Astrovirus as a Cause of Gastroenteritis in Infants and Children

Thesis

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By

Hemmat Salah Abdel-Aleem
MB., B.C.H.
Cairo University

Under Supervision of

Prof. Dr. Moustafa Abdel-Aziz El-Hodhod
Professor of Pediatrics
Faculty of Medicine, Ain Shams University
Dr. Maie Fouad Nassar
Assistant Professor of Pediatrics
Faculty of Medicine, Ain Shams University
Dr. Soha Ezz El-Arab Abdel-Wahab
Assistant professor of Clinical Pathology
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
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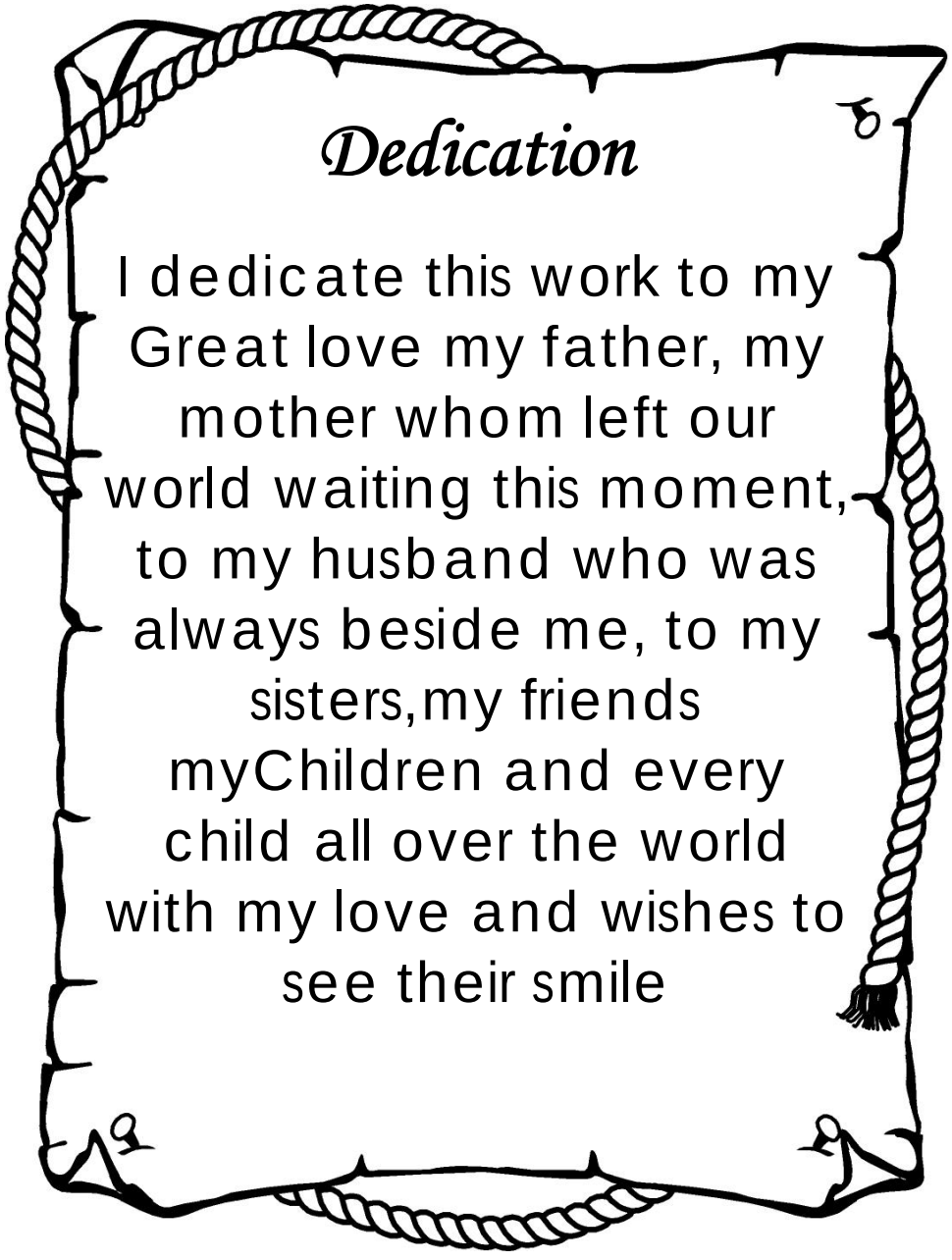

Dedication

I dedicate this work to my Great love my father, my mother whom left our world waiting this moment, to my husband who was always beside me, to my sisters,my friends myChildren and every child all over the world with my love and wishes to see their smile

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List of Abbreviations

ACIP..... Advisory committee on immunization practice

CHO ..... Carbohydrate

DIFT..... Direct immunofluorescent test

ECF..... Extracellular fluid

EIA ..... Enzyme linked immunoassay

ELISA.... Enzyme linked immunosurbent assay

EM..... Electric miscroscopy

EPEC..... Enteropathogenic Escherichia coli

ETEC..... enterotoxigenic Escherichia coli

GIT ..... Gastrointestinal tract

HAstv..... Human astrovirus

HIV ..... Human immunodeficiency virus

IEM..... Immunoelectric microscopy

IgA ..... Immunoglobulin-A

IgG..... Immunoglobulin G

IIF..... Indirect immunofluorescent test

MAbs ..... Monoclonal antibodies

mRNA.... Messenger RNA

ORFs..... Open reading frames

ORS ..... Oral rehydration solution

RIA ..... Radioimmunoassay

RT-PCR Reverse transcriptase polymerase chain reaction

SCFAs.... Short chain fatty acids

SRSVs.... Small round structured viruses

SRVs..... Small round viruses

VIP..... Vasoactive intestinal peptide

WBC..... White blood cell

WHO ..... World health organization

INTRODUCTION

Acute gastroenteritis is a major source of morbidity and mortality among young children in developed and developing countries ***(Oh et al., ٢٠٠٣).***

Gastroenteritis (also known as gastric flu, and stomach flu although unrelated to influenza) refers to inflammation of the gastrointestinal tract, involving both the stomach and the small intestine and resulting in acute diarrhea. The inflammation is caused most often by infection with certain viruses, less often by bacteria or their toxins, parasites, or adverse reaction to something in the diet or medication. Worldwide, inadequate treatment of gastroenteritis kills ٥ to ٨ million people per year, and is a leading cause of death among infants and children under ٥ ***(Wikipedia, ٢٠٠٨).***

Among viral agents causing gastroenteritis, human Astrovirus take second or third place after Rota virus and Calici virus as the most frequent causes of illness ***(Espul et al., ٢٠٠٤)***. Astrovirus is a small strand RNA virus, it is water born that has an endemic level of digestive morbidity in the general population ***(Komorya et al., ٢٠٠٣).***

Human astrovirus was first discovered in the stool of the children with gastroenteritis and characterized by electron microscopy in ١٩٧٥ ***(Putzker et al., ٢٠٠٠).*** Astrovirus is about

٢٧-٣٤ nm in diameter, it was given its name for the characteristic five to six point star shape detected by electron microscopy after staining of fecal extract ***(Bass and Qui, ٢٠٠٠)***.

Hypothesis And AIM OF THE WORK

Etiology of gastroenteritis is not defenite in more than half of the cases. So, recent researches are studying new etiological agents. Hence, the aim of this study was to determine the prevalence of astrovirus as a cause of gastroenteritis in Egyptian children.

Gastroenteritis

Definition:

Gastroenteritis is a condition that causes irritation and inflammation of the GIT (the pathway responsible for digestion that include the mouth, esophagus, stomach and intestines ***(Benjamin, ٢٠٠٦).***

Signs and symptoms of gastroenteritis

The main symptom is diarrhea but it may be accompanied by nausea, vomiting and/ or crampy abdominal pain ***(Arthur, ٢٠٠٨).***

Diarrhea

Diarrhea is a problem not only of the developing world, but also of the western world. However the economic implication of diarrheal diseases are particularly evident in the poorer countries ***(Farthing et al., ٢٠٠٠)***

Diarrhea in children accounts for approximately ٥ million deaths per year in the developing world. In United States, diarrhea accounts for ١٠% of all outpatient visits and ١٤ hospital admissions per ١٠٠٠ children each year younger than one year of age ***(Ghishan et al., ٢٠٠٨)***

Diarrhea is an important cause of malnutrition, this is because patients with diarrhea eat less and their ability to

absorb nutrient requirements is reduced, moreover their nutrient requirements are increased as a result of the infection. Each episode of diarrhea contributes to malnutrition. When episodes are prolonged their impact on growth is increased ***(WHO, ١٩٩٠-a)***.

Definition

Vanderhoof (١٩٩٩) defined diarrhea as the excessive loss of stool water and electrolyte. In infants, stool volume more than ١٥ gm/kg/٢٤ h is considered diarrhea.Whereas by three years of age, stool output greater than ٢٠٠gm/٢٤h is considered diarrhea.

In breast fed infant who normally passes several soft or semi liquid stools each day, it is practical to define diarrhea as an increase in stool frequency or liquidity that is considered abnormal by the mother. On the other hand, greenish motion without change in stool consistency is not considered diarrhea and is of no significance ***(NCDDP, ١٩٩٦).***

A diarrheal day was defined as the occurrence of ≥٣ unformed stools (or ≥١ if bloody) in a ٢٤ h period ***(Naficy et al., ٢٠٠٠)***

Classification

Diarrheal diseases can be classified in various ways:

The first major subdivisions are acute, chronic and persistent Diarrhea ***(Farthing et al., ٢٠٠٠).***

Acute diarrhea implies a sudden onset, generally over hours rather than days and duration of less than one week,chronic diarrhea is generally of more gradual onset and lasts more than one to two weeks, whereas persistent diarrhea refers to diarrheal episodes of presumed infectious etiology that begins acutely but have an unusual long duration often more than fourteen days ***(WHO., ١٩٨٨ and Bhan et al., ١٩٩٦).***

Pathophysiology:

Absorption of water from the small intestine is caused by osmotic gradient which is created when solutes (particularly sodium) are actively absorbed from the bowel lumen by the villous epithelial cells (Fig.١). There are several mechanisms whereby sodium is absorbed in the small intestine (Fig.٢). To enter the epithelial cells, sodium is linked to the absorption of chloride ion or absorbed directly as sodium ion or exchanged for hydrogen ion or linked to the absorption of organic substances such as glucose or certain amino acids. The addition of glucose to an electrolyte solution can increase sodium

absorption in the small intestine as much as three folds ***(WHO, ١٩٩٠a).***

After being absorbed, sodium is transported out of the epithelial cells by an ion pump referred to as Na^+ K^+ ATPase. This transfers sodium into the extracellular fluid (ECF) elevating its osmolarity and causing water and other electrolytes to flow passively from the small bowel lumen through intercellular channels and into the ECF (Fig.٢). This process maintains an osmotic balance between fluid in the bowel lumen and the ECF ***(WHO, ١٩٩٠a).***