ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Diagnosis and Treatment Approach of Children with Acute Gastroenteritis in A Tertiary Center: Medical Cost Analysis

Üçüncü Basamak Bir Merkezde Akut Gastroenteritli Çocuklara Tanı ve Tedavi Yaklaşımı: Tıbbi Maliyet Analizi

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Abstract

Introduction: Although there are well defined guidelines in the literature for diagnosis and treatment of acute gastroenteritis which is common diseases in children, most of time patients are not managed according to these guidelines and unnecessary tests and treatments are performed. The unnecessary tests and treatments costs account for a significant percentage of healthcare spending. We aimed to analyze the diagnostic and therapeutic cost of patients with acute gastroenteritis who admitted to the tertiary center in Turkey.

Materials and Methods: A total of 342 patients, aged under 18 years were admitted to Gazi University Hospital and diagnosed with acute gastroenteritis were included to the study. The clinical features, diagnosis and treatment approach and medical costs of the patients were recorded and analyzed. The medical costs were calculated according to the bills which were sent to Social Security Foundation known as SGK.

Results: According to the bills which were sent to SGK the mean total cost was calculated $22.99±13.40, the mean laboratory test cost was $11.14±9.72 and the mean cost of the treatment in the hospital was $2.64±6.21. 70% of testing cost and 90% of treatment cost were inappropriate according to the current guideline recommendation about diagnose and treatment of acute gastroenteritis.

Conclusion: Health professionals, especially pediatricians, should aim to apply appropriate diagnostic and therapeutic approaches, taking into account current guidelines. In this way, it will be possible to reduce medical costs and avoid waste in acute gastroenteritis cases.

Keywords
Acute gastroenteritis, cost analysis, diagnosis-treatment approach

Anahtar kelimeler
Akut ishal, maliyet analizi, tanı-tedavi yaklaşımı

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Öz

Giriş: Çocuklarda sık görülen bir hastalık olan akut gastroenteritin tanı ve tedavisi için literatürde iyi tanımlanmış kılavuzlar olmasına rağmen çoğu zaman hastalar bu kılavuzlara göre yönetilmemekte ve gereksiz tetkik ve tedaviler uygulanmaktadır. Gereksiz test ve tedavi maliyetleri, sağlık harcamalarının önemli bir yüzdesini oluşturmaktadır. Türkiye'de üçüncü basamak bir merkeze başvuran akut gastroenteritli hastaların tanı ve tedavi maliyetlerini analiz etmeyi amaçladık.

Gereç ve Yöntem: Çalışmaya Gazi Üniversitesi Hastanesi'ne başvuran ve akut gastroenterit tanısı alan 18 yaş altı toplam 342 hasta alındı. Hastaların klinik özellikleri, tanı ve tedavi yaklaşımları ve tıbbi maliyetleri kayıt altına alınarak analiz edildi. Tıbbi maliyetler, SGK olarak bilinen Sosyal Güvenlik Kurumu'na gönderilen faturalara göre hesaplandı.

Bulgular: SGK'ya gönderilen faturalara göre toplam maliyet ortalaması $22,99±13,40, laboratuvar test maliyet ortalaması $11,14±9,72 ve hastanede

tedavi maliyeti ortalaması $2,64±6,21 olarak hesaplandı. Akut gastroenterit tanı ve tedavisi ile ilgili güncel kılavuz önerilerine göre test maliyetinin %70'i ve tedavi maliyetinin %90'ı uygunsuz bulundu.
Sonuç: Sağlık profesyonelleri, özellikle çocuk doktorları, güncel kılavuzları dikkate alarak uygun tanı ve tedavi yaklaşımlarını uygulamayı hedeflemelidir. Bu sayede akut gastroenterit olgularında tıbbi maliyetlerin düşürülmesi ve gereksiz harcamaların önlenmesi mümkündür.

Introduction

The diarrheal diseases are a major public health problem all over the world. Acute gastroenteritis is generally defined as a decrease in the consistency of stools (loose or liquid) and/or an increase in the frequency of evacuations (typically ≥3 in 24 hours), with or without fever or vomiting. Acute gastroenteritis typically lasts <7 days and not >14 days (1,2). There are well-defined guidelines in the literature for diagnosis and treatment of acute gastroenteritis such as European Society for Pediatric Gastroenterology, Hepatology, and Nutrition/European Society for Pediatric Infectious Diseases (ESPGHAN/ESPID) Evidence-Based Guidelines and National Institute for Health and Care Excellence: Clinical Guidelines and American Academy of Pediatrics Practice Guideline (1-4). Unfortunately, in most cases patients are not managed according to these widely accepted, evidence based guidelines and unnecessary tests and treatments are performed (5). Although the incidence and mortality of gastroenteritis is low in developed countries, the hospital admissions, the emergency department (ED) observations, laboratory tests and treatment costs are high. Therefore, unnecessary tests and treatment costs related to acute gastroenteritis cover an important percentage of health care expenses (2,6). Although there are numerous studies focusing on diarrheal diseases, most of these studies were not conducted in developing countries, such as Turkey. Therefore, the cost analyses studies for acute gastroenteritis from developing countries are limited. The aim of this study was to investigate how children with acute gastroenteritis are diagnosed and treated in a tertiary center in Turkey and to analyze medical costs associated with those procedures.

Materials and Methods

The study was initiated with 411 children under the age of 18 years that were admitted to the pediatric outpatient clinics and pediatric ED and diagnosed with gastroenteritis. Two weeks after the diagnosis the parents of patients were contacted by the phone call and questioned their children's condition in order to exclude persistent and chronic gastroenteritis. The patients meeting the following criteria were excluded; who did not give consent to participate in the study, unable to reach parents for follow-up, having persistent or chronic gastroenteritis, and having malnutrition according to Gomez classification. Sixty-nine patients were excluded from the study. Following the exclusions, the study was conducted with 342 acute gastroenteritis patients. The demographic data, medical history, physical examination findings, laboratory test and treatment data were obtained from patient files and hospital medical information system.

Cost Analysis: The costs were calculated according to the final bills that were sent to the Social Security Foundation (SGK) by the hospital. The cost in USD ($) was calculated according to the following exchange rate: 1 USD=18.80 Turkish Lira (TRY) Source: The Central Bank of the Republic of Turkey (January 17, 2023). Patients' laboratory tests and treatments were investigated and analyzed according to ESPGHAN/ESPID Evidence-Based Guidelines for the Management of Acute Gastroenteritis in Children in Europe: Update 2014 (1). In this guideline the laboratory tests and treatments were also reviewed according to patient medical history, physical examination findings and clinical assessment. In our study, we evaluated each test and treatment according to the above guideline and then classified clinical features of the patient and as appropriate and unnecessary. Medical costs were calculated by detection of appropriate and unnecessary laboratory tests and treatments. Only the medical costs that were billed to SGK by the hospital were analyzed, while the prescription cost and indirect costs were not included to the study.

Statistical Analysis

Data analysis was performed using SPSS software (SPSS Inc., version 16, Chicago, IL). Standard descriptive statistics were used to summarize patient

characteristics. The data was described as mean ± standard deviation, ranges and rates.

Ethical approval was received for this study from the Local Ethics Committee of Gazi University Faculty of Medicine (decision no: 61, date: 20.04.2011).

Results

Our study included 342 patients under the age of 18 years, of whom 186 (54.4%) were male and 156 (45.6%) were female. The mean age of all patients was 58.2±56.4 months. The three most common complaints of the patients were diarrhea and vomiting (30.4%), diarrhea alone (16.7%) and diarrhea with vomiting and fever (13.5%). At the time of admission, 295 patients (86.3%) had diarrhea, 203 patients (59.4%) had vomiting, 105 patients (30.7%) had fever and 75 patients (21.9%) had abdominal pain. The mean number of stools per day was 4.3±2.1 (range: 3-15). According to clinical dehydration scale 11 patients (3.2%) had mild dehydration, 5 patients (1.5%) had moderate dehydration and 1 patient (0.3%) had severe dehydration. One or more tests were performed for 257 patients (75.1%). The most frequently performed test was stool examination (52.6%), the second most frequently performed test was rotavirus (RV) antigen test (48.2%). The stool culture was performed only in 3 patients (0.9%), none of which were stool culture positive (Table 1). Nutritional advices were given to all patients and 244 (71.3%) patients were discharged without any medical treatment. Meanwhile, 98 (27.1%) patients were given medical treatment along with the nutritional recommendations. Among those patients 50 (14.6%) were given intravenous fluid therapy, 30 (8.8%) patients were prescribed antibiotics and 28 (8.2%) patients were prescribed probiotics. None of the patients were given special formula, antiemetic, antidiarrheal, antimotility or antisecretory agents (Table 2). According to the bills sent to the SGK the mean total hospital cost was $22.99±13.40, the mean laboratory test cost was $11.14±9.72 and the mean cost of the treatment in the hospital was $2.64±6.21. The costs of unnecessary laboratory tests and treatments were analyzed according to the ESPGHAN/ESPID guideline. According to our calculations, mean unnecessary test cost was $7.85±8.92 and the mean unnecessary treatment cost in the hospital was $2.38±5.95 (Table 3).

Table 1. The distribution of the laboratory tests

Laboratory test	n (%)
Stool examination	180 (%52.6)
Stool rotavirus antigen	165 (%48.2)
Serum sodium (Na)	102 (%29.8)
Blood urea nitrogen (BUN)	102 (%29.8)
Serum creatinine (Cr)	102 (%29.8)
Serum potassium (K)	101 (%29.5)
Serum chloride (Cl)	93 (%27.2)
Serum bicarbonate	93 (%27.2)
Serum calcium (Ca)	89 (%26)
Urine analysis	57 (%16.7)
Serum uric acid	50 (%14.6)
Abdomen radiography	27 (%7.9)
Complete blood count (CBC)	21 (%6.1)
Urine culture	14 (%4.1)
Abdomen ultrasonography (USG)	6 (%1.8)
Serum C-reactive protein (CRP)	4 (%1.2)
Stool culture	3 (%0.9)

Table 2. The distribution of the treatments

Treatment	n (%)
Only nutritional advices	244 (%71.3)
Intravenous (IV) fluid therapy	50 (%14.6)
Prescribed antibiotics	30 (%8.8)
Prescribed probiotics	28 (%8.2)
Anti acidosis ($NaHCO_3$)	7 (%2)
Oral rehydration solution (ORS)	3 (%0.9)
Zinc (Zn)	2 (%0.6)
H2 receptor antagonist	2 (%0.6)
Allopurinol	1 (%0.3)

Discussion

Acute gastroenteritis is one of the major reasons of mortality and morbidity in children, however in most cases it can be cured with supportive therapies in a very short time (7). In our study, the phone interviews that were conducted two weeks after hospital applications showed that only 6 patients (1.7%) had persistent gastroenteritis, which proved that nearly all our patients had full recovery. One of the main principles of managing a child with acute

Table 3. Cost analysis of the study group (n=342)		
	Cost in TRY (mean, SD)	Cost in US Dollar ($) (mean, SD)
Total hospital cost	432.212±251.92	22.99±13.40
Laboratory test cost	209.432±182.736	11.14±9.72
Appropriate	61.476±111.296	3.27±5.92
Inappropriate	147.58±167.696	7.85±8.92
Treatment cost in hospital	49.632±116.748	2.64±6.21
Appropriate	4.7±39.48	0.25±2.10
Inappropriate	44.744±111.86	2.38±5.95
TRY: Turkish Liras, SD: Standard deviation		

gastroenteritis is determining his/her dehydration status. Children under 2 years of age in particular, should be accurately examined for the signs of dehydration. The main goals in managing a child with acute gastroenteritis are determining the level of dehydration and if a child develops dehydration, starting the appropriate treatment (6). The ratio of patients with dehydration in our study was 5%, while in other studies in the literature that ratio ranged between 12-33% (8-10). We believe that in our study factors such as age group, the ease of accessibility to health care, hospital's location in the capital city and the patients' high socio-economic level contributed to the low dehydration rate. In developing countries such as Turkey, controlling health expenditures by reducing unnecessary tests and treatments is crucial. One example of such unnecessary tests and treatments that increase the medical costs is acute gastroenteritis, which is frequently seen in childhood age groups and is one of the common causes of their hospital applications. To our knowledge there are limited data to analyze the costs of tests and treatments pertaining to acute gastroenteritis. In a study conducted by Tieder et al. (11) the most frequently ordered test was serum electrolytes (26.8%), followed by complete blood count (15.3%), urine sample and culture (14.2%), RV antigen test on stool (7.9%) and stool sample and culture (6%). Moreover, 54.5% of the cases in this series were given some treatment, and the most frequently given treatment was ondansetron (9.1%). They also found that the mean cost of medical treatment of patients hospitalized due to acute gastroenteritis was $4188±2590 and the mean cost of medical treatment of patients observed in the emergency room was $591±636 (11). In addition, in the study conducted by Lorgelly et al. 136 patients under the age of 5 that were diagnosed with acute gastroenteritis were followed and it was found that the mean cost of their medical treatment was 59.91±125.67 pounds (12). In the US the direct annual cost of RV gastroenteritis observed in children under 5 years old is $264 million and with additional indirect costs this amount becomes about $1 billion (13). In our study, only the medical services that were performed in the hospital and were billed to the SGK were included in the cost analysis. These medical services consisted of fees for examinations, tests and treatments conducted in the hospital. The total hospital costs and total test costs calculated in our study were lower than those reported in other studies (11-16). We believe that the costs in our study were lower than other studies due to the factors such as cheaper cost of health care services in Turkey compared to the US and European countries and that in our study the cost analysis only included direct costs such as payment for medical services that were performed in the hospital. Further cost analysis studies that include indirect costs of treating children with acute gastroenteritis are needed.

Study Limitations

This study had some limitations like any other study. It was conducted only one tertiary center in Ankara. Another limitation is that only billable costs were analyzed in the study. Conducting studies including direct and indirect costs from hospitals at different stages in different cities will contribute to health expenditures and cost-effectiveness studies.

Conclusion

Despite the presence of well-defined and accepted guidelines in the literature regarding the diagnosis and treatment of acute gastroenteritis, in most cases patients are not followed according to these guidelines leading to unnecessary tests and treatments. These unnecessary tests and treatments increase overall medical costs, therefore having a considerable effect on the economy of developing countries like Turkey. We believe that if health care professionals, pediatricians in particular, would aim to implement more appropriate tests and treatment approaches for diagnosis and treatment of acute gastroenteritis the unnecessary costs would be greatly reduced.

Ethics

Ethics Committee Approval: Ethical approval was received for this study from the Local Ethics Committee of Gazi University Faculty of Medicine (decision no: 61, date: 20.04.2011).

Conflict of Interest: No conflict of interest was declared by the authors.

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