Gastroenteritis in the Maltese Islands

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The thirty-first World Health Assembly of 1978 urged its member states through its resolution (WHA 31.44) to identify diarrhoeal diseases in the Mediterranean as a major priority area for necessary action. Towards this end a WHO Mediterranean Meeting was convened in Rome in April 1980; besides Malta, eight other Mediterranean countries participated in the meeting, and these were Algeria, Greece, Italy, Morocco, Spain, Tunisia, Turkey and Jugoslavia. The rendezvous was the Istituto Superiore di Sanita in Rome. Malta was represented by Dr. P. Cuschieri and Dr. A. Mifsud.

The main purpose of the meeting was to submit specific recommendations relating to the following:

1. Epidemiological surveillance and exchange of information between National Health authorities and WHO.
2. The diagnosis and laboratory identification of pathogens, old and new.
3. Oral rehydration therapy.
4. Support for water and sanitation and related health education programmes.

The countries bordering on the Mediterranean basin are an attraction to tourists from the North mainly because of beach availability and warm climate; the latter, however, encourages microbial multiplication in food and beverages, and this in its turn favours food poisoning. On the other hand, quite a few tourists visit not one but several Mediterranean regions on their holiday round, and spread of infection from country to country is thereby facilitated. Although bordering on the same sea, the various holiday resorts vary in quite a few aspects, particularly in socio-economic development, cultural and educational patterns, food habits, standards of hygiene, sanitation and health services. In the larger countries, differences also exist between one region and another.

Although notification of disease is a pre-requisite to proper and adequate surveillance, it is difficult to ascertain to what extent these measures are adopted by member countries, in view of the detrimental effect this might have on the tourist industry, which always plays a major role in the national economic balance.

Commenting from the bacteriological point of view, Dr. Cuschieri reviewed the enteric pathogens which are common in Malta. Cholera has not appeared since the early 1900's, and this has been supported and confirmed by routine and periodic bacteriological investigations on local sewage and by stool cultures on visitors from overseas who suffer from a diarrhoeal disease.

Bacillary dysentery has been on the decline since 1970; *Shigella sonnei* predominates with an occasional *Shigella flexneri*. Four cases of typhoid fever were reported in 1979, and the consumption of raw food, particularly shellfish, has been incriminated more often than not over the past few years; paratyphoid fever is rare.

The majority of Salmonella food poisonings were caused by *S. typhimurium* (55%), whilst *S. anatum* accounted for another 31%. Meat and chicken made-up dishes have been the more frequent culprits.

Enteropathogenic *E. coli* account for a minimal amount of diarrhoeal diseases in children. The development of techniques for the detection of Campylobacter and Yersinia is still under way, and it is envisaged that facilities would soon be available for the diagnosis of Rotavirus and Norwalk Agent.

With regards to the situation in Malta from the paediatric point of view, quoting data gathered from hospital records and from the Department of Statistics it was apparent that the vast majority of enteric infections are treated by the general practitioner at home by a variety of proprietary anti-diarrhoeal agents and glucose-electrolyte mixture administered orally to replace milk feeds; traditionally, to one litre of sterilised water a tablespoonful of sugar and a teaspoonful of salt are added. With the onset of dehydration, the child is then referred to hospital for fluid replacement, usually in the form of quarter saline in 5% dextrose, and this is more commonly administered through a peripheral vein. Very rarely a cut-down is required when shock has supervened, and blood volume replacement would then also require blood or plasma.

Two pre-graduate medical students surveyed all the admissions of children under the age of ten years during 1979 into the paediatric wards of Karin Grech Hospital; a summary of the statistics prepared from this study follows. With a population of 57,000 children under the age of ten years in the Maltese Islands during 1979, an average of 1.1% required admission into hospital for control of a diarrhoeal disease. Of these, 50% were in the first year of life, and 25% in the first six months. The mean hospital stay was seven days, and intravenous fluid replacement was the rule for the first few days. Antibiotic therapy

was guided by stool cultures and sensitivities, but was more usually limited to the more severe enteric infections. The majority of the cases were admitted between June and August (46%), with a nadir between March and May (14%). The mortality rate was among the lowest recorded at the Meeting, and estimated at 1.5 per thousand admission into hospital for diarrhoeal disease.

It is interesting to compare notes with the other participating Mediterranean countries. In Morocco, diarrhoeal disease have a peak incidence in August and mainly effect children under the age of two years; Salmonella is responsible for 72% of stool cultures, and lack of adequate sanitary hygiene plays a major role in pathogenesis. Bacillary dysentery is a problem in Yugoslavia where it is reported to effect 211/100,000 population. Rotavirus is the main offending organism in Spain, accounting for 50-60% of all diarrhoeas of infancy. In Tunisia, enteric infections are a major cause of referrals to hospital; infants between the ages of one and eleven months are mainly effected, and the mortality is extremely high, amounting to 24% of all admissions for diarrhoea. (17% of all deaths in infancy are caused by upper respiratory tract infections). Salmonella is responsible for 60% of cases, Shigella 25%, E. coli 10% and *Vibrio cholera* 3%. Epidemics come on in waves and also effect hospital populations; resistance to antibiotics is a feature, particularly with *S. wien*, which has reached Tunisia from Algeria. The cholera vibrio is also showing resistance to tetracycline in some countries like Bangladesh where this antibiotic has been gravely abused.

In Turkey, diarrhoeal diseases run into millions of cases per year, but only 4% of these are notified; this is partly owing to the fact that tourism is still the most important industry. Cholera cases are due to Vibrio El Tor which causes a much milder disease than classical cholera, and is associated with a low fatality rate.

Notification of diarrhoeal diseases is not obligatory in Greece. Typhoid fever is not a problem, and paratyphoid is practically non-existent. In Thessalonica, *Vibrio parahaemolyticus* thrives in shellfish and sea-water. Campylobacter is a problem with pig and chicken handlers. 47% of diarrhoeal diseases under the age of three years are caused by Rotaviruses, whereas Hepatitis A and B viruses are important pathogens in older children under 15. The infant mortality rate in diarrhoeal diseases is high, and ranges at 19 per thousand cases.

Typhoid is a major problem in Italy, effecting 9.2/100,000 population; Shigella is less common. Two recent outbreaks of cholera were attributed to the consumption of raw sea food. The 1973 cholera epidemic was a national disaster; it cut off 75% of the tourist industry, and in 1980 it is still 25% less than it was before the epidemic. The fatality rate of diarrhoeal diseases is very low in adults, but accounts for 5% of the infant mortality rate; the fatality rate in hospitalised cases is next to nil.

A few practical points of interest which came up during these reports included the following listed hereunder:

1. Enteropathogenic E. coli is manifesting a decreasing incidence throughout the world.
2. *S. anatum* may be present in duck's eggs.
3. There is a constant increase of Salmonellosis in non-temperate climates, e.g. Germany, i.e. in countries not favouring growth and proliferation of pathogenic micro-organisms.
4. *V. cholera* has been cultured from steamed and boiled crabs in Louisiana.
5. *Campylobacter jejuni* is on the increase in Europe.
6. Yersinia grows well at low temperatures and is a problem with refrigerated food and with veterinary surgeons.
7. *S. wien* and *S. agana* display a marked resistance to antibiotics.

Breast milk is abundant in antibodies, and my first recommendation at the Meeting was for the promotion of breast-feeding at least for the first six months of life. This was immediately seconded by Italy and Greece. My other recommendation was for discouraging the indiscriminate use of antibiotics, which more often than not cause more harm than good, particularly from superinfection by resistant bacteria and viruses. This too was recorded and adopted.

The commonest pathogens of infantile diarrhoeas are the Rotavirus and Norwalk-like virus (Norwalk agent; Hawaii agent; Ditchling agent; W agent; M.C. agent). Other viral entero-pathogens include Astrovirus, Calcivirus, adenovirus-like agent, Otofuke agent. Small round virus, corona virus, enterovirus and influenza virus. - Antibiotics are obviously contra-indicated. Antimicrobial therapy with bacterial diarrhoeas is controversial; with severe Shigellosis antibiotics with high blood levels are required - resistance to ampicillin is common. In severe cholera, tetracyclines reduce shedding, the duration and the final amount of diarrhoea. Resistance to this antibiotic is encountered in Bangladesh and some parts of Africa because of abuse. With typhoid fever, resistance to chloramphenicol is occasionally encountered.

There exist a variety of drugs which reduce secretory diarrhoea; WHO recommends that they be used with extreme caution if at all. Aspirin and Indomethacin are prostaglandin inhibitors, and it is believed that these prostglandins are important in the pathogenesis of diarrhoea; these drugs may act by influencing the chloride in the fluid output into the gut lumen. Chlorpromazine is another drug used against diarrhoea, but it may aggravate hypotension. Cyclohexamine is a poison and inhibits protein synthesis. Ethacrynic acid paradoxically is an anti-diarrhoeal but is also a powerful diuretic and therefore potentially dangerous. Nicotinic acid and loperamide are also included in this list of antidiarrhoeal agents, but their action is unpredictable. Neomycin is frequently incorporated in various preparations, but it

may damage the intestinal mucosa and cause malabsorption. Tincture of opium, paregoric and atropine are dangerous in children and dysentery patients because of delayed intestinal transit time. Steroids are expensive, useless and may cause adverse side-effects. Charcoal, kaolin, pectin and bismuth are of no value. *Mexaform* is useless and may be dangerous, whilst *Lomotil* is particularly dangerous in infants (Euro Reports and Studies 44). Nothing much can be left in the therapeutic armamentarium at this stage.

Replacement of fluid and electrolyte losses suffices in most instances, and this can usually be effected through the oral route. Intravascular and extracellular fluid loss of water and electrolytes causes an isotonic hypovolaemia; aldosterone secretion increases and the GFR decreases in order to conserve sodium. There is diminished tissue perfusion and shock causing lactic acidosis. The associated bicarbonate loss in the stool causes a hyperchloraemic metabolic acidosis, and the large potassium concentration in the diarrhoeal stool depletes the potassium stores. The serum K^+ may be normal in acidosis at the expense of low intracellular K^+; correction of the acidosis will cause K^+ to enter the cells and cause a low serum K^+. WHO has recommended the following formula for an oral rehydrating solution:-

NaCl	3.5 G/litre =	90 mmol/litre
KCl	1.5 G/litre =	20 mmol/litre
$NaHCO_3$	2.5 G/litre =	80 mmol/litre
Glucose	20 G/litre =	111 mmol/litre

It is slightly hypertonic for small children so that more of diluent is required in preparation. The glucose is metabolised and does not contribute to the osmotic strength of the solution in the intestines.

Water losses and requirements vary with age and these variations must be taken into account when planning replacement and maintenance fluid programmes. Tables 1 and 2 illustrate the differences encountered between infancy and adulthood. It is to be remembered that neonates cannot concentrate their urine as well as older infants and children. After due allowance is made for losses and maintenance, the thirst mechanism can safely be relied upon to maintain homeostasis.

Enteric infection is the greatest killer among children, and it is estimated that 30% of deaths under 5 years are due to diarrhoeal diseases. There is a marked decrease in incidence in breast fed infants, and the trend noticably increases on the institution of mixed feeding. Weight loss is a problem, and if the disease is protracted there is also an arrest of height gain.

One official from the Italian Health Ministry remarked that a child with diarrhoea stood a better chance of survival without the treatment prescribed by the general practitioner. The same cannot be said for the local situation, and it will so remain as long as antibiotics and dangerous anti-diarrhoeals are not abused. Promotion of breast feeding is the best prophylactic, and simple water and electrolyte replacement by oral rehydrating solution (ORS) is calculated to save 70% of admissions for replacement by the intravenous route. Fasting causes disappearance of enzymes from the gastro-intestinal tract; with ORS, acidosis and hypokalaemia are gradually corrected and hunger is re-acquired permitting weight gain and a speedier approach to convalescence. Lactase is particularly very labile, and is one of the last enzymes to be restored to function after enteric infection - hence the importance of avoiding milk and milk substitutes until well into convalescene.

Table 1:

Daily Fluid Losses in Healthy Children and Adults

	7 kg male	*70 kg male*
Insensible	45 ml/kg	22.5 ml/kg
Renal	40	20
Faecal	10-15	2.5
Total	95-100	45

Table 2:

Daily Maintenance Fluid Requirements

Age	*ml/kg*
1-3 days	*60-100*
4-10 days	*125-150*
3 months	*140-165*
6 months	*130-155*
9 months	*125-145*
1-3 years	*115-135*
4-6 years	*90-110*
7-9 years	*70-90*
Adult	*40-50*

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Table 3:

Assessment of Dehydration and Fluid Deficit in Infants

	Degree of dehydration (% loss of body wt)		
	Mild (4-5%)	**Moderate (6-9%)**	**Severe ± shock (+ 10%)**
Appearance	Thirsty, alert, restless.	Thirsty; restless or lethargic; irritable or drowsy.	Drowsy; limp; cold; Sweaty and often cyanotic extremities; may be comatose.
Skin elasticity	Normal	Decreased, mild to moderate	Marked decrease.
Eyes	Normal	Sunken (detectable)	grossly sunken.
Tears	Present	absent	absent
Fontanelle	Normal	depressed	depressed
Mucosae	Moist	dry	very dry
Radial pulse	normal	rapid/weak	rapid/feeble/absent
Rectal temp	Nil	present	present
Urine flow	Normal	scanty	Nil for +8 hours.
Respiration	normal	deep/rapid	deep/rapid
Heart	normal	Tachycardia	Tachycardia/feeble
Estimated deficit	40-50 ml/kg	60-90ml/kg	100-120 ml/kg