

The Problem of Diarrhoeal Disease in Developing Countries

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INTRODUCTION :

Although it is a global problem, there is a higher incidence of diarrhoea in developing countries and it is children who are the commonest prey to its repeated attacks.

Over the last hundred years or so, scientists have been researching causes, cures and the prevention of diarrhoea. A study of recent literature reveals many discoveries and many of the aetiological agents that cause diarrhoea have only been identified recently. Oral rehydration therapy has been invented and now established on a firm footing. Advances in genetics has raised the hopes of effective prevention through new vaccines.

Diarrhoea still remains a major health problem and a cruel killer in the developing coun-

tries. This chapter reviews the recent literature on the effects of diarrhoea on:

- a. mortality
- d. morbidity
- c. nutrition and
- d. economic and other activities.

A review of the mechanisms that cause diarrhoea and the known aetiological agents is not attempted here.

EFFECTS ON MORTALITY :

In most countries of the developing world, infant and child mortality are very high compared to the developed world. This is not very surprising since infant and child mortality are an index of development and the patterns of mortality observed in these countries reflects their

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overall standard of life. A study carried out in Haiti in the 1950s found child mortality in the developing world five times higher than that in developed world with children under 5 years of age constituting 50 percent of all deaths compared to 10 percent in the developed world¹. Behar, et al² about the same time reported that 58 percent of all deaths in rural Guatemala occurred in children under 5 years of age and that one-third of children died before reaching their fifth birthday. Gopalan in summarising child mortality statistics of the sixties for India showed that 40 percent of all deaths occurred in children under 5 years of age which, as he reported, was 10 times higher than in the U.K³. A good comparison of mortality patterns in the developing and developed worlds is available from the Inter-American Investigation of Mortality in Childhood. The under-5 years mortality rate in the USA was 5.4 per 1,000 and compared to this, El Salvador had 50.5⁴.

The situation has not changed much over the last 30 years or so. A study conducted in rural Bangladesh during the late seventies found that 53 percent of all deaths occurred in children under 5 years of age, which meant that less than 16 percent of the population bore the burden of more than 50 percent of all deaths occurring in one year. The first five years were found to be the most difficult time in a child's life in Bangladesh and if a child could bypass this period he could expect to live 63 years which is 'not markedly dissimilar from those of developed countries⁵.

The role that infections plays in the above sad state of affairs is well documented⁶⁻⁷. Diarrhoea is one of the most common causes of death in children. Many publications have appeared during the previous 20-30 years showing the scale of diarrhoeal illnesses in causing child deaths. Walsh et al quoting from World Health Organization and other agencies and individual studies reported that a total of 5-10 million deaths are caused by diarrhoeal diseases every year⁷. This, when compared with deaths from

other infections provided in the same report, is the highest toll from any infection. Although a good number of studies are available on diarrhoea-mortality, methodological problems have reduced the scope of comparison between these studies. A recent attempt calculated that 4.6 million children under age of 5 years die from diarrhoeal disease every year in Africa, Asia (excluding China) and Latin America⁸. They selected 22 home surveillance studies and two multi-country mortality studies as a basis for investigating diarrhoeal morbidity and mortality. In the 16 countries whose mortality data were compared, the highest mortality rate from diarrhoea was in children under 2 years of age. For this age group, the median annual mortality rate from diarrhoea was found to be 20 per 1,000 population. For children under age 5, the median rate was 13.6. A study conducted in four Guatemalan villages more than a quarter century ago found a skewed distribution of deaths by age occurring from diarrhoea. For all ages, the diarrhoeal death rates were found to be 15 times higher than in the USA and for the 1-4 age group, the ratio was more than 500 times higher⁹.

For Bangladesh, it has been estimated that more than 250,000 people, most of whom are children, die every year from diarrhoea¹⁰. The study by Chen, et al has provided some detailed information on the causes of death amongst Bangladeshi children⁵. For the children under 5 with an overall death rate of 280, diarrhoea accounted for 80 deaths followed by tetanus with 40. As most tetanus occurs in the neo-natal age, the picture is more revealing when the figures for children 1-4 years of age are considered. In this age group, 44 percent of all deaths were due to diarrhoea. Watery and dysenteric diarrhoeas were half-half whereas in infancy watery diarrhoea had a far higher rate (watery 16.8 and dysentery 2.8 per 1,000 live births).

The contribution of diarrhoea to adult mortality is often unappreciated and it has been estimated for Bangladesh that 46 percent of all deaths in 15-44 age group would have been caused by diarrhoea had there been no treatment facility in

the area of his study¹¹. It may be mentioned here that this treatment facility studied by Chen was available to only 160,000 of Bangladesh's 100 million population¹¹.

EFFECTS ON MORBIDITY :

(A study published in 1975 revealed that a child under 2 years of age in Guatemala was ill with diarrhoea 10-14 percent of the time, fever 5 percent and respiratory illness 35 percent of the time¹². Being sick for nearly half the year, for these Guatemalan children illness was practically the norm rather than the exception¹³. In Bangladesh children have been reported as being unwell 75 percent of the time¹⁴.)

The measurement of diarrhoeal morbidity is more difficult than that for mortality, due mainly to the lack of a satisfactory definition of diarrhoea⁵. Several studies on diarrhoeal morbidity have been reported but there are major differences in the terms used to define a diarrhoeal episode. The definitions have varied from the relatively simple of one 'more than two watery or loose motions in 24 hours', as used in a Bangladesh study¹⁵; to a more complex one in Guatemala, '<1 year of age—5 or more liquid stools per 24 hours; >1 year—3 or more liquid or semi-liquid stools preceded by 2 weeks of normal stools¹⁶. Some studies have used the mother's definition as a measure of diarrhoeal disease^{17,18}. This, however, can lead to an under estimate as diarrhoea occurs frequently in children in the developing world and it is 'not necessarily considered to be an illness by mother¹⁸. Snyder et al in their cross-cultural review estimated that 744 to 1,000 million episodes of diarrhoea are experienced by the children under 5 years of age in Africa, Asia (excluding China) and Latin America every year⁸. Walsh et al reported that 3.5 billion diarrhoeal infections take place in Africa, Asia and Latin America each year⁷. This is by far the highest number in the list of all infections cited by them. Had breast-feeding not been widely used in this part of the world, the incidence might have been much higher⁹.

Although diarrhoea is generally considered a Third World problem, its incidence in the developed world is not less important. Nearly six illnesses each year for each child under age 2 has been reported in the United States¹⁹. Similarly, high incidence of the disease has been reported in England²⁰. However, the estimated figures for the developing world are even greater. Chen quoting figures provided by Rohde reported that diarrhoeal morbidity constituted upto half of all illness among children¹¹. Mata found 43 percent illnesses associated with diarrhoea in Guatemala⁶. Zijl compared data from five developing countries and reported an attack rate of 2.4 to 5.8 episodes per child per year²¹. Rohde computed annual attack rates of 1.5 to 7.5 episodes per child per year from different indepth studies²³. Assuming an average duration of 8 days per episode a prevalence of 3 to 16 percent has been estimated²². This implied that 3 to 16 out of 100 children in the developing world expect to suffer from diarrhoea at any given— 'a staggering morbidity burden by any criterion!¹¹

Snyder et al in a cross-cultural study found the highest incidence of diarrhoea to be in children under 2 years of age⁸. The median rates were found to be highest for children 6-11 months old. It was 4.3 in African region, 3.5 in Asian region and 2.3 in Latin American region. Leeuwenburg et al. also found a significantly higher attack rate in children 6-11 months old¹⁸. In Costa Rica, half of all diarrhoeal illnesses were found to occur in children under 2 years of age²³. Higgins, et al studied 100 Egyptian children and found only 5 children who did not suffer any diarrhoea during the year-long length of the study²⁴. A study from urban Jakarta, Indonesia, provided some data on the duration of diarrhoea in children. Out of 618 diarrhoeal episodes recorded, 511 had a duration of less than one week, 86 has 1-2 weeks, 16 had 2-3 weeks, 4 had 3-4 weeks and 1 had diarrhoea for 4-5 weeks²⁵. A study in Nigeria found that children spent 10.5 percent of their time with diarrhoea²⁶.

A wealth of information is also available on diarrhoea in Bangladeshi children. A longitudinal study of two villages using intensive surveillance found that diarrhoea was the most common illness after respiratory tract illnesses with the highest incidence in children 2-11 months of age²⁷. Chen reviewed urban and rural diarrhoeal morbidity data in Bangladesh and suggested that diarrhoea was more common in rural areas³¹. He showed for urban and rural areas that morbidity rates were highest in young children and declined with age with 39 percent of all diarrhoeas being experienced by children under 5 years of age. In a retrospective survey in rural Bangladesh, similar differentials were also found²⁸.

EFFECTS ON NUTRITION :

'Infections of almost any degree of severity appear to worsen nutritional status by interfering with food intake and by causing an increased loss of essential nutrients from the body. Conversely, the commonest type of malnutrition, even when subclinical, affects one or more of the resistance to infection²⁹.

Of all infections, those leading to diarrhoea probably have the most adverse effect on the nutritional status of the children^{32,30,31}. Diarrhoea is the most common illness of nutritional importance³³. The exacerbating effects of diarrhoea on nutritional status has been shown quite extensively in many settings. Studying the children of Guatemala, it was found that repeated bouts of diarrhoea lead to significantly more growth retardation in both height and weight compared to other illnesses. A strong inverse relationship between diarrhoeal infections and calorie intake in the children of Santa Maria Cauque in Guatemala was found⁶. Rowland et al, reported that diarrhoea was the most significant infection affecting the growth of the Gambian children³².

Studies have shown the diarrhoea-associated malabsorption of sugar, nitrogen, fat and micronutrients³², and a reduction in protein-calorie intake have been reported in sick Bangladeshi children³³.

Similar results were shown in Bangladesh with respect to macronutrients³⁴. Acceleration of catabolic processes leading to higher consumption of nutrient reserves due to diarrhoea has also been documented³⁵. Although not yet quantified, the direct nutrient losses due to diarrhoea has been long suggested and recently Rahaman in Bangladesh found an excessive loss of protein in the stools of diarrhoea patients.³⁶ The link between diarrhoea and nutritional blindness has also been recently suggested³⁷. Apart from these, diarrhoeal disease causes an indirect effect on the mortality of children after the neonatal period by contributing to deaths from kwashiorkor and from such infections such as measles^{2,9,38}.

The reason why diarrhoea retards growth in children is not clear²⁷. Chen has postulated that the nutritional impact of diarrhoea operates through four 'basic' mechanisms: reduced food intake, malabsorption, increased metabolism and intestinal loss of nutrients.³⁵

EFFECTS ON ECONOMIC AND OTHER ACTIVITIES :

Many researchers ignore the consequences of diarrhoea for the adult population. Apart from the well documented and previously discussed effects on mortality, morbidity and nutrition, diarrhoea affects the lives of adults in several other ways—some directly and others indirectly. In Bangladesh, it has been calculated that 4.5 adult work days are lost annually due to diarrhoea morbidity coincides with the harvesting and planting of major crops, the potential impact on economic and other activities is probably higher than this figure suggests.¹¹ Diarrhoea is an illness which causes constant annoyance and restricts movement even when it is not very severe. Resources are spent on medication and this is particularly important to a daily subsistence family. Any extra expenditure on health, which may be considerable in some situations, means a cut in the daily food budget and/or using the village money lenders.

CONCLUSION :

The above review intended to bring together the relevant information on the consequences of diarrhoeal diseases, particularly in the developing world. It has been estimated that 5-10 million deaths are caused by diarrhoeal diseases every year and the mortality is greatest in children under 2 years of age. In Bangladesh alone, more than 250,000 people are estimated to die from diarrhoea every year, most of whom are children. Morbidity from diarrhoea is also alarmingly high. Between 3-5 billion diarrhoea infections are estimated to occur every year in the developing countries, most of which occurs in children under 2 years of age. In Bangladesh, the highest incidence of diarrhoea is found to occur in children 2-11 months old and it is the most common illness after respiratory tract illnesses. The interaction between diarrhoea and malnutrition is well documented in Bangladesh, but the effects of diarrhoea on economic and other activities are less well documented.

That diarrhoea is a major health and nutritional problem is beyond question but unfortunately though, not much could be done to date to bring it under control. The recent few years, however, has seen an increased realisation of the importance of controlling the disease particularly the deaths from diarrhoea. The World Health Organization has created a diarrhoea control programme at its Geneva headquarters³⁹ and an International Centre for Diarrhoeal Disease Research has been established in Bangladesh.⁴⁰ The Appropriate Health Resources Technology Action Group in London (AHRTAG) has been publishing the 'Diarrhoea on Dialogue' since 1980. Oral rehydration therapy (ORT), a treatment method for most diarrhoeas, has been incorporated as an important element of the UNICEF Child Survival and Development Revolution.⁴¹ An international conference on oral rehydration therapy (ICORT), was organised in 1983 to bring world-wide attention to the urgent need to tackle diarrhoea⁴² and a second ICORT was also organised in December 1985. ORT programmes are now being implemented in many developing countries.

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