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Research Article

The Morbidity of Anaemia in Children with Colostomies. A Cohort-Based Study

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Abstract

Introduction: Anaemia is a contributor to significant morbidity in children with colostomies. The causes of anaemia maybe be multi-factorial the effect of which may impact on the growth and nutritional aspects of the child while ultimately delaying definitive surgery. To quantify the morbidity of anaemia in children with colostomies, we sought to objectively identify the association between the presence of colonic stomas and the levels of haemoglobin and mean corpuscular volume in a cohort of children managed in a tertiary hospital in Kenya.

Materials and Methods: A descriptive cohort study carried out in Kenyatta National hospital between 2015 and 2017 which recruited 40 patients in total. Blood samples were collected for haemoglobin and mean corpuscular volume levels as markers for anaemia. For comparison similar samples were collected from a pool of patients matched for age and sex with umbilical and inguinal hernia to serve as controls. Data was analysed and presented based on the hematologic indices above.

Results: There were 22 (55%) cases who met the definition of anaemia based on a haemoglobin cut off values compared to 13 (32.5%) controls. Both the mean haemoglobin level and mean MCV were significantly lower in the children with colostomies.

Conclusion: Colostomies are associated with anaemia in children. Identification and correction of anaemic states through screening, haematinics and colostomy care may mitigate the morbidity associated with anaemia.

Keywords: Anaemia; Colostomy in Children

Abbreviation

HB: Haemoglobin; MCV: Mean Corpuscular Volume; WHO: World Health Organization; KNH: Kenyatta National Hospital; UON: University of Nairobi; OR: Odds Ratio; CI: Confidence Intervals; HSCD: Hirschsprung's Disease; ARM: Anorectal Malformation

Introduction

Colostomy fashioning is important in management of both congenital and acquired gastrointestinal tract pathologies in neonates and children. In the majority of cases they serve as temporary channels for stool output as part of a staged approach towards definitive surgery after which the stoma can be reversed [1,2].

The complication rates following colostomies are varied between 10 and 70%. Of these the most common complications include peristomal dermatitis, stomal prolapse, stomal stenosis and bleeding [3]. Anaemia as a complication may follow patients with colostomies and can be attributed by several factors. In the perioperative phase, colostomies may be complicated with bleeding. Second, the stomas are associated with recurrent trauma to the exposed mucosa and surrounding skin leading to chronic blood loss which further worsens the anaemic state. Finally, colostomies are associated with nutritional deficits which lead to iron deficiency anaemia [1,2].

To quantify the morbidity of anaemia in children with colostomies, we sought to objectively identify the association between the presence of colonic stomas and the levels of haemoglobin (HB) and mean corpuscular volume (MCV) in a cohort of children managed in a tertiary hospital in Kenya.

Materials and Methods

The study was a descriptive cohort study carried out between 2015 and 2017 at the Kenyatta National Hospital, the largest tertiary referral hospital in Kenya. All patients in the study were under the age of 10 years and had colostomies at the time of recruitment. Blood samples were collected following standard aseptic phlebotomy protocol for a haemogram test, whose analysis was performed with an automatic counter from Sysmex®. The cut-off values indicative of inadequate levels of haemoglobin (Hb) and mean corpuscular volume (MCV) was defined according to age as per the WHO reference ranges [4]. For comparison on hematologic

indices, blood samples were also taken from a control group of patients with inguinal and umbilical herniae matched for age, sex and socio-economic status.

Data analysis was performed in the Statistical Package for the Social Sciences program, version 21.0. (SPSS V.21.0, IBM). The Chi-square test, Fisher's exact test and student T test were used to compare means and ascertain association among clinical variables. P-values, odds ratio (OR) and 95% confidence intervals (CI) were calculated where applicable. A p-value of less than 0.05 was considered significant.

Ethical approval was sought and granted by the KNH-UON Ethics and Research Committee. Reference No. P528/08/2015. Informed written consent was also obtained from parents/guardians of patients. All patients who were diagnosed with anaemia were referred for appropriate management to the relevant personnel.

Results

Demographics

A total of 40 paediatric surgical patients were recruited in the study. The mean and median age in years was 4.46 and 3.86 respectively. The male to female ratio was 1.6:1. The demographics according to age, sex and socioeconomic status are summarised in table 1.

Demographic data		N = 40	(%)
Age	< 2 years	9	22.5
	2 - 4 years	15	37.5
	5 - 10 years	16	40.0
Gender	Male	25	62.5
	Female	15	37.5
Income	< $ 50	30	75.0
	$ 50 - $ 200	10	25.0
Housing	Permanent	16	40.0
	Semi-permanent	24	60.0
Level of Education	Primary	12	30.0
	Secondary	24	60.0
	Tertiary	3	7.5

Table 1: Demographic data of study participants.

Clinical data

The two primary diagnosis were Hirschsprung disease (HSCD) and Anorectal Malformations (ARM). Twenty-four patients had HSCD while 16 patients had ARM. The mean and median duration since fashioning of the colostomy was 1.0 years and 1.9 years (IQR 1 to 3.8) respectively, with a range from less than a month to 11.8 years. A total of 22 (55%) of patients with colostomies met the definition of anaemia based on a haemoglobin cut off values for age. The clinical features according to diagnosis, the duration of colostomy and the state of anaemia are summarised in table 2.

Clinical Features		N = 40	(%)
Diagnosis	HSCD	24	60.0
	ARM	16	40.0
Duration of colostomy	≤ 1 year	15	37.5
	> 1 year	25	62.5
Anaemia	Present	22	55.0
	Absent	18	45.0

Table 2: Clinical data of study participants.

HSCD: Hirschsprung's Disease; ARM: Anorectal Malformation.

Hematologic measures

Thirteen patients (32.5%) from the control group met the definition of anaemia based on a haemoglobin cut off values for age. Both the mean haemoglobin level and mean MCV were significantly lower in the children with colostomies than the control group as shown in table 3.

Hematologic Measure	Cases (n = 40)	Controls (n = 40)	Mean difference (95% CI)	P value
Haemoglobin (g/dl)	10.30 ± 1.87	11.29 ± 2.06	1.00 (0.14 - 1.86)	0.026
MCV (fL)	61.85 ± 18.15	71.14 ± 13.13	9.29 (2.35 - 16.24)	0.011

Table 3: Mean haemoglobin and MCV values among study participants.

MCV: Mean Corpuscular Volume; CI: Confidence Interval; g/dl: Grams Per Decilitre; fl: Femtoliters.

The hematologic measures of children with colostomies were analysed against the primary diagnosis and the duration of colostomy. A diagnosis of HSCD was associated with a significant reduction in mean hemoglobin levels (9.66 ± 1.70) compared to ARM (11.36 ± 1.70), p = 0.005. Similarly, the mean MCV in children with HSCD was (59.09 ± 16.38) compared to a mean MCV of (66.44 ± 20.53) in those with ARM, p = 0.249. There was no statistical difference seen in hematologic parameters based on the duration of colostomy (Figure 1a and 1b).

Discussion

Anaemia is a contributor to significant morbidity in children with colostomies. The causes maybe be multi-factorial the effect of which may impact on the growth and nutritional aspects of the child while ultimately delaying definitive surgery. This study shows a 55% occurrence of anaemia in ostomy patients with lower HB and MCV indices.

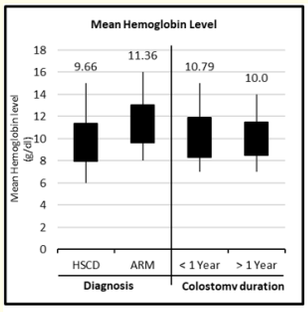

Figure 1A: A diagnosis of HSCD was associated with a significant reduction in mean HB levels. There was no significant difference noted based on colostomy duration.
g/dl: Grams Per Decilitre.
HSCD: Hirschsprung's Disease.
ARM: Anorectal Malformation.

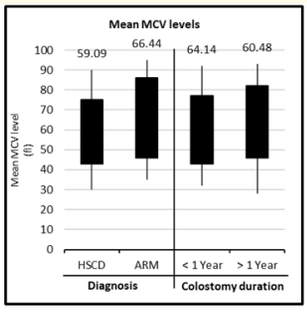

Figure 1B: A diagnosis of HSCD was associated with a reduction in mean MCV levels. There was no significant difference noted based on colostomy duration.
MCV: Mean Corpuscular Volume.
fl: Femtoliters.
HSCD: Hirschsprung's Disease.

Figure 1: Hematologic parameters based on primary diagnosis and colostomy duration.

A population-based study done in Kenya in 2010 estimates the prevalence of anaemia in children to be at 28.8%. The higher rates of anaemia in Kenya are partly attributed to the low socioeconomic status among the general population which is reported in literature and also evident in our study [5]. Cumulatively, the prevalence of anaemia in this study was 43.7% with a higher prevalence of anaemia in ostomy patients than in the control group, 55% vs 32.5% respectively.

Studies have reported that the prevalence of anaemia in hospitalised children with bowel stomas is as high as 60% [6,7]. There are a number of factors gathered from literature that may lead to anaemia in patients with colostomies. First, there is mucosal bleeding which may be as a result of improperly fitting colostomy bags and frequent use of gauze dressing [1,3]. Additionally, vitamin K deficiency especially in the neonatal period may lead to bleeding in the immediate post-operative period [2]. Secondly, skin excoriation and peristomal dermatitis is associated with chronic blood loss which eventually leads to anaemia [1-3]. Lastly, colostomies are impacted with significant degrees of malnutrition which is associated with depletion of iron stores through inadequate dietary intake and impaired gut absorption leading to iron deficiency anaemia [1,2,8-10].

A primary diagnosis of HSCD was associated with lower haemoglobin concentrations than ARM. Children with HSCD suffer long term morbidity due to impaired gut function and motility as a pathophysiologic entity of disease. This usually manifests as a consequence of chronic constipation, poor appetite and enterocolitis [11]. Therefore, children with HSCD may have higher levels of malnutrition and consequently at a greater risk of anaemia. Secondly, the location of colostomy in HSCD was transverse as opposed to sigmoid in their ARM counterparts. It is likely that there is more skin excoriation given the nature of output from a more proximal site.

Poor stoma site care could explain high prevalence of anaemia, possibly associated with poor socioeconomic status coupled with the prohibitive costs of colostomy bags and other site care materials [12]. This is particularly worsened by the time factor with increased severity of anaemia expected in longer colostomy duration. Our study however did not show any significant differences in both Hb and MCV parameters when analysed against colostomy duration.

This study is not without limitations. The sample size is not large enough, therefore subgroup counts were not adequate to conduct standard analysis on associations. However, the evidence gathered from this study is adequate to generate hypothesis on further prospective studies on this subject.

Based on our findings we recommend anaemia screening on all patients with colostomies. Additionally, haematinics and proper colostomy care are important considerations in all children with stomas to ensure adequate haemoglobin levels despite the ongoing losses.

Conclusion

Anaemia was more prevalent in children with colostomies and especially those with a diagnosis of Hirschsprung disease. Identification and correction of anaemic states through screening, haematinics and colostomy care may mitigate the morbidity associated with anaemia.

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Conflict of Interest

None.

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