Sensitivity and specificity of bloody diarrhea in shigella gastroenteritis

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SUMMARY: Özmert EN, Örün E, Şengelen M, Yalçın SS, Yurdakök K, Gür D. Sensitivity and specificity of bloody diarrhea in shigella gastroenteritis. Turk J Pediatr 2010; 52: 488-490.

The sensitivity and specificity of bloody diarrhea in the diagnosis of shigella gastroenteritis in a *Shigella sonnei* prevalent center was investigated.

The shigella-proven gastroenteritis cases who were admitted to Hacettepe University İhsan Doğramacı Children's Hospital Diarrheal Diseases Unit (Jan 2003 - Oct 2006) constituted the study group (n=65). Age- and sex-matched children admitting to the same center with non-shigella diarrhea constituted the control group (n=65).

The sensitivity, specificity, and positive and negative predictive values of bloody diarrhea were found to be 30%, 100%, 100% and 58%, respectively. Sensitivity of bloody diarrhea in the diagnosis of shigella gastroenteritis was low in this center. New strategies and recommendations in the management of mild nonbloody cases are needed.

Key words: bloody diarrhea, shigella, gastroenteritis, sensitivity, specificity.

Management of shigella gastroenteritis has been a challenge due to the related morbidity and mortality. The annual number of shigella cases throughout the world was estimated to be 164.7 million, of which 163.2 million were in developing countries, leading to 1.1 million deaths. In industrialized countries, the estimated annual number was 1.5 million. Among these cases, 69% of all episodes and 61% of all deaths involve children under five years[1]. The most prevalent serotype in developing countries was reported to be *Shigella flexneri* (60%) and that in industrialized countries was *S. sonnei* (77%)[1]. In earlier reports, up to 55% of shigella cases were reported to be dysenteric, shigella being the most common cause of bloody diarrhea in childhood[2]. Shigella leads to 80 million cases of dysentery and 700,000 deaths annually[3]. Thus, the World Health Organization (WHO) recommends treating all bloody diarrhea cases as shigella[4]. This study was conducted to determine the sensitivity and specificity of bloody diarrhea for the diagnosis of shigella gastroenteritis in a *S. sonnei* prevalent center.

Material and Methods

The shigella-proven gastroenteritis cases (0-16 years old) who were admitted to Hacettepe University İhsan Doğramacı Children's Hospital Diarrheal Diseases Unit between January 2003 and October 2006 constituted the study group. Age- (±1 year) and sex-matched children admitting (± 1 month) to the same center with non-shigella diarrhea and without a history of antibiotic usage constituted the control group. Cases with persistent diarrhea were also excluded. The hospital files of the cases were reviewed retrospectively. At the center, routine stool culture is obtained from all admissions for salmonella, shigella and campylobacter. The statistical analysis was conducted using SPSS (Statistical Package for Social Sciences) 10.0. Student's t-test and chi-square test were used for statistical comparisons.

Results

There were 65 cases in the study group and 65 cases in the control group. In the study group, *S. sonnei* was determined in 59, *S. flexneri*

in 5 and *S. boydii* in 1. In the control group, none of the stools revealed a microorganism (salmonella or campylobacter). The mean age of all cases was 7.9±3.9 years (1-16 years, median: 8 years). The mean duration of diarrhea on admission was 1.7±2.1 days in the study group and 1.9±1.7 days in the control group (p>0.05). The clinical characteristics of the groups are shown in Table I. The mean stool output per day was 8.9±5.7 in the study group and 5.7±4.0 in the control group (p<0.001).

The sensitivity, specificity, and positive and negative predictive values of bloody diarrhea for the diagnosis of shigella were found to be 30%, 100%, 100% and 58%, respectively. When the cases were analyzed according to age, the sensitivity, specificity, and positive and negative predictive values of bloody diarrhea for the diagnosis of shigella were found to be 10.5%, 100%, 100% and 54% in children

under five years and 20%, 100%, 100% and 55.5%, respectively, in children older than five years.

Another finding for which statistical difference was determined between the groups regarded the history of fever. The sensitivity, specificity, and positive and negative predictive values of history of fever for the diagnosis of shigella were 89%, 59%, 66% and 83%, respectively.

The sensitivity, specificity, and positive and negative predictive values of >5 white blood cells (WBC) in stool for the diagnosis of shigella were 41%, 22.6%, 72% and 48%, respectively.

Discussion

Developing countries suffer the most from the morbidity and mortality of shigella gastroenteritis. Appropriate antibiotics shorten the course and decrease hospitalization, complications and deaths[5]. However, the

Table I. The Clinical Characteristics of the Shigella-Positive and Shigella-Negative Cases.

Clinical characteristic	Shigella (+) n=65	Shigella (-) n=65	p
Duration of diarrhea			
≤ 3 days	59 (92.2)	51 (78.5)	>0.05
> 3 days	5 (7.8)	14 (21.5)	
Stool frequency/day			
2-6	31 (47.7)	46 (70.8)	
7-11	16 (24.6)	12 (18.5)	>0.05
12-20	16 (24.6)	7 (10.8)	
Stool content			
Blood	19 (29.7)	-	
Mucus	16 (25)	15 (23.1)	<0.05
No blood or mucus	29 (45.3)	50 (76.9)	
Abdominal pain	36/49 (73.5)	36/46 (78.2)	>0.05
Vomiting	19/26 (73.0)	13/19 (68.4)	>0.05
History of fever	58/65 (89.2)	30/59 (50.8)	<0.05
Weight for age ≤ 10 p	14/52 (26.9)	10 /59 (16.9)	>0.05
Fever (≥ 37.5°C)	30/52(58)	20/48 (42.0)	>0.05
Dehydration			
None	41 (63.1)	59 (90.8)	
Mild	10 (15.4)	2 (3.1)	<0.05
Moderate	13 (20.0)	4 (6.2)	
Severe	1 (1.5)	-	
WBC (/mm³)*	24.126±3667 (n=50)	10.713±4269 (n=37)	<0.05
Hemoglobin (g/dl)*	12.7±1.5	12.7±1.3	>0.05
>5 WBC in stool	18/44 (40.9)	7/31 (22.6)	<0.05
Hospitalization	1 (1.5)	-	

*: Values mean±SD; all others are n (%).
WBC: White blood cell count.

facilities for routine stool cultures may be limited in many countries. On the other hand, the overuse of antibiotics with wrong broad indications may further increase the observed growth in antibacterial resistance. Thus, in this study, the validity of the current recommendation of treating all dysentery cases as shigella unless proven otherwise was evaluated in a *S. sonnei* prevalent center. The specificity and positive predictive value of bloody diarrhea was found to be very high. However, the sensitivity was low. This finding was in accordance with the results from other centers in recent years[6,7]. The sensitivity of bloody diarrhea from Bangladesh[6] was reported to be 37.4%. The sensitivity, specificity, and positive and negative predictive values of bloody diarrhea from Asian countries were reported to be 27%, 93%, 17% and 96%, respectively. Thus, shigella remains the most common cause of bloody diarrhea in children.

Another tool for correct diagnosis may be stool examination. The sensitivity, specificity, and positive and negative predictive values of >5 WBC in the stool for the diagnosis of shigella were 41%, 22.6%, 72% and 48%, respectively, in this study. In the study from Bangladesh, >5 macrophages in the stool examination was found to have sensitivity, specificity and positive predictive value of 21%, 96% and 89%, respectively.

These findings indicate that bloody diarrhea should still be treated as shigella unless proven otherwise. However, this criterion leads to many patients being left untreated, especially in developing countries. In our center, only 20% of cases with nonbloody shigella diarrhea were treated with antibiotics[8]. What is the impact of these cases on the shigella burden?

While improved clinical criteria would improve clinical management and survival of children in developing countries, there is a need to reconsider the indications for antibiotic treatment in well-nourished, nonbloody shigella diarrhea cases, especially in *S. sonnei* prevalent areas.

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