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Review article

EFFECT OF INTESTINAL PARASITIC INFECTION AND NUTRITIONAL STATAS ON ACADEMIC PERFORMANCE OF SCHOOL CHILDREN

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Abstract

There are many reasons for children to underperform at school, such as, medical problems including Intestinal parasitosis, below average intelligence, specific learning disability, attention deficit, hyperactivity disorder, emotional problems, a poor socio-cultural home environment, psychiatric disorders, or even environmental causes. Presence of Intestinal parasitic infection could affect school performance negatively. But the presence of one or more intestinal parasites did not indicate any effect or association with school performance. Underweight, overweight and obesity were less prevalent. Nutritional status has no any effect on academic performance in the study. Thus, it needs further investigation employing other techniques and study designs.

Keywords: intestinal parasitic infection, nutritional status, anemia. pathogenic parasites

Introduction

Academic underachievement has been a persistent area of concern for educators, parents, and students for at least in the past 35 years. Today, there is no problem more perplexing or frustrating than the situation in which a bright child cannot or will not perform at an academic level corresponding with his or her intellectual ability (1). There are many reasons for children to underperform at school, such as, medical problems, below average intelligence, specific learning disability, attention deficit hyperactivity disorder, emotional problems, a poor socio-cultural home environment, psychiatric disorders, or even environmental causes (2). Many children of lower socioeconomic status

drop out from their school due to different reasons. In fact, poverty and academic underachievement are the two major reasons for drop out. Socioeconomic and cultural factors play a role in this. Stress builds as the level of education increases and by the time some of these children reach high school, they develop unpredictable difficulties. These emotional and behavioral disorders can be seen in up to 20% of school going children (3).

There are many negative effects of intestinal parasites on school children: Health problems such as malnutrition/anemia, growth retardation, diarrhea and vomiting/nausea, intestinal obstruction and poor concentration at class, high absenteeism/lower attendance, high repetition and dropout rates, and poor academic performance (4). Helminth infections are important causes of morbidity and mortality in many developing countries. An estimated 1,471 million cases of infection with Ascaris lumbricoides, 1,200 million cases of infection with hookworm, 1,049 million cases of infection with Trichuris trichiura, and 200–300 million cases of schistosomiasis occurred worldwide (5).

School age children in developing countries bear the greatest health burden due to helminth infections. According to a World Bank report, morbidity due to helminth infections accounts for an estimated 20% of the disability-adjusted life years lost due to infectious diseases in children less than 14 years old. Among the well-described morbidities associated with helminth infection in children are under-nutrition, anemia, and failure to achieve genetic potential for growth (5, 6). Intestinal parasitic infections are among the major disease of public health problems in sub Saharan Africa. Apart from causing mortality and morbidity, infection with intestinal parasites has been associated with stunting of linear growth, physical weakness and low educational achievement in school children (7).

Poor nutrition in school children seriously compromises their health and learning capacity and there is disturbing evidence that the nutritional status among school children is deteriorating. In previous generations, anemia, rickets and poor growth were associated with low socio-economic status. However, current radical changes in lifestyle among both poorer and better-off strata in industrialized countries mean that personal preference about foods, fashion, physical activity levels and the media are now driving the nutritional patterns of school children more than the availability of food itself (8).
Nationally, only 3 per cent of Ethiopia's schools have clinics serving students. About 75 per cent of the population suffers from some form of communicable disease. Primary school children have to walk long distances and through difficult terrain to attend schooloften in crowded classroom, inadequate trained teachers, school materials. Four out of ten children will not reach their full educational potential (9). Playgrounds are basically nonexistent in Ethiopia, though play have a significant role in the primary years of life and help children develop socially, emotionally and intellectually (9). Educational factorsare too much to list that could affect student's school academic performance, but few were listed in the above introduction. Therefore, the rational of this study is to identify the determinant factors that could affect student's performance in school.

1. Literature review

There is ample evidence that better health improves academic performance. Throughout the world, there are many examples indicating that school-based treatment of medical problems results in improved academic performance (10). Currently, school health described as a complete assessment and descriptions of environment, services, and education that affects school health conditions worldwide is unavailable (10). School health program is defined with respect to environment, services and education. Environment consists of: Physical, biological, psychological and social; a healthy organizational culture within the school; productive interaction between the school and community of which it is a part (10). Services include: Preventive, curative, and referral services; nutritional and food safety services; counseling, psychological and social services; safe water and sanitation services and health promotion

services for staff. Education includes: academic skills and knowledge development; health and nutrition education; life skill education; staff education through training and development of school personnel (10). There are different factors that affect school academic performance.

1.1. Intestinal parasitic infection

In one school, Jamaican children who were treated for moderate whipworm infections raised their test scores, which had lagged by 15%, from the level of uninfected children. School food programs also have a marked effect on attendance and school performance (10). A clear illustration of detrimental effects of helminthes infection on educational performance was provided in Jamaican school children aged 9-12 years (11). Treatment of *T. trichiuia* infection was followed by significant improvements in the result of tests of auditory short-term memory and scanning and retrieval of long-term memory. Nine weeks after treatment, previously infected children performed as well as uninfectedchildren. Absenteeism was more frequent among infected than uninfected children; the heavier the intensity of the infection the greater the absenteeism, to the extent that some children attended school for only half as much time as their uninfected peers (11).

Infections with intestinal worms and *Schistosoma* species are widespread and common among school-age children in the United Republic of Tanzania (12). School aged children are vulnerable to Iron deficiency anemia exacerbated by parasitic infection because typically they harbor heaviest worm loads in communities (12). The incidence of intestinal parasitism among the public elementary school children in Baguio City Philippines was determined for the school year 1983-1984 (13). Of the 369 children studied, 68.29% harbored parasites. Ascaris was the most common parasite seen with an incidence of 42.65%. Trichuris was seen in 35.71% and hookworm in 0.27%. Multiple infections were found in 20.23%. The ages of the childrensurveyed ranged from 10-16 years. Children free of parasitic infections obtained highergrades than the infected group. This difference was of statistical significance. Theteachers in charge of the treated group noted a significant improvement in schoolperformance following treatment (13).

A study among school children in rural areas close to southeast of Lake Langano, Ethiopia showed that, out of 259 students surveyed for Intestinal parasites, 83.8% had one or more parasites, and hook worm was the leading 60.2% followed by *shistosoma mansoni*, 21.2%(14). The prevalence of infections with more than one parasite (polyparasitism) was higher in students from Kime (more than or equal to three parasites per student is about 67%) than from Langano Society of International Missionaries school (more than or equal to three parasites per student is about only 23.5%) (14). A cross sectional survey on intestinal parasites was conducted in Jiren, Elementary and secondary school, Jimma town from a total of 301 students, the prevalence of parasites were 68.4%, *Ascaris lumbriciodes* was the leading (52.2%) followed by Trichuris trichiura (18.6%) (15).

A country wide (Ethiopia) survey of *Giardiasis*, using formal-ether concentrationmethod, among school children and residents showed that the overall prevalence rates of 8.9% and 3.1%, respectively. The corresponding rate for non-school children (5-19 years of age are more significantly infected than their non-school counter parts ($p<0.005$) (16).

A cross-sectional study of Intestinal helminthic infection was conducted among 150 children in Lake Awassa area, south Ethiopia under the age of 15 engaged in fishing, and fishing processing works (17). The overall prevalence for at least one helmenthicinfection was 92.7% and the most prevalent parasites were Ascaris lumbricoides, 76% (17). Another cross sectional study to estimate the prevalence of intestinal parasites has been conducted in 1996 in south Wollo in the towns of Kombolcha, Bati, and Mekaneselam (18). From a total of 698 students who participated in the study, 43.6% of them were positive for various intensities. Shistosoma mansoni, 24.9% was the

commonestfollowed by *Ascaris lumbricoides*, 18.3% and Trichuris *trichiura* (4.4%).These figures presented the overall prevalence of parasites in the three localities (18).

1.2. Nutritional status

Strong evidence exists that poor growth is associated with delayed mental development and that there is a relationship between impaired growth status and both poor performance and reduced intellectual achievements (19). Growth retardation in early childhood is also associated with significant functional impairment in adult life and reduced work capacity, thus affecting economic productivity (19). The major areas of nutritional problems of primary school age children in developing countries are Protein Energy Malnutrition (PEM), micro nutrient deficiencies, and short term hunger (19).

The composition and timing of school meals and their nutritional value play a role ineducational achievement (20). In USA (United States of America), a study of a school breakfast program found that children of low income parents who received breakfast at school scored higher on tests of basic skills and were less likely to be tardy or absent than were children of low income parents who did not receive breakfast at school (8). Studies conducted in India and Jamaica found that provision of school meals-lunch and breakfast had a significant effect on students' performance in school (8). In conflict-ridden areas of Sri Lanka, a quarter of the children were stunted or too short for their age, and nearly one in three were severely wasted, that is, far too thin for their height (21).

A household survey study to assess changes in body mass index (BMI) among 50 000 adolescents aged 10 to 19 years living in the Poorest and Richest Regions of Brazil in 1975, 1989, and 1997 showed that adolescents of rich (southeast) and poor (northeast) regions showed a substantial increase in BMI (22). In the southeast, the prevalence of overweight, defined by international age- and gender-specific BMI cutoffs, for both genders reached 17% in 1997, whereas in the northeast, the prevalence tripled, reaching 5% among boys and 12% among girls. Older girls living in urban areas in the southeast showed a decrease in prevalence from 16% to 13% in the latter 2 surveys. For all boys and for young girls, the BMI values for the 85th percentile in 1997 were much higher than the 95th percentile values in 1975 (22).

A study to determine the prevalence of overweight and at-risk-for-overweightin school children from Baltimore City based on International Obesity Taskforce referencevalues showed for BMI-for-age, 20.7% of girls and 17.2% of boys wereoverweight (BMI > 95thpercentile) and 15.3% of girls and 14.1% of boys were at-risk-for-overweight (BMI) between the 85thand 95th percentiles) (23). A study on nutritional status of Malaysian school children showed that, the prevalence of under nutrition and micronutrient deficit problems is markedly low (21). Underweight and stunting in children from urban primary schools is generally below 10%. However, the magnitude is significantly higher – from 25% to 50% in children from rural schools and low-income households in urban schools (21).

School academic performance was compared among primary school pupils of different nutritional and health status in Nsukka, Enugu State of Nigeria for assessment of their health and nutritional history (24). Two hundred eighty five (73.1%) of the pupils selected, participated in the final studies. There was predominance of malnutrition among the pupils. Only 28.9% of the pupils were of normal weight for height (using Z scores). Forty seven percent were mildly underweight, 20.1% were moderately underweight, while 4.0% were severely underweight. Overall nutritional status (using weight for age Z scores) significantly affects school performance ($p<0.05$). Only 26.0% of the pupils were of normal height for age, the rest being stunted (24).

Two hundred sixty seven primary school and 190 secondary school students in Nigeria were chosen randomly from the lists of the co-educational schools in a large metropolitan area. Two hundred and sixteen were males and 241

were females. Weight-for-age and height-for-age measurements were done to assess obesity. The overall prevalence of obesity based on weight for age was 3.2% for males and 5.1% for females. In addition, 9.3% of the males and 7.9% of the females were classified as over weight (25). In a study of Prevalence and severity of malnutrition and age at menarche in western Kenya of 928 randomly selected adolescent school girls aged 12–18 years, the overall prevalence of stunting and thinness was 12.1% and 15.6%, respectively. Of the total, two percent were severely stunted. The prevalence of stunting and thinness decreased with age and mean height for age z-scores converged towards the median of the United States (US) reference curve (20). A community based cross sectional anthropometric study was conducted to assess the nutritional status of children less than five years of age in North Western Ethiopia. One thousand four hundred and twenty two children were enrolled in the study. Stunting which is expressed by height for age below-2 standard deviation (SD) was seen in 43% of the children. The prevalence of wasting which is expressed by weight for height below SD was 9%. The highest percentages of stunting and wasting were found in the age group 12-23 months (26). The study to assess the nutritional status of school age children in Addis Ababa school age children using the 5^{th} percentile of the National Center for Health Statistics (NCHS) reference data, the prevalence of thinness was 28.4% for boys and 20.4% for girls: the average being 24%. The prevalence of stunting (<3^{rd} centile) was 13.8% for boys and 6.2% for girls with an average of 9.8% for both sexes. The prevalence of overweight was 3.3% (27). A Demographic and Health Survey conducted in 2000 found that 55 per cent of Ethiopian children under the age of five are stunted due to malnutrition.

1.3. Socio-economic status

In the United States, low-income children scored significantly lower on achievement tests than higher-income children before they participated in a school breakfast program (28). It has been recognized that children from poor socio-economic status families have higher chances of poor school performance. Malnutrition due to poverty coupled with low education and status of parents adversely affects their cognitive development. Such children also have higher chances of experiencing, right from their pre-school years, parental attitudes which do not motivate them to study and an unsatisfactory home environment which does not encourage learning (witnessing domestic violence, family stressors, adverse life events)(28).

1.4. Psychosocial problem

A study done in China in 1987 to determine the academic outcomes of families withsiblings and without among 1,460 school children and their parents in urban and rural areas showed that those without siblings had higher academic scores than those withsiblings among urban children, but these advantages were not evident among rural children (29). Maintaining and supporting the psychological health of students and staff are as important as addressing physical health. Mental health problems such as suicide and depression and other stress-related disorders affect large number of young people. Children and adolescents with emotional problems exhibit their impairments in a variety ways (10). They may fail academically, be rejected socially and have a poor self image. They may have difficulty relating to peers and adults and may lack respect for the laws of their country (10). In Rawalpidi District in Pakistan through the school mental health program, students' work together to promote their mental health. Evaluation of the program showed that students improved their grades, increased their attendance and decreased their dropout rates (10).

A study conducted in Dessie, Ethiopia, to assess differential vulnerabilities of preparatory school adolescents to a psychosocial problem with reference to their living arrangement and parental attachment showed that approximately a quarter of the students included in the study reported feeling of sadness which made them stop performing some regular activities (30). The study revealed that lower family connectedness and having a living arrangement separate from both biological parents (or living with friends, relatives or alone) were associated with increased odds of having a depressive symptom after controlling for observed covariates (30).

1.5. Physical health/Fitness of the school children

Traditionally, physical education is closely associated with education and focuses on the development of motor and sports skills (10). There is evidence of linking physical education to improved academic performance. The Trois Rivieres study in Canada demonstrated significant gains in academic performance among primary school children as a result of increased time spent on physical education. School based clinics show evidence of improving students' knowledge about how to be effective consumers of health services, reducing substance abuse, and lowering hospitalization rates (10).

Recommendations:-

De-worming program has to be encouraged with the collaboration of Woreda health office and other stakeholders. The program has to work specially on students. Students' health status affects their enrolment, and retention, therefore, health initiatives or clubs in school should be introduced and should focus on primary disease prevention. Health education on personal hygiene and sanitation has to be delivered. Awareness should be created on the negative impacts of Intestinal parasitic infestation on academic performance. Family planning education has to be given for their families and the families have to attend in nearby health service deliveries.

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