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Outcome of Short-Term and Long Term Antibiotic Prophylaxis in Colostomy Closure

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ABSTRACT

Background and Objectives: Antibiotic prophylaxis is a common practice in children undergoing colostomy closure for anorectal malformation, Hirschsprung's disease. Traditionally, antibiotics are given for unnecessarily longer period of time, which consumes scarce health resources having alternate efficient use. The present study was undertaken to compare the outcome between short-term and long-term antibiotic prophylaxis in colostomy closure.

Materials & Methods: This randomized clinical trial was conducted in Dhaka Shishu Hospital, Dhaka over a period of 15 months from April 2001 to June 2002. Children admitted with anorectal malformation, Hirschsprung's disease for colostomy closures were the study population. However, immuno-compromised children or children already getting antibiotics were excluded from the study. A total of 46 such children were consecutively included and were randomly allocated to long-term group (n = 21) and short-term group (n = 25). The long-term group received antibiotic up to 5th postoperative day, while the short-term group received the same antibiotic up to 2nd postoperative day. Transverse colostomy was the main procedure employed in colostomy closure; however, a few patients required sigmoid colostomy. The outcome measures were incidence of wound infection, hospital stay and cost of treatment.

Result: Majority of the children were between 1 - 5 years of age (75% in short-term and 50% in long-term group) followed by under 1 year (10% in short-term and 40% in long-term group) and > 5 years (15% in short-term and 10% in long-term group). The overall male to female ratio was 3:1. Majority (85%) of the patients in both long-term and short-term groups belonged to lower income group. Over half (52.2%) of the children had anorectal malformations (ARM) and the rest (47.8%) had Hirschsprung's disease (HD). Children were generally malnourished according to Gomez classification. Majority (91%) was operated on by transverse colostomy and few (9%) by sigmoid colostomy. Three patients in each group developed postoperative wound infection. Blood culture of none of these patients yielded growth of any organism, though wound swab culture did so in 5 cases out of 6 infected patients. In 2 cases, the organism was *E.coli*, in 2 cases, it was *Pseudomonas* and in one case *Staph. aureus*. Total cost of antibiotics in short-term therapy was less than 50% of that required in long-term therapy. The outcome in terms of recovery, complications and postoperative hospital stay was no different between groups.

Conclusion: The study concluded that short-term antibiotic prophylaxis is as efficacious as long-term in preventing wound infection in patients with colostomy closure for anorectal malformation and Hirschsprung's disease. Short-term antibiotic prophylaxis is cost-effective.

Key words: Colostomy closure, short-term, long-term, antibiotic costeffective.

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INTRODUCTION

Infection of a wound can be defined as the invasion of microorganisms through tissues following a breakdown of local and systemic host defences.[1] Post-operative wound infections are the most frequent nosocomial infections among surgical patients and are related to an increase in morbidity, mortality, prolong hospital stay and an

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increase in the cost of medical care.[2] Despite advances in antimicrobial therapy, aseptic and surgical techniques, infection continues to be a puzzling problem for the surgeons. Approximately one million patients have post-operative wound infection each year in the United States, extending the cost of hospitalization by 20 percent.[3] Four components, in varying degree, are present in any infection, such as, virulence of organism, size of inoculums, presence of nutrient sources and breakdown of hostdefense.[4] Measures intended to prevent wound infection are attempts to modify the host and local tissue factors, which, among others, includes short preoperative hospital stay, preoperative optimization of comorbid illness, control of the operative environment, use of aseptic and meticulous surgical technique and prophylactic antibiotic.[5]

Of these measures the efficacy and impact of antimicrobial prophylaxis has clearly been demonstrated to be significant. Prophylaxis is uniformly recommended for all clean-contaminated, contaminated or dirty procedures.[5] Colorectal procedure has a very high intrinsic risk of infection and warrants a strong recommendation for prophylaxis. Several studies have demonstrated efficacy of prophylactic antibiotics with rates of infection decreasing from over 50% to less than 9%.[6-8] Timing of antibiotic administration is also of crucial importance. The first dose should always be given before the procedure, ideally within 30 minutes and certainly within two hours of the time of incision.[9] The antibiotic should be effective against microorganisms anticipated to cause infection, achieve adequate local tissue levels, cause minimal side effects and be relatively inexpensive.[5]

The available data suggests that short-term (up to 2 days postoperatively) use of an antimicrobial agent is as efficacious as long-term (5 days) postoperative use in elective colorectal surgery and even in patients with high risk for major abdominal infection.[2,10] Short-term antibiotic prophylaxis in elective colorectal surgery is cost saving as well as saving of nursing time.[11] In our common practice we use antibiotic for 7-10 days postoperatively or for longer duration. There is no data available in our setting to support short-term antibiotic prophylaxis in elective colorectal surgery, which would have less toxicity and fewer adverse events. Colostomy is commonly practiced in paediatric surgery, especially in anorectal malformation (ARM), Hirschsprung's disease (HD) and necrotizing enterocolitis, and as such, it was selected as a prototype in our study to standardize the antibiotic protocol for prophylaxis. The present study was, therefore, intended to compare the outcome between short-term and long-term antibiotic prophylaxis in colostomy closure.

MATERIALS AND METHODS

This randomized clinical trial was conducted in Dhaka Shishu Hospital, Dhaka over a period of 15 months from April 2001 to June 2002. Children admitted with anorectal malformation, Hirschsprung's disease or necrotizing enterocolitis for colostomy closure were the study population. However, immuno-compromised children (like children with severe malnutrition, malignant disease or major systemic diseases or hypersensitivity or children under steroid or cytotoxic therapy) or children already getting antibiotics were excluded from the study. A total of 50 children from 6 months to 12 years of age undergoing colostomy closure were consecutively included in the study; of them 4 patients were excluded from the study because of severe malnutrition, leaving 46 for final study. The children were then randomly allocated to long-term group (n = 21) and short-term group (n = 25). The long-term group received antibiotic cefotaxime (50 mg/kg 8 hourly IV) and metronidazole

(10 mg/kg 8 hourly IV) up to 5th postoperative day, while the short-term group received the same antibiotic up to 2nd postoperative day. Transverse colostomy was the main procedure employed in colostomy closure (n = 42); only 4 patients received sigmoid colostomy. The outcome measures were incidence of wound infection, hospital stay and cost of treatment. The statistical analyses were performed using computer software SPSS (Statistical Package for Social Sciences), version 17 and test statistics used to analyse the data were descriptive statistics and Chi-square (χ^2) Test. The level of significance was set at 0.05 and $p < 0.05$ was considered significant.

RESULTS

The age distribution shows that about 40% of the children in long-term group were under 1 year, 52.4% 1-5 years and the rest 9.5% 5-12 years old, where as in short-term group 76% were 1-5 year, 8% under 1 year and 16% 5-12 years old. The difference between the groups in terms of age is significant (p = 0.047). Long-term group comprised 14(66.7%) males and 7(33.3%) females, whereas short-term group formed of 22(88%) males and 3(12%) females (p=0.081). In long-term group 3(14.3%) patients were from middle income group and 18(85.7%) from lower income group. In short-term group 4(16%) patients were from middle income group and 21(84%) patients from lower income group. Most of the patients were malnourished according to Gomez classification. In long-term group, only 1(4.8%) patient was nutritionally normal, 11(52.4%) had Grade-I (mild) and 9(42.9%) had Grade II (moderate) malnutrition. In short-term group only 3(12.0%) were within normal limit, 8(32.017.4%) were mildly and 14(56.0%) moderately malnourished. In long-term group 10(47.6%) patients had a preoperative hospital stay of < 5 days, 6(28.6%) patients had 5 - 10 days and 5(23.8%) patients 11 - 15 days and no patient had a preoperative stay exceeding 15 days. In short-term group 13(52.0%) patients had a preoperative stay of < 5 days, 8(32.0%) patients had 6 - 10 days, 3(12.0%) patients 11 - 15 days and 1(4.0%) patient had a hospital stay of > 15 days (Table I).

TABLE I: Comparison of baseline characteristics between groups (n=46)

Baseline characteristics*	Group		p-value
	Long-term (n = 21)	Short-term (n = 25)	
Age (years)			
<1	8(38.1)	2(8.0)	0.047
1-5	11(52.4)	19(76.0)	
5-12	2(9.5)	4(16)	
Sex			
Male	14(66.7)	22(88.0)	0.081
Female	7(33.3)	3(12.0)	
Socioeconomic status			
Lower income	3 (14.3)	4(16.0)	0.872
Middle income	18(85.7)	21(84.0)	
Nutritional status			
Normal	1(4.8)	3(12.0)	0.328
Grade I	11(52.4)	8(32.0)	
Grade II	9(42.9)	14(56.0)	
Preoperative hospital stays (days)			
<5	10(47.6)	13(52.0)	0.606
5-10	6(28.6)	8(32.0)	
11-14	5(23.8)	3(12.0)	
≥ 15	0(0.0)	1(4.0)	
Antibiotic protocol	21(100.0)	25(100.0)	

Figures in the parentheses indicate corresponding %;

**Chi-squared Test (χ^2) was done to analyze the data.*

Disease pattern of study Population

In terms of distribution of diseases, long-term group had more anorectal malformation (ARM) (57.1%) than Hirschprung's disease (42.9%), while the short-term group had the reverse pattern, ARM (40%) and Hirschprung's disease (60%) (p=0.246) (Fig. 1).

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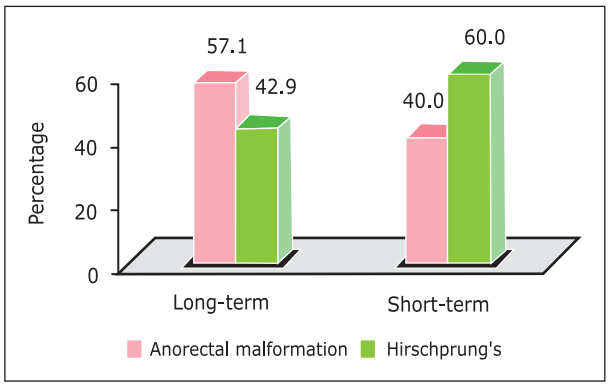

FIGURE 1: *Disease pattern of study population*

Patterns of wound infection

In short-term group, 1(4%) patient with ARM and 2(8%) patients with HD had postoperative wound infection. In long-term group, 2(9.5%) patients with ARM and 1(4.8%) patient with HD had postoperative wound infection (Table II). In both groups, 1(4%) patient had major and 2(8%) patients had minor wound infection. Of the 6 patients who were infected postoperatively 2 exhibited raised WBC and 5 exhibited raised CRP. Five patients showed growth of microorganism on wound swab culture; but none was found positive for blood culture (Table III). The microorganisms grown were *E Coli, Pseudomonas* and *Staph. aureus*. The average cost of antibiotic treatment for a 10 kg-child was Taka 510 in short-term group and that in long-term group was Taka 1034.

TABLE II: Comparison wound infection between long-term and short-term groups (n=46)

Patterns of wound infection*	Group		p-value
	Long-term (n = 21)	Short-term (n = 25)	
ARM	2(9.5)	1(4.0)	0.750
HD	1(4.8)	2(8.0)	

Figures in the parentheses indicate corresponding %;
**Chi-squared Test (χ^2) was done to analyze the data.*

TABLE III: Post-operative investigations in infected patients (n=6)

Post-operative investigations in infected patients	Frequency (%)
Leucocytosis (>11,000)	2(33.3)
Raised CRP (> 6 mg/dl)	5(83.3)
Growth of microorganism on blood culture	0(0.0)
Growth of microorganism on wound swab culture	5(83.3)

Postoperative hospital stay:

Most patients (n = 40) did not need to stay more than 5-9 days postoperatively, 4(17.5) patients stayed postoperatively for 10-14 days and 2(8.8) patients stayed > 15 days. There was no significant difference between the groups in terms of postoperative hospital stay (p = 0.974) (Table IV).

TABLE IV: Comparison of postoperative hospital stay between groups (n=46)

Post-operative hospital stay (days)*	Group		p-value
	Long-term (n = 21)	Short-term (n = 25)	
5-9	18(85.7)	22(88.0)	
10-14	2(9.5)	2(8.0)	0.974
≥ 15	1(4.8)	1(4.0)	

Figures in the parentheses indicate corresponding %;
**Chi-squared Test (χ^2) was done to analyze the data.*

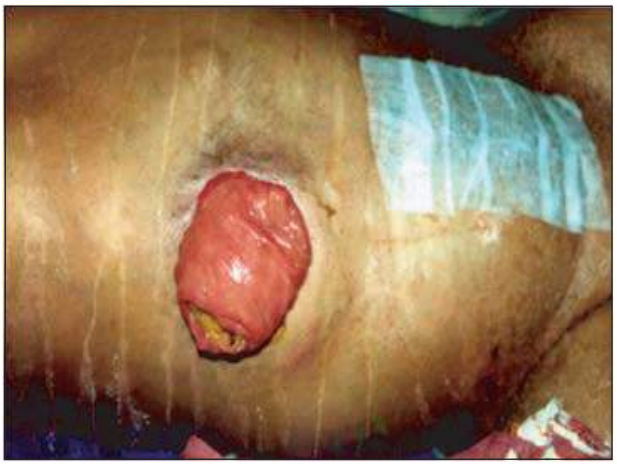

FIGURE 2: *Right transverse colostomy before closure.*

DISCUSSION

In the present study, majority of the children were between 1 - 5 years of age (75% in short-term and 50% in long-term group) followed by under 1 year (10% in short-term and 40% in long-term group) and > 5 years (15% in short-term and 10% in long-term group). The overall male to female ratio was 3:1 suggesting that congenital ARM and HD requiring colostomy predominantly occur in male children which are quite consistent with the worldwide prevalence of Hirschprung's disease and anorectal malformation and their sex distribution. Majority (85%) of the patients in both long-term and short-term groups belonged to lower income group indicating that congenital malformation of the large gut more often occur in the poorer section of the society. However, the reason may also be that most of the treatment facilities of Dhaka Shishu (Children) Hospital are free of cost and lower income group avail these facilities. These data correlates well with the study of Hossain[2] and Hawlader.[13]

Among the 46 patients, 24(52.2%) were of anorectal malformations (ARM) and 22(47.8%) were of Hirschsprung's disease (HD) reflecting the pattern of congenital malformations for which colostomies are commonly performed in Dhaka Shishu (children) Hospital. Majority (91%) of the patients was operated on by transverse colostomy and only 4(9%) by sigmoid colostomy. This means that in our setting we prefer transverse colostomy more often than sigmoid colostomy, though sigmoid colostomy is conventionally preferable to transverse colostomy in ARM.[12-13]

Children were generally malnourished according to Gomez classification. In long-term group only 1(2.2%) patient and in short-term group 3(6.6%) were nutritionally normal. All other patients in either group were suffering from mild to moderate degree of malnutrition. In Bangladesh malnutrition is common in children and the diseases of gut might have aggravated the condition.[14]

In short-term group, 1(4%) patient with ARM and 2(8%) patients with HD had postoperative wound infection. In long-term group, 2(9.5%) patients with ARM and 1(4.8%)patients with HD had postoperative wound infection. Only one patient (ARM with transverse colostomy) from long-term group and one from short-term group (HD with transverse colostomy) developed major wound infection. No single cause could be identified as the cause of wound infection. Blood culture of none of these patients could reveal any organism, though wound swab culture yielded growth of microorganisms in 5 cases out of 6 infected patients. In 2 cases, the organism was *E.coli*, in 2 cases, it was *Pseudomonas* and in one case by *Staph. aureus*. Total cost of antibiotics in short-term therapy was less than 50% of that required in long-term therapy. As the outcome in terms of recovery and complications is no different between groups, the short-term therapy could be preferred in terms of cost-effectivity. Although postoperative hospital stay was no different between groups in this study, in future we can adopt a short-term antibiotic prophylaxis in colostomy closure to reduce the undue prolonged hospitalisation of the child for medication purpose only.

CONCLUSION

This study revealed that there is no significant difference of incidence of postoperative wound infection between the two groups suggesting that short-term antibiotic prophylaxis is as efficacious as long-term. It is cost-effective and saves nursing hours which could be utilized for other patients of most need.

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