

Stool Examination and Antibiotic Prescriptions Related to Infectious Diarrhea in Children: A Literature Review

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Abstract

Based on the duration and type of symptoms, diarrhea is categorized into acute or chronic and infectious or non-infectious. Infectious diarrhea is most commonly caused by parasites and enteric bacterial infections in developing nations. The identification of the etiological agent is crucial to the diagnosis and management of diarrhea. Stool examination and stool culture are two non-invasive tests that can be used to determine the etiology of infectious diarrhea. Stool analyses can provide crucial details regarding conditions that affect the gastrointestinal system. Stool can be examined both macroscopically and microscopically. It is necessary to create general guidelines for the use of antibiotics in hospitals and healthcare facilities in order to optimize its wise usage. Stool examination is important for antibiotic prescription because identifying the exact pathogens that caused the diarrhea lead to more effective usage of antibiotic.

Keywords: Diarrhea, Stool, Antibiotic, Children, Resistance, Infectious, Pathogens

1. Introduction

Due to an imbalance in the normal functioning of the small and large intestine's physiological processes that are responsible for the absorption of various ions, other substrates, and ultimately water, diarrhea is the increase in the amount of water in stools. Based on the duration and type of symptoms, diarrhea is categorized into acute or chronic and infectious or non-infectious (Nemeth & Pflieger, 2021). Infectious diarrhea is most commonly caused by parasites and enteric bacterial infections in developing nations. Although the prevalence of bacteria-induced illnesses is notably high even in the United States (Hodges & Gill, 2010). The identification of the etiological agent is crucial to the diagnosis and management of diarrhea, thus there are important factors to take into consideration. One of them is the variations in stools' consistency, color, volume, and frequency that result from various reasons (Nemeth & Pflieger, 2021). Stool examination and stool culture are two non-

invasive tests that can be used to determine the etiology of infectious diarrhea (Putra et al., 2007). Over-prescription of antibiotics for diarrhea has been reported in developed nations, and a major contributing factor to inappropriate antibiotic use is doctors' responses to patients' expectations for their medication. However, because of a "probable bacterial causes," unnecessary antibiotic prescription is given in as many as 10% of hospitalized children (Bruzzeze et al., 2018).

Based on the explanation above, this article aim to review the benefit of stool examination to identify the exact pathogens that caused diarrhea, so the use of antibiotic could be more precise and effective, therefore reducing the overused of antibiotic that could cause antibiotic resistance pathogen.

2. Methods

Researcher search the literature using the keyword of that used separately and in combination included : "Infectious Diarrhea", "Antibiotic", "Stool Examinations", "Resistance", "Children". Using the Google scholar and PubMed as primary database.

3. Discussion

Stool analyses can provide crucial details regarding conditions that affect the gastrointestinal system. Stool can be examined both macroscopically and microscopically. The macroscopical characteristics of stool samples, such as color, consistency, quantity, form, odor, and mucus presence, should be assessed. A small amount of mucous in the feces is normal. The presence of excessive or bloody mucus, however, is abnormal. Because bilirubin and bile are present, the typical color is tawny. The stools of newborns may be watery or pasty and may be green. A diagnostic method for identifying protozoa, helminths, and fecal leukocytes is microscopic examination. The microscopic examination of the stool is the most important step in the identification of stool abnormalities and intestinal problems. Leukocytes and erythrocytes are not identified in typical feces. Examinations should be done on stool samples collected from the mucus-filled area in order to see leukocytes. Typically, leukocytes are seen in bacterial infections, but in cases of diarrhea brought on by viruses and parasites, they are not detected. Because of the wide variation in its sensitivity to detecting inflammatory diarrhea, the presence of leukocytes in the stool is not a sensitive test in the diagnosis of inflammatory diarrhea (Kasirga, 2019).

A study conducted by Putra et al., (2007) showed that out of 41 patients with persistent diarrhea, 27 patients underwent stool cultures, with an 85.2% positive result, including 29.6% *Enterobacter aerogenes*, 48.2% non-pathogenic *E. coli*, 3.7% *Proteus mirabilis*, and 3.7% non-pathogenic *E. coli* and *Proteus mirabilis* combination. 17 patients underwent parasite stool analysis and concentration test, with 47.0% showing positive

results, including 29.4% for Microsporidia, 11.8% for *Blastocystis hominis*, 5.9% for both combinations, and 5.9% for *Giardia lamblia* (Putra et al., 2007). In developing countries, rotavirus was the enteropathogen most frequently found, with a median of 20%, in a published summary of 73 studies of children who sought medical treatment for diarrhea in 33 countries. In spite of this, enterotoxigenic *E. coli* (median 11%), *Campylobacter* (median 7%), and *Shigella* organisms (median 5%) were the most commonly identified pathogens (Podewils et al., 2004). In addition, research conducted by Baqui et al., (1992) stated that children in their study did not experience acute or persistent diarrhea, and *G. lamblia* and *E. histolytica* isolation rates were low. Because both of these parasites are classified as well-established intestinal pathogens, this results were surprising. The prevalence of *E. histolytica* infection in children under the age of five was, however, low, according to earlier parasitologic and serologic studies conducted in Bangladesh. Children in urban areas of Bangladesh were found to have a higher frequency of *G. lamblia* than children in rural areas, according to research. It is stated that they may have underestimated the true prevalence of infection because the study only examined at a smear of a single stool sample that had already been prepared in MIF solution (Baqui et al., 1992). In 67.3% of children with diarrhea, a potential pathogen was identified. *Shigella* spp., enterotoxigenic *Bacteroides fragilis*, diarrheagenic *Escherichia coli*, group A rotavirus, and their respective prevalences were 46.7%, 22.5%, 4.7%, and 7.3% (Vu Nguyen et al., 2006). Also considering a case-control study in Denmark conducted by Olesen et al., (2005) which showed that, a virus was detected in 26% of 424 cases enrolled in the study; a bacterial pathogen was detected in 17% of cases excluding AVEEC; and a parasite was detected in 4% of cases. The most common pathogen detected and the strongest association with disease was Rotavirus, and zoonotic *Salmonella* was the most frequently isolated bacterial pathogen (Olesen et al., 2005). Lastly, an initial study in Italy conducted by Caprioli et al., (1996) reported that in 59% of the children with diarrhea, enteropathogens were discovered. Rotavirus (23.6%), *Salmonella* (19.2%), and *Campylobacter* (7.9%) were the main agents linked to the disease. Children observed as inpatients had significantly higher rates of rotavirus whereas outpatients had significantly higher rates of campylobacter. A small percentage of individuals had infections with diarrheagenic *E. coli*, *Shigella flexneri*, *Yersinia enterocolitica*, *Cryptosporidium*, and *Giardia* (Caprioli et al., 1996).

In the study conducted by Susanti et al., (2017) the antibiotic sensitivity test showed only Ciprofloksazin was found to be sensitive to the *E. coli* strain EPEC. *Salmonella* spp. were sensitive to antibiotics such as chloramphenicol, cefixime, and ceftriaxone. Most antibiotics were resistant against *C. difficile* in the two infected children, except for Ceftriaxone and Ciprofloksazin, which were resistant against one of the two infected children,. There are antibiotics that still sensitive to *Shigella* spp. including Cefixime, Ceftriaxone, and Ciprofloksazin. It had been revealed in several previous research that Cotrimoxazole and Ciprofloksazin were

still sensitive against *E. coli*. In this study, it was discovered that an *E. coli*-infected child had been resistant to cotrimoxazole. One *Salmonella* bacteria was resistant to Cotrimoxazole and Ciprofloxacin. According to their study, *Shigella* spp were resistant to Cotrimoxazole and Chloramphenicol. Antimicrobial Resistance in Indonesia or AMRINStudy revealed that 43% of the 2494 community members had *E. coli* resistance to several antibiotics, including ampicillin (34%), cotrimoxazole (29%) and chloramphenicol (25%). It is necessary to create general guidelines for the use of antibiotics in hospitals and healthcare facilities in order to optimize its wise usage. These guidelines are anticipated to be applied as a reference for hospitals and other healthcare facilities establish antibiotic policies and guidelines (Susanti et al., 2017).

Antibiotics prescriptions on diarrhea mainly used empirically, but the ranges of effective antibiotic is more limited because of the rise bacteria with antibiotics resistance rates. Specifically admitted antibiotic could prevent serious complications such as sepsis especially in children with underlying condition. Therefore maximizing the use of stool examination to identify the specific pathogen that caused the diarrhea is important to choose the specific antibiotic regimen that effective for the bacteria thus preventing resistance to antibiotic. Stool examination is also useful to detect antibiotic sensitivity towards the pathogen, that could prevent clinician to give antibiotic that already resistance (Bruzzese et al., 2018).

4. Conclusion

Stool examination is important for antibiotic prescription because identifying the exact pathogens that caused the diarrhea lead to more effective usage of antibiotic. Empirically prescribed antibiotics without stool examination could lead to overuse and antibiotic resistance.

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