

Original Research Article

Helminthiasis in School Aged Children in a select population in the Niger Delta.

Abstract

Aim: Heaminthiasis and its effect on the heamatological parameters in school aged children

Study Design: A cross sectional study (Descriptive study)

Place and Duration: The study was carried out at Emohua Local Government Area of Rivers State between January – April 2011.

Methodology: Concentration Method (Sedimentation) was used to examine the stool samples, Packed cell volume (PCV) was obtained by the use of heamatocrite centrifugation and reader method; differential white blood count (WBC) was done according to Cheesbrough (2000)

Results: Result of the study showed variability in the four helminthes parasitemia among the 360 pupils investigated. Out of the 264 (73.3%) positive samples 142 (53.7%) and 122(46.21%) were females and males respectively. Age specific parasitemia was relatively high in all age groups attributably to favorable ecological factors promoting helminthes transmission. However, overall age related parasitemia showed that the 5-7 age group had relatively highest parasite load in the study. The study also showed that females (53.7%) and males (46.21%). The weight and height of infected pupils in relation to the uninfected varied statistically ($p < 0.05$) across the age ranges but not statistically different ($p > 0.05$) within the age groups. *A. lumbricoides* (53.3%) was the most prevalent amongst the infected.

Conclusion: Overall mixed parasitemia was (23.4%) while the 8-9 age range recorded the highest prevalence (28.2%). Sex related prevalence varied greatly in terms of percentage parasitemia within and across the sexes. Parasitemia was not significantly different ($p > 0.05$) within the age groups but was significantly different ($p < 0.05$) between the sexes. PCV values were below the normal range in both the infected uninfected in the study group indicating poor nutritional status of the population.

Key words: Age specific parasitemia, helminthes transmission, mixed parasitemia, nutritional status.

1. INTRODUCTION

Intestinal helminths are amongst the array of parasitic infections that have impacted negatively on the health and socio-economic status of individuals in the sub tropical and tropical regions of the globe [1,2,3,4,5]. Globally, an estimated 3.5 billion people are affected with 450 million showing various degrees of morbidity and an annual mortality of 135,000 individuals [6,7,8]. It

27 is believed that this figure will increase exponentially as world population
28 surges except the millennium development goals are not realized especially in
29 developing world. Poverty in its variable shades; poor nutrition, poor sanitary
30 conditions, poor housing, lack of potable water and inadequate or non-existent
31 primary health facilities perpetuate the occurrence and spread of helminth
32 infections especially amongst children and women.

33 Children between the ages of 1-12 are the most vulnerable group [9,10,11] due
34 to their unsanitary disposition including; geophagy and finger biting [5].
35 According to [12], a third of all cases of soil transmitted helminthiasis occur in
36 sub Saharan Africa with victims being infected with at least one of the quartet
37 of nematodes; *Ascaris lumbricoides*, *Trichuris trichiura*, Hookworms
38 (*Ancylostoma duodenale* and *Necator americanus*) and *Strongylus stercoralis*.
39 The subliminal clinical presentations of these worms often make them
40 asymptomatic undetected thus neglected by the infected. This period of
41 apparent none existence of clinical manifestation encourages the accumulation
42 of parasites in the victim through repeated infections and aggressive larva
43 migration in the host. This arrant larval migration result to severe tissue
44 damage and overt expression of lymphokins [13]. [14] stated that
45 gastrointestinal nematodes interference with absorptive surfaces, physical
46 obstruction in the lumens, production of proteolytic substances, loss of macro-
47 nutrient fluid and electrolytes, direct depletion of red blood cells and
48 consumption of nutrients intended for the body aggravate the pathology of
49 helminthiasis. To establish this assertion several researchers including; [15 and
50 16] discovered that de-wormed children recorded normal growth patterns than
51 the untreated. In their study, [17] associated high worm load with impaired fat
52 digestion and depressed cell-mediated immunity in Hookworm infected adults.

Hookworm is also associated with pernicious anaemia, increased basal metabolic rate, anorexia and diarrhea in the infected.

Over time nutritional anthropometric measures have remained one of the most practical and useful means of assessing the nutritional status of a population particularly children and their growth patterns [18]. Investigating the impact of helminthiasis on growth markers of a population [19] established that high load of gastrointestinal nematodes negatively affected the serum retinol levels in infected victims. This nutritional debt in severe helminthiasis result to growth faltering and anemia that inhibit the mental development of pre-school children [20, 21, 22, 23, 24]. Retardation in height and weight could be used as useful indicators in identifying and evaluating the health status of a child [24, 25, 26]. In view of the foregoing, this study intends to establish the influence of helminthiasis on health markers; weight, Height, packed cell volume, Hemoglobin differentials and leukocyte count of school aged children in Emouha Local Government Area of Rivers state.

2. MATERIALS AND METHODS

2.1. The study Area

The study area is Emohua; the headquarters of Emohua Local Government Area of River State, Niger Delta, Nigeria. It falls within latitude 4° 52'N and longitude 6° 52'E, enjoys both the tropical rain forest vegetation. The region is ramified with the dendritic drainage system which predisposes it to consistent flooding between the months of August to October. The area is typically rural and is dominated by the Ikwerre ethnicity indulging in subsistence farming and artisanal fishing. Drinking water is usually sourced from ground and surface reservoirs in the area.

2.2. Sample collection

The study is a cross sectional study of pupils in public primary schools. Properly designated sterile vials were handed out to randomly selected pupils in selected schools with specific instructions on stool specimen collection procedures. These were returned a day later; samples fixed with 10% formalin and stored in an iced vat. 2ml venule blood of respondents were taken by a trained medical personnel into properly designated EDTA bottles. Biodata of respondents were taken including height (cm) and weight (g). Blood and stool samples were analyzed within 24 hours after collection.

2.3. Laboratory examination of feecal sample

The formal-ether concentration method was used to examine the stool samples. Thin blood smears were prepared, fixed and stained with Giemsa stained for the determination differential white blood cell count (WBC). The Packed cell volume (PVC) of the blood samples was determined using the micro haematocrite procedure according to [27].

2.4. Microscopy

Parasitemia was determined with the binocular light microscope using the x4, x10 and x 40 objectives. The differential leucocyte count white blood cell count were achieved using the oil immersion objective.

2.5. Data analysis

Anova was used to analyze the data

3. Results

The prevalence of gastro intestinal helminthiasis in school aged children in relation to age and sex in a select population of in Rivers State of Nigeria. Data showed that

overall helminth parasitemia was more in females than males. Out of the two hundred and sixty four 264 (76.7%) infected pupils, one hundred and twenty two 122(46.21%) were females and one hundred and forty two, 142 (53.78%). Sex related prevalence varied greatly in terms of percentage parasitemia within and across the sexes. Parasitemia was not significantly different ($p>0.05$) within the age groups but was significantly different ($p< 0.05$) between the sexes. There was great variability in parasitemia within the age groups however, the 5-6years aged pupils expressed more helminthes parasitemia in terms of overall individual percentage parasite load than in the other age groups (Table 1.,).

Table 1., Helminthes parasitemia in school aged children in the study area.

Age group	Over number examined	No No examined (%)	Female No Infected (%)	No No examined (%)	Male No Infected (%)	Overall Infection (%)
5-7	28	16 (57.1)	16 (100)	12(42.8)	6 (50.0)	22(78.5)
8-10	106	55 (51.8)	44(80.0)	51(48.1)	34(66.6)	78(73.58)
11-16	194	100 (51.5)	70(70.0)	94(48.45)	70(74.46)	140(72.2)
14-16	32	16 (50.0)	12(75.0)	16(50.0)	12(75.0)	24(75.0)
Total (%)	360	187 (51.94)	142(53.7)	173(48.05)	122(46.21)	264(73.3)

3.1. Effect of Helminthiasis on the Heamatological Parameters of Pupils

The mean Total White Blood Cell (TWBC) count of infected females (6.55 ± 1503.74) and males (6.4548 ± 1333.41) was higher in than that of the uninfected females (6.36 ± 1259.19) and males (6.80 ± 1331.20) in the study (Table 2.). This trend was replicated in the percentage values of Eosinophils and Basophils in the sampled population. However, the Packed cell volume (PCV) of the uninfected were higher in relation to the infected. Data revealed a

consistent discrepancy between the heamatological values of the females from those of the male in the study.

Table 2., Haematological values of uninfected and infected males in the study area.

Hematological parameters	Sex	Uninfected Mean $\pm$ S.D	Infected Mean $\pm$ S.D
TWBC ($\times 10^9$ /l)	Male	6.80 $\pm$ 1331.28	6.45 $\pm$ 1333.41
	Female	6.36 $\pm$ 1259.19	6.55 $\pm$ 1503.74
LYMPHOCYTE (%)	Male	52.41 $\pm$ 10.21	44.71 $\pm$ 10.82
	Female	47.17 $\pm$ 10.88	47.14 $\pm$ 11.37
EOSINOPHILS (%)	Male	2.0 $\pm$ 0.80	3.25 $\pm$ 2.15
	Female	1.63 $\pm$ 1.06	3.56 $\pm$ 1.96
BASOPHILS (%)	Male	0.04 $\pm$ 0.19	0.02 $\pm$ 0.13
	Female	0.0 $\pm$ 0.0	0.01 $\pm$ 0.12
PCV (%)	Male	35.23 $\pm$ 3.67	32.16 $\pm$ 4.77
	Female	36.62 $\pm$ 3.23	32.42 $\pm$ 4.54
HB (g/dl)	Male	11.74 $\pm$ 1.22	10.72 $\pm$ 1.59
	Female	12.21 $\pm$ 1.07	10.81 $\pm$ 1.51

3.2. Age Specific Helminthiasis

Age related specific parasitemia showed four nematodes; *A. lumbricoides*; Hookworm; *S. stercoralis* and *T. trichuris* were prevalent in the study area. *A. lumbricoides* (53.3%) was the most prevalent amongst the infected. Overall mixed parasitemia was (23.4%) while the 8-9 age range recorded the highest prevalence (28.2%). Age related specific nematodiasis indicated that the 11-13 age range expressed the highest load of *A. lumbricoides* (75.1%) while the 14-16 age range recorded the highest load of Hookworm (41.6%) in the sampled population.

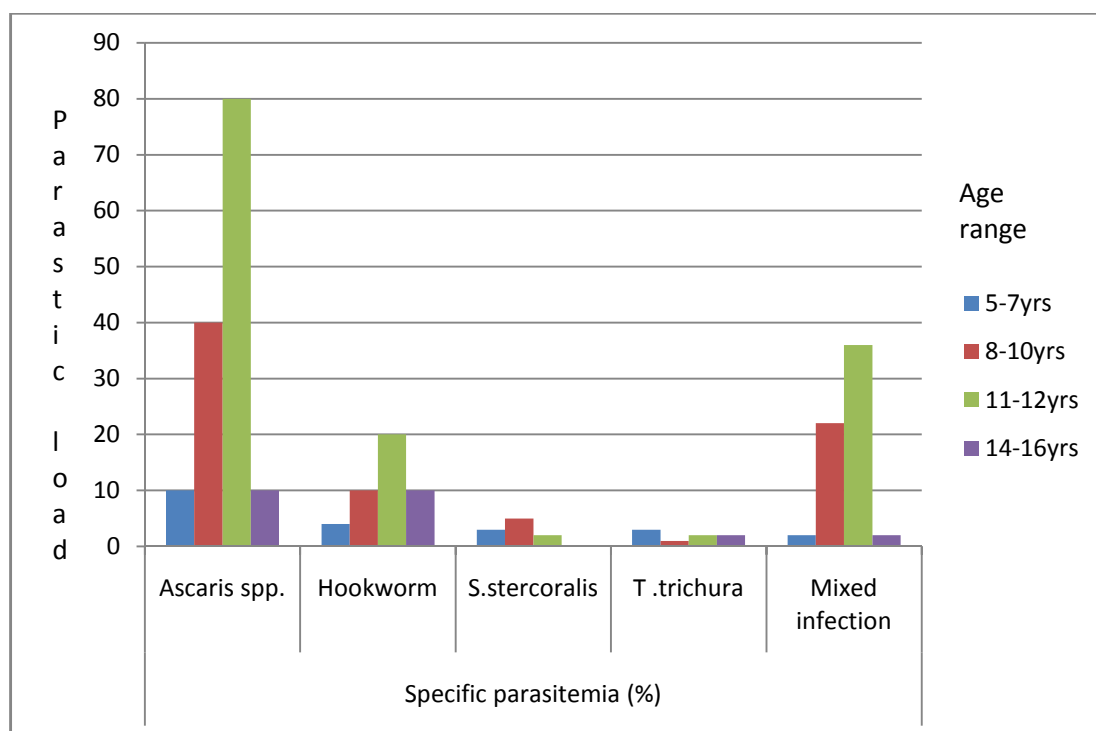


Figure 1., Specific parasitemia in school aged pupils in the study area.

3.3. Effect of Helminthiasis on growth parameters

Figure 2., shows the effect of helminthiasis on the weight and height of school aged pupils in the sampled population. There was great variability in the weights and heights of infected pupils in relation to the uninfected. This variability in growth parameters (weight and height) in the sampled population were statistically significant ($p < 0.05$) across the age ranges but were not statistically different ($p > 0.05$) within the age ranges.

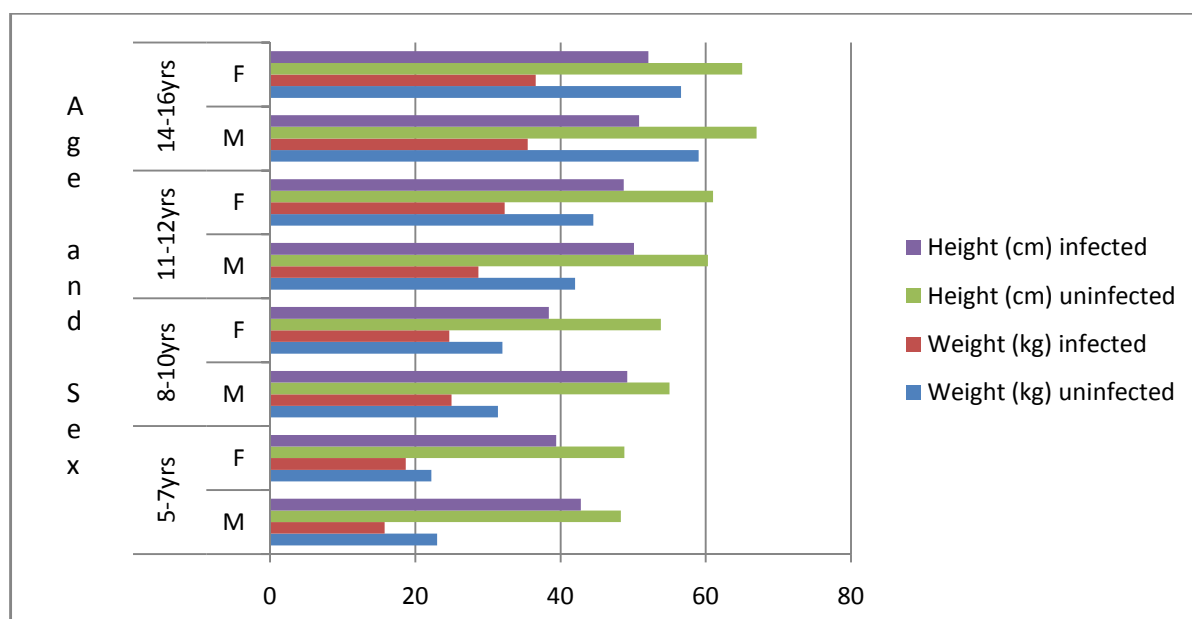


Figure 2: Effect of gastrointestinal helminthes on the weight (kg) and height of school aged children in the study area.

4. DISCUSSION

The high parasitemia of helminthes recorded in the sampled population could be attributed to favorable ecological conditions such as unsanitary living conditions and poor hygienic disposition of the study set. The variability within the age groups in line with studies by [4, 5, 11, 14]. Geophagy and finger biting; unhygienic dispositions common in infants were implicated for the high prevalence observed in the 5-7 age group. All the age groups showed appreciable infections, a factor associated with suitable environmental conditions and suitable host specific factors thus the asymptomatic pattern witnessed amongst the infected.

Sex related prevalence also varied greatly in the studied population with females expressing more parasites than males in the sampled population; a situation that contradicts previous studies [2, 4, 9, 11]. However, the 14-16 age group had the highest parasitemia a situation that deviates from previous findings by

Studies by [2,3,4,11] had suggested that the 14-16 age group expresses lowered parasitemia based on improved hygienic disposition occasioned by puberty and the perceived self consciousness. However, the study observed increased parasitemia in the 14-16 age group maybe due to their overtly outdoor disposition and exposure to parasite contaminated environment that present infective stages of parasites.

Four nematodes *A. lumbricoides*, Hookworm, *T. trichura* and *S. stercoralis* prevalent in the sampled population with *A.lumbricoides* relatively more prevalent Hookworm. However, age associated specific parasitemia varied greatly across the age groups, with the 11-13 and 14-16 age groups expressing more of *A.lumbricoides* and Hookworm respectively. Overall parasitemia was cumulatively higher in the 8-10 and 11-13 age groups. Poly parasitism was relatively high in the study a similarity observed in studies by [28] in school age children who were consistent in school in Honduras. The high mixed parasitemia evident in the 8-10 age group indicated overt outdoor dispositions of the sampled population; a result that deviates from that of [28].

5. CONCLUSION

The study shows that infection stimulated specific immune reactions that affected the haematological characteristics of the infected. The mean TWBC values of the infected varied significantly from that of the uninfected. This trend was replicated in the other lymphocyte proportions in relation to the infected. Ironically, all the subjects in this study showed hematocrit levels that were below the normal range suggestive of general nutritional deficiency in the population. This could be attributed to the socio-economic status of the parents or guardians of the pupils. It could also be due to lack of nutritional awareness leading to imbalanced diet in the midst of plenty to eat. This argument is presented here because 80% of the populace in the study area are farmers and fishermen producing enough for food for their house hold. The relatively low hematocrit values recorded in this study could be due to the

rapid growth often witnessed in children within the examined age groups. Consequently, this growth surge places a high demand on bioavailable iron in order to sustain the increasing red cell masses not withstanding their nutritional status [22, 29, 30].

ETHICAL CONSENT AND APPROVAL:

The ministry of the Health River State in conjunction with the Local Government Health Department of Emuoha Local Government Area gave ethical clearance for the study. Advocacy visits were also paid to the Heads of Schools in consultation with the Parents Teachers Association to obtain permission for sampling.

COMPETING INTERESTS:

Authors hereby declare that no competing interests exist the publishing this work

REFERENCES

1. Egger, R J, Hofluis, E H, Bloem, MW and Chusilp, K. Association between Intestinal Parasitoses and Nutritional state in 3-8 year old Children in Northeast Thailand. *Tropical Geogeria Medicine*. 1990, 42:312-23.
2. Obiamiwe, BA and Nmorsi, P. Human gastro-intestinal helminthes in Bendel State. *Nigerian Angew. Parasitol*. 1991, 32: 177-183.
3. Ekpenyong, EA and Eyo, JE. Prevalence of Intestinal Helminths infections among Schooling Children in Tropical Semi Urban Communities. *Animal Research International*. 2008, 5(1): 804 – 810 804.
4. Eze. NC and Nzeako, SO. Intestinal Helminthes amongst the Hausa and Fulani settlers at Obinze, Owerri, Imo State, Nigeria. 2011, *Nigeria J of Parasitology*, 32(2) 225-229.

- 220 5. Nwaneri, DU, Ibadin, MO, Ofovwe, GE, Sadoh, AE. Intestinal helminthiasis in
221 children with chronic neurological disorders in Benin City, Nigeria: intensity and
222 behavioral risk factors. *World Journal of Pediatrics*. 2013. 9(2)152-157.
- 223 6. Murray, CJI and Lopez, AD. *The Global Burden of Disease Vol II, Global Health*
224 *Statics, A Compendium of Incidence, Prevalence and Mortality estimates for over*
225 *202 conditions*, Harvard School of Public Health on behalf of the WHO and World
226 Bank Cambridge M.A. (1996).
- 227 7. WHO. Soil transmitted helminthiasis. Eliminating soil transmitted helminthiasis as
228 a public health problem in children: Progress report 2001-2010 and strategic plan
229 2011-2020, Geneva. WHO/HTM/NTD/PCT/2012.4. WHO/HTD/NTD/PCT/2012.4.
230 2012.
- 231 8. Ukpai, OM and Ugwu, CD. The prevalence of gastro-intestinal tract parasites in
232 primary school children in Ikwuano Local Government Area of Abia State, Nigeria.
233 *The Nigerian Journal of Parasitology*. 2003, 24:129-136.
- 234 9. Arani, SA, Alaghehbandan, R, Akhlaghi, L, Shahi, M and Laria, R. Prevalence of
235 intestinal parasites in a population in South of Tehran, Iran, *Rev. Inst. Med. Trop.*
236 *S. Paulo*, 2008. 50 (3):145-149.
- 237 10. Mordi, RM, Evelyn, UE, Fredrick, OA and Okafor, FU. Intestinal Nematode
238 Infection amongst school children in Aniocha South Local Government Area of
239 Delta State, Nigeria. *Nig. J. Parasitology*, 2011, 32 (2): 203-207.
- 240 11. Nwaneri, DU, Omuemu, VO. Intestinal Helminthiasis and Nutritional Status Of
241 Children Living In Orphanages In Benin City, Nigeria. *Niger J Clin Pract*. 2013;
242 16:243-8
- 243 12. Webb, EL, Ekii; AO and Pala; P. Epidemiology and Immunology of helminthes=HIV
244 interactions. Walter Kluwers Health, Lippincolt williams and winlkins. 2012, 1746-
245 630x. www.cohivandaids.com

- 246 13. Adedoyin, MA, Awogun, IA, Juergensen, T. Prevalence of intestinal parasitoses in
247 relationship to diarrhoea among children in Ilorin. *West African Journal of*
248 *Medicine*, 1990, 9:83-88.
- 249 14. Jelliffe, DB. *Ascaris lumbricoides* and Malnutrition in Tropical Children. *Doc*
250 *Med Geog Trop*. 1953, 5:314-20.
- 251 15. Lani, SS, Latham, MC and Heather, KM. Treatment with a single dose of
252 Albendazole improves growth of Kenyan school children with hookworm,
253 *Trichuris trichiura* and *Ascaris lumbricoides* infection. *American Journal of Tropical*
254 *Medical Hygiene*. (1989), 41(11):78-87.
- 255 16. Micheal, CL. *Ascaris* and Hookworm disease: their impact on Human Nutrition.
256 *Post Graduate Doctor Africa*. 1990, 12 (5):114-120.
- 257 17. Onyemelukwe, GC and Musa, BOPT. Lymphocytes subsets in Patients with
258 Hookworm Infestation in Zaria, Nigeria, *Africa Journal Medical Science*. 2001.
259 30:255-259.
- 260 18. Heald, FP and Gong, EJ. Diet. Nutrient and Adolescence *In: Modern Nutrition in*
261 *Health and Disease*, William and Wilkins Maryland, USA. 1999.
- 262 19. Diana, K, Greiner, T and Gebre-Medlin, M. Five year follow-up of a food based
263 Vitamin A intervention in Tanzania *Public Health Nutrition*. 2000, 3 (4): 425-
264 431.
- 265 20. Reinthaler, FF, Mascher, F, Klem, G and Sixl, W. A survey of gastrointestinal
266 parasites in Ogun State, Southwest Nigeria. *Annals of Tropical Medicine and*
267 *Parasitology*. 1988, 82:181-184.
- 268 21. De Onis, M. and Habicht, J. Anthropometric references Data for International
269 use: Recommendation from a WHO expert committee. *American Journal of*
270 *Clinical and Nutrition*. (1996), 64:650-8
- 271 22. Van Stuijvenberg, M.; Elizabeth, JDK, Mieke Faber, MK, Diane GK and Spinnler
272 Benad, AJ. Effect of Iron-, Iodine and β -carotene- fortified biscuits on the

- micronutrient states of primary school children a randomized controlled trial.
Am. J. Clinical Nutrition, (1999), 69:497-503.
- 23.Ike. OS, Thomas N, Ukaejiofor, EO, Nubila I, Shu EN and Ezema I. Comparison of
haematologica parameters determined by the Sysmex KK-2IN Automated
Haemalogy Analyzer and the manual counts. *BMC Clinical Pathology*. 2010 10:3
doi: 10: 1186/1472-6890-10-3. [http://www.biomed](http://www.biomedcentra.com/1472-6890/10/)
centra.com/1472-6890/10/.
- 24.Habicht, JP, Martorell, R, Yarbrough, C, Malina, MR and Klin, R and Weight,
FH Standards for Preschool Children, and there really ethnic differences in
Growth Potentials? *Lancet*, 1994, 1:1611-5.
- 25.Delgado, H, Plama, P and Fischer, M. The use of the Height Census of School
Children in Central America and Panama. *Food Nutrition Bulletin*. 1991, 13 (1): 17-
29.
- 26.Kafafi, A and Abdel-Mottaleb, AM. Effect of Socio-economic Standard or Growth
of School Children in Cairo. *Alazhar Medical Journal*. 1992, 21 (B): 53-64.
- 27.Cheesbrough, M. *District Laboratory Practice in Tropical Countries*, part 2,
(Cambridge low price edition) Cambridge Universal Press, New York. pp. 2005,
256-347.
- 28.Sanchez, AL, Jose AG, Mary- TU, Maria, MR; Maritza, C and Theresa, WG. Soil
transmitted helminthes infections and Nutritional status in School Age Children
from Rural Communities in Honduras, *PloS Negl, Trop. Dis*. 2013, 7 (8) e 2378. Doi
10:1371/journal pntd. 0002378.
29. Lusfigma, S; Prichard, RK, Gazzinelli, A, Grant, WN, Boatina, BA, McCarthy, JS and
Basanez, MG. A research agenda for helminth Diseases of Human: The problem
of Helminthiasis. *PloS Negl. Trop. Dis* .2012, 6(4) e 1582. doi: 10:1371/journal
pntd 0001582.
- 30.Ojo, Y. and Flickety. How to study Haematology. Cancer treatment center.
Sweden Ghana Medical Centre. 2013, www.sgmcltd.com

300 31.Ahmed, SG and Uraka, J. Impacts of intestinal parasites on hematological of
 301 sickle cell anaemia patients in Nigeria. *Eastern Mediterranean Health Journal*. Vol.
 302 2011, 17(9) 710-713.

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