The Correlation between the Helminthes Infection and Nutritional Status among School-going Children in the Rural Area of Mardan Khyber Pakhtunkhwa Pakistan

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ABSTRACT

Malnutrition contributes directly or indirectly to more than 60% of 10 million child deaths each year. Soil-transmitted helminths (STH) infections are a major public health problem that affects more than two billion people around the world. Iron deficiency anemia is the most prevalent hematologic disorder in school-going children. Therefore, the aims were the study to assess the correlation between the helminthes infection and nutritional status among school-going children in the rural areas of Mardan Khyber Pakhtunkhwa Pakistan. A total of 300 samples were taken from the school-going children. The samples were taken through cross-section survey, physical examination, lab investigations and clinical examination from the both the helminthic and anemic children. The current research work shows that 1 of 3rd of the school-going children who had signs and symptoms of iron deficiency anemia were affected with iron deficiency anemia the ages of 4 to 7 years 40(40%), 7 to 10 years 35(35%) and 10 to 13 years 25(25%) respectively. severe anemia was rare at 10%, moderate anemia at 25% led by the mild type of anemia with a high percentage of 65% on the basis of Hb level. lower class families were more affected by iron deficiency anemia with 60%, children of middle class were less affected by anemia with 35% while children of upper class families were much less affected by anemia which may be due to the socioeconomic state of the family. Therefore it is recommended that iron supplementation, nutrition education and helminthic awareness programs should be conducted in schools.

Keywords: Iron, deficiency, anemia, prevalence, children, helminths
INTRODUCTION

Iron is essential for normal human growth. Iron is required for many essential body functions, including oxygen transport, adenosine triphosphate (ATP) production, DNA synthesis, mitochondrial function, and protection of cells from oxidative damage. Iron deficiency anemia is the most prevalent hematologic disorder in school-going children. It is estimated that around 2.15 billion individuals suffer from iron deficiency anemia (McCann et al 2007). In a recent review of the prevalence of iron deficiency anemia in the United States, 9% of toddlers and up to 11% of adolescent girls were iron-deficient. The absorption of dietary iron is assumed to be 5-10%, but it increases 3-5 times when iron storage is depleted. Inadequate dietary iron, iron absorption and intense exercise, along with blood loss and parasitic infections are some etiologies of iron deficiency anemia (IDA). Some consequences of IDA are growth retardation, exercise intolerance, behavioral changes, and abnormal thermogenesis. Although the prevalence of IDA has declined in industrialized countries, there have been few changes globally (Cook et al 1994). According to a UNICEF report, two billion people suffer from anemia worldwide and most of them have IDA, especially in underdeveloped/developing countries, where 40-50% of children under age 5 are iron deficient. It has been reported that 46.5% of Indonesian and 30-60% of Guatemalans under the age of 5 have suffered from IDA (Yip 1999). In Iran, 30-50% of women and children, especially those in low-income families, are suffering from iron deficiency (Karemi et al 2004). Anemia has been shown to affect mental development and learning capacity. In infancy it may cause a permanent loss of IQ later in life, shortened attention span, irritability, and fatigue, difficulty with concentration, lethargy, weakness and increased susceptibility to infection. Consequently, anemic children tend to do poorly on vocabulary, reading, and other tests (Arlappa et al 2010). In Saudi Arabia most of the studies on anemia were based on nutritional status and concentrated on preschool children who were under six years old, so data on the nutritional status of children and adolescents in the Kingdom are insufficient (Rao 2015). According to a World Health Organization (WHO) report, IDA is most frequent in children and women around the world, especially in non-industrialized countries. It is the only nutrient deficiency which is also significantly prevalent in virtually all industrialized nations. In addition, there are no current global figures for iron deficiency.

Anemia as an indirect indicator it can be estimated that most female preschool children and pregnant women in non-industrialized countries, and at least 30-40% in industrialized countries, are iron deficient. Intestinal helminth infections that are transmitted through the soil occur mostly in students of elementary school age, because they often have the most frequent contact with dirt (playing in playgrounds, rare use of shoes). Some species of STHs that commonly infect humans are roundworm (Ascaris lumbricoides), whipworm (Trichuris trichiura) and hookworm (Ancylostoma duodenale and Necator Americanus). The harm caused by intestinal worms is huge, especially in the physical development, intelligence and productivity of children. Helminths can cause malnutrition, anemia and impaired growth, which in turn will have an influence on a child’s level of intelligence (Kordas et al 2004).

The main aim of the present study was to assess the prevalence of anemia among school-going children of rural area of Mardan Khyber Pakhtunkhwa, to detect prevalence and clinical presentation of iron deficiency anemia (IDA) in school-going children, to detect socioeconomic factors of iron deficiency anemia, to detect age wise prevalence of iron deficiency anemia.
A cross-section survey was conducted on randomly selected school-going children with iron deficiency anemia aged from 4 to 13 years in Mardan Khyber Pakhtunkhwa after obtaining ethical approval from the School Head Teachers and the research ethics committee of faculty of medicine at Tehsil Head Quarter Hospital Takht Bhai Mardan.

**Sample size**
A total of 300 samples were taken from those children with signs and symptoms of iron deficiency anemia as well as the helminthes Infection.

**Children aged**
Aged wise three groups were made including 4-7, 7-10, and 10-13 years of aged

**Questionnaire**
Questionnaires were set to collect data about age, black tea intake, gender, education, and social classes based on monthly income, use of unfortified cow milk, vitamin supplementation drugs, and dietary intake. The principal author validated the Pashto version of questionnaire by involving two independent bilingual translators who performed forward and back translation and an expert committee at Tehsil Headquarter Hospital Takht Bhai Mardan.

**History**
Data history is taken to fulfill the following
- Clinical history was taken from children and relatives including age, onset of anemia, nutritional history, and intake of iron supply.
- History of fatigue, poor activity, exertion, dyspnea. Breathless ness at rest.
- History of blood transfusion

**Thorough Physical Examination:**
- Clinical examination, general, chest, cardiac, abdominal, and neurological examination

**Lab investigations and Tests: All patients were subjected to:**
- Complete blood picture and reticulocyte count. Patients with microcytosis underwent the following:
- Serum iron, ferritin and TIBC

An automatic hematological analyzer and biochemistry analyzer were used for clinical examination

**Sample type**
Blood samples were taken from all patients through EDTA tubes and whole blood for CBC test and in gel tube for serum to test ferritin ,iron TIBC for the transporting to hospital

**Statistical analysis:**
After collecting information from the selected sites of the study area through questionnaires, and the completion of laboratory tests, the statistical analysis of data was carried out through excel 2010.

**RESULTS**
Table 1. Shows that 1 of 3rd of the school-going children who were sign and symptoms of iron deficiency anemia were effected with iron deficiency Anemia with age of 4 to 7 years 40(40%), 7 to 10 years 35(35%) and 10 to 13 years 25(25%) respectively.

**Table 1. Age wise prevalence of anemia**

<table>
<thead>
<tr>
<th>Age</th>
<th>Sample size</th>
<th>Normal</th>
<th>Anemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-7</td>
<td>100</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>7-10</td>
<td>100</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>10-13</td>
<td>100</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>total</td>
<td>300</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>
Examination of patient with sign and symptoms of iron deficiency anemia where pale skin children were more frequent, leading by weakness of children with percentage of 35% while symptoms of fatigue were very less as compare to other sign and symptoms.

Table: 2 Signs of anemia and examination of patients under the study

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No. children (Hb &lt; 11.5 gm/dL) N</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pale skin</td>
<td>55</td>
<td>55%</td>
</tr>
<tr>
<td>Weakness</td>
<td>35</td>
<td>35%</td>
</tr>
<tr>
<td>fatigue</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table.3 shows that severe anemia was rare with 10%, moderate anemia 25% leading by mild type of anemia high percentage of 65% on the basis of Hb level.

Table.3 Prevalence of iron deficiency anemia on the basis of types

<table>
<thead>
<tr>
<th>Type of anemia</th>
<th>Hb level</th>
<th>Sample size</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe anemia</td>
<td>(Hb &lt; 7.0 g/dL)</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>(Hb 7 &lt; 10 g/dL)</td>
<td>25</td>
<td>25%</td>
</tr>
<tr>
<td>Mild type of anemia</td>
<td>(Hb 10 &lt; 11 g/dL)</td>
<td>65</td>
<td>65%</td>
</tr>
</tbody>
</table>

Table.4 shows that children of lower-class family were more affected by iron deficiency anemia with 60%, children of middle class were less effected by anemia with 35% while children of upper-class family were very less effected with anemia which may be due to the socioeconomic state of the family. The prevalence of anemia is a severe nutritional problem of public health significance. Therefore, iron supplementation and health and nutrition education programs should be strengthened. The community needs to be encouraged to diversify their diets by consuming iron-fortified and iron-rich foods.

Table.4 prevalence of iron deficiency anemia on the basis of socioeconomic state

<table>
<thead>
<tr>
<th>Economic state</th>
<th>Normal Hb</th>
<th>Low Hb</th>
<th>No.sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower class</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Middle class</td>
<td>65</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>Upper class</td>
<td>95</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

Table.5 This study found that the prevalence of STH among study subjects was 20(6.65%), of age 4-7 years were 10(3.33%), age of 7-10 years were 8(2.66%) while the age of 10-13 years were 2(0.66%). The most common types of worm infections were Ascaris lumbricoides (25.0%), Trichuris trichiura (11.2%) and mixed infections (3.8%). A significant correlation was found between the presence of STH infection and underweight nutritional status. Conclusions the presence of STH infection in children is strongly influenced by their hygiene practices. Small clinics and student healthcare units should play an active role in conducting periodic assessment of children’s nutritional status and in providing them with information on STH symptoms and prevention.
Correlation between the Helminthes and Nutritional Status among school children

<table>
<thead>
<tr>
<th>Age</th>
<th>Sample size</th>
<th>Normal</th>
<th>No. Helminthes Children</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-7</td>
<td>100</td>
<td>90</td>
<td>10</td>
<td>3.33%</td>
</tr>
<tr>
<td>7-10</td>
<td>100</td>
<td>92</td>
<td>8</td>
<td>2.66%</td>
</tr>
<tr>
<td>10-13</td>
<td>100</td>
<td>98</td>
<td>2</td>
<td>0.66%</td>
</tr>
<tr>
<td>total</td>
<td>300</td>
<td>280</td>
<td>20</td>
<td>6.65%</td>
</tr>
</tbody>
</table>

DISCUSSION

The current research work shows that the prevalence of STH among study subjects was 20(6.65%), of age 4-7 years were 10(3.33%), age of 7-10 years were 8(2.66%) while the age of 10-13 years were 2(0.66%). The most common types of worm infections were Ascaris lumbricoides (60%), Trichuris trichiura (35%) and mixed infections (5%). A significant correlation was found between the presence of STH infection and underweight nutritional status. Conclusions the presence of STH infection in children is strongly influenced by their hygiene practices. Small clinics and student healthcare units should play an active role in conducting periodic assessment of children’s nutritional status and in providing those with information on STH symptoms and prevention similar work also conducted (Ezeamama et al 2005).

The current study shows that the 1 of 3rd of the school-going children who were sign and symptoms of iron deficiency anemia were effected with iron deficiency anemia with age of 4 to 7 years 40(40%), 7 to 10 years 35(35%) and 10 to 13 years 25(25%) respectively. Similarly a research work also conducted by [16] A majority (81%) of the rural children of West Bengal were anemic, and the prevalence was significantly (p<0.001) higher among 1–3-year-old (91%) as compared to 4–5-year-old (74.6%) children. A significantly (p<0.01) higher proportion of 1+ (OR = 7.7; 95% CI: 2.6–22.4) and 2+ year children (OR = 3.0; 95% CI: 1.5–6.0) and those belonging to lower socio-economic heduled Caste and Scheduled Tribe communities were at risk for anemia (OR = 2.3; 95% CI 1.3–3.9).

Examination of patient with sign and symptoms of iron deficiency anemia were pale skin children were more frequent, leading by weakness of children with percentage of 35% while symptoms of fatigue were very less as compare to other sign and symptoms. The current results shows that severe anemia were rare with 10%, moderate anemia 25% leading by mild type of anemia high percentage of 65% on the basis of Hb level. Same work also performed by (Dewayani et al 2004) risk factors for moderate to severe anemia included incomplete immunization, stunted growth, recent infection, absence of bed net, low household living standard, rural residency (Mali), low maternal education, and low community development index (Benin). In addition, multilevel analysis indicated a clustering level of anemia in communities (intra class correlation) of 14% and 19% in Benin and Mali, respectively.
The study showed that children of lower class family were more effected by iron deficiency anemia with 60%, children of middle class were less effected by anemia with 35% while children of upper class family were very less effected with anemia which may be due to the socioeconomic state of the family. The prevalence of anemia is a severe nutritional problem of public health significance. Therefore, iron supplementation and health and nutrition education programs should be strengthened. The community needs to be encouraged to diversify their diets by consuming iron-fortified and iron-rich foods. (Masyithah et al (2017) Similarly the anemia percentage was recorded high in lower socioeconomic family children, than middle class and upper class. The percentage of anemic children was also high in age group of 10 - 12 years. Pale skin was the most common symptom of anemia.

CONCLUSION

The prevalence of anemia is a severe nutritional problem of public health significance. Therefore, iron supplementation and health and nutrition education programs should be strengthened. The community needs to be encouraged to diversify their diets by consuming iron-fortified and iron-rich foods Nutritional status of school children in district Mardan at Khyber Pakhtunkhwa in Pakistan.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS’ CONTRIBUTIONS

All authors equally contributed in the designing, experiments and wrote the manuscript. All authors read and approved the final manuscript.

REFERENCES


Correlation between the Helminthes and Nutritional Status among school children


