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PUBLIC HEALTH SIGNIFICANCE OF TRICHURIASIS

by

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Introduction

Like all soil-transmitted helminthiases, trichuriasis, caused by Trichuris trichiura, is usually a chronic, insiduous, silent disease, though certainly not innocuous nor always benign. Except for severe infections in children, trichuriasis is not often characterised by drastic signs and symptoms nor is the disease manifested as dramatic outbreaks. Instead, it is usually associated with poverty and poor environmental sanitation, being a disease of the poor and socioeconomically deprived and therefore often forgotten and neglected.

Epidemiology

The sources of infection, modes of transmission, rates of infection and re-infection and factors that determine the endemicity of trichuriasis are similar to those for ascariasis, as the infective stages of both helminths are infective eggs in the soil. In Malaysia, Trichuris is the predominant soil-transmitted helminth and the commonest type of helminthic infection in the country is Trichuris mixed with Ascaris (Kan, 1982, 1984a).

Prevalence of trichuriasis. Trichuriasis is a highly prevalent disease, occupying tenth place among the most prevalent infectious diseases in Asia, Africa and Latin America (Walsh & Warren, 1979). Except for Thailand, where only 0.17% of 4,043 people examined were found to be infected with Trichuris (Sornmani et al., 1981), trichuriasis is prevalent throughout the countries in Southeast Asia. In Indonesia, 73% of 13566 single stool samples examined were infected, and in the Philippines, 74% of 18262 single stool examinations were positive for Trichuris (Cross & Basaca-Sevilla, 1981). In both countries, the prevalence of Trichuris was higher than that for Ascaris and hookworm. In Malaysia, over a period of 50 years (1934-84), a total of 66938 stool samples from Malay, Chinese, Indian and aborigine children and adults (from birth to over 70 years) were examined from all types of communities and sub-populations, including hospital patients, school children and communities in rural plantations, urban slums, semi-rural settlements, urban flats and off-shore islands (Kan, 1985). The overall prevalence of trichuriasis was 54.0% (range: 3.1-96.8%).

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However, except for hospital admissions, most of the prevalence studies carried out among the general population were obtained from examinations of formed stools, as it was difficult to return soft or watery stools in plastic stool packets or other containers. It is possible that such surveys would have missed out the majority of moderate to heavy infections which are frequently accompanied by diarrhoea and/or dysentery. In addition, most prevalence surveys were spotty, isolated and not truly representative of the exact situation in an area or country. Thus, vast populations, especially in less developed rural areas, were not surveyed, due to the limited human and financial resources available.

Intensity of infection. Estimation of the intensity of infection or worm burden is necessary to investigate the severity of clinical symptoms and morbidity. It is also useful for the evaluation of anthelmintic efficacy. Most worm burdens are estimated by egg counts, expressed as eggs per gram of stool (epg). Using the Katz egg count method, as modified by Suzuki (1980), the majority of Malaysian children was shown to have moderate to heavy Trichuris worm burdens, with those in the urban slums having an average of 9830 epg and those in the rural estates, village settlements and urban flats ranging from 2135 to 3295 epg (Kan, unpublished data). The average Trichuris egg count of Malaysian school children ranged from 1872-7245 epg (Kan, 1984a).

As with prevalence, the intensity of trichuriasis was estimated from egg counts made from formed stools which were more indicative of worm burden. Egg counts of heavy infections, from watery, dysenteric stools with scanty faecal material, could not be accurately made by any of the conventional methods. Eggs, though abundant, were usually unequally distributed or bunched together and were often too numerous to be accurately counted. Assessment of worm burdens in such cases could be supplemented with sigmoidoscopic examinations (Lee et al., 1976). The inability to correlate severity of symptoms with worm burden leads to the under-estimation of the severity of heavy trichuriasis.

Distribution of trichuriasis. The distribution of trichuriasis among 11874 Malaysian children from birth to 15 years of age was further analysed according to type of community, race, age and sex of the children (Kan, unpublished data). Trichuriasis was most prevalent among children from urban slums (60.8%), followed closely by those in rural plantations (58.0%), whereas only about one quarter of children from village settlements and urban flats were infected (28.5% and 24.3% respectively). While the overall prevalence of trichuriasis among 25246 children and adults from all types of communities was 33.0% (Kan, 1982), trichuriasis was generally more common among children from the ages of 4-15 years and less common among infants and toddlers from birth to 3 years of age. Among 211 pre-school children (4-6 years) from urban slums, 83.8% had Trichuris (Chia et al., 1978). The prevalence of trichuriasis among Indian school children (7-12 years) from eight urban and rural schools in Malaysia ranged from 85.2% to 100% (Kan, 1984a).

Symptomatology and clinical picture

The actual pathogenic potential of Trichuris in the causation of morbidity and mortality is uncertain and difficult to determine. This is due in part to the chronicity and lack of specificity of clinical symptoms produced by the parasite. Trichuriasis may exist as a silent, sub-clinical infection or may present as acute, massive and sometimes life-threatening disease. Even in cases of severe infection, the exact morbidity and mortality attributable specifically to Trichuris is difficult to assess because of the frequent co-existence of this infection with bacterial, protozoan and other helminth infections, as well as complications caused by these concomitant infections.

The clinical severity of trichuriasis is closely related to the number of worms, duration of infection and the age and nutritional status of the host (Beaver et al., 1984). The clinical profiles of about 150 children with heavy trichuriasis were observed in detail by several workers (McKay et al., 1971; Kamath, 1973; Iyngkaran et al., 1976; Lee et al., 1976; Scragg & Proctor, 1977, 1978; Bowie et al., 1978; Gilman et al., 1978). The symptoms listed by these workers, in descending order of frequency, included diarrhoea and dysentery, anaemia, malnutrition, association with other intestinal infections, hypoalbuminaemia, rectal prolapse, digital clubbing and cardiac failure. Some of these signs and symptoms will be discussed below.

Diarrhoea and/or dysentery. Diarrhoea associated with Trichuris is usually mild, intermittent and prolonged. Among 51 children observed, 147 or 97.4% had chronic diarrhoea of at least one month's duration (range: 1 month to 5-6 years). The diarrhoea may be characterised by frequent passage of small amounts of stool mixed with blood and mucus. Fecal volume is small and straining at defecation sometimes produces rectal prolapse. Other instances of acute diarrhoea may be voluminous, profuse, watery and dysenteric stools with abundant eggs among scanty stool elements. This was often accompanied by excessive loss of fluids and severe electrolyte imbalance. The infected child may pass up to four watery stools a day. Diarrhoea becomes more severe when accompanied by infection with bacteria, protozoans or other helminths. In addition, frequent and rapid re-infection with Trichuris and other intestinal parasites worsens the condition and results in recurrent or persistent diarrhoea.

Anaemia. In addition to diarrhoea and dysentery, severe trichuriasis often results in microcytic, hypochromic anaemia due to iron deficiency. This was observed in 95.4% (144 out of 151) of children studied. While the actual causative mechanism for anaemia in trichuriasis is controversial, it is undeniable that anaemia partly resulted from direct blood loss from the friable colon, due to the special mode of attachment of Trichuris within the caecal mucosa. Blood loss caused directly by Trichuris, though significantly much lower than that caused by hookworm, may be sufficient, in massive infections, to unbalance iron metabolism and induce iron deficiency anaemia (Layrisse et al., 1967). Intestinal hypermotility as a result of diarrhoea may also lead to impaired reabsorption of iron. Furthermore, anaemia may be aggravated by a marginal diet with inadequate intake and assimilation of iron and protein. The condition was so profound in some children (25.6% or 23 out of 90) that they were diagnosed as cases of potential cardiac failure on the basis of anaemia alone. Concomitant hookworm infection further exacerbates the condition of anaemia among these children.

Malnutrition. All parasitic diseases, especially those that cause chronic, persistent diarrhoea, as in the case of Trichuris, are probably important contributory factors of malnutrition. The nutritional status of children infected with Trichuris ranged from satisfactory, undernourished, severely marasmic to frank kwashiokor (Scragg & Proctor, 1977). Among 125 children studied, 117 or 93.6% were deficient in height and weight for age and all of them were below the third percentile of the Boston standards for height and weight. The effect of trichuriasis on nutritional status is indirect but cumulative. Anorexia, nausea, vomiting, abdominal pain, diarrhoea and dysentery result in reduced food intake. The substitution of solid food with a non-nutritive gruel after episodes of diarrhoea further aggravates the situation and could precipitate malnutrition in cases of borderline or subclinical malnutrition (Bengoa, 1974). Intestinal hurry in severe diarrhoea also leads to loss of albumin, electrolytes and fluids. Hypo-albuminaemia, with a mean serum albumin level of 3.57g to below 3.0g/100 ml was reported in 53.8% (35 out of 65) of children studied. The chief manifestations in these children were failure to gain weight, weight loss or physical growth retardation. Subsequently, the general health of the child is undermined and he is more prone to infections by other pathogens. This eventually results in frequent absenteeism from school, poor academic performance and early dropout from school; all perpetuate illiteracy, poor employment potential and poverty in adulthood. The occurrence of recurrent, prolonged and persistent diarrhoea may eventually affect the economic productivity of a community, as loss of physical stamina and general poor health undermines efficiency and decreases work output. Consequently, the ability to produce or purchase food is reduced and this further aggravates the condition of undernutrition or malnutrition (Scrimshaw, 1968).

Concomitant infections. Trichuriasis potentiates infection with other pathogens of the large gut, especially amoebiasis, balantidiasis and pathogenic bacteria such as Shigella, Salmonella and, to a lesser extent, Escherichia coli. This is due to the disruption of mucosal intactness caused by attachment of Trichuris to the caecal mucosa. Environmental factors, which ensure the transmission of trichuriasis, also facilitate the spread of other intestinal infections such as giardiasis and other soil-transmitted helminthiases. Concomitant infections with intestinal pathogens were reported in 36.2% to 71.6% of children with heavy trichuriasis.

Rectal prolapse. Persistent massive trichuriasis may initiate rectal prolapse which is generally considered to be pathognomonic with trichuriasis (Pawlowski, 1984). Rectal prolapse was only observed in 37.8% (48 out of 138) of children studied and may result from intermittent diarrhoea with bouts of constipation and straining at defecation. Profuse acute diarrhoea and dysentery may lead to loss of anal sphincter tone. Irritation of the nerve endings of the caecal mucosa by the worms may also contribute to rectal prolapse.

Digital clubbing. Marked digital clubbing was another physical finding seen in 36.8% (46 out of 125) of children observed. The etiology of clubbing is not well understood as iron deficiency anaemia is associated with koilonychia rather than digital clubbing. Clubbing has been shown to be reversed in about 3 months after deworming and appears to be related to the presence of Trichuris and the worm burden. Clubbing did not regress in one case, which was probably due to incomplete eradication of worms or to re-infection (Lee et al., 1976; Bowie et al., 1978).

Public health significance of trichuriasis

The pathological contribution of Trichuris is still not fully recognised. Morbidity caused by Trichuris is ill-defined and under-estimated, and mortality due directly or indirectly to Trichuris is unrecorded, unreported or attributed to other concurrent infections or conditions.

The factors which are responsible for this general lack of awareness of the public health significance of trichuriasis are numerous and varied. While massive trichuriasis may present with distinctive features like rectal prolapse or digital clubbing, the majority of infections are chronic and mild, with vague, non-specific symptoms like chronic diarrhoea, pallor, growth retardation, abdominal discomfort and anaemia. Failure of medical personnel to recognise these symptoms and their significance, or misinterpretation of these symptoms and their attribution to other causes may lead to misdiagnosis, unnecessary investigations and delayed treatment. Even when symptoms are recognised, attempts to confirm and quantify the infection by stool examination cannot often be done immediately nor are the results immediately available. When treatment is instituted after confirmation, the results are often not very encouraging, as Trichuris is relatively refractory to most broad-spectrum anthelmintics because of its mode of attachment (Kan, 1984b). In addition, intestinal hurry in severe trichuriasis reduces contact time between anthelmintics and the worms. This necessitates multiple dose regimes of several days' duration, which are often poorly complied with except in hospitalised cases. Frequent re-infection in endemic areas also requires repeated treatment.

The majority of medical and health personnel have not only become accustomed and indifferent to high prevalences of trichuriasis, but are also discouraged by difficulties enountered in its control, or by failure of previous uncoordinated, unsustained and, therefore, unsuccessful attempts at control. This is further aggravated by the fact that trichuriasis, like other intestinal infections, is a disease of the poor and underprivileged. While their needs are most dire and urgent, their plight is often ignored and unnoticed, as they lack the interest and support of those who are in a position to alleviate their problems.

Needs

The public health significance of trichuriasis will continue to be under-estimated and even ignored if active steps are not taken to carry out surveys of larger and more representative population samples with emphasis on the epidemiological, demographic and environmental factors affecting its prevalence and distribution. Also needed are more rapid and efficient qualitative and quantitative diagnostic procedures and more definite morbidity characterisation and mortality registration. These steps will generate public awareness and influence policy decisions to implement and support concerted and coordinated efforts for the long-term, large-scale control of trichuriasis, to prevent its becoming a major public health problem.

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