Original article

Frequency of *E. coli* pathotypes in acute diarrhea of children and its related factorsat Beassat hospital, Sanandaj

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Abstract

Objective: Diarrhea is a leading cause of morbidity and mortality among children in developing countries. The bacterial pathogen most commonly associated with childhood diarrhea is *Escherichia coli*. A one-year prospective study was carried out in Sanandaj to determine the prevalence and roles of the different *E. coli* pathotypes in children less than five years of age with acute diarrhea. **Methods**: Rectal swab were collected prospectively from children with acute diarrhea and transported to the Department of Microbiology, School of Medicine, KUMS, Sanandaj during 2008. The study was approved by the institutional ethics committee. **Results**: During this study period, rectal swabs were investigated from a total of 466 children 1 to 144 months of age (mean, 29.97 months ± S. D) with diarrhea. Among the children, 191 (41%, 191/466) were girls, and 275 (59%,275/466) were boys. The age-specific incidence rates of acute diarrhea among children 13－24 and 1－12 months of age were 37.37% (37/99) and 26.26% (26/99), respectively, during the study period. A total of 99 strains of *E. coli* were detected. EPEC 59 (59.59%) and EIEC 22 (22.22%), were the most commonly found *Escherichia coli* strains detected in stools from children. Disk diffusion testing showed *E. coli* strains resistance to tetracycline (89.89%), chloramphenicol (88.88%), Ampicillin (79.79%), Amoxicillin (75.75%) and Ceficime (75.75%). Among risk factors like age, sex, haemoglubin, father's and mother's education, food and weight of children only mother's education was significant (*P* = 0.018). **Conclusion**: In most of the clinical laboratories in Iran, *E. coli* does not considered as an etiologic agent responsible for diarrhea. Results in this study revealed that *E. coli* should be considered as an etiologic agent causing acute diarrhea among children. We therefore, recommend the routine isolation and identification of *E. coli* strains in all the clinical laboratories in Sanandaj. Guidelines for appropriate use of antibiotics in Sanandaj need updating.

Keywords: Prevalence of acute diarrhea; Children; *E. coli* strains; Sanandaj

INTRODUCTION

Acute diarrhea is a major cause of morbidity and mortality in infants and young children all over the world, more so in the developing countries. Five hundred million cases of acute diarrhea occur annually in children aged less than five years throughout the world[1].

Several pathogens are incriminated as the cause of acute diarrhea. Among viruses, rotavirus is now recognized as the major cause of diarrhea in infants and young children in both developed and developing countries [2,3]. After rotavirus, common enteropatho-

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gens are: *Salmonella*, *Shigella*, *Campylobacter jejuni*, *Escherichia coli*. *Yersinia enterocolitica* has also been recognized as a common cause of bacterial gastroenteritis [4-6].

The exact incidence of these microbes may vary from place to place and at different periods of the year. Literature survey shows few reports on microbial agents causing acute diarrhea among children in Iran [7-9]. Overall, enteropathogen agents of diarrhea are very poorly documented in Iran particularly in Kurdistan province.

On this background, present study will report the prevalence and roles of the different *E. coli* pathotypes in children less than five years of age with acute diarrhea and risk factors attributable in causing acute diarrhoea among these children in Kurdistan province.

It is worth to note that WHO and UNICEF, and other partners are interested in updating the previous reviews on total and cause specific diarrhoea morbidity and mortality in the world, to best estimate the burden of diarrheal diseases [10].

On the best of our knowledge perhaps, this will be the first report to investigate the etiological agents causing acute diarrhoea in children in Kurdistan province.

MATERIALS AND METHODS

This study carried out at Beassat hospital, Sanandaj, which is a reference centre for children in Kurdistan province. Beassat hospital is an academic educational hospital which is affiliated to KUMS.

Children (1 month to 12 years old) who has acute diarrhea (defined as passage of three or more loose or watery stools in a 24 hour period), and who refers to the Beassat hospital, Sanandaj.

A physician performed a physical examination and assessed the patient's dehydration status as none, mild, moderate, or severe according to clinical signs. A health assistant administered to an adult guardian a questionnaire regarding demographic background, medical history, and previous treatment. Rectal swab specimen was collected immediately after admission to use for etiological studies. Rectal swab was cultured for *E. coli* strains using standard techniques [11].

The *E. coli* strains were tested for the antibacterial susceptibility using Kirby-Bauer procedure [12].

RESULTS

During this study period, rectal swabs were investigated from a total of 466 children with diarrhea who were 1 month to 12 years old (mean, 29.97 months ± S. D) and 99 were diagnosed as acute diarrhea. The age-specific incidence of acute diarrhea among children who were 1 – 12, 13 – 24, 25 – 36 and 37 – 48 months of age were 26.26 % (26/99), 37.37 % (37/99), 14.1 % (14/99) and 8.1 % (8/99), respectively. Among those who were 4 – 12 years old, the incidence was also 14.1 % (14/99).

Of the 466 children, 191 (41 %, 191/466) were girls, and 275 (59 %, 275/466) were boys. With a total incidence of 21.24 % (99/466), 34 out of 191 girls (7.29 %, 34/466) and 65 out of 275 (13.95 %, 65/466) were diagnosed as acute diarrhea.

A total of 99 *E. coli* strains were isolated from 466 children of less than 12 years of age with diarrhea. Of the total 99 *E. coli* strains, 59 (59.59 %) were EPEC, 22 were (22.22 %) EIEC. The remaining 18(18.18 %) were comprised of EHEC (11.11 %) and ETEC (7.07 %) pathotypes. Results for the antimicrobial susceptibility testing of the different categories of diarrheagenic *E. coli* strains are listed as follow: Disk diffusion testing showed *E. coli* strains resistance to tetracycline (89.89 %), Ampicillin (79.79 %), Chloramphenicol (88.88 %), Ciprofluxacine (30.30 %), Ceftriaxone (30.30 %), Co-trimoxazol (70.70 %), Nalidixic acid (36.36 %), Nitrofuratoin (20.20 %), Cephalotin (60.60 %), Amoxicillin (75.75 %) and Ceficime 75.75 %.

Among risk factors like age, sex, haemoglubin, father's and mother's education, food and weight of children only mother's education was significant (P = 0.018).

DISCUSSION

It has been estimated that 9.2 million deaths in the developing world have been caused by infectious diseases, and diarrheal diseases are the fourth most prevalent cause [13]. Acute or chronic enteritis due to the different categories of *E. coli*, mainly ETEC and EAggEC, is an emerging problem in many parts of the world [14].

Our study focused on 466 children, less than 12 years of age, who were treated at Beassat Hospital-Sanandaj. We examined six different strains of *E. coli* and found that nearly 21.24 % children treated in Pediatric department for gastroenteritis tested positive for *E. coli* strains.

In this study, EPEC was found to be the category

of diarrheagenic *E. coli* which most frequently causes diarrhea in children less than 12 years of age, as has been reported for many studies in developing countries [14 – 16]. In our study, only seven ETEC strains were isolated. Our study showed that the high prevalence of *E. coli* strains in diarrhea cases among children in Sanadaj was 21.24 %. However, other studies conducted in Iran reported prevalence rates of 3 % – 21.7 % [17 – 19]. The reasons for this variation perhaps could include behavioral and cultural differences and time of sampling.

Resistance to tetracycline (89.89 %), chloramphenicol (88.88 %), Ampicillin (79.79 %), Amoxicillin (75.75 %) and Ceficime (75.75 %) was seen which is in agreement with other studies from other parts of the world [20, 21].

CONCLUSION

In most of the clinical laboratories in Iran, *E. coli* does not considered as an etiologic agent responsible for diarrhea. Our results revealed that *E. coli* should be considered as an etiologic agent causing acute diarrhea among children. We therefore, recommend the routine isolation and identification of *E. coli* strains in all the clinical laboratories in Sanandaj. It is concluded that EPEC infection has the potential to become a serious health problem among children. More extensive studies should be conducted to map the features of our isolates so that meaningful measures can be taken to control the spread of these organisms. Guidelines for appropriate use of antibiotics in Sanandaj need updating.

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Original article

Need for improving quality of operating structures and processes for better ARV adherence for patients with HIV/AIDS in Tanzania and other African countries: an experience from Tanzania

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Abstract

Objective: The study was carried out in order to determine the following objectives: (1) To determine the proportion of patients who state achieving or not achieving optimal adherence to antiretroviral therapy (ART) in selected Care and Treatment Sites in Arusha and Dares Salaam regions in Tanzania. (2) To identify factors such as structural, cultural or disease related contributing to sub-optimal adherence to antiretroviral (ARVs). (3) To assess quality of operating structures and processes for provision of antiretroviral (ARVs) in the selected healthcare facilities. (4) To document suggestions and proposals for improving ART adherence among ARV users. **Methods:** Data from 7 studied facilities (3 public and 4 private/or faith based) includes 207 interviews from ARV users, 28 staff interview staff, 26 observations during consultations, 8 focus group discussions, 10 key informant interviews, and stock checks in 6 facilities. The study design was a cross-sectional using both qualitative and quantitative data collection techniques. Quantitative data were collected by using an adherence tool check list, while qualitative data were obtained using a consultation observation checklist, semi-structured interviews, focus group discussions (FGDs) and key informant interviews. **Results:** There were slight variations in the quality of operating structures and processes in the two studied regions. However results indicate that ARV adherence in Arusha region was comparatively similar to that of Dares Salaam. The composite adherence for one month in seven facilities was 90% and only 21% of ARV users achieved optimal adherence. **Conclusion:** The overall mean composite adherence rate of 90% in the two areas surveyed is encouraging. More efforts to improve the quality and processes of operating structures in our study facilities and others in Tanzania are needed to ensure optimal adherence among the larger group (79%) of ARV users who are currently taking less than the critical 95% of their medications.

Keywords: Antiretrovirals (ARVs); HIV/AIDS; Antiretroviral therapy (ART); Adherence; Tanzania

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INTRODUCTION

HIV is a serious public health problem in Tanzania, with an estimated prevalence of 7% among adults[1]. HIV is a major development crisis that im-

pacts health, economic, and social progress - reducing life expectancy, deepening poverty, and exacerbating food shortages[National AIDS Control Programme (NACP)].

The advent of ARVs in 1996 changed the HIV experience for people in the world's richest countries[2]. Although ARVs do not provide a cure and pose additional challenges due to potential side-effects and the emergence of drug-resistant strains of HIV, they have dramatically improved rates of mortality and morbidity, improved quality of life, revitalized communities and transformed the perception of AIDS from that of a plague to a manageable, chronic illness[2].

Over the past few years, the price of ARVs has fallen dramatically, thus making them more available in the developing world where they were previously unaffordable for millions of people. The Government of Tanzania (GoT) has ambitious plans to put more than 400 000 people on ARVs within a five-year period (October 2004-September 2009). As ART enrolment is scaled up in Tanzania, there is a need for community mobilization and empowerment in order to address social factors that constrain adherence. An understanding of these factors is crucial in order to plan for the increase in ART access. Insufficient adherence to ARVs may result in treatment failure and the emergence of drug-resistant strains of HIV and require a change to second-line treatment regimens, thereby greatly increasing treatment costs[3].

Adherence is described as the engagement and accurate participation of an informed patient in a plan of care[4]. It encompasses the extent to which a patient follows instructions and implies understanding, consent and partnership. It also includes entering into and continuing in a care plan, as well as keeping appointments and tests as scheduled[4]. Studies have shown no significant difference in adherence between resource-limited and resource-rich countries, suggesting that patients in all environments have trouble adhering to medicines 100 % of the time.

To maintain viral suppression of HIV requires maximum adherence (at least 95%) to ART[5,6]. It is therefore recommended that all ARV programmes worldwide should have a concurrent plan for adherence assessment and support[4,7].

The role of socio-demographic characteristics, such as gender, race, age, exposure category and educational level as predictors of adherence has produced largely inconsistent results[8]. Low adherence is not restricted to certain social classes, but is widespread and unpredictable. It varies not just between individuals, but also for the same individual over time[9,10] Adherence is therefore best thought of as a variable behaviour rather than as a constant characteristic of an individual. Most people will exhibit low adherence some of the time[8].

Psychological factors, including mental health problems such as depression, have been associated with low adherence in HIV-infected adults and adolescents, as have other psychological variables such as perception of one's ability to follow a medication regimen, or self-efficacy[11-14]. Beliefs about health and illness, in particular about the necessity of medication to ward off illness and concerns about potential adverse events, have been found to be influential in both HIV and other disease areas[15,16].

MATERIALS AND METHODS

This study was a cross-sectional study survey using both qualitative and quantitative techniques[17]. Quantitative data were collected using an adherence tool, exit interviews and semi-structured interviews. The adherence tool measured ARV adherence by using three different methods: a two day recall period, pill count, and visual analogue where glass and beads were used. This was done before the patients collected medication from the pharmacy. The exit interview was conducted after the patient had been attended to.

Qualitative data were obtained using an observation of consultations checklist, semi-structured interviews, exit interviews, focus group discussions (FGDs) and interviews with key informants.

Study sites and population

The study was conducted in Arusha and Dares Salaam regions of the United Republic of Tanzania. Arusha is situated in the northern highlands and has a population of almost 1.3 million, while Dares Salaam lies in the coastal region with almost 2.5 million inhabitants[18]. These two cities were chosen