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Use of Antibiotics in Acute Watery Diarrhoea Among < 5 Children Prior Admission to The Paediatric Ward of A Medical College Hospital in A Rural Area of Bangladesh

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Abstract: ***Background:*** Acute watery diarrhea remains a significant health concern for children under five, particularly in low-resource settings. This study investigates the association between maternal education, socioeconomic factors, and the management of acute watery diarrhea, including antibiotic usage, in this vulnerable age group. ***Methods:*** This cross-sectional study was conducted among < 5 children presenting with acute watery diarrhea at the paediatric ward of Kumudini Hospital. Data were collected prospectively on basic demographic characteristics, maternal education levels, and details regarding antibiotic use prior admission to paediatric ward, which were analyzed to determine patterns and influences on treatment approaches. ***Result:*** The study included 180 children, predominantly males (58.89%). Most families had monthly income more than 10,000 BDT. The primary education level for most mothers was secondary (58.89%). Antibiotics were prescribed in 139 cases, with 52.51% by registered doctors and 44.60% by non-registered practitioners. Antibiotics were most commonly administered within the first three days of illness (69.78%) and were generally used for less than seven days (66.18%). Children of illiterate mothers had the highest antibiotic use (52.51%), and a substantial reliance on non-registered practitioners for prescriptions was noted, especially among children whose mothers had primary education. ***Conclusion:*** The study highlights a significant impact of maternal education on the treatment of acute watery diarrhea in children under five.

Keywords: Acute Watery Diarrhea, Antibiotic, Maternal Education, Pediatric.

Original Research Article

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Article at a glance:

Study Purpose: *The purpose of this study was to assess the use of antibiotics in acute watery diarrhea among children aged less than five years' prior admission to the pediatric ward of Kumudini Women's Medical College Hospital.*

Key findings: *A significant proportion of children under 5 with acute watery diarrhea are given antibiotics prior to hospital admission, despite most cases being viral in origin (e.g., rotavirus).*

Newer findings: *New guidelines advocate for stricter regulation and monitoring of antibiotic prescription practices in rural healthcare settings to curb misuse.*

Abbreviations: *AWD – Acute Watery Diarrhea, BDT – Bangladeshi Taka, Mothers' Education Level – MEL, Registered Doctor – RD, Non-Registered Practitioner – NRP.*

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INTRODUCTION

Acute watery diarrhea remains a significant global health concern, particularly among children under five years of age. Despite numerous advancements in healthcare, diarrheal diseases continue to be a leading cause of morbidity and mortality within this vulnerable age group, especially in resource-limited settings. The

management of acute watery diarrhea often involves the use of antibiotics; however, their irrational administration, coupled with consumption from non-registered practitioners, poses serious public health risks. The indiscriminate use of antibiotics to treat acute watery diarrhea has become increasingly scrutinized over recent years. These antibiotics are frequently prescribed under the assumption that they will expedite recovery and prevent complications. Nonetheless, the majority of acute watery diarrhea cases are caused by viral pathogens, rendering antibiotics ineffective. Despite this knowledge, antibiotics are often unnecessarily prescribed, influenced by factors such as patient and caregiver expectations, healthcare provider practices, and misconceptions about the benefits of antibiotics in treating diarrheal diseases.[1, 2]

Children under the age of five are particularly vulnerable to the adverse effects of irrational antibiotic use. Their immature immune systems and physiological characteristics make them more susceptible to infections and prone to the harmful effects of antibiotics. Furthermore, young children may not be able to effectively communicate their symptoms, potentially leading to delays in seeking appropriate medical care and exacerbating their condition.[3] Additionally, the source of antibiotics is critical in determining their safety and efficacy. In many communities, especially within low- and middle-income countries, antibiotics are often sourced from non-registered practitioners such as informal drug vendors or traditional healers. While these sources may provide convenient access to medications, the antibiotics obtained are frequently of questionable quality and may lack proper regulation or oversight.[4]

The consumption of antibiotics from non-registered practitioners poses significant public health risks. These medications may be counterfeit, substandard, or improperly stored, leading to decreased efficacy and an increased likelihood of adverse drug reactions. Moreover, the lack of regulation and oversight in the sale and distribution of antibiotics by non-registered practitioners contributes to the emergence of antibiotic resistance, posing a severe threat to global health.[5] Addressing the issue of irrational antibiotic use in managing acute watery diarrhea among children under five requires a comprehensive approach. This includes raising awareness among healthcare providers, caregivers, and the general public about the appropriate use of antibiotics and the risks associated with their misuse. It also involves strengthening regulatory mechanisms to ensure the quality and safety of antibiotics available on the market, as well as improving access to affordable and reliable healthcare services.[6] The irrational use of antibiotics in the management of acute watery diarrhea among children under five, especially when obtained from non-registered practitioners, represents a significant public health challenge. Addressing this issue necessitates collaborative efforts from healthcare providers, policymakers, and the community at large to promote judicious antibiotic use, strengthen regulatory oversight, and enhance access to quality healthcare services. Failing to address this challenge risks exacerbating the global threat of antibiotic resistance and compromising the health and well-being of future generations.[7-10] This study aimed to assess the use of antibiotics in acute watery diarrhea among children aged less than five years' prior admission to the pediatric ward of Kumudini Women's Medical College Hospital.

METHODS

A cross sectional study was conducted in the Department of Pediatrics at Kumudini Hospital, targeting children under the age of five. The study period spanned from October 2023 to March 2024, during which children were purposively included in the study. Data were collected prospectively. Data collection was carried out using a preformed questionnaire designed to gather information from the mothers of < 5 children suffering from Acute Watery Diarrhoea. Data was collected by face-to-face interview, focusing on baseline characteristics and the use of antibiotics prior admission. For the statistical analysis, categorical variables were analyzed and presented in frequencies and percentages, and the results were displayed in tables. To ensure the integrity of the data collection process, study investigators performed random checks. All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) software, version 26.0.

RESULTS

In the study, a total of 180 children under the age of five were analyzed. Of these, 106 (58.89%) were male and 74 (41.11%) were female. The majority of the children, 167 (92.78%), practiced Islam, while 13 (7.22%) were Hindu. Regarding the monthly family income, 5 families (2.78%) earned less than 5,000 taka BDT, 19 families (10.55%) had an income between 5,000 to 10,000 taka BDT, and 156 families (86.67%) earned more than 10,000 taka BDT. In terms of the mothers' education, 39 (21.67%) had completed primary education, 106 (58.89%) secondary education, 32 (17.78%) had education above higher secondary, and 3 (1.67%) were illiterate. The duration of diarrhea among the children varied, with 94 (52.22%) experiencing symptoms for up to 3 days, 78 (43.33%) for 4 to 13 days, and 8 (4.44%) for more than 13 days.

Table 1: Distribution of children based on basic characteristics (n=180)

Basic characteristics	(n,%)
Sex	
Male	106, 58.89%
Female	74, 41.11%
Religion	
Islam	167, 92.78%
Hindu	13. 7.22%
Monthly Family Income	
<5000	5,2.78%
5000-10000	19,10.55%
>10000	156,86.67%
Education of mother	
Primary	39,21.67%
Secondary	106,58.89%
Above HSC	32,17.78%
Illiterate	3,1.67%
Duration of Diarrhea	
Upto 3 days	94,52.22%
4-13 days	78,43.33%
>13 days	8, 4.44%

Among the 139 children who received antibiotics, the sources of prescriptions varied: antibiotics were self-prescribed in 4 cases (2.87%), prescribed by a registered doctor in 73 cases (52.51%), and by non-registered practitioners in 62 cases (44.60%). Regarding the number of antibiotics used administered, the majority, 122 children (87.77%), received a single antibiotic and 17 children (12.22%) received two antibiotics. The introduction of antibiotics was most commonly within the first 3 days of acute watery diarrhea (AWD) symptoms in 97 children (69.78%), between 4 to 7 days in 38 children (27.34%), and after 7 days in 4 cases (2.87%). The duration of antibiotic use also varied, with 133 children (95.68%) being treated for less than 7 days, while 6 children (4.31%) received treatment for 7 days or more.

Table 2: Distribution of children based on antibiotic use (n=139)

Antibiotic use	(n,%)
Antibiotic prescribed by	
Self	4, 2.87%
Registered doctor	73, 52.51%
Non-registered doctor	62, 44.60%
Number of antibiotics used	
1	122,87.77%
2	17,12.22%

Introduction of antibiotic	
Within 3 days of AWD	97,69.78%
4-7days	38,27.34%
≥7days	4,2.87%
Duration of antibiotic use	
<7 days	133,95.68%
≥7days	6,4.31%

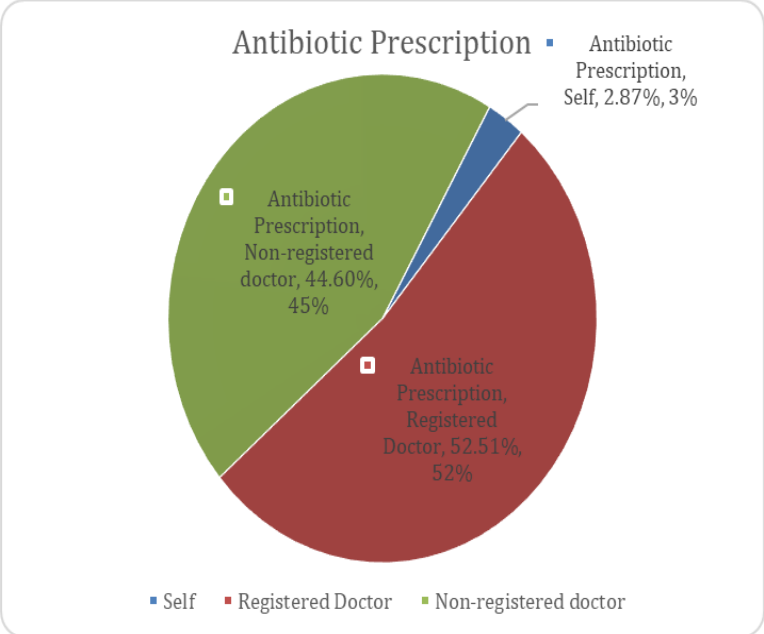

Figure 1: Distribution of study population based on antibiotic prescribed by registered or non-registered doctor

The study further examined the correlation between the education level of the mothers and antibiotic use in their children, covering 139 cases. Mothers with primary education had 45 children (32.37%) using antibiotics, which was statistically significant with a p-value of 0.02. Mothers with secondary education were associated with antibiotic use in 9 children (6.47%), showing a p-value of 0.08, suggesting a less clear association. Those with education levels above higher secondary had 12 children (8.63%) using antibiotics, with a p-value of 0.51, indicating no significant correlation. Interestingly, the highest antibiotic use was found among children of illiterate mothers, totaling 73 cases (52.51%), which was highly significant with a p-value of 0.007.

Table 3: Distribution of children based on education of mother and antibiotic use (n=139)

Education of mother	n, %	df, p-value
Primary	45, 32.37%	3, **0.02**
Secondary	9, 6.47%	3, 0.08
Above HSC	12, 8.63%	2, 0.51
Illiterate	73, 52.51%	4, **0.007**

The distribution of antibiotic prescriptions relative to the education level of mothers among the studied children showed varied patterns. For self-prescribed antibiotics, children of illiterate mothers accounted for the highest number, with 3 instances (75.0%), followed by a single instance (25.0%) among children of mothers with primary education. No self-prescription was noted among children of mothers with secondary education or higher. Antibiotics prescribed by registered doctors were most common among children of illiterate mothers, constituting 43 cases (58.90%), with

decreasing frequency observed in children of mothers with above higher secondary (11 cases, 15.06%), primary (10 cases, 13.70%), and secondary education (9 cases, 12.32%). Conversely, antibiotics prescribed by non-registered doctors were most frequent among children of mothers with primary education (34 cases, 54.84%), followed by illiterate mothers (27 cases, 43.54%), with only one case (1.61%) from mothers with above higher secondary education and none from mothers with secondary education.

Table 4: Distribution of children based on education of mother and antibiotic prescription (n=139)

Education of mother (n,%)	Self-prescribed (n=4)	Registered doctor(n=73)	Non-registered doctor(n=62)
Primary	1,25.0%	10,13.70%	34,54.84%
Secondary	0,0.0%	9,12.32%	0, 0.0%
Above HSC	0, 0.0%	11,15.06%	1,1.61%
Illiterate	3, 75.0%	43,58.90%	27,43.54%

DISCUSSION

In the current study, the predominance of males among children with acute watery diarrhea was notable at 58.89%, which is consistent with the findings of Mahmud et al. who reported a male prevalence of 61.5% among pediatric diarrhea patients in Bangladesh.[11] This similarity underscores a common trend in gender-specific health-seeking behavior and possibly inherent biological susceptibilities. Regarding socioeconomic factors, only 10.55% of the families in this study had incomes ranging from 5,000 to 10,000, mirroring the economic conditions reported by Chowdhury et al., where a median family income bracket in a similar setting ranged from 4,800 to 9,600, which likely influences healthcare access and decisions including the use of antibiotics.[12] The educational background of mothers significantly influenced healthcare practices, with 58.89% having attained secondary education. This aligns with the research by Huq and Tasnim, who found that children of mothers with secondary education were less likely to receive inappropriate medical treatments due to better health literacy.[13] The importance of maternal education is further evidenced by Bari et al., who reported improved treatment outcomes for diarrhea when mothers had higher educational levels, noting that 60% of mothers with secondary education adhered strictly to prescribed treatment regimens.[14]

In terms of clinical management, most cases of diarrhea were resolved within 3 days (52.22%), akin to Bari et al.'s findings where the average duration of diarrhea among children was approximately 2.5 days when managed effectively with appropriate rehydration and dietary management.[14] Antibiotic stewardship showed that 52.51% of antibiotic prescriptions were by registered doctors, close to findings from Chowdhury et al., where 49% of antibiotics for pediatric patients were prescribed by healthcare professionals.[15] However, 44.60% were also prescribed by non-registered practitioners, suggesting a significant reliance on informal healthcare, which is a notable contrast to areas with stricter antibiotic control measures. A major finding of our study was that 87.77% of children received antibiotics for single day, and most antibiotics were introduced within the first 3 days of acute watery diarrhea (69.78%), closely paralleling Samir et al.'s observation that 85% of antibiotic treatments for pediatric acute infections in Bangladesh were initiated within 48 hours of symptom onset.[16] The short duration of antibiotic use, typically less than 7 days (66.18%), is slightly higher but still comparable to the 63% reported by Bari et al., where short-duration antibiotic therapy was emphasized to mitigate resistance development.[14] The impact of maternal education on antibiotic usage was significant; children of illiterate mothers demonstrated the highest antibiotic use at 52.51%, compared to the 78% reported by Huq and Tasnim, illustrating the influence of maternal literacy on child health management.[13] This group also predominantly relied on both registered (58.90%) and non-registered doctors (43.54%) for prescriptions, reflecting a substantial gap in health literacy and affirming previous findings that lower maternal education is linked to higher inappropriate healthcare utilization.[17] Furthermore,

the reliance on non-registered doctors among children of mothers with primary education (54.84%) underscores ongoing challenges in health literacy, consistent with Mondal et al.'s research, which identified low maternal education as a factor in irrational antibiotic practices.[18] Notably, no antibiotics were self-prescribed among children of mothers with secondary education or above, which supports Chowdhury et al.'s findings that higher maternal education correlates with lower rates of self-medication due to better awareness of its risks.[15-23]

Self-prescribing and the overprescribing of antibiotics represent significant public health challenges, particularly for children. Self-prescribing, where medications are used without medical guidance, often leads to incorrect dosing, inappropriate duration of therapy, and the use of drugs with no therapeutic benefit for the condition being treated. For children, whose physiological responses and metabolic rates differ significantly from adults, these practices are especially hazardous. They not only increase the risk of adverse drug reactions but also contribute to the development of antibiotic resistance, a global threat that undermines the efficacy of these critical treatments. Overprescribing, often fueled by misdiagnosis or pressure from caregivers, exacerbates these issues. It leads not only to unnecessary exposure to medication side effects but also hastens the spread of resistant pathogens. This situation calls for stringent regulatory measures, enhanced physician and parent education programs, and broader public health campaigns aimed at promoting the rational use of antibiotics. Emphasizing the necessity of prescriptions for antibiotic use and enforcing policies that curb over-the-counter sales can significantly mitigate these risks, ensuring safer pediatric health management and preserving antibiotic efficacy for future generations.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study underscores the significant impact of socioeconomic factors, particularly maternal education, on the management of acute watery diarrhea in children under five. The findings reveal a high prevalence of antibiotic use, particularly among children of illiterate and minimally educated mothers, highlighting the critical role of maternal education in influencing healthcare decisions and practices. The reliance on non-registered medical practitioners for antibiotic prescriptions further emphasizes the urgent need for public health interventions to enhance health literacy and access to qualified healthcare providers. To address these challenges effectively, it is essential to implement targeted educational programs for parents and stricter regulatory measures to control antibiotic distribution and use. Such strategies will not only improve the quality of pediatric healthcare but also contribute to the broader goal of combating antibiotic resistance, ensuring better health outcomes for future generations.

Authors' contributions

ABMAH, TR, MMH: Concept and design, data acquisition, interpretation and drafting. MAM and KK: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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