EFFECTS OF NUTRITIONAL DEFICIENCY ON PARASITIC INFECTION OF THE INFANT IN GREATER ACCRA, GHANA

KOREBUMI MINAKAMI*, REGINALD K. ANTESON and MAXWELL A. APPAWU

Abstract: In Accra City and five rural villages near Accra, human parasites and nutritional status were examined in 269 preschool children. Nine species parasites were recognized. Nutritional status was determined by the measurement of weight and height. Malnutrition was frequently found in the children belonged to the age group 0-5 years. The infective rates of parasites in children were 58.0% in the normal nutritional status and 25.0% in the malnutritional status. Infective rate was higher for the well-nourished children and was lower in the malnutritional children. We also recognized that infective rates of parasites differed from species of parasites.

INTRODUCTION

Both parasitic infection and human malnutrition are important health problems in the developing countries today. These problems are investigated independently, but relations between human parasites and nutritional status of hosts are not known. Stephenson and Holland (1987) reviewed how helminth parasites had influenced the nutrition of human host. Five helminthes, Schistosoma, Ascaris, Trichuris, Strongyloides and hookworms are common human parasites to cause malnutrition of the developing world's young children (Stephenson and Holland, 1987). Odugbemi et al. (1982) reported that these parasites caused diarrhoea, that increased nutrient-losses and induced malnutrition, in Nigerian children. Nevertheless, these parasites were not important diarrhoeal agents in Indonesian children (Soenarto et al., 1983) and in Ghanaian children (Minakami et al., 1991). If parasites are important causation to induce malnutrition in children, parasites might be found high-frequently in the malnutritional children. But, malaria (Plasmodium falciparum) was found higher in the children that did not have malnutrition and lower in the other children that had malnutrition (Vázquez and Sánchez, 1988). Present results demonstrate the relations between parasitic infection and malnutrition in Ghanaian children.

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MATERIALS AND METHODS

The survey was conducted in Accra City and five villages (Ayikai-Doble, Akraman, Okashibiade, Yaoman and Onyasanu) of the northwest Accra along Densu River in Ghana. Samples of stool, urine and blood smear were collected from 269 infants up to seven years old children. Body weight (kg) and height (cm) were also measured.

Nutritional status (weight for height) were determined according to the procedure of Jelliffe (1966). Each stool specimen was mixed with a drop of water and a drop of Lugol solution (5% iodine, 10% KI and make 100 ml with distilled water) on a microscopic slide in the laboratory and examined for the presence of protozoan and helminth parasites. Formal-ether method (Ritche, 1948) also was applied to parasitological investigation of the same stool specimen. Urine specimen was centrifuged at 1,500 rpm for 10 min and the sediment was examined for the presence of Schistosoma eggs and other parasites. Blood smear specimen was stained with Giemsa solution and examined for evidence of malaria parasites.

RESULTS

Thirty nine per cents of examined children were infected with parasites (Table 1). Mixed infection was common. *Ascaris* was the most prevalent parasite and was identified in 70 children (26.0%). *Schistosoma* eggs in urine of children were found in 35 persons (17.7%). This high incidence rate of *Schistosoma* due to the Densu River where is an endemic area of *Schistosoma haematobium*. In the malaria infection, *P. falciparum* was predominant in this study area.

The nutritional status of children was divided into five ranks according to the Jelliffe (1966). In the normal healthy 81 children with the nutritional status revealed 100%, parasites were found in 47 cases (58%). On the other hand, the parasite positive rate in the most malnourished (revealed with 60% nutritional status) children was 25% (Table 2). The relations between parasitic infection and nutritional status in human host indicated that the infective rate decreased according to the change for the worse of the nutritional status.

![Table 1 Parasitic infection rates among 269 infants in Accra](image-url)
Fig. 1 shows that the species specificity of parasites was recognized. Although the number of carriers suffered from Ascaris, Schistosoma or Plasmodium was reduced by the degree of malnourished status, the number of Strongyloides carriers was not interfered with nutritional status of host.

**DISCUSSION**

Ascaris, Strongyloides and hookworms were found as major parasites of the residents in rural Accra (Wurapa *et al.*, 1975) and in semi-slum of Accra City (Anteson *et al.*, 1981). Present study revealed similar results with the previous studies. Compared with the previous studies, we found that Schitosoma infection rate was higher. This is due to the reason that the rural survey area of this study was an endemic area of *S. haematobium*.

Five species of parasites, Ascaris, Strongyloides, Schistosoma, Trichuris and hookworms

<table>
<thead>
<tr>
<th>Degree of Nutritional status (%)</th>
<th>Parasite positive rates (%)</th>
<th>Number of parasites carrier</th>
<th>Number of invest.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 (Standard)</td>
<td>58.0</td>
<td>47</td>
<td>81</td>
</tr>
<tr>
<td>90</td>
<td>37.0</td>
<td>30</td>
<td>81</td>
</tr>
<tr>
<td>80</td>
<td>30.4</td>
<td>17</td>
<td>56</td>
</tr>
<tr>
<td>70</td>
<td>29.0</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>60</td>
<td>25.0</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

![Figure 1](20.png) Distribution of infection and nutritional status among 107 infants carried with parasites.
cause malnutrition in the developing world's children because of the nutritional deficiency induced by parasites (Stephenson and Holland, 1987). Most parasitological studies had been examined the effects on human hosts induced by parasites and few information regarding to the malnutritional effects to parasites in human hosts are known. Vázquez and Sánchez (1988) found that *P. falciparum* was found higher in the well-nourished children and lower in the malnutritional children. We got similar results in the helminth parasites (Table 2). The positive infection rates decrease due to the decrease of the nutritional status.

Malnutrition induces various changes of body in the early developmental stage of both human and animal. In the malnourished young rats, the level of biogenic amines in brain and periperal tissues (Stern *et al*., 1975) and periperal blood ammonia levels (Stevens *et al*., 1975) increased. In human, Johnson *et al*. (1972) found the hyperammonemia in newborn infants accompanying parenteral nutrition; Abo–Hussein *et al*. (1984) found highly significant increase of blood- and cerebrospinal fluid-ammonia in the children with protein energy malnutrition. In malnourished children (Stephan and Waterlow, 1968) and malnourished rats (Schimke, 1962), low protein diet caused a reduction in the activity of urea-cycle enzyme and therefore hyperammonemia was induced.

The present study demonstrated that the nutritional deficiency decreased the positive infection rate of parasites in the children up to seven years old. The body condition of the malnutritional status might be unconfortable for human parasites, because the concentration of blood ammonia is significantly higher than in the well-nourished children.

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アクラ市のアクラ市近郊農村5 部落において、7 割以下の子供269名について、人体寄生虫と栄養状態についての調査を行った。寄生虫の感染率は39.0％で、9種類の寄生虫が認められた。栄養失調は5 割以下の子供に多かった。寄生虫感染率と栄養状態との関係は、栄養状態が正常な子供では感染率58.0％、栄養失調の子供では25.0％であった。栄養状態が悪いほど、寄生虫感染率は低かった。5 割以下の栄養失調症の子供は、高アンモニア血症を起こすので、血中のアンモニア濃度の上昇が寄生虫の人体寄生を困難にしていると考えられる。

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