Introduction

Diarrheal diseases hold profound messages as well as opportunities that range from public health to basic science.\(^1\) Significant mortality and morbidity in the developing world is attributable to diarrheal diseases.\(^2\) The result of a multifactorial etiology, a complex interplay of social, economic and biological forces serve to keep these diseases within the population and render attempts at reduction of the disease burden ineffective. Apart from poverty, diarrhea morbidity and mortality is associated with population overgrowth.\(^3\)

Seasonal cycles of infectious diseases have been variously attributed to changes in atmospheric conditions, the prevalence or virulence of the pathogen, or the behavior of the host organism.\(^4\) An understanding of the seasonal variation of enteric pathogens would contribute greatly in focusing healthcare initiatives in a climate of limited resources to a cost-effective reduction in disease morbidity and mortality which is why it has attracted considerable attention from healthcare researchers around the world with several studies having been conducted in both the developing and the developed countries.\(^5\)-\(^19\)

There are a limited number of papers available from Pakistan that document the variety of bacterial isolates from stool samples and, although these have characterized the enteric isolates from stool samples (Aeromonas, Shigella, Campylobacter and Rota virus)\(^20\)-\(^23\), they have not ventured into a study of the seasonal variations of these organisms. This study reports common isolated organisms in stool samples of patients with diarrhea and their seasonal variation.

Materials and Methods

A retrospective descriptive analysis was done of all the stool samples submitted for bacterial culture at The Aga Khan University Hospital Laboratory or at its Collection Points in Karachi, Pakistan from January 1997 to December 2001. All stool samples submitted from the city of Karachi including both the adult (defined as age >14 years) and pediatric population (defined as age <14 years) were included in the study. For analysis purposes, all stool samples negative for bacterial culture were excluded. The data was analyzed for variables like age, sex, origin of stool samples (inpatient vs. outpatient), and enteric pathogens isolated. Data was analyzed using SPSS version 11.0 and EPI info version 6.0.

Results

A total of 16379 stool samples collected in Karachi, Pakistan at The Aga Khan University Laboratory...
during the study period were studied for the various bacterial pathogens. Bacterial pathogens were isolated in 6670 samples with a detection rate of 40.7%; 9709 samples were negative on bacterial culture. Majority of stool samples were submitted from within the hospital (n=5454, 81.8%) as compared to outpatient samples (n=1216, 18.2%). There were 3702 (55.5%) males and 2968 (44.5%) females. The mean ages of the various sub-groups of patients and culture detection rates (culture detection rate is calculated using denominator of 16379 i.e., total no. of stool samples) are given in Table 1.

Altogether 20 species of different pathogenic bacteria were isolated from the stool samples submitted to The Aga Khan University Laboratory. The most common organisms were Vibrio cholera O1 Ogawa (33.8%), Campylobacter jejuni (17.3%), Enteropathogenic E. coli (9.9%), Salmonella paratyphi b (6.6%), and Shigella flexneri (6.2%). The other less commonly isolated pathogens include V cholera 0139, Campylobacter coli and Aeromonas hydrophila. Age-wise distribution of the five most common isolates is shown in Figure 1.

Detection rate of bacterial pathogen was high in summer as compared to other seasons (p=0.000001). Seasonal bacterial pathogen detection rates are shown in Figure 2. The seasonal distribution of the other organisms is shown in Table 2. Trends in seasonal variation of three most common fecal bacterial isolates from cultures are shown in Figure 3.

Vibrio cholera O1 ogawa was the most common single species identified in our study samples. Majority of the stool samples cultured Vibrio cholerae O1 ogawa during the summer as compared to the other seasons (p< 0.00001). On comparison between the pediatric and adult population, over all 41.6% (958/1343) of the adult isolates were Vibrio cholerae O1 ogawa as compared to 27.1% (1174/4327) and this was a statistically significant difference noted (p <0.0001). A significant difference was found among different pediatric age groups in terms of Vibrio cholerae O1 ogawa culture results (p <0.05). All but 58 samples were submitted from within the hospital.

Campylobacter jejuni was the second most frequently isolated pathogen. This organism also showed a summer preponderance (p<0.00001). The isolation rates were higher in children (p<0.0001) although no difference was found among the various pediatric age-groups (p= 0.02). Salmonella paratyphi b was more common in summer (p <0.05), in males (p<0.001) and in the pediatric age group (p<0.005). Salmonella paratyphi b was also more common in the infants (p<0.00001).

Shigella flexneri was more common during the summer (p<0.0001). A slight preponderance towards adult age group was noted (p=0.06). However on further analysis among the pediatric age groups Shigella flexneri was more common in the 1-5 years group (p<0.005).

Enteropathogenic E.coli was more frequently isolated during the summer (p<0.0001) and in males (p<0.05). Isolation of all the Enteropathogenic E coli (EPEC) cases in pediatric age group was an interesting finding. Maximum number of cases were infants (p <0.0001) followed by 1-5 years group.

Discussion

The isolation of pathogenic enteric bacteria from 40.6% of the total sample size is a high rate. In comparison 33 % of fecal samples showed enteropathogens in Nepal.5 Rates were lower as compared to 73.5% in Surabaya, Indonesia24 and 58.4% in Manila Philippines.25 Since Aga Khan University Hospital is a tertiary care facility, we assume that clinical characteristics of the patients at the time of presentation must have prompted the healthcare providers to send stool culture and sensitivity testing right away. Especially in the lower socioeconomic strata, investigation are kept to a minimum and only where extremely necessary, e.g. for recurrent or resistant symptoms. The true burden of disease may be much more than can be estimated from these figures, because many patients are treated empirically without use of cultures.
Determining the season variation of enteric pathogens will enable health care providers to empirically treat diarrheal diseases. Such improved understanding will allow targeted interventions among those most vulnerable, which will enable further documentation of cost effectiveness and the potential for improved human development, which is critical to reducing the widening disparity and population overgrowth, which increasingly threaten our global security. Ours is a baseline study, which will provide insight to the doctors in our community and guide further prospective studies of patients presenting with gastroenteritis.

References


