



INCIDENCE OF ANAEMIA DUE TO HOOKWORM INFESTATION IN PATIENTS ATTENDING MURTALA MUHAMMAD SPECIALIST HOSPITAL, KANO, NIGERIA

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ABSTRACT

A study on the incidence of anaemia due to hookworm infestation was carried out among patients attending Murtala Muhammad Specialist Hospital in Kano metropolis between December 2010 and January 2011. Out of the 200 stool samples examined by formol-ether concentration technique, only 1 (0.5%) was found to be positive for the hookworm infection and the anaemia status of the positive patient was negative as determined using haematocrit technique. Therefore, this study presented a very low incidence of the infection and the anaemic status obtained from the hookworm positive patient showed that the infection is not severe. The reason for the low incidence of the hookworm infection in this study could be attributed to strict personal and community hygiene, improved sanitary conditions, better awareness, proper disposal of sewage and less availability of breeding habitats for the hookworm larvae in the area. Therefore, more emphasis should be laid on personal and community hygiene in order to remain healthy and free from this kind of infection among other measures.

Keywords: Anaemia, hookworm, hospital, community hygiene

INTRODUCTION

Hookworm is a parasitic nematode (roundworm) that lives in the small intestine of its host, which may be a mammal such as dog, cat or human. Two species of hookworm commonly infect humans, *Ancylostoma duodenale* and *Necator americanus*. *A. duodenale* is found in the tropics and subtropics while *N. americanus* is found in cooler and drier climates (Hougland and Schad, 1978). Hookworm has been classified as one of the most destructive of human helminth parasites and thought to infect more than 600 million people worldwide (Markell *et al.*, 2006).

Infection by hookworm is the second most common human helminth infection after ascariasis. They occur in predictable areas where sanitary and environmental conditions favour the development of filariform larvae and infection of hosts (Crompton, 1999). Many of the affected populations live in rural communities of developing countries where hookworm infections are endemic (Crompton, 1999). Hotez *et al.* (2005) reported that in most endemic areas, adult women are the most severely affected by anaemia, mainly due to their much higher iron need as a result of menstruation and repeated pregnancy in addition to the fact that customarily, they do not have access to good food as the men. Hookworm occurs both in adults and children but it is more common in children. It has been recognized as one of the leading causes of child morbidity in the developing countries of the tropics and subtropics. Hence, in susceptible children, this infection affects their intellectual cognitive, and causes growth retardation, intra-uterine growth retardation (IUCR), prematurity and low birth weight (LBW) among new born babies in the infected mothers (Markell *et al.*, 2006).

Hookworms are transmitted by direct contact with the skin especially unbroken skin or by oral transmission. Infection is spread by faecal pollution of the soil and can be contacted especially when a person is working barefooted (Bethony *et al.*, 2006). The worms are hooked to the walls of the small intestine using their curved anterior end hence, the name hookworm, where they feed by sucking blood from the intestinal walls. This results in blood loss which is sufficient to cause severe iron deficiency anaemia in heavy infections (Pawlowski *et al.*, 1991).

A variable proportion of any population where hookworm is endemic develop serious diseases as a consequence of the infection and hookworm anaemia may be considered to represent a breakdown of adaptation. Therefore, hookworm infection can be of major public health importance and hence, the control of the infection becomes necessary. Control of hookworm infection depends on prevention of soil pollution with faeces and proper disposal of night soil as well as treatment of patients and carriers all at the same time limits the source of infection (WHO, 1996).

The most serious consequence of hookworm infection is chronic blood loss from the small intestine leading to the development of iron- deficiency anaemia. In people whose dietary intake of iron is low and whose body iron stores are already depleted, heavy hookworm loads can give rise to iron-deficiency anaemia within just a few weeks especially in women and children. The clinical consequences of this loss will depend on the host's underlying iron status as well as the presence of other causes of anaemia (Fleming, 2000).

Studies indicate that there are some worm burden threshold above which clinically significant anaemia is likely to occur, with the precise threshold dependent on the host's iron status (Lwambo *et al.*, 1992).

Consequently, since hookworm infection is considered as a great public health problem and produces serious disease in humans due to blood loss, research on hookworm infection and anaemia has become important so as to reduce the spread of the infection. The aim of this study was therefore to determine the incidence rate of hookworm and anaemia interactions among patients attending Murtala Muhammad Specialist Hospital, Kano. The specific objective of the study was to determine the incidence rate of hookworm infection in the patients using formol-ether concentration technique. It was also intended to determine the anaemia status of the patients that are positive for hookworm infection using Haematocrit method.

MATERIALS AND METHODS

Study Area

This study was conducted at Murtala Muhammad Specialist Hospital, located in Kano metropolis, Nigeria. The hospital is being attended by patients both within and outside the state. Kano metropolis is located on latitude 11°53'N and longitude 8°26'E of the equator (Encarta, 2007). It is an urban closed-settled zone and a densely populated city in northern Nigeria, with an estimated population of 3,630,000 (Redmond, 2009). It is a center of major trans-saharan commercial activities; located within the semi-arid Sudan savannah zone of West Africa about 849km from the edge of the Sahara desert (Mukhtar *et al.*, 2010).

Inclusion Criteria

The subjects included in this study were only those suspected for hookworm infection, referred to the laboratory by medical doctors and also voluntarily agreed to participate in the study by endorsing the Research Consent Form, which was countersigned by the Supervising Medical laboratory Scientist in the laboratory.

Stool Sample Collection

Two hundred stool samples and one blood sample were collected from patients attending Murtala Muhammad Specialist Hospital, Kano. These samples were taken to the laboratory for further analysis.

Sample Processing

Macroscopic Examination of Stool Samples

Each sample was examined for consistency. Stool samples were either formed, semi-formed or watery. The samples were also examined for colour, presence of blood and mucus.

Direct Microscopic Examination

This method for stool examination was chosen because it is adequate for detecting the ova of hookworm in the stool of patients. Sub-sample of each faecal sample was collected using the emulsifying stick. A drop of normal saline was added to the sub-sample and emulsified. The whole preparation was covered with a cover slip and observed under the light microscope. The presence of ova in the faecal sample indicated positive hookworm infection (Cheesebrough, 2000a).

Formol-ether Concentration Technique

Approximately 1g of the faecal sample was collected using an applicator stick and transferred into a test-tube containing 4ml of 10% formalin. The mixture was thoroughly emulsified and the resulting suspension was sieved through a fine mesh-sized sieve and collected in a beaker. The sieved suspension was transferred into a centrifuge tube and 3-4ml of diethyl ether was added. A test-tube stopper was used to cover the centrifuge tube and the mixture shaken vigorously for 1 minute. The stopper was removed and the test-tube placed in a centrifuge and spun at 3000rpm for 1 minute, resulting in the formation of four layers; the sediments containing the parasite, formol water, faecal deposit and ether-dissolved fat layer. The three upper layers were discarded leaving the sediments at the bottom of the tube. The sediments were placed on a clean grease-free slide and covered with a cover slip. The preparation was examined for ova of hookworm under the microscope using x10 and x40 objectives (Cheesebrough, 2000a).

Assessment of Anaemia Using Haematocrit Method

The anaemia status of the patient positive for the hookworm infection was determined using haematocrit method, thus, cotton wool containing spirit was used to clean the right thumb of the patient. A sterile lancet was used to prick the thumb and blood was collected in a capillary tube of about 75mm in diameter to fill one-third of the tube. The capillary tube containing the blood was placed in a haematocrit centrifuge and centrifuged at 3000rpm for 3-5 minutes. The capillary tube was removed from the centrifuge and placed in a hand-held microhaematocrit reader to read the Packed Cell Volume (PCV) count for the Red Blood Cells (RBC) (Cheesebrough, 2000b).

RESULTS

Out of the 200 stool samples examined in this study, 101 were presented by male and 99 by female patients. Only 1(0.5%) was found positive for hookworm. The incidence of the hookworm infection occurred only in a male patient between the ages of 31-45 years (Table 1-2). The anaemia status of the patient positive to hookworm is presented in Table 3.

Table 1: Incidence of Hookworm Infection among Patients Attending Murtala Muhammad Specialist Hospital with Respect to Sex Between December 2010 and January 2011

Sex	Number examined	Number Infected	Percentage Infected
Male	101	1	0.50
Female	99	0	0.0
Total	200	1	0.50

Table 2: Incidence of Hookworm Infection among Patients with Respect to Age Group Attending Murtala Muhammad Specialist Hospital Between December 2010 and January 2011

Age (Yrs.)	Number Examined	Number Infected	Percentage Infection
0-15	82	0	0
16-30	60	0	0
31-45	40	1	0.5
46-60	18	0	0
Total	200	1	0.5

Table 3: Anaemia Status of Hookworm Positive Patient Attending Murtala Muhammad Specialist Hospital Between December 2010 and January 2011

No. Examined for Hookworm Infection	No. Positive for Hookworm Infection (%)	PCV (%)	Anaemia Status of Hookworm Positive Patient
200	1 (0.5)	40.0	- (-ve)

DISCUSSION

From the results of this study (Table 1), it can be seen that among the 200 patients examined at Murtala Muhammad Specialist Hospital in Kano metropolis, only 1 patient was found to be positive for hookworm. From Table 2, it can also be seen that the incidence of the infection occurred only in male between the aged 32 years. This showed that there is very low incidence of hookworm in the area as compared to what was obtained in similar studies such as that reported by Odebumi *et al.* (2007) with 3.2% incidence rate and Ibrahim and Zubairu (2010) with 8.7% incidence rate. Indeed, the anaemia status of the single patient that was positive for the hookworm infection was negative (0.0%) as presented in table 3. Therefore, the low incidence of hookworm infection obtained from this study could be attributed to the fact that the hospital is city-based, where a significant number of those attending the hospital have better awareness, strict personal hygiene, improved sanitary conditions, proper disposal of sewage and hardly could one find a person walking barefooted (Bethony *et al.*, 2006) as compared to those in the rural areas (Crompton, 1999; Adeyeba and Essiet, 2001).

The low incidence of the hookworm infection recorded in this study could also be attributed to decrease in the breeding habitats for the parasites in Kano metropolis, which is a fertile soil with humus or vegetation, poor disposal of night soil and also most

of the ponds and burrow pits have been treated, hence, another reason for the low incidence and low transmission of the infection in the area (Usman, 1988). It should however be noted that, the incidence rate observed here could be different if the study was conducted in the rainy season as Anya and Nwosu (1980) has earlier investigated the effect of rainfall in Nigeria and found that dryness is not a good condition for the survival of hookworm's larvae as they are sensitive to desiccation.

The incidence of hookworm infection was found to be very low in the current study, and anaemia was totally absent. It can be concluded therefore that the people living in Kano metropolis have less chances of becoming infected with hookworm due to improved personal and community hygiene as well as increase awareness through health care improvement programmes by both government and non-governmental organizations. The following recommendations are therefore offered: -

1. More emphasis should be laid on personal and community hygiene in order to remain healthy and free from hookworm and other infections.
2. Government through the health care personnel and health organizations should continue to organize public awareness programs to keep the spread of this and similar infections under control.

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