MANAGEMENT OF A LARGE OUTBREAK CAUSED BY NOROVIRUS AND CAMPYLOBACTER JEJUNI OCCURRED IN A RURAL AREA IN TURKEY

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ABSTRACT

Objective: *A gastroenteritis outbreak was developed due to Campylobacter jejuni and Norovirus and affected thousands of people in Tokat province of Turkey between 29 March and 10 April 2009. In this study, we aimed to present clinical and epidemiological characteristics of this gastroenteritis outbreak, and share our experiences. Although there have been increasing number of gastroenteritis outbreaks originating especially from food and rarely from water in various countries to the best of our knowledge this was the first Norovirus and C. jejuni outbreak reported in our country.*

Material and Method: *Patients records that had presented to the State Hospital and health centers with the complaint of gastroenteritis between 29 March and 10 April 2009 were examined retrospectively. One hundred of the patients were randomly selected, and a questionnaire was performed in which epidemiologic and clinical questions were asked.*

Results: *7,800 patients were presented to health centers during the time period mentioned above. Of the fecal specimens of 24 patients, 8 had C. jejuni, 11 had Norovirus. Forty-three patients (37 children and 6 adults) were hospitalized for treatment.*

Conclusion: *Gastroenteritis outbreaks can affect numerous people simultaneously. Early and definite detection of the factor agent and source in these outbreaks is the key issue in terms of prevention and control of the outbreak. In cases of an outbreak, it is neccesary to both eliminate the source and appropriately treat the patients.*

Key Words: *Outbreak, Norovirus, Campylobacter jejuni*
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TÜRKİYE'DE KIRSAL KESİMDE NOROVİRÜS VE CAMPYLOBACTER JEJUNİ'YE BAĞLI GELİŞEN BÜYÜK ÇAPLI BİR SALGIN VE YÖNETİMİ

ÖZET

Amaç: 29 Mart-10 Nisan 2009 tarihlerinde Türkiye'nin Tokat ilinde, C. jejuni ve Norovirüse bağlı gelişen ve binlerce insanı etkileyen bir gastroenterit salgını meydana geldi. Bu çalışmada, bu gastroenterit salgınının klinik ve epidemiyolojik özelliklerini ve yaşadığımız tecrübeleri paylaşmayı amaçladık. Son yıllarda değişik ülkelerde özellikle gıda ve nadiren su kaynaklı ve etkenin norovirüs olduğu gastroenterit salgınları artış göstermesine rağmen, bu salgın bizim bilgilerimize göre ülkemizden rapor edilen ilk Norovirus ve C. jejuni salgınıdır.

Materyal ve Metod: 29 Mart-10 Nisan tarihleri arasında gastroenterit şikayetiyle devlet hastanesi ve sağlık merkezlerine başvuran hastaların kayıtları retrospektif olarak incelendi. Rastgele seçilen 100 hastaya epidemiyolojik ve klinik bulgularla ilgili soruların yer aldığı bir form dolduruldu.

Bulgular: Bahsi geçen tarihler arasında sağlık merkezlerine 7800 hasta başvurdu. 24 hastaya ait dışkı örneklerinin 8'inde C. jejuni, 11'inde Norovirüs saptandı. 43 hasta (37 çocuk ve 6 erişkin) hastaneye yatırılarak tedavi edildi.

Sonuç: Gastroenterit salgınları aynı anda binlerce insanı etkileyebilir. Bu salgınlarda etken ajanın ve kaynağın erken ve kesin tespiti salgının önlenmesinde ve kontrolünde anahtar rol oynar. Bu, salgın durumlarında bir yandan kaynağın eliminasyonu, diğer yandan hastaların uygun tedavilerinin yapılabilmesi için gereklidir.

Anahtar Kelimeler: Salgın, Norovirüs, Campylobacter jejuni **Nobel Med 2013; 9(2): 47-51**

INTRODUCTION

Noroviruses are members of Caliciviridae family, previously known as Norwalk-like viruses, with gastroenteritis factor. These viruses are among the causes of sporadic gastroenteritis and gastroenteritis outbreaks originated from water and food all around the world.[1,2] In recent years, *Norovirus* outbreaks have been reported in increasing frequency. *Campylobacter jejuni*, a gram negative microaerophilic bacterium, is an important and common factor of acute bacterial gastroenteritis and it generally causes sporadic cases. Although *C. jejuni* outbreaks associated with contaminated water and foods have also been reported.[3]

A town in Turkey witnessed acute gastroenteritis outbreak through end of March 2009. A few weeks before the outbreak, number of acute gastroenteritis diagnosed patients varied between 55-144/week, whereas, this number increased during the last days of March, suggesting a possibility of an outbreak. On the third day of the outbreak, a committee was established. In order to determine the pathogen agent/agents, the patients and samples from the environment were assayed. Since the patients came from various quarters of the city, the source was considered to be municipal water supply. On the fourth day of outbreak, written and visual media was used to acknowledge the public, restricting of the use of tap water. On the sixth day, the schools were recessed for two days. In the seventh day, pathogens were determined as *C. jejuni* and *Norovirus*. The peak in terms of the applied patient number obtained on the sixth day, was tending to decrease onwards. It was the 13rd day when the number was normalized to the seasonal standards.

In this study, we aimed to present clinical and epidemiological characteristics of gastroenteritis outbreak, and share our experiences.

MATERIAL and METHOD

Patient records of state hospitals and health centers with complaints of gastroenteritis between March and April 2009 were examined retrospectively. Viral gastroenteritis was defined as two or more loose stools in 24 h and/or vomiting twice or more in 24 h, with additional symptoms including nausea, fever, abdominal pain, headache, myalgia, general malaise and chills.[4]

Additionally, an infection form was filled by randomly selected patients who had gastroenteritis and who had been controlled by within 3-7 days of the outbreak. The form included data on age, neighborhood, onset of complaints and presence of underlying diseases, physical examination findings, and contact information of patients. One hundred randomly selected patients who replied to the surveys were contacted by phone a week later and information on the course of the disease was obtained.

Fecal microscopic examinations and routine cultures of entire patients were performed in microbiology laboratory of our hospital. In order to exclude the other etiologic agents, on third and fifth days, 24 fecal samples were taken and sent to Association of Turkish Public Health, by using transport mediums and in compliance with the cold chain policy. Multiplex PCR kits *Norovirus* genotype 1 and genotype 2 (Fast-track diagnostics, FTD gastrointestinal pathogens, Luxemburg) were used to determine *Norovirus* in fecal samples in a ABI 7500 (ABI7500,USA) real-time PCR device. *C. jejuni* was determined using specific medium. Campylobacter Blood-Free Selective agar (CCDA: Charcoal Cefoperazone Desoxycholate agar), Butzler agar and colombia blood agar were the primary culture media used for isolation of *C. jejuni*. The cultures are incubated in 42°C, and subtypes of the proliferated microorganisms are identified according to colonization morphologies, and attributes of proliferation and biochemical parameters. Routine microbiological analysis of the tap water samples was carried out in a local health laboratory. Determination of *Norovirus* and bacterial agents in tap water samples were done in the laboratory of Association of Turkish Public Health.

RESULTS

Population of town of Erbaa was reported as 95.815 in an address-based population registration system with 56.800 of them living in county seat, according to TUIK reports (http://tuikapp.tuik.gov.tr/adnksdagitapp/adnks.zul). There was a state hospital (150 beds) and five health centers in the outbreak area. 7.800 patients with the complaint of gastroenteritis were presented to the state hospital and to five health centers located in the county seat between 29 March and 10 April. Of these patients, 4,200 were female and 3,600 were male, and 1,400 patients were under the age of five. The numbers of patients who had presented to the state hospital and from the onset of the outbreak were presented in Figure 1.

Various epidemiological, clinical, and laboratory characteristics of the patients that were filled out on forms were summarized in Table 1.

Of the fecal specimens of 24 patients sent to Association of Turkish Public Health, 8 had *C. jejuni*, 11 had →

Norovirus (8 genotype 1 and 3 genotype 2). However, these pathogens were not detected in municipal water.

Forty three patients (37 children and 6 adults) were hospitalized for treatment. Various clinical and laboratory findings of the hospitalized patients were summarized in Table 2.

DISCUSSION

A gastroenteritis outbreak caused by *Norovirus* and *C. jejuni* that affected thousands of people was presented in this study. At the time of the outbreak, the number of patients presented to healthcare centers due to gastroenteritis was 7.800, but the number of people affected from the outbreak was estimated to be higher. Although gastroenteritis outbreaks originating especially from food and rarely from water in various countries have been increasing in recent years, to the best of our knowledge this was the first *Norovirus* and *C. jejuni* outbreak reported in our country. Although, visual and written media has reported other outbreaks caused by Norovirus in cities of Aksaray and Rize.

Noroviruses belong to caliciviridae family and are single-stranded and without envelope RNA viruses, and these viruses are among the most frequent causes of gastroenteritis outbreaks originated from food and sporadic gastroenteritis around the world in all age groups.[1,2] In USA, 23 million people were reported to be infected with Norovirus every year.[4] While food is the main reason of transmission, *Norovirus* outbreaks with water origin has been rarely reported.[5] Of the 348 *Norovirus* outbreaks reported to CDC between the years of 1996 and 2000, 39% was of food origin, 12% was due to physical contact, and 3% was of water origin. The source was not possible to detect in 18% of these outbreaks.[6] A majority of *Norovirus* outbreaks originating from water were based on well water contaminated by sewer, and in addition, few number of outbreaks was also reported originating from municipal water mains, bottled water, and swimming pools.[5] In our study, although *Norovirus* was not detected in municipal water mains in the mentioned outbreak, the huge number of patients consulted simultaneously around the city, the contamination of the drinking water with sewer, and the difficulty of *Norovirus* detection in water sources, showed that the outbreak was of water origin. Expansion rate and the size of the outbreak also supported this assumption. Physical contact in later periods was also considered to play a role in the expansion of the outbreak.

Norovirus infections and outbreaks generally occur in the autumn and winter period, and they show a peak especially in January-March. This is believed to be possibly associated with surface and spring water being contaminated due to higher amounts of precipitation.[4] Consistent to those, this outbreak commenced at the end of March. Thus, it must be kept in mind that the factor in outbreaks occurring during those months might be *Norovirus*.

Table 1: Various clinical and laboratory findings of 100 patients that replied to survey

Epidemiological, clinical, and laboratory findings	n=100
Male	38
Female	62
Child patient under the age of 5	28
Nausea	75
Vomiting	65
Stomach ache	80
Diarrhea	70
Fever	8
No characteristics in fecal microscopy	65
Presence of leukocyte-erythrocyte in feces	35
Presence of parasites in feces	0
Salmonella-Shigella type bacteria growth in feces	0

Table 2: Clinical and laboratory characteristics of hospitalized patients

Clinical and laboratory findings	n=43 (%)
Male gender	14 (32)
Female	29 (67)
Child patient	37 (86)
Nausea-vomiting	36 (84)
Fever	14 (33)
Stomach ache	41 (95)
No characteristics in fecal microscopy	16 (37)
Presence of leukocyte-erythrocyte in feces	27 (62)
Presence of parasites in feces	0 (0)
High urea-creatine	29 (67)

Major clinical findings in *Norovirus* gastroenteritis, stomach ache, nausea, vomiting and diarrhea are seen in the 24-48th hours following the exposure to the virus. Sub-febrile fever can be seen.[7] In this outbreak, the most frequent symptoms were diarrhea, vomiting, stomach aches, and nausea, consistent with other studies and information found in the literature.[8,9]

Hospitalization was not necessary apart from 43 patients that developed dehydration. Rest of the patients were treated as outpatients. The most frequent complication of Norovirus gastroenteritis is dehydration and is more prevalent in children and elderly. A specific treatment for *Norovirus* gastroenteritis is not required, in such cases of viral gastroenteritis. Patients with dehydration only need to be treated with fluids either orally or intravenously. →

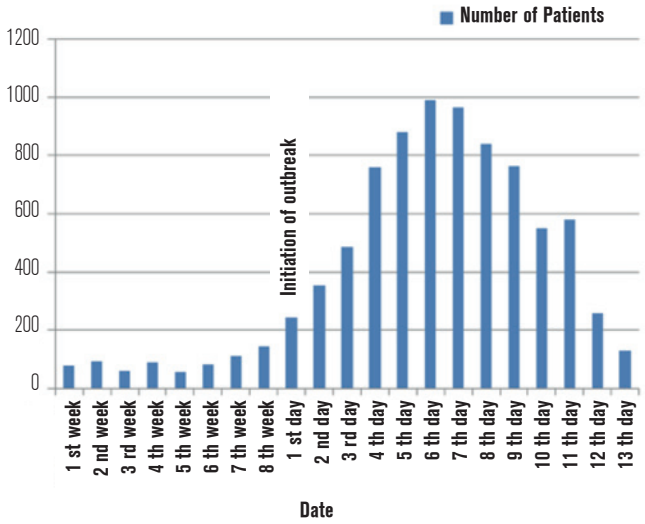

Figure: Number of patients presented to healthcare centers based on the days of outbreak

Even though *Norovirus* gastroenteritis affects all age groups, it follows a more severe course especially in younger children, elderly people, and people with chronic diseases.[10] Also in this outbreak, all age groups were affected. However, only a small number of patients, majority of which were children below the age of 5, and adults aged >65 were hospitalized due to severe dehydration and need of intravenous fluid treatment.

Symptoms and findings of the disease and the size of the outbreak may give information about the possible agents. As a matter of fact, majority of the patients had the symptoms of nausea, vomiting, diarrhea, and stomach ache in this outbreak, with no fever, in initially lead to the belief that *Norovirus* was the factor. However, direct microscopic tests demonstrated that the presence leukocyte-erythrocyte in feces of some of the patients gave a clue that another pathogen might also have been a factor. Consistent with this idea, *C. jejuni* was isolated in further tests of some patients. *C. jejuni* is among the most frequent causes of bacterial gastroenteritis predominantly in developed countries.[11] Even though sporadic *C. jejuni* infections are generally self-restricting, *C. jejuni* outbreaks that are rarely observed and originate from water and food pose a significant public health issue.[3,12-14] While most of the sporadic infections are associated with the consumption of poultry, a majority of the outbreaks have been correlated with the consumption of unpasteurized milk or unchlorinated water.[15] Also in the outbreak presented in the study, unchlorinated mains water was assumed to be the source of infection. As in this outbreak, the bacteria could barely be demonstrated in water sources due to limited number of bacteria found in water and they exist in water temporarily.[16,17] *C. jejuni* outbreaks are generally observed during spring and early autumn as in this outbreak.[18] To our knowledge, no gastroenteritis outbreak due to *C. jejuni* was ever reported in our country.Although data of the cases are missing, frequency studies concerning *C. jejuni* among the causes of gastroenteritis can be found in the literature.[19-20]

In our study, two microbial factors were playing role in this outbreak. *Norovirus, C. jejuni, Giardia lamblia, Salmonella typhimurium* were the reported agents in similar outbreaks.[21] Also, there have been limited number of outbreaks with viruses, bacteria, or parasites that are gastroenteritis factors.[22-24] Common feature of NoV and *C. jejuni* outbreaks is that they spring out particularly right after intensive rainfall seasons. We believe that faecal contamination of water supplies in heavy rainfalls causes this agent to lead to outbreaks.

In conclusion, gastroenteritis outbreaks can affect numerous people simultaneously. Early and definite detection of the factor agents in these outbreaks is very important in terms of the prevention and controlling of the spread of the outbreak. In cases of an outbreak, it is necessary to both eliminate the source and appropriately treat the patients. Early isolation of the responsible pathogen shows higher priority in terms of the appropriateness of treatment and prevention of unnecessary use of antibiotics. It should be kept in mind that there may be multiple pathogens responsible for the outbreak as in our study. Diagnosis and treatment of patients affected from the outbreak should be carried out in a separate department. The staff serving these patients should also be separated. Following up the patients needing hospitalization in separate clinics is also important in the control of nosocomial spread.

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