

Parasitic Infestations, Anaemia and Blood Glucose Level in Out-Patients of a Secondary Health Centre in Southwestern Nigeria

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Abstract: This study focused on the relationship between some parasitic infestations and anaemia and blood glucose level among 112 (26 males, 86 females) out-patients of a public secondary health centre in Ijebu area of Ogun State, Nigeria. The age range of the patients was 13 to 70 years and the study was carried out between January and February, 2009. Venous blood sample collected from each patient was tested for packed cell volume using haematocrit centrifuge, *Plasmodium* parasitaemia using Field's stain and fasting blood glucose level using glucometer. For each patient, urine sample, collected between 8.00 and 10.00 hrs, was centrifuged and examined microscopically for *Schistosoma* eggs and early morning faecal sample was examined using direct smear technique for intestinal protozoans and helminthes. Overall, 30.4% (34 / 112) of the examined patients had one or more parasitic infestations which included *Plasmodium* (17.9%), *Entamoeba histolytica* (5.4%), *E. coli* (4.5%), *Ascaris lumbricoides* (6.3%), *Trichuris trichiura* (1.8%), hookworm (1.8%) and *Schistosoma haematobium* (1.8%). Among the intestinal helminthes *A. lumbricoides* was statistically most prevalent ($\chi^2 = 4.09$, $P < 0.05$). The record of *E. histolytica* and *E. coli* in this study is the first of its kind, from Ijebu area of Ogun State, Nigeria. All patients infested with each of *Plasmodium*, *A. lumbricoides*, *T. trichiura* and hookworm were anaemic. For each of *E. histolytica*, *E. coli* and *S. haematobium*, $\geq 40\%$ of the infested patients were anaemic. One of the anaemic patients infested with *Plasmodium* (female, aged 34 years) and the only anaemic *S. haematobium*-infected patient (female, aged 45 years) were also hyperglycaemic (blood glucose level: 102 mg / dl and 250 mg / dl, respectively). This study has shown that some parasitic infestations, at least, contribute to anaemia while they appear to have little, if any, impact on blood glucose level in the study area. There is need to pragmatically educate the inhabitants of the study area on the importance of hygienic practices and adequate nutritious diets.

Key words: *Plasmodium* • Intestinal helminthes • Intestinal protozoans • Anaemia • Blood glucose level • Out-patients

INTRODUCTION

Many parasitic infections negatively influence the blood qualitatively and quantitatively in the course of their presence in humans. For instance, during erythrocytic phase *Plasmodium* causes destruction of erythrocytes and also metabolizes haemoglobin. *Schistosoma* can also metabolize haemoglobin within erythrocyte and cause blood loss during the movement of their spiny eggs via blood vessels. Many intestinal

parasites often cause wholesale blood loss [1-3]. Glucose is one of the important nutrients often found in the blood and its concentration may be influenced by the presence of some parasites [2].

The negative influence innately-associated with many human parasites aggravates the severity of morbidity of such parasitic infestations. In view of this, several studies have evaluated the occurrences, causes and consequences of the severe morbidity associated with many parasitic infestations [4-7].

However, there seems to be paucity of information on related subjects from Ijebu area of southwestern Nigeria. Therefore, this study was designed to elucidate the relationship between some parasitic infestations and anaemia and blood glucose level among out-patients of a public secondary health centre in Ijebu area of Ogun State, Nigeria.

MATERIALS AND METHODS

Study area and patients: The study was conducted at the public secondary health centre (General Hospital) in Ijebu-Ode. Ijebu-Ode is both urban and cosmopolitan and it is the headquarters of Ijebu-Ode Local Government area, in Ogun State, southwestern Nigeria. The composition and characteristics of the township and its population have been described in an earlier paper [8]. The secondary health centre serves as a referral hospital to many public and private health centres in Ijebu area of Ogun State.

The study population consisted of 112 (26 males, 86 females) out-patients of the secondary health centre who reported in the laboratory. The age range of the patients was 13 to 70 years. The study was carried out between January and February, 2009.

Pre-study protocols: Before the study commenced, the authorities of the secondary health centre used for the study were contacted for permission and ethical approval of the study procedure which were graciously granted.

Blood sample collection and examination: For each patient venous blood sample was collected using sterile needle and syringe. The blood sample was transferred into an ethylene diamine tetra-acetic acid (EDTA) bottle. Each sample was then tested for packed cell volume (PCV) using haematocrit centrifuge. PCV values of $47 \pm 7\%$ and $42 \pm 5\%$ were taken to be normal for males and females, respectively. Patients with lower PCV values were categorized as anaemic. Two blood films (one thin and one thick) were made from each blood sample and were stained with Field's stain A and B for *Plasmodium* parasitaemia determination. In addition, fasting blood glucose level of each patient was determined with glucometer. Fasting blood glucose level of 80 ± 20 mg/dl of blood was taken to be normal. Patients with lower blood glucose levels were categorized as hypoglycaemic while those with higher blood glucose levels were categorized as hyperglycaemic.

Urine sample collection and examination: Urine sample was collected from each patient between 8.00 and 10.00 hrs into labeled clean universal bottles. Each sample was sedimented by centrifugation and the sediment was examined microscopically.

Faecal sample collection and examination: Based on instruction, each patient submitted a little portion of his/her early morning faeces which was brought in a clean sample bottle. Each sample was examined using direct smear technique [9]. Due logistics problems, counting of parasite eggs and cysts were not done.

RESULTS

Overall, 30.4% (34 / 112) of the examined patients had one or more parasitic infestations. The prevalences of the parasitic infestations recorded are shown in Table 1. Among the intestinal helminthes *Ascaris lumbricoides* was statistically most prevalent ($\chi^2 = 4.09$, $P < 0.05$). *Entamoeba histolytica* and *E. coli* had statistically similar prevalences ($\chi^2 = 0.08$, $P > 0.05$).

Among the parasite-infested patients, the observed mixed intestinal infestations are *E. histolytica* + *E. coli* (2 / 34, 5.9%), *E. histolytica* + *A. lumbricoides* (1 / 34, 2.9%) and *E. histolytica* + *E. coli* + *A. lumbricoides* (1 / 34, 2.9%).

Table 2. summarises the occurrence of anaemia, hypoglycaemia and hyperglycaemia among the patients. Anaemia had statistically highest occurrence (90 / 112, 80.4%) compared to hypoglycaemia and hyperglycaemia ($\chi^2 = 123.86$, $P < 0.001$). There was no significant difference in occurrence of anaemia between the genders ($\chi^2 = 0.58$, $P > 0.05$).

All patients infested with *Plasmodium* were anaemic and one of them (female, aged 34 years) was also moderately hyperglycaemic (blood glucose level: 102 mg / dl). Similarly, all infested patients infested with each of

Table 1: Prevalence of some parasitic infestations among out-patients of a Nigerian secondary health centre

Parasite	No. positive*	Prevalence (%)
<i>Plasmodium</i>	20	17.9
<i>Entamoeba histolytica</i>	06	5.4
<i>Entamoeba coli</i>	05	4.5
<i>Ascaris lumbricoides</i>	07	6.3
<i>Trichuris trichiura</i>	02	1.8
Hookworm	02	1.8
<i>Schistosoma haematobium</i>	02	1.8

*No. examined = 112

Table 2: Occurrence of anaemia, hypoglycaemia and hyperglycaemia among out-patients of a Nigerian secondary health centre

	Male					Female					Total		
Age groups (yrs)													
	No. exam.	No. (%)	No. (%)	hyper glycaemic	No. (%)	No. (%)	hypogl- ycaemic	hyper glycaemic	No. exam.	No. (%)	hypogl- ycaemic	hyper glycaemic	
13-17	3	03 (100)	0	0	1	01 (100)	0	0	4	04 (100)	0	0	
18-40	13	10 (76.9)	0	0	73	62 (84.9)	03 (4.1)	03 (4.1)	86	72 (83.7)	03 (3.5)	03 (3.5)	
41+	10	06 (60.0)	01 (10.0)	02 (20.0)	12	08 (66.7)	0	03 (25.0)	22	14 (63.6)	01 (4.5)	05 (22.7)	
Total	26	19 (73.1)	01 (3.8)	02 (7.7)	86	71 (82.6)	03 (3.5)	06 (7.0)	112	90 (80.4)	04 (3.6)	08 (7.1)	

A. lumbricoides, *Trichuris trichiura* and hookworm were anaemic. For *E. histolytica*, *E. coli* and *Schistosoma haematobium*, 66.7% (4 / 6), 40% (2 / 5) and 50% (1 / 2) respectively, were anaemic. The anaemic *S. haematobium*-infected patient (female, aged 45 years) was also hyperglycaemic (blood glucose level: 250 mg / dl). Except for one case of *E. histolytica* + *E. coli*, all mixed infestations occurred in anaemic patients.

DISCUSSION

The relatively high prevalence of parasitic infestations among the examined patients is a clear indication that the parasites are still of serious public health importance in the study area. This is because with the exception of *E. histolytica* and *E. coli*, all the parasitic infestations have been earlier reported in some other studies from different parts of Ijebu area [8, 10-12].

To the best of our knowledge, the record of *E. histolytica* and *E. coli* in this study is the first of its kind, at least in recent time, from Ijebu area of Ogun State, Nigeria. Unlike in most previous studies from the study area, faecal samples were examined in the laboratory almost immediately after collection from the patients. This underscores the importance of prompt processing and examination of fresh faecal samples in epidemiological studies. *E. histolytica* and *E. coli* usually coexist in human large intestine and their presence, like other intestinal parasites, signifies poor personal and environmental hygiene [1, 3].

The widespread occurrence of anaemia among the examined patients is worrisome but agrees with the earlier observation that about 30% of the world population is anaemic [13]. Anaemia is commonly caused by deficiency of iron in diet [13, 14]. It is common knowledge that due to combined forces of ignorance and poverty the diets of many individuals and households in developing countries often lack many essential blood-building ingredients,

including iron. These factors might have contributed to the high occurrence of anaemia in the study area. Nevertheless, it is an established fact that the presence of many parasitic infestations such as *Plasmodium*, hookworm and *S. haematobium* has the innate tendency to elicit anaemia in humans [3, 6, 7, 15, 16]. Therefore, the multiple effects of parasitic infestations and iron-deficient diet among inhabitants with parasites in the study area cannot be overemphasized.

In this study no case of hypoglycaemia was found associated with any parasitic infestation. This is incongruous with the fact that acute febrile illness and vomiting, which are often associated with some of the recorded parasites (especially *Plasmodium*), are some of the causes of hypoglycaemia [17]. However, two cases of hyperglycaemia occurred concurrently with parasitic infestations in this study. It has long been known that blood glucose level is regulated by insulin (often influenced by age) in human body [14]. The hyperglycaemia cases might have been due to insulin deficiency. This view is supported by the fact that these occurred in patients who were over 33 years old.

This study has shown that some parasitic infestations, at least, contribute to anaemia while they appear to have little, if any, impact on blood glucose level in the study area. However, there is need to periodically and consistently educate the inhabitants of the study area on the importance of hygienic practices and adequate nutritious diets.

ACKNOWLEDGEMENT

We appreciate the permission of the authorities of the General Hospital, Ijebu-Ode, Ogun State, Nigeria, where the study was carried out. We also thank the technical staff of the laboratory of the Hospital for their timely cooperation and assistance throughout the study.

REFERENCES

1. Ukoli, F.M.A., 1984. Introduction to parasitology in tropical Africa. John Wiley and Sons Ltd., Chichester, pp: 464.
2. Smyth, J.D., 1996. Animal Parasitology, Cambridge University Press, Cambridge, 17-18: 110-115.
3. Heyneman, D., 2004. Medical Parasitology. In: Medical microbiology, Brooks, G.F., J.S. Butel and S.A Morse, (Eds.). 23rd Edition. McGraw Hill, Boston, pp: 661-701.
4. Nebe, O.J., G.O. Adeoye and P.U. Agomo, 2002. Prevalence and clinical profile of malaria among the coastal dwellers of Lagos State, Nigeria. Niger. J. Parasitol., 23: 61-68.
5. Akanbi, O.M., A.B. Odaibo, K. Afolabi and O.G. Ademowo, 2004. Prevalence of malaria and anaemia in pregnancy in Ibadan, south-western Nigeria. Niger. J. Parasitol., 25: 51-55.
6. Ameh, I.G., J.A. Onah and R.M. Amao, 2004. Intestinal parasitiasis: Positive cases and low haematocrit among pregnant women at the antenatal clinic, Vom, Nigeria. Niger. J. Parasitol., 25: 33-37.
7. Achidi, E.A., A.J. Kuoh, J.T. Minang, B. Ngum, B.M. Achmbom, S.C. Motaze, M.J. Ahmadou and M. Troye-Blomberg, 2005. Malaria infection in pregnancy and its effects on haemoglobin levels in women from a malaria endemic area of Fako Division, South West Province, Cameroon. J. Obstet. Gynaecol., 25(3): 235-240.
8. Agbolade, O. M., N.C. Agu, O.O. Adesanya, O.A. Odejaye, A.A. Adigun, E.B. Adesanlu, F.G. Ogunleye, A.O. Sodimu, S.A. Adeshina, G.O. Bisiriyu, O.I. Omotoso and K.M. Udia, 2007. Intestinal helminthiases and schistosomiasis among school children in an urban center and some rural communities in southwest Nigeria. Kor. J. Parasitol., 45(3): 233-238.
9. WHO, 1991. Basic laboratory methods. In: Medical parasitology. World Health Organization, Geneva.
10. Taiwo, A.K. and O.M. Agbolade, 2000. Intestinal helminthiasis among school children in Oru, Ogun State, Nigeria. Niger. J. Sci., 34: 283-286.
11. Agbolade, O.M., D.O. Akinboye and A. Awolaja, 2004. Intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North, Ogun State, Nigeria. Afr. J. Biotechnol., 3: 206-209.
12. Sam-Wobo, S.O., C.F. Mafiana and A.B. Idowu, 2004. Re-infection patterns of ascariasis among school children in Ogun State, Nigeria. Niger. J. Parasitol., 25: 7-13.
13. Wardlaw, G.M., 2003. Contemporary nutrition: Issues and Insights. 5th Edition. McGraw Hill, New York, pp: 317-319.
14. Singh, I., 2002. Textbook of human histology. 4th Edition. Jaypee Medical Publishers Ltd., New Delhi, pp: 70-72.
15. WHO, 1993. The control of schistosomiasis: Second report of the WHO Expert Committee. WHO Technical Report Series, No. 830, pp: 40-45.
16. Bruun, B. and J. Aagaard-Hansen, 2008. The social context of schistosomiasis and its control: An introduction and annotated bibliography. WHO, Geneva, pp: 7-18.
17. Waugh, A. and A. Grant, 2001. Anatomy and physiology in health and illness. 9th Edition. Churchill Livingstone, Edinburgh, pp: 235-236.