scale aquaculture which emphasizes on-farm utilization with low capital input could serve as a catalyst if encouraged and properly integrated into the rural development process. It is advocated that small-scale aquaculture should be given due consideration in the unified Agricultural Extension System that recognizes the farmer- participatory approach to problem diagnosis and resolution, using the instruments highlighted in the text. Increased adoption of technologies is expected to significantly improve smallholder productivity for a sustainable rural development.

Proper awareness should be given to the role of Geographic Information System (GIS) in small- scale aquaculture by the appropriate government agencies. Effort should also be made to utilize the new method of collection and analysis of data in small-scale aquaculture for sustainable rural development.

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