Frequency of Intestinal Parasite Among Asthmatic Sudanese Children in Certain Hospitals of Khartoum State

By

DR. ATIF AHMED MOAHMED SAAD
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Supervisor

PROF. SALAH AHMED IBRAHIM
MD, FRCP.
Professor,
Department of Paediatrics & Child Health,
Faculty of Medicine,
University of Khartoum.
 تعالى قال:
allaah othmana wальн الذين يرفع خبيرة تعلمون بما واعلل عظاممسداق المحادثة سورة، ١١ الآية

:أَدْرَكَهُ ﴿٢٠﴾

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Abstract

A hospital based study was conducted in some hospital in Khartoum State to determine the frequency of intestinal parasites among asthmatic children.

The aims of the study were to a) estimate the frequency of parasite among asthmatic children, and b) find out the association between intestinal parasite (according to type) and asthma severity.

One hundred asthmatic children (65 boys and 44 girls) attending these hospital in Khartoum state were studied. They were aged 5 – 61 years. History, examination; anthropometric measurement and FEFR were recorded. Serum IgE and stool examination for parasites were done for each case.

Intestinal parasite were detected in 33 (33%) of cases. The Parasite Gardia lamblia, H. nana, Enrobous vermicularis, E.coli, E.histolytica, accounted for 72%, 72%, 3.9%, 60.6% and 60.6% respectively; but cryptosporidium and schistosoma mansoni were seen in 30.3% of positive cases.

The Severity of asthma increased significantly with the presence of parasite (P < 0.01) and, was also associated with significant increase in serum IgE level.

There is a need for further evaluation using larger sample size and to study the effect of antihelminthic treatment.
ملخص الأطروحة

larıyla تنفيذ (NV), هيئة الخدمات الصحية الإقليمية وفرع جمعية الأطباء، دار يافا.

النظام الزمني لفتترة الكارثة، وآليات المستشفيات في بعض الدراسات. هذه الأعداد محددة (N)...

تعد القواطع السابقة نتائج دراسة تم إجراؤها بكمية كبيرة. تم استخدام الإحصائيات لتحديد العلاقة...
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Chapter One

1. INTRODUCTION AND LITERATURE REVIEW

1.1 General Consideration

Asthma, the most common chronic disease among children in developed nation\(^1\), carries a substantial direct and indirect economic cost worldwide\(^2\). Whereas most asthma originate in childhood, the natural history of asthma is poorly understood. It has been widely observed that the prevalence of asthma and other allergic disease has risen over the past decades in the industrialized nation\(^3\). However, the baseline prevalence childhood asthma is substantially lower in developing countries\(^1\). In developing tropical countries, endemic helminthic infection is the major public health problem\(^4\). The epidemiologic observation that asthma is very common and helminthic infection relatively uncommon in developed countries and that the converse is true. In many developing countries there has been speculations that two phenomena may be inversely associated\(^5\). However the relationship remains uncertain.
An increase in the incidence and severity of asthma both in children and adult has been noted in the recent year, this observation has been supported by prevalence survey and hospital admission data; there is also considerable concern that the severity is increasing with prevalence although the factors responsible for this are uncertain.

**Definition:**

There is no universally accepted definitions of asthma, it may regarded as a diffuse obstructive lung disease with hyper activity of the airway to variety of stimuli and a high degree of reversibility of obstructive processes which may occur either spontaneous or as a result of treatment.

**Historical background:**

Although asthma is one of the disease longest recognized as district entity, it has moved to center stage as a public health problem only in the last years.
In ancient Egypt respiratory difficulties were common and the Ebers papyrus (SSO BG) refer to a condition probably asthma.

The Chinese were familiar with asthma in the third millennium B.G., and their earliest writing mentioned the plant MaHung from which, in modern times ephedrine was excreted for use in asthma.

In ancient-Greece, varying degrees of laboured beating were differentiated, if it is moderate in severity it called dyspnoea and if it is marked in severity called asthma. Hippocrates and his disciples considered asthma symptoms. Aretaeus (181-131 AD) classified asthma as a disease and not merely symptoms. His description was probably the best in ancient time.

In 8th century many of physician suffer from disease themselves. Von Helmant compared the asthmatic attack to an epileptic and names asthma “The falling sickness of the lung”.
In 19th century Sir John Floyer was the first to differentiate the condition clearly from other varieties. He described two types of asthma continued and periodic, and he was the first to appreciate the importance of the expiratory component of bronchial construction; he also recognized the several factors underlying the asthmatic state (eg. Hereditary, weather, season etc...) (21).

In the 18th century, this witnessed significant development. The importance of occupation was emphasized by a great Italian physicians, Bernardino Bombazine and William Gullen the great Edinburgh clinical teacher defined asthma as “difficulty of breathing, returning at intervals with a sense of straightness in the breast”.

19th century Reisseun demonstrated that the bronchial wall contained a layer of muscle, which when contract constricts the bronchial airway. The Rene a French physician classified the nature and diagnosis of asthma by physical examination of the thorax using the stethoscope which he inverted in 1818.
In 1878 Paul Ehrlish demonstrated the eosinophilia in the WBC to be a feature of clinical pathology of asthma. In 1910 asthma was classified as allergic disease. In 1950 Vitalograph came into general clinical use, and provided a useful means of monitoring expiratory airway obstruction. In 1969 peak expiratory flow meter was introduced with a lot of advantages.

**Epidemiology:**

Asthma is a leading cause of chronic illness in childhood. There is considerable concern that the prevalence of asthma and its severity are increasing allover the world. Although, the factors responsible for this increase are uncertain. There has been speculation that changes in life style and urbanization in industrialized countries may be responsible. The highest prevalence was found in United Kingdom, Australia, New Zealand and Republic of Ireland; lowest prevalence rates were from several eastern European countries, Indonesia, Greece, China and India.
Few data are available from Arab countries but Kuwait and Lebanon have high prevalence and Oman had lowest prevalence\(^1\).

In 1948 it was estimated that asthma affect 100 million world wide. From 1980 – 1990 the incidence of asthma in children under age 8, increased to five percent per year. Resulting in an increase of more than 100% in that time period, this is according to the National Health interview survey\(^1\).

Although it is the most chronic disorder in children, it remains grossly under diagnosed, and affect at least 10% of school age children and it regularly cause absence from the school\(^1\).

It occurs at any age. Ten to 15% of boys and 7 – 10% of girls may have asthma during childhood, whereas 30% of patients are symptomatic by one year of age, 80 – 90% have their first symptoms before 4-5 years\(^1\). Males have an incidence 1.4% per year between birth and four years old, this drops to 1% per year between the age of 5 and 9 years, and it is 0.2% per year over the rest age ranges\(^1\).
Females have a slightly lower incidence in the youngest age group 9.0% per year, and it is decrease to 7.0% per year between the ages of 5-9 years and fluctuates from 4.2% to 8.8% per year over the rest of age ranges (1).

However establishing the real prevalence of wheeze in many countries is problematic, because estimation could be affected by a number of factors such as the treating doctors and families (1).

There are some regional variations of the disease and there are important differences of the prevalence between geographical areas of world.

This included increase in allergies exposure (1, 2).

The etiology of asthma and allergic disease remain poorly understood, especially in the developing countries. Epidemiological studies have failed to reach their potential because of the variability in their methodology (1).

The role of the environmental factors is increasingly become important in developing countries but this can not be easily said for the developed one which are stepping up in industrialization, and with marked dietary alteration among the high socio-economic class (1), such an increase
occurs in offsprings of first generation migrants from rural to urban areas, these changes are too rapid to be explained by change in gene pool and suggest the operation of important environmental influence. Moreover, a so called western life style has been the factor most commonly cited to explain this worrying increase asthma prevalence and where the children are exposed from early infancy to wide range of foods, infection, indoor and outdoor allergens and irritant and to the effect of motor vehicle pollution. Although asthma is a complex disorder involving autonomic, immunological, infectious, endocrine and psychological factors in varying degree in different individuals. The control of diameter of the airway may be considered a balance of neural and humeral forces. In some patient with so called extrinsic or allergic asthma, exacerbation follows exposure to environmental factors such as dust, pollens and dander. Often but not always, such patients have increase concentration of both total IgE and specific IgE against the implicated allergic factors.
Genetics and Asthma:

Asthma tends to run families.

In "Cooke and Vander they demonstrated that in many families asthma, hay fever, urticaria occurred in successive generations, but they were unable to detect any constant mode of inheritance (1). The importance of family was confirmed by Van Arsdel and Motulsky, who studied nearly 1,000 students at University of Washington; they found that if both parent of student were allergic 85% of the offspring were allergic. If one was allergic 8%, if no 6% were allergic (1). Several lines of evidence suggested the ability to synthesize large amount of IgE directed against environmental allergens (atopy). Atopy is genetically controlled IgE responses to highly purified allergen fragment are often restricted to individual bearing a particular Major Histocompatibility Complex (MHC) class II, but IgE responses to more complex allergens are not MHC restricted, there are no clear association of atopic asthma with a particular HAC type (2)."
Natural History: ١،٦

Asthma affects ١٪ of the school age children. The natural history remains unclear (١٥). Between ٣٪-٤٪ of children with asthma are expected to be markedly improved, or become symptoms free by early adulthood. On the other hand significant disease will persist in ٣٪ of the patients (١٣). The effect of asthma on lung growth was different for boys and girls. Boys with asthma had a large growth in the Vital Capacity (VC) than boys without asthma by ٨٪. Asthmatic girls however, had reduction in FEV, relative to non asthmatic girls (١٥). Age of onset has a complicated relationship to disease prognosis, while children have more chance of remission than adult, within childhood, an earlier age onset carries a worse prognosis.
Pathophysiology and Pathogenesis: ٧،١

There is marked variation in the caliber of intrapulmonary airways. And this is a characteristic finding in asthma. In addition asthmatic patient often report acute episodes on exposure to non specific irritant such as cold air, in organic, dust, cigarette smoke, perfumes and paints. The bronchial epithelium is often damaged and may be shed into the airways, the basement membrane thickened with subeithelial fibrosis and there is bronchial inflammation with oedema, vasodilatation and mixed cellular infiltrate, consisting of eosinophils, neutrophils and T-lymphocyte.

Epidemiological and clinical observation has linked IgE antibody to severity of asthma (٧). The airways in asthma showed infiltration by neutrophils and eosinophils degranulated mast cells, sub-basement – membrane thickening, loss of epithelial cell integrity and occlusion of the bronchial lumen by mucus, hyperplasia and hypertrophy of bronchial smooth muscle and hyperplasia of global cells were also present. These
finding are of severe fetal asthma, and the initial and sustained responses of the airway to allergens (\textsuperscript{14}).

To initiate the synthesis of IgE, switch by B cells to the production of particular immunoglobulin isotype requires two signals for synthesis of IgE. The first signal is delivered by interleukin \textsuperscript{4} or interleukin-\textsuperscript{31}, when these cytokines bind to receptors on B cells, the receptors for interleukin-\textsuperscript{4} and interleukin \textsuperscript{31} share a common alpha chain and use the same signal transduction pathway (\textsuperscript{15}).

The second signal delivered when CD\textsubscript{40} on B-cells bind to its legend on T-cells (\textsuperscript{14}).

Once synthesited and released by B-cells, IgE circulates in the blood before binding to high affinity IgE receptor on the surface of mast cells in tissue, peripheral blood baseophils and low affinity IgE receptors on the surface of lymphocyte, platelets, eosinophils and macrophage (\textsuperscript{14}).

Whether the binding of IgE to its low affinity receptors activates cells and contributes to inflammation are unclear, soluble receptors (low affinity receptors) however appear to be important in regulation IgE synthesis. Baseophilis and
Mast cell can secrete interleukin-4 and interleukin-13, however since the release of cytokinase depends on cross linking of IgE by allergen, these cell most likely amplify rather than induce the synthesis of IgE. Mast cells arise in the bone marrow and has long been regarded as an important effect or cell of asthma through its capacity to respond the IgE dependent activation with release of both preformed and newly generated mediators. The cross-linked mast cell bound to IgE by allergen, induces the activation of membrane and cytosolic pathway that cause the release of performed mediators such as histamine and initiate the synthesis of arachidonic acid metabolites.

Mast cell produce several cytokines, including interleukin-1, granulocyte - macrophage, colony stimulating factor, interferon gama, and tumor necrosis factor. The potential for extracellular release of these cytokines raises the possibility that mast cell contribute to both acute and chronic allergic inflammation. So the inhaled allergen precipitates acute obstruction of the airway by initiating the release from mast cells of
histamine and leukotrienes, which cause constriction of the smooth muscles. This early phase reactions usually resolves within an hour. Four to six hours later, prolonged late phase reaction with obstruction of the air flow may develop as a result of cytokines and chemokines generated by resident inflammatory cells.

Eosinophil begins in the bone marrow and is regulated by IgA through interleukin-7, interleukin-5 and granulocyte–macrophage colony stimulating factors, interleukin-5 induced terminal differentiation of immature eosinophils. The eosinophils is the sources of inflammatory prefers, major basic protein can directly damage airway epithelium, intensify bronchial responsiveness and cause degranulation of basophils and mast cells. These effects increase the severity of asthma, it is also a rich source of leukotrienes, particularly the cystinyl leukotrin C4, which contact airway smooth muscle, increase vascular permeability and may recruit more eosinophils to the airway.

Eosinophils also synthesize and release IL-\(\wedge\) in response to Platelet Activity Factor (PAF). The asthma
interleukin-5 stimulates the release of eosinophils into the circulation and prolongs their survival. Challenge in the airway with allergen increase the local concentration of interleukin-5, which correlates directly with the degree of airway eosinophils. Secretary IgA has been suggested to be the principal immunoglobulin mediating eosinophils function at mucosal surface.

T-lymphocyte has a role in atopic allergy. It contains IL-4 and IL-5 (1). And it has long been implicated in the regulation of IgE production particularly through the production of IL-4 which promotes isotype switching of γ cells of IgE and facilitates differentiation IgE producing plasma cell (2).

T-cells together with eosinophils are important in the pathogenesis of asthma. They were found in histological studies performed before and after a course of inhaled cortico-steroid. A six month double-blind placebo – controlled clinical trial of cyclosporin A (a specific inhibitor and T-cell activation) which showed a clear beneficial effect on spirometric measures in patients with chronic severe asthma.
Interest in the mechanism of cellular recruitment in asthma has also directed attention towards the vascular endothelium as a potential site for therapeutic intervention. The rate of decline in lung function with age is great in adults with asthma than those without asthma and the ability to reverse the impairment in pulmonary function in many patients with asthma depends on the early recognition and treatment (3). Recent observation in children with asthma (age 5-21) suggests that preventing the progressive loss of lung function in childhood may require recognition and treatment of the disease during the first 5 year of life (4,5). Whether there is mechanistic link between this loss of airway function and structural remodeling of the airway in early life is not yet known.

**Clinical manifestation of asthma**

The onset of asthma symptoms exacerbation may be acute or insidious; the acute episodes are often caused by exposure to irritants and airway obstruction develop rapidly
The signs and symptoms of asthma include cough with sounds, tight and is non productive early, wheezing, tachypnea, and dyspnea with prolonged expiration and use of accessory muscles for respiration; cyanosis, hyperinflation of the chest and the chest, tachycardia, and pulses paradoxus which may be present to varying degrees depending on the severity of the attack. Cough may be present without wheezing or wheezing may present without cough. Tachypnea may present without wheezing. These manifestations will vary depending on the severity of the exacerbation.

When the patient is in extreme distress the cardinal sigh (wheezing) may be absent. Shortness of break may be so severe to affect the child activity e.g. walking or talking and there is difficulty in expiration and inspiration. Abdominal pain is common as well as vomiting which may be relieved after the relief of
bronchospasm. During severe obstruction there may be low great fever.

A barrel chest deformity is sign of chronic unremitting airway obstruction of the severe asthma.

**Clinical Patterns of Asthma:**

According to the National Heart, Lung and Blood institute, expert panel report guidelines for the diagnosis and management of asthma together with Dowsons criteria for definition of asthma severity the classification were.

**Mild asthma:** *(A)*

Frequency 1-4 per years with no symptoms in between the attacks.

Good school attendance (absence of 1-2 days per years).

Good exercise tolerance.

No or little interruption of sleep.

No hyperinflation.

PEFR more than 80.

**Moderate asthma:** *(B)*
Frequency \( \leq 1 \) per years. 1-

Cough and wheeze between severe affects. 2-

School attendance may be impaired (\( \leq 1 \) day missed per years). 3-

Diminished exercise tolerance. 4-

Child may lose sleep at night. 5-

Hyper inflation of the chest. 6-

Complete recovery or partial between attacks 7-

(PEFR \( \leq 60\% \)) and less the \( 80\% \).

**Severe asthma:** (C)

Frequency of attack > \( 1 \) per years. 1-

Recurrent hospitalizations. 2-

Missed significant amount school days > \( 7 \) days per years. 3-

Sleep often interrupted (wakes by asthma most days (\( \leq 1 \)) a week. 4-

Poor exercise tolerance. 5-

Chest deformities. 6-

More severe disturbance of lung function PEFR \( \leq 60\% \). 7-

1,10 Triggering Factor of Asthma:
Various allergic and specific stimuli provoke the attack of asthma, this includes:

i- **Allergens**: like animal allergens (pets like cats, dogs, rodent birds) house-dust, mites, indoor and out-door allergens.

ii- **Food and medicine sensitivities**: like aspirin, beta blocker food (e.g. potatoes).

iii- **Respiratory infections**

iv- **Irritant** smoke perfumes, cooking odours, gas fumes, air pollution.

v- **Chemicals**: industrial and occupational exposure.

vi- **Physical activity** (exercise)

vii- **Mode change laughing and crying.**

\[11.1\]

**Diagnosis of Asthma:**

Asthma is a clinical diagnosis which is based on the recognition of a pattern of symptoms, signs and history for an accurate diagnosis\(^{11.1} \).

There must be:

a- Episodes of symptoms of airflow obstructions.
b- Airflow obstruction or symptoms that are at least partially reversible spontaneously or pharmacology\(^1\).

c- Exclusion of alternative diagnosis.

*Symptoms and signs of Asthma:*

The onset of asthma symptom exacerbation may be acute or insidious. Acute episode are most often caused by exposure to irritant, and airway obstruction develops rapidly in five minute, it is most likely due to smooth muscle Spasm the large airways. Exacerbation that occur by viral infection of the respiratory tract was of slower sunset with cough and wheezing over a few days, because airway patency is lower at night, many children have acute asthma at this time, the signs and symptoms of asthma include cough with sounds tight and is non productive early, wheezing, tachypnea and dyspnea with prolonged expiration and use of the accessory muscle of respiration; cyanosis hyperinflation of the chest and tachycardia and pulses paradoxus which may be present to varying degrees depending on the severity of asthma \(^1\).
Cough may be present without wheezing or wheezing may be present without cough. Tachypnoea also may be present without wheezing. The manifestations will very depending on the severity of the exacerbation when the patient is in extreme distress. The cardinal sign (wheezing) may be absents. Shortness of breath may be so severe to affect the child activity e.g. walking or taking there is difficulty in expiration and inspiration.

Abdominal pain is common as well as vomiting which may be relieved after the relief of symptoms. A barrel chest is sign of chronic unvomitting airway obstruction of severe asthma.

Management of asthma:

General goal:

The aim of the general goals of asthma therapy is to prevent chronic symptoms and exacerbation during day and night and to maintain normal activity level including exercise and other physical activities. Treatment, also needed to have normal or near normal lung functions.
Other goals for treatment is to be satisfied with the asthma care received and have no or minimal side effect with receiving optimal medications(1).

Quick relief medications:
Are used to provide prompt treatment of acute airflow obstruction and its accompanying symptoms such cough, chest tightness, shortness of breath and wheezing. These include short-acting inhaled beta₂-agonist and oral steroid(2).

Long-term control:
These are taken daily to achieve and maintain control of persistent asthma. The most important ones are those that reduce inflammations like inhaled steroid, they are the most potent inhaled anti-inflammatory currently available and well tolerated and safe at recommended doses(3).

Approach to managing asthma:
All patients need to have a short-acting inhaled Beta₂ agonist to be taken as needed for symptoms relief. Patient with mild, moderate or severe persistent asthma require daily long term control medication to control their asthma(4).

Gaining control of asthma by:
i. Short appropriate - treatment with dose follow up.

ii. Give therapy at higher level to achieve rapid control then tapers to minimum level to maintain control.

b- Maintaining control:

Increase or decrease in medication may be needed as asthma severity and control varies cover the time.

Mortality in Asthma: ١,١٣

Approximately ٠٠٠,٥ people die each year due to asthma, across racial and socioeconomical groups, the death rate from asthma mirrors the incidence ١٤. Studies in adult estimates have shown repeatedly that around ٪٠٨ of death occurred as a result of poor patient education, supervision and management and recent new treatment survey on childhood asthma death suggested that they were largely preventable ١٥٦٦٧٨٩.
Risk factor for death from asthma are many but underestimation of severity of asthma and delay in implementation and appropriate treatment, also under use of bronchodilators and corticosteroid. Non-compliance is an important factor.

Psychosocial dysfunction and stress that may interfere with compliance or perception of increasing airway obstruction. Sedation, excessive allergic exposure, recent emergency treatment and recent admission to hospital from asthma increases the risk of fatal asthma. Patients subjected to sudden some airway obstruction and patient with chronic steroid dependent asthma are a specially risk of fatal asthma.

**Definition and Classifications of Intestinal Parasites:**

Intestinal parasitic helminthes and protozoae infections were reported to be among the most common infections of human world-wide, particularly in the poorest communities throughout the developing countries.
The term “parasites” had been used historically and conventionally to refer to those infections organisms that belong the animal Kingdom, that was protozoa, helminthes and arthropoda. Protozoa were described as unicellular organism that were able to multiply within their hosts, in contrast worms or helminthes are multicellular and usually do not divide within human host\(^{(1)}\). The two major group of helminthes shown were nematodes or roundworms and platyhelminths or flat-worms. The later were represented by two classes: trematodes or flukes and cestodes or tape worms\(^{(1)}\).

**Prevalence of intestinal parasites: \(1,1^0\)**

The global prevalence and intensity of human intestinal protozoan and helminthic infections showed considerable variations in distribution. The seasonal occurrence was due to geographical and climatic factors and human activities such as changing the environmental and improving sanitation\(^{(1)}\).

In India, the prevalence of intestinal protozoa and helminthes infection was studied amongst school children age \(5 - 12\) years in sub-urban area; the overall prevalence
rate was ٪۴۶.۴۶. Of these ٪۴۳.۴۳ were protozoal infections, ٪۲۸.۵۱ helminthic infections and ٪۷۴.۴۱ as combined. *Ascaris lumbricoides* infections was the commonest helminthic infection (٪۱۸.۷) while the giardiasis was the commonest protozoal infection (٪۱۹). A survey on *scaris lumbricoides* was conducted during ۱۸۷۶ – ۱۸۷۷ in a rural community of Nova Scotion (Canada) of the ۱۱۱ individual tested, ۱۲۱ (٪۱۱.۱٪) were infected. All these infected were under ۲ years of age (٪۱۸). A survey among ۱۸۲ school children in Wjlas, Seraleone, showed that *Ascaris lumbricoides* was the most common helminthic encountered ٪۳.۳٪, followed by Trichrius *Trichiurae* (TT) ٪۷.۶٪ and hookworm infection ٪۴.۱٪ (٪۱۸). In a study carried out in Nigeria primary school children showed and overall intestinal parasites infection was ٪۱.٪. The prevalence of parasites was *Ascaris lumbricoides* ٪۴.۸٪. *T. Trichiurae* ٪۵.۸٪, *E. histolytca* ٪۴.٪, *Taenia saginata* ٪۳.٪, *schistosoma mansoni* ٪۴.٪ (٪۳۱.٪). In two primary school in Nairobi the relationship of social factors to the prevalence of soil borne helminthes was investigated. ٪۴٪ of school
children in relatively poor area had ascaris infections while \( 4.4\% \) of children in area with relatively high standard. Overall prevalence of trichuries infection was high \( 83\% \) and that of hookworm was \( 22\% \) \( (35) \).

In Qualyob city of Nile Delta in Egypt, examined primary school children showed prevalence rate of schistosomiasis \( 8.8\% \), amebiasis \( 8.7\% \), giardiasis \( 9.0\% \), teaniasis \( 9.1\% \), ascariasis \( 9.0\% \), entobiasis \( 9.9\% \) and hymenlopiais \( 9.8\% \) \( (35) \).

In two districts of Arbil, Northern Iraq, investigation showed that the prevalence of intestinal parasites in school children was \( 87.7\% \) in Koran district and \( 64\% \) in Azadi district. \( G. lamblia \) was the commonest intestinal protozoan and \( H. nana \) and \( Ascaris lumbricoides \) were the commonly reported intestinal helminthes \( (35) \).

In Sudan the prevalence of intestinal parasistes was observed by Gabbdh S in four primary school children in Elengas area, Khartoum city. The prevalence rate was \( 46\% \), the commonest parasites were \( G. lamblia \) \( 4.3\% \), then \( H. nana \) \( 6.2\% \), \( T. saginata \) \( 6.8\% \), \( E. vermicularis \) \( 2.6\% \), \( S. mansoni \) \( 4.4\% \) and \( E. histocytica \) \( 7.3\% \) \( (65) \).
School children in Al Hag Yousif area, Khartoum north, showed that the prevalence of intestinal parasites was $43\%$ and the dominant parasites were *G. lamblia*, *E. histolytica* then *H. nana* and *T. saginata*.

**Asthma and helminthes:**

There is growing interest in the possible relationship between asthma and helminthes infection, although the relationship remain uncertain and controversial. A related aim was exposure of a possible association between the pathogenic mechanism underlying atopic disease and immune response to parasite study was done in two Venezuelan regions; rural and urban, prevalence of bronchial asthma and the influence of environmental conditions among individuals; The prevalence of bronchial asthma was $0.3\%$ in rural subject who also parasitized by helminthes and $6.3\%$ in subject from urban region. The prevalence of Ascares was high.

A Study done in Egypt – Tanta showed that the relation between asthma, IgE and parasite was compared in patient, patient with asthma and non asthmatic
controls. Total IgE was found to be higher in asthmatics than controls. The high IgE correlation with parasite infection were also high.

Another Study done in China: Helminthes and allergic disease in relationship to current and past infection with parasite and asthma atrophy were investigated. The prevalence of either history of parasite infection or positive stool examination was \( 5.42 \% \), Ascares was associated with increase in risk of asthma \( P < 0.001 \) and high dose response to methacholine \( P = 0.003 \). This data suggest a complex relationship between childhood asthma and parasite.

Another Study done in Colombo south hospital (Srilanka). The result was obtained after clinical and analytical test for \( 30 \) symptomatic and \( 22 \) asymptomatic children. Most of symptomatic children were atopic. One third of all children has helminthiasis, there was a marked improvement of symptomatic patients after carbamazin therapy and PEFR improved in all symptomatic patient.
In a study done in Venezuela, clinical improvement of asthma was documented after antihelmintic treatment with albendazol for one year, however after two years without treatment the severity of asthma reverted to the initial state. The result indicates that intestinal helminthic infection can contribute to the clinical symptoms of asthma.
- Asthma is the commonest cause of chronic ill health in childhood and a little is known about etiology and natural history and association with parasites.

- No similar study was done in asthmatic Sudanese children before.
OBJECTIVES

The study aim to:

1. To estimate the frequency of intestinal parasites among the asthmatic children.

2. To find out the association between intestinal parasites according to type and asthma severity.
Chapter Two

1. MATERIALS AND METHODS

Study Design: ٢٢١

Prospective, cross sectional comparative, hospital based study.

Study Area: ٢٢٢

This study was conducted at:

Khartoum Teaching Hospital (KCEH),
Omdurman Children Emergency Hospital (OCEH),
Ahmed Gasim Hospital.

Study Period: ٢٢٣

The data was collected from August ٢٠٠٢ to October ٢٠٠٢ in period of ٣ month and ٣ days per week were chosen by investigator to see the asthmatic patients admitted to these hospital.

Study Population: ٢٢٤

Children above ٥ years attending to KCEH, OCEH and Ahmed Gasim Hospital with asthma.
Inclusion Criteria:

All asthmatic children aged 5-61 years presented to these hospitals during the study period.

Exclusion Criteria:

- Parents’ refusal to participate.
- Children < 5 years old

Consent:

Informed verbal consent was obtained from the treating doctors and the parents.

Sample Size:

Was calculated by the equation: To be = \( \frac{Z^2pq}{d^2} \)

\[ N = \frac{Z^2pq}{d^2} \]

Sample size = \( \frac{N}{d} \)

Statistical certainty (at 90% level of confidence).

Prevalence (1%) \( p = \)

Probability of failure \( q = \)

Desired margin of error \( D = \)
Study Technique and Tools:

Research team:
This included the author who completed the questionnaire and conducted physical examination. Laboratory (lab) technician and lab assistant.

Research tools: Details of adopted ISAAC. questionnaire concerning the following data were obtained:

- Personal data
- Symptoms and signs of asthma
- Triggering factor
- Family history and social history
- History of helminthic infection
- Full clinical examination and physical signs, were recorded including; weight, height and head circumference. PEFR was measured using Mini-Wright-peek flow meter in mc
- Collection of the stool sample: child was supplied with plastic container with cover for stool sample. Examination of the stool by concentration method using zinc sulphate and
ether formal was done in the lab for presence of parasites.

viii- Blood sample: ۳ml of blood was taken, centrifuged, ۱ml of serum taken immediately, kept in refrigerator temperature ۰۰۰۰C for serum IgE.

٢٫١٫١ مسایل:

٢٫١٫١٫١ وزن:
The child was weighed with light dresses and without shoes. The weight was measured in kilograms and the reading taken to the nearest ۱٫٠ kg. The weights were plotted on the centile Chart's (٣۶).

٢٫١٫١٫٢ ارتفاع:
This was measured with the child standing straight, the head straight, and facing horizontally, with the hands hanging by the side and lower limbs straight with the feet put together and without shoes; measured in centimeters and the reading taken to the nearest ۱٫٠ cm. The height was plotted on the centile chart (٥٦،٤٦).
PEFR:

This was measured using mini Wright peak flow meter in L/min. Peak expiratory flow rate in the fastest rate at which air can move through airway during a forced expiration starting form fully inflated lung. The PEFR was taken with the child standing up and holding the peak flow meter horizontally. The child was told to take a deep breath, seal his/her lips around the mouthpiece and then blow out as fast and hard as possible.

After the child was familiar with proceeder and has successfully performed an example; he/she be blow out the peak flow meter three times. The best of the three reading was recorded for each child. 

Total Serum IgE Level:

Serum total IgE levels were determined by mean of the UniCAP immunoassay system (Roche diagnostic, Elelys immunoassay system).

Examination of the stool

Using formal ether and zinc sulphate concentration technique for detection of the parasites. One gram of faeces was emulsified in about 4 ml of physiological saline
and sieved. Then 7 ml of 10% Formal water and 3 ml of ether were added to. The mixture was shacked for 30 seconds to one minute and after centrifugation, four layers in the tube were seen. They were: ether, faecal debris, formal and sediment, which contained parasites at the bottom of the tube. One drop of sediment was sucked by a pipette, smeared on a glass slide and covered with a cover glass. The prepared slide was examined microscopically by 10 and 40 objective.

Smear, which were positive for any protozoan cysts were stained by lugols iodine for identification.

Management of the Affected Children:

Every child discovered to have parasitic infection had been given specific treatment. The medications were offered through treating doctor.

Data Analysis:

The data was entered into the computer software. The Statistical Package for Social Sciences System (SPSS) was used for analysis.

Chi-square test was used and a p-value of less than .05 was considered statistically significant.
Chapter three

"Results"

A total of ١٠٠ asthmatic children, age ٥ - ٦١ years were studied. There were ٦٢, ٢٥ and ٢٢ cases from KCTH, OCEH and Ahmed Gasim hospital respectively.

١.٣. distribution of cases according to age:

Children of the age group ٥ -٧ yrs (٦٠ -٨٤ months) old had the highest frequency of ٥٤٪.

The lowest frequency ٪٣ was reported in children ٦٠ Yrs and more (٨٤months) (table ١).

٢.٣. sex distribution of cases of childhood asthma:

The males were ٦٥ (٦٥٪) and the females were ٤٤ (٤٤٪) (fig ١)
Table 1: Distribution of cases according to age
N = 100

<table>
<thead>
<tr>
<th>Age in months</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 - 48</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>59 - 88</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>89 - 122</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>123 - 156</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>157 - 180</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>≥180</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 1: Sex distribution of cases of childhood asthma
n = 100

- Male: 56%
- Female: 44%
٣.٤. Distribution of cases by residence:
Residence included Khartoum ٦٦ (٢٩٪) cases, Omdurman ٢٥ (٠٪) cases and Khartoum North ٢٢ (٢٢٪) (fig ٣).

٣.٥. Presenting symptoms of the study group:
Cough, sleep disturbance and wheeze were the commonest symptoms in ١٠٠٪، ٦٩٪ and ٦٩٪ of cases respectively.
Fever was observed in ٦٩٪ of cases, abdominal pain in ٥٠٪ of cases, vomiting, diarrhea and itching in ٣١ cases (fig ٤).

٣.٦. Distribution of cases according to age at first presentation of wheeze:
The commonest age at first presentation of wheeze was ١ -٣ yrs (١٢ -٣٦ months) and this is found in ٤٤ (٤٤٪) of cases then followed by more than ٧ yrs (٨٤ -١٨٢ months) in ٨١ (٨١٪) of cases.
The lowest age of ١st presentation of wheeze was less than ١ yr (<١٢months) (table ٣).

٣.٧. History of helminthic infection among the study group:
Fig ٧ shows that ٦٤ (٦٤٪) of cases had a history of helminthic infection, while ٤٥ (٤٥٪) cases had no history.
Figure 2: Distribution of cases by residence
n = 100

- Khartoum: 52%
- Omdurman: 26%
- Khartoum North: 22%
Figure 3: Presenting symptoms of the study cases
N=100

- Cough 100%
- Wheeze 96%
- Fever 96%
- Abdominal pain 62%
- Vomiting 40%
- Diarrhoea 31%
- Itching 25%
Table 4. Distribution of cases according to age at first presentation of wheeze

\[ n = 100 \]

<table>
<thead>
<tr>
<th>Age at 1st presentation of wheeze (months)</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12</td>
<td>5</td>
<td>.5</td>
</tr>
<tr>
<td>12 - 36</td>
<td>44</td>
<td>.44</td>
</tr>
<tr>
<td>36 - 48</td>
<td>10</td>
<td>.10</td>
</tr>
<tr>
<td>48 - 60</td>
<td>9</td>
<td>.09</td>
</tr>
<tr>
<td>60 - 84</td>
<td>9</td>
<td>.09</td>
</tr>
<tr>
<td>84 - 108</td>
<td>18</td>
<td>.18</td>
</tr>
<tr>
<td>≥ 108</td>
<td>81</td>
<td>.81</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Figure 4: History of helminthic infection among the study group
n = 100

46%

54%

Positive  Negative


٢،٧. **Triggering factors of asthma in the study group:**

The triggering factors identified included; respiratory infection in ٩٠٪ of cases, dust-mite and smokes in ٩٣٪ of cases, food allergens in ٣٦٪ of cases and animal or other housing condition in ٤٣٪ of cases (table ٣).

٢،٨. **Type of asthma medications taken by the study group:**

Ninety nine percent of children received salbutamol , ٩٦٪ hydrocortizone , ٣٦٪ aminophilline , ٣٦٪ prednisolne and ٥٪ adrenaline (table ٤).

٢،٩. **Relationship between family history of atopy and the study group:**

Family history of asthma was shown to be related to the risk of child having asthma. Family history of was present in ٤٤٪ (٤٤٪) of cases, paternal in ٣١٪ (٣١٪) cases, maternal ٩١٪ (٩١٪) cases, sibling ٨٪ (٨٪) cases and other ٤١٪ (٤١٪) cases.

Consanguinity was shown to be related to the risk of child having asthma in ٩١٪ (٩١٪) of cases (table ٥).
### Table 3: Triggering factors of asthma in the study group

*n = 100*

<table>
<thead>
<tr>
<th>Triggering factors</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest infection</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Dust-mite</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Smoke</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Animal or other housing condition</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Food allergen</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Drugs</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>--------------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Salbutamol</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>Hydrocortisone</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Aminophylline</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>adrenaline</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Risk factors</td>
<td>Yes (N)</td>
<td>No (N)</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>Family history</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Father asthmatic</td>
<td>13</td>
<td>87</td>
</tr>
<tr>
<td>Mother asthmatic</td>
<td>19</td>
<td>81</td>
</tr>
<tr>
<td>Sibling asthmatic</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>Consanguinity</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>F.H. of eczema</td>
<td>27</td>
<td>73</td>
</tr>
</tbody>
</table>
Education of parents of the study group:

Fig 5 shows the frequency of asthma increased with increasing level of father education and deceased mother education.

Father occupation of the study group:

As shown in fig 7, children whose father were skilled laborers, employee officer and unskilled laborer had asthma more than children whose father professional, trade and ship owner.

Family income of the study group in SDD per month:

Thirty seven percent of cases, 27%, 26% and 10% of the study cases have a family income of ≤2,000 SDD, >2,000 – 4,000 SDD, >4,000 – >6,000 SDD, ≤6,000 SDD and ≥6,000 SDD respectively (fig 8).
Figure 5: Education of parents of the study groups

N = 100

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>32%</td>
</tr>
<tr>
<td>Adult education</td>
<td>19%</td>
</tr>
<tr>
<td>Khalwa</td>
<td>6%</td>
</tr>
<tr>
<td>Primary school</td>
<td>8%</td>
</tr>
<tr>
<td>Secondary school</td>
<td>12%</td>
</tr>
<tr>
<td>Post secondary</td>
<td>3%</td>
</tr>
</tbody>
</table>

Fathers
Figure 6: Father’s occupation of the study group
n = 100

Mothers
Figure 7: Family income of the study group in SDD/Month

- < 20,000: 10%
- 20,000 - 40,000: 26%
- 40,000 - 60,000: 27%
- > 60,000: 37%
Asthma severity in the study cases:

A scoring method of severity was used similar to that used by Zurik et al. Six variables were used which include:

1. Frequency of the attack last years
2. Days of school absence per year
3. Exercise tolerance
4. Frequency of use of bronchodilators
5. Days of sleep disturbance
6. PEFR

Of the 100 children with asthma in the study group 73 (73%) cases had mild asthma, 24 (24%) had moderate asthma and 12 (12%) of cases have severe asthma (table 6).

Weight distribution of the study group in percentile:

The wt of most children were between the 3rd and the 79th percentile. No children had wt above the 79% percentile (fig 8).

Height distribution of the study group in percentile:

As seen in fig 9 the majority of children had their ht between the 3rd and the 79th percentile, while 9 children had their ht below the 3rd percentile.
٣،١١. Presenting signs of the study cases:
As shown in fig ١٠ the signs were wheeze ٩٩٪, cripitation ٩٩٪, fever ٤٧٪, pallor ١٣٪, hepatomegally ٨٪ and spleenomegally ٧٪.
Figure 8: Weight distribution of the study group in percentiles
n = 100

Percentage

60 50 40 30 20 10 0

> 3rd 3rd 50th 97th

Centile

12% 35% 53% 0%
Figure 9: High distribution of the study group in percentiles

n = 100
Figure 10: Presenting signs of the study cases

Percentage

Pale Wheeze Hepatomegal

Signs

12% 42% 99%

0 10 20 30 40 50 60 70 80 90 100

0 2% 12% 99%
٣،١٧. Frequency of intestinal parasites and the study group:
A positive stool examination for giardia lamblia was found in ٦٠٨١٪ of cases, hymenolepis nan ٦٠٨١٪, giardia + H.nana ٦٠٨١٪, Giardia + Entamoeba coli ٦٠٨١٪, Entrobius vermicularis ٦٠٨١٪, Schistosoma mansoni ٦٠٨١٪, Entamoeba histolytica ٦٠٨١٪, H. nana + E, coli ٦٠٨١٪, E. coli ٦٠٨١٪, cryptosporidium ٦٠٨١٪, Giardia +E.histolytica ٦٠٨١٪ and H. nana +E.histolytica ٦٠٨١٪ (table ٧).

٣،١٨. Serum IgE levels in the study group:
The significant titers of serum IgE more than ١٠٠٠ IU/ml. as shown in fig. ١١ ٤٣٪ of children had their serum IgE level between ١٫٠ – ١٠٠٠ iu/ml, ٥٩٪ between ١٠٠٠ – ١٠٠٠ IU/ml and ٠١٪ of cases had their serum IgE level more than ١٠٠٠ iu/ml.
### Table 7: Frequency of intestinal parasites in the study group

<table>
<thead>
<tr>
<th>Intestinal parasite</th>
<th>Present (N)</th>
<th>Absent (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giardia lambilia</td>
<td>6</td>
<td>27</td>
<td>18.18</td>
</tr>
<tr>
<td>Hymenolpis nana</td>
<td>6</td>
<td>27</td>
<td>18.18</td>
</tr>
<tr>
<td>Giardia + entamoeba coli</td>
<td>4</td>
<td>29</td>
<td>12.12</td>
</tr>
<tr>
<td>Giardia + h. nana</td>
<td>4</td>
<td>29</td>
<td>12.12</td>
</tr>
<tr>
<td>Entrbius vermicularis</td>
<td>3</td>
<td>30</td>
<td>9.03</td>
</tr>
<tr>
<td>Schistosoma mansoni</td>
<td>2</td>
<td>31</td>
<td>6.06</td>
</tr>
<tr>
<td>Entamoeba histolytica</td>
<td>2</td>
<td>31</td>
<td>6.06</td>
</tr>
<tr>
<td>H. nana + E. coli</td>
<td>2</td>
<td>31</td>
<td>6.06</td>
</tr>
<tr>
<td>Entamoeba coli</td>
<td>1</td>
<td>32</td>
<td>3.03</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>1</td>
<td>32</td>
<td>3.03</td>
</tr>
<tr>
<td>Giardia + E. histolytica</td>
<td>1</td>
<td>32</td>
<td>3.03</td>
</tr>
<tr>
<td>H. nana + E. histolytica</td>
<td>1</td>
<td>32</td>
<td>3.03</td>
</tr>
</tbody>
</table>

P value < 0.01
Figure 11: Serum IgE level in the study group

- 0.1-800 iu/ml: 54%
- 801-2000 iu/ml: 36%
- > 2000 iu/ml: 10%
Nutritional status of the study group and intestinal parasites:

Good nutritional status was reported in 7(12.02%) of cases with intestinal parasites, satisfactory in 22(06.66%) cases and poor nutritional status was found in 4(21.21%) of cases p value = 0.268 (fig\(\frac{1}{4}\)).

Relation between age in months and presence of parasites:

As shown in table 8 the relation of age in months and the presence of parasites in the stool was not significant (p value=0.92).

Mother education and the presence of parasites:

The frequency of positive stool examination for parasites was found to be increased with decreased mother education level. About 17(11.10%) of cases with positive parasites had illiterate mothers, 2(0.6)% Khalwa, 11(3.30%) primary school education 4(2.12%) secondary school education and no children with parasites had mothers post secondary educated ( p value = 0.060) table 9.
Figure 12: Nutritional status of the study group and intestinal parasite

$n = 33$

- 66.60% Good
- 21.21% Satisfactory
- 12.12% Poor
<table>
<thead>
<tr>
<th>Age in months</th>
<th>Parasite present</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 - 84</td>
<td>13</td>
<td>39.39</td>
</tr>
<tr>
<td>84 - 108</td>
<td>8</td>
<td>24.24</td>
</tr>
<tr>
<td>108 - 132</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>132 - 156</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>156 - 180</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>≥ 180</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>total</td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>

P value < 0.052
Table 9 Mother education and the presence of parasites

\( n = 33 \)

<table>
<thead>
<tr>
<th>Mother education</th>
<th>Parasite present(N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>17</td>
<td>51.51</td>
</tr>
<tr>
<td>Adult education</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Khalwa</td>
<td>20</td>
<td>60.6</td>
</tr>
<tr>
<td>Primary school</td>
<td>10</td>
<td>30.3</td>
</tr>
<tr>
<td>Secondary school</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>

P value < 0.003
Relation between presence of parasites and serum IgE level:

The serum IgE level increased with increased rate of positive stool parasites. Twenty (66.66\%) of cases with serum IgE level between 10-200 iu/ml, 10 (33.33\%) with IgE level more than 200 iu/ml and two (90.9\%) with IgE level 1-10 iu/ml (p value = 0.001) fig 14.

PEFR and presence of parasites:

The peak expiratory flow rate decreases with the presence of parasites; 22 (22\%) cases with intestinal parasites had PEFR less than 60, 9 (22\%) had PEFR of 60-70 and 2 (9.09\%) had PEFR ≥70 (p value = 0.001) table 10.
Figure 13: Relation between present of intestinal parasite and serum IgE level

\[ n = 33 \]
Table 10. PEFR and presence of parasites

\[ n = 33 \]

<table>
<thead>
<tr>
<th>PEFR (%)</th>
<th>Parasites present (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 60</td>
<td>22</td>
<td>66.6</td>
</tr>
<tr>
<td>60 - 80</td>
<td>9</td>
<td>27.3</td>
</tr>
<tr>
<td>≥ 80</td>
<td>2</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

P value < 0.003
٣.٣٠. Asthma severity and presence of parasites:

Ten out of ٢١ (٢٧٪) cases with severe asthma had positive stool for parasites, ٦١ out of ٢٤ (٩٠٪) with moderate asthma had parasites while ٧ out of ٧٣ (١٢٪) cases with mild asthma had intestinal parasites (p value < ٠.٠٠٢) table ١١.

٣.٣١. Relation between days of school absence and presence of stool parasites:

As seen in fig ١٠ the days asthmatic child absent from school increased by increased rate of positive stool examination for parasites (p value < ٠.٠٢).

٣.٣٢. Type of parasites and serum IgE level:

As demonstrated in table ١٢, about three cases with IgE level ٠.٠٨ – ٠.٠٠٢ iu/ml had Giardia, two cases with IgE level ١.٠ – ٢٠ iu/ml had giardia, while only one cases with Giardia had IgE level more than ٠.٠٠٢ iu/ml.

IgE level of ٠.٠٨ – ٠.٠٠٢ iu/ml was found in three cases with H. nana, three cases with Entrobius vermicularis, one case with E. coli, one with E. histolytic, one with S. mansoni, one with Giardia +E.histolytica, one with H.nana + E.coli and one H. nana + E. histolytica.
Serum IgE level more than ٠٠٠٢ iu/ml was seen in three cases with H. nana, one with S.mansonii and one with E. histolytica (p value<٠٠٠٠٠٠٠٠٠).
Table 11: Asthma severity and presence of parasites
\( n = 33 \)

<table>
<thead>
<tr>
<th>Severity</th>
<th>Parasites present</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild (73)</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td>Moderate (24)</td>
<td>16</td>
<td>43.09</td>
</tr>
<tr>
<td>Severe (12)</td>
<td>10</td>
<td>46.60</td>
</tr>
<tr>
<td>Total (101)</td>
<td></td>
<td>33</td>
</tr>
</tbody>
</table>

P value < 0.01
Figure 14: Relation between days of school absence during the past months and present of intestinal parasite (P < 0.023) 

n = 33
Table 12. Type of parasites and serum IgE level
\( n = \text{33} \)

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Serum IgE level (iu/ml)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0 - 0.00</td>
<td>0.00 - 0.002</td>
</tr>
<tr>
<td>G. lamblia</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>H. nana</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>E. vermicularis</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>E. coli</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>E. histolytica</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S. mansoni</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Giardia + E. coli</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Giardia + E. histolytica</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Giardia + H. nana</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>H. nana + E. coli</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>H. nana + E. histolytica</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>22</td>
</tr>
</tbody>
</table>

\( P \) value < 0.0001
Asthma severity and serum IgE level:

As seen in table 13, the level of the serum IgE increased with increased severity of asthma. Ten out of 21 (47.6%) cases with severe asthma had serum IgE level more than 1000 iu/ml, 63 out of 34 (7.58%) had IgE level ≥1000 iu/ml, while no cases with mild asthma had serum IgE level of more than 1000 iu/ml.

Peak expiratory flow rate and serum IgE level:

As seen in table 41, the PEFR decreased with increased level of IgE (p value = 0.034).

History of helmithic infection and PEFR:

As demonstrated in table 51, the PEFR was significantly decreased with positive history of helminthic infection (p value<0.001).
Table 12: Asthma severity and serum IgE level

\( n = 130 \)

<table>
<thead>
<tr>
<th>severity</th>
<th>Serum IgE level (iu/ML)</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0 - 0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 - 0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 - 0.0</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Moderate</td>
<td>00</td>
<td>06</td>
</tr>
<tr>
<td>Severe</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>total</td>
<td>37</td>
<td>17</td>
</tr>
</tbody>
</table>

P value < 0.0003
### Table 1: peak expiratory flow rate and serum IgE level

\( n = 100 \)

<table>
<thead>
<tr>
<th>Serum IgE level (iu/ml)</th>
<th>Peak expiratory flow rate (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥800</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>800 – 1,000</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>800 – 2,000</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td>≥2,000</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

P value < 0.017
Table 10 History of helmithic infection and PEFR  
\( n = 100 \)

<table>
<thead>
<tr>
<th>PEFR</th>
<th>History of helmithic infection</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>≤ 60</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>60–80</td>
<td>13</td>
<td>37</td>
</tr>
<tr>
<td>≥ 80</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>54</td>
</tr>
</tbody>
</table>

P value < 0.001

PEFR = Peak expiratory flow rate
٣.٣١. **History of helminthic infection and serum IgE level:**

Table ٦٦; shows that the level of serum IgE was increasing with the rate of history of helmithic infection (p value < ٠٠٠٠٠٠٠٠٠٠٠٠٠٠).  

٣.٣٢. **Asthma severity and history of helminthic infection:**

Table ٧٧; shows that the severity of asthma increased with history of helminthic infection, ١٣ out of ٣١ cases with severe asthma had a history of helminthic infection, ٢٢ out of ٤٣ with moderate asthma had a positive history and ١١ out of ٦٧ cases had a history of helminthes (p value < ٠٠٠٠٠٠٠٠٠٠٠٠٠٠).
<table>
<thead>
<tr>
<th>Serum IgE level</th>
<th>History of helminthic infection</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>0.01–0.010</td>
<td>17</td>
<td>37</td>
</tr>
<tr>
<td>0.01–0.100</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>≥0.100</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>total</td>
<td>46</td>
<td>54</td>
</tr>
</tbody>
</table>

P value < 0.0003
<table>
<thead>
<tr>
<th>Severity</th>
<th>History of helminthic infection</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mild (37)</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>Moderate (42)</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>Severe (21)</td>
<td>13</td>
<td>40</td>
</tr>
<tr>
<td>Total (100)</td>
<td>46</td>
<td>54</td>
</tr>
</tbody>
</table>

P value < 0.00431
This study is designed to investigate the inter relationship between asthma and helminthic infections in certain hospitals in Khartoum State, and to correlate a positive stools examination or a history of helminthic infection with severity of asthma and the level of serum IgE.

There exists considerable evidence that helminthic infections can either increase or decrease the allergic reactivity of infected population. Sudan is one of the developing nations, childhood exposure to helminthic infections appear to be more common in the developing nations of the tropical region. Helminthic parasites can stimulate the production of specific IgE antibody, which sensitizes the mast cells of the host. For these reasons we evaluated the level of serum IgE and presence of parasite among asthmatic children, and to correlate this data with severity of asthma.

In this study, the frequency of a positive stools examination for parasite was 33 (3.3%) patient and history of helminthic
infection was found in ٦٤٪٦٤ patients. This results is similar to that found in Chinese asthmatic children who had helminthic infection (٪٤٢), over all prevalence of ٪٧٤(٨٥). Also several studies in non Chinese population as in Amazon Basin had suggested an association between helminthiasis and increased risk of asthma٩٦-٩٧.

In Sudan the prevalence of intestinal parasite was studied in four primary school children in Elengaz area (Khartoum) and was found to be ٪٤٦(٦٥). Another study done in Elhag Yousif area (Khartoum North) gave a prevalence rate of ٪٤٣(٧٥). While M. Ismail found the prevalence of intestinal parasites in Khartoum State to be ٪٧٣. In these three studies wheezing was rebooted to be one of the presenting features.

**Severity of Asthma and Parasite Infections:** ٤٨

In this study about ٧٣ of children had mild asthma, ٢٤ children had moderate asthma and ١٢ children had severe asthma. Regarding the positive infection frequency about ٦١٪٨٤ patients with positive stool examination for parasite had moderate asthma ٠١ child ٪٠٣ had severe asthma and ١٢٪١٢ children had mild asthma. So we found that this is significant relationship
between severity of asthma and presence of parasites. (P-value < \( \cdot \cdot \cdot \cdot \).)

The relation between childhood asthma and previous history of helminthic infection was also shown to be related to severity of asthma. The were \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% of cases with positive history of helminthic infection who had moderate asthma, \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% patients had severe asthma and \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% patients had mild asthma.

The results are consistent with previous studies done in Chinese asthmatic children. The prevalence of positive parasite in stool examination or a history of helminthic infection was \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% in other study on Malaysian children showed relationship between exposure to toxocara infection and development of childhood asthma\( \cdot \cdot \cdot \). The PEFR also shown to be significantly affected by a history of helminthic infection or positive parasite in stool examination, about \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% children of PEFR < \( \cdot \cdot \cdot \) \% had a positive stool examination for parasites and \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% patients had a history of helminthic infection in this study.

Nine children \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% with a PEFR \( \cdot \cdot \cdot \) \( \cdot \cdot \cdot \) \% had stool positive examination and \( \cdot \cdot \cdot \) \% children had a history of helminthic infection. PEFR of \( \cdot \cdot \cdot \) \% and more was observed in \( \cdot \cdot \cdot \) children with no history of helminthic infection and in two children with negative
stool examination. This data is highly significant (P-value < 0.01) suggest the relation between asthma and helminthic infection.

Asthma severity, parasitic infection and serum IgE level:

A model of the possible influence of helminthic infection on the allergic reactivity of tropical population has been proposed by Lynch (1970) with mild helminthesis, reactivity to specific allergen is elevated by the non specific potential of IgE synthesis against environmental antigen and possibly also by direct reactivity against parasite.

In this study it was found that the level of IgE was significantly high (P-value < 0.01) in children who either had a positive stool examination for parasite or history of helminthic infection versus a negative history or negative stool examination for helminthic infection.

In the study, there is inter relationship between asthma severity, parasitic infection and serum IgE, it was found that many children had mild asthma of them had a positive stool
examination, history of helminthic infection and their serum IgE level (–) normal or slightly increased. Forty two children had moderate asthma, of them had a positive stools examination for parasite, children had a history of helminthic infection and their serum IgE increase between to iu/ml. Twenty one children had severe asthma of them had a positive stools examination for parasite, children had a history of helminthic infection and their serum IgE level was more than iu/ml, which is very high; this data suggest strong relation between asthma and helminthic infection. It is similar to study done in Sri-Lanka children. An other study done in Egypt (Tanta); serologic analysis of total and specific IgE antibody level and their relationship to parasite infection, serum IgE level were significantly higher in patient with parasite infection and asthma (geometric mean iu/ml than the control).

The age of first presentation of wheeze and positive stool examination for parasite was not significant and these outcomes could not be investigated in the current study. There have been some concern about growth failure in asthma.
In this study the weight and height of asthmatic children were between \( \text{3rd} \) and \( \text{89th} \) percentile. Only two children had their weights below the \( \text{3rd} \) percentile and \( \text{9} \) children had their heights below the \( \text{3rd} \) percentile.

The most common triggering factor in this study was chest infection, dust and animals. This finding is in agreement with Abuekteich, et al (\( \text{67} \)) who found that respiratory infection and dust were triggering factor for asthma.

Finally; age, sex and residence were found to have no significant effect among asthmatic children in relation to parasite infection.
CONCLUSIONS

In this study all children were aged 5-6 years with an established diagnosis of bronchial asthma.

- The weight and height of most of asthmatic children were between the 3rd and 97th percentile.
- Family history was strongly related to childhood asthma.
- The occupation of father, family income and mother education were found to have an affect on their child infection with intestinal parasite and severity of asthma.
- The frequency of intestinal helminthic infections among asthmatic children was 33%.
- There was an increase in asthma severity with a history of helminthics or positive stool examination for parasite.
- The severity of asthma was affected by type of intestinal parasite and infection with more than one parasite.
- The presence of parasite and severity of asthma strongly related to an increase the level of serum IgE.
- The results of this study are consistent with the possibility that helminthic infection can contribute to symptomatology
of asthma, and that this could occur both through a direct effect of parasite and through nonspecific potentiation of allergic reactivity toward environmental allergens.
RECOMMENDATIONS

(1) The relationship between asthma and previous helminthic infection need further evaluation.

(2) There may be some value in an evaluation of the effects of targeted antihelminthic treatment on the expression of asthma.

(3) Personal hygiene should be implemented for the promotion of child health in general.

(4) Further studies on asthma of parasitic infection are recommended. These studies could include: aspect like schistosoma mansoni and asthma.

(5) Any child who present to hospital with signs and symptoms of bronchial asthma stool analysis should be done for parasite.

(6) Any child with evidence of parasite should be evaluated for possible bronchial asthma before and after treatment.
(7) Facilities for stool examination and PEFR should be available at any hospital.

(8) Classification of severity of asthma should be done for every case of asthma.

REFERENCES


(26) Holgate ST, Lightman S. Inflammation and repair, horizons in medicine - J R Coll Physician Lond 1996; (7): p. 120.


Alshishtawy MM, Abdalla AM, Gelber LE, Champen MD. Serological analysis of total and specific IgE antibody levels and their relationship to parasite infection. Int Arch Allergy Immunol 1991; 96(4): 343-54.


Lynch NR, Palenque M, Hage I, Diprisco MC. Clinical improvement of asthma after antihelminthic treatment in

Lyle I, Palmer S, Juan C, Celedon ST, Bingam W. A scaris lumbricoides infection is associated with increased risk of childhood asthma and atopy in rural China. Am J Respir Crit Care Med 1997; 156(1): 300-4.


Lynch NR. Influence of Socio-economical Level on Helminthic Infection and Allergic Reactivity and Immunity to


Dedication

I Dedicate This Study
To
My parents and family
With love
&
To All Asthmatic Children