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A Case Study of and Risk Factors for Bacteriological Diarrhea among Five Years Children

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Abstract – Acute Bacteriological diarrheal disease among children younger than 5 years old remains a major cause of morbidity and mortality worldwide. Severe infectious diarrhea in children occurs most frequently under circumstances of poor environmental sanitation and hygiene, inadequate water supplies, and poverty. In India, the control of diarrhoea disease (CDD), including promotion of breastfeeding, oral rehydration therapy and specific health education is a part of national strategies aiming to improve the quality of life and reduce the burdens caused by diseases. Despite this fact, diarrheal disease is still the second leading cause of infectious morbidity and mortality in children as well as in adults in India. The local epidemiology of diarrhea in most rural areas of Indian states has not been researched thoroughly. In addition, most studies in India have focused on a specific pathogen rather than identifying the most common pathogens of diarrhea among children in rural areas. Better understand the local epidemiology of diarrhoea disease could be a valuable contribution to the development of public health prevention. We therefore conducted a study in Indian Hospital in order to identify risk factors for diarrhea among children less than five years of age in this area.

Keywords: Bacteriological Diarrhea, Five Years Children, Environmental, Health, Diseases, Infectious, Adults, India, Rural Areas, Development, Public Health, Hospital.

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INTRODUCTION

Diarrhea is the most important public health problem connected to water and sanitation and can be both “waterborne” and “water-washed”. In recent decades, a consensus developed that the key factors for the prevention of diarrhea are sanitation, personal hygiene, availability of water and good quality drinking water; and that the quantity of water that people have available for hygiene is of equal or greater importance for the prevention of diarrhea as the bacteriological water quality (World Health Organization, 2009). In India, the control of diarrhoea disease (CDD), including promotion of breast-feeding, oral rehydration therapy and specific health education is a part of national strategies aiming to improve the quality of life and reduce the burdens caused by diseases. Despite this fact, diarrheal disease is still the second leading cause of infectious morbidity and mortality in children as well as in adults in India.

Risk factors vary with the child’s age, the pathogens involved, and the local environment. To our knowledge, most studies conducted in India have not analyzed risk factors according to different age groups and local environment. On the other hand, those studies have mostly focused on the molecular epidemiology of specific pathogens, such as rotavirus, Escherichia coli, Shigella spp. My study aimed to identify the most common pathogens, and age-specific and local risk factors for diarrheal disease among children aged less than five years admitted to Indian Hospital. Identification of pathogens and risk factors, and then recommendations of simple, immediate, and effective risk-reduction measures would help local health care services to reduce morbidity and mortality due to diarrhea among young children in the area.

Almost everyone has become ill of, or will be affected by diarrhea at some point in their lives. Diarrhea can occur as a symptom of many different illnesses, as a side effect of some drugs or may be due to anxiety among other things. Diarrhea results from an imbalance in the absorption and secretion properties of the intestinal tract; if absorption decreases or secretion increases beyond normal, diarrhea results. It can range in severity from an acute, self-limited annoyance to a severe, life-threatening illness. The definition of diarrhea depends on what is normal for the individual. For some, diarrhea can be as little as one loose stool per day. Others may have three daily bowel movements normally and not be having what they consider diarrhea. According to K. Armon, diarrhoea is defined as a change in bowel habit for the individual child resulting in substantially more

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frequent and/or looser stools (Fewtrell et. al., 2015). Although changes in frequency of bowel movements and looseness of stools can vary independently of each other, changes usually occur in both. Clinical features vary greatly depending on the cause, duration, and severity of the diarrhea, on the area of bowel affected, and on the patient's general health.

REVIEW OF LITERATURE:

In children, the strict definition of diarrhea is excessive daily stool volume, more than the upper limit of around 10g/kg/day (Fewtrell and Water, 2012). It is certainly possible to have diarrhea by this definition with stools that are at least partially formed, or to not have diarrhea even with liquid bowel movements. As a practical matter, it is seldom possible for a physician to determine exactly how many grams per day of stool a child is having. You must therefore use the history to estimate for yourself whether true diarrhea is present. The history would usually provide most of the information you require to classify the diarrhea by type and to consider the diagnostic approach (Fewtrell and Water, 2012).

THE MAIN CAUSATIVE AGENTS OF DIARRHEA:

Though some diarrhoes are due to errors of metabolism, chemical irritation or organic disturbance, the vast majority are caused by infectious pathogens (Nguyen, et. al., 2011).

Bacterial infections: Diarrhea caused by enteric bacterial infections is very important worldwide, especially in tropical and developing countries, and is a serious problem among older children and adults as well as in infants and young children.

Viral infections: Rotavirus is one of the most common causes of severe diarrhea. Other viruses may be important causes of diarrheal disease in human, including Norwalk virus, Norwalk-like viruses, enteric adenoviruses, caliciviruses, and astroviruses.

Parasites: Parasites can enter the body through food or water and settle in the digestive system. Parasites that cause diarrhea include Giardia lamblia, Entamoeba histolytica, Cyclospora cayetanensis and Cryptosporidium.

Food intolerances: Some people are unable to digest some component of food, such as lactose - the sugar found in milk, or gluten found in wheat and barley.

Reaction to medicines some kinds of antibiotics (such as clindamycin, cephalosporins, sulfonamides…), laxatives and antacids.

Intestinal diseases like inflammatory bowel disease or celiac disease.

Functional bowel disorders such as irritable bowel syndrome, in which the intestines do not work normally.

TYPES OF DIARRHEA:

Diarrhea may be classified into four general types, based on the mechanism, including osmotic diarrhea, secretory diarrhea, exudative diarrhea, and motility disorder diarrhea. According to WHO, Vesikari T and Torun B, and Banerjee B, Hazra S and Bandyopadhyay D, based on clinical syndromes, diarrhea could be classified into four types, each reflecting a different pathogenesis, including acute watery diarrhea, dysentery, persistent or prolonged diarrhea and chronic diarrhea.

Acute watery diarrhea: this term refers to diarrhea characterized by abrupt onset of frequent, watery, loose stools without visible blood, lasting less than two weeks. Usually, acute watery diarrheal episodes subside within 72 hours of onset. It may be accompanied by flatulence, malaise and abdominal pain. Nausea, vomiting may occur and also fever may be present. The common causes of acute watery diarrhea are viral, bacterial, and parasitic infections. Bacteria also can cause acute food poisoning. The enteric pathogens causing this diarrhea in developing countries are largely the same that are encountered in developed countries, but their proportions are different (Abdullahi, et. al., 2010). In general, bacterial pathogens are more important in countries with poor hygienic conditions. The most important causes of this diarrhea in developing countries are Rotavirus, Shigella, entero toxigenic E. coli (ETEC), Vibrio cholerae, Campylobacter jejuni, entero pathogenic E. coli (EPEC), Salmonella spp. and Cryptosporidium. The most dangerous complication is dehydration that occurs when there is excessive loss of fluids and minerals (electrolytes) from the body. With vomiting, dehydration becomes more severe. Dehydration is especially dangerous in infants and young children due to rapid body water turnover, high body water content and relatively larger body surface (Sule, et. al., 2011). Patients with mild dehydration may experience only thirst and dry mouth. Moderate to severe dehydration may cause orthostatic hypotension with syncope (fainting upon standing due to a reduced volume of blood, which causes a drop in blood pressure upon standing), a diminished urine output, severe weakness, shock, kidney failure, confusion, acidosis (too much acid in the blood), and coma.

Dysentery may simply be defined as diarrhea containing blood and mucus in feces. The illness also includes abdominal cramps, fever and rectal pain. The most important cause of bloody diarrhea is Shigella. Shigella is a genus of bacteria with four species: S. dysenteriae, S. flexneri, S. boydii and S. sonnei. In developing countries, the main causative

agents of dysentery are S. flexneri, S. boydii and S. dysenteriae, whereas S. sonnei is the main cause in developed countries. S. dysenteriae type1 (Sd1) is responsible for epidemic shigellosis. S. dysenteriae type1 can result in severe complications including persistent diarrhea, septicemia (blood poisoning), recta1 prolapse and haemolytic-uraemic syndrome (HUS). HUS is a serious condition affecting the kidneys and blood clotting system. S. flexneri, S. boydii and S. sonnei are usually less dangerous than S. dysenteriae type1 and they do not cause large epidemics.

Persistent diarrhea is defined as diarrheal episodes of presumed infectious aetiology that have an unusually long duration and last at least 14 days. About 10 percent of diarrheas in children from developing countries become persistent, especially among those less than three years and more so among infants. The episode may begin acutely either as watery diarrhea or dysentery. This diarrhea causes substantial weight loss in most patients (Vargas, et. al., 2010). It may be responsible for about one-third to half of all diarrhea-related deaths. Since persistent diarrhea is a major cause of malnutrition in the developing countries, even the milder, non-fatal episodes contribute to the overall high mortality rates that are frequently associated with malnutrition in these countries.

Chronic diarrhea: This term refers to diarrhea which is recurrent or long lasting due to mainly non-infectious causes. Chronic diarrhea may be caused by gastrointestinal disease, may be secondary to systemic disease, and may be psychogenic in nature. Pathophysiologically, chronic diarrhea may be categorized as inflammatory diarrhea (caused by regional enteritis, ulcerative colitis), osmotic or malabsorptive diarrhea (resulted from lactose intolerance, tropical sprue, celiac disease, Whipple's disease, chronic pancreatitis, bile duct obstruction), secretory diarrhea (caused by medications, bowel resection, mucosal disease), dysmotility diarrhea (caused by conditions such as diabetic neuropathy or irritable bowel syndrome) and factitious (self-induced, e.g., from laxative abuse) diarrhea (Nguyen et. al., 2015).

THE GLOBAL BURDEN OF DIARHEAL DISEASE IN CHILDREN:

Diarrhea is a global problem, but is especially prevalent in developing countries in conditions of poor environmental sanitation, inadequate water supplies, poverty and limited education. According to WHO, approximately one billion cases of diarrhea occur each year worldwide causing a burden that was about 99.2 million DALYs (disability adjusted life years) lost. It is well known that diarrheal disease is one of the leading causes of illness and death in young children in developing countries (Thiem, et. al.,, 2014). Diarrhea accounts for 21% of all diseases causing deaths at below five years of age and causes 2.5 million deaths per year, although diarrhea morbidity remains relatively unchanged, about one billion episodes or 3.2 episodes per child-year.

IMPACT OF DIARRHEAL DISEASE ON CHILDREN:

The number of deaths caused by diarrhea, 2.5 million yearly is a large burden. In addition, many time this number have long-term, lasting effects on nutritional status, growth, fitness, cognition, and school performance. Some studies have revealed the impact of diarrhea on growth. It is believed that diarrhea have a significant impact on growth due to reduction in appetite, altered feeding practices and decreased absorption of nutrients. Patwari AK 52 quoted that there was a marked negative relationship between diarrhoea and physical growth and development of a child. Each day of illness due to diarrhoea produces a weight deficit of 20-40 grams. Molbak et al found that infants who spent more than 20 % of their time with diarrhea had a weight deficit of approximately 370 grams at follow-up after 1 year of age. There was also an impact on height and that impact varied by age and sex. For example, during infancy, boys who spent from 20% to less than 40% of their time with diarrhea were 5.1 mm shorter than who had no diarrhea, whereas the deficit in girls was negligible. At age of 1-4 years, with the same time spent with diarrhea, the deficit on height was 2.1 mm and 3.0 mm in boys and girls respectively (Adams, 2010). According to Checkley W. et al 53, children ill with diarrhea 10% of the time during the first 24 months were 1.5 cm shorter than children who never had diarrhea. In addition, the adverse effects of diarrhea on height varied by age. Diarrhea during the first 6 months of life resulted in long-term height deficits that were likely to be permanent. In contrast, diarrhea after 6 months of age showed transient effects. Similarly, Molbak and Briend indicated that after 6 months of age, the effect of diarrhea on growth was transient due to catch-up growth.

TREATMENT OF DIARRHEA:

The goals of treatment are to maintain hydration, treat the underlying causes and relieve the symptoms of diarrhea. Rehydration and its correction of any electrolyte imbalance are critical in the treatment of diarrhea. Symptomatic relief is a second therapeutic goal. Not all diarrheal episodes in the developing countries are associated with dehydration and, consequently, do not require rehydration therapy. However, promotion of the basic concept that diarrhea and vomiting are likely to results in life-threatening dehydration continues to be of great importance. This educational promotion should be aimed at all levels from families to doctors. Oral rehydration therapy (ORT) was introduced in 1979 and rapidly became the cornerstone of the CDD

programme (Control of Diarrheal Diseases). Consisting of the oral administration of sodium, a carbohydrate and water, ORT was potentially the most significant medical advance of the 20th century. It has contributed substantially to reducing childhood deaths from diarrheal disease because it is extremely effective in treating acute watery diarrhea. ORT, using the WHO formula, is suitable for the management of all types of dehydration.

ORS-WHO (oral rehydration salts) can be regarded as a universal, all-purpose, solution; but does not mean that is the optimal solution. However, it is important to have a single acceptable formula that can be recommended and promoted worldwide (Victora et. al., 2012). ORS-WHO is an extremely safe therapeutic tool. More than two billion units of ORS have been administered without serious complications.

PREVENTION AND CONTROL OF DIARRHEA:

The WHO' s CDD Programme and other organizations (UNICEF, USAID, etc) have given first priority the prevention of diarrheal deaths, rather than prevention of cases, and focused on promotion of ORT. It is estimated that ORT was used in about 69% of all diarrheal episodes in developing countries.

ORT alone, however, has little impact on dysentery or on persistent and complicated diarrhea which currently account for over half of diarrhea deaths. A long-term, sustainable solution to childhood diarrheal disease must combine treatment with actions to eliminate diarrheal disease through prevention.

It is estimated that 90% of the child diarrheal disease burden is the result of poor sanitation conditions and inadequate personal, household and community hygiene behaviors. Therefore, understanding environmental and behavioral risk factors and their interactions is a prerequisite for devising effective preventive approaches.

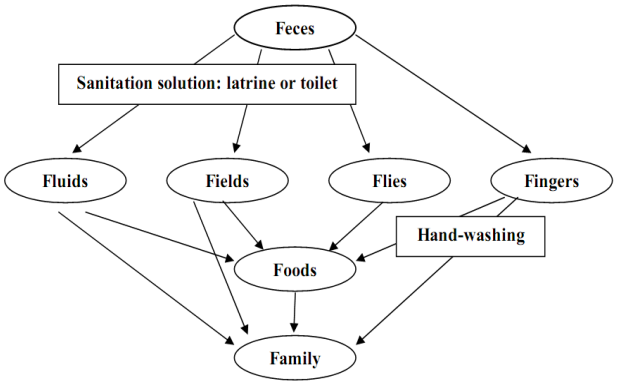

Figure1: Breaking the fecal-oral transmission cycle

Primary preventive interventions reduce environmental risk factors and high-risk behaviors for whole communities by interrupting the disease transmission cycle (Fig. 1). For diarrheal disease this means promoting changes in hygiene behavior to protect people from ingesting diarrheal disease pathogens and providing sanitation solutions to protect the environment from fecal contamination.

CONCLUSION:

The results of the study show that the factors, namely the child having sibling(s), irregular latrine cleaning; Latrine-sharing among more than 5 people; irregular hand washing by mothers after going to toilet; no hand-washing by mothers before feeding children; unsafe storage of food for later use; irregular kitchen cleaning and infrequent cleaning/emptying of storage container before refilling it with fresh water, were significantly associated with the risk of diarrhea among children less than five of age admitted to Indian Hospital. Entero pathogenic Escherichia coli (EPEC), rotavirus and Shigella spp. are found to be common pathogens causing diarrhea among hospitalized children. Diarrheal diseases, bacteria still remain one of the major causes with Escherichia coli, Salmonella spp and Shigella spp being the most important bacterial pathogens among infants. This can be minimized by improving personal hygiene, quality of drinking water and treatment of infected cases as well as quick isolation and treatment of infected cases as well as encouragement of breast feeding for lactating mothers.

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