

Clinical profile and outcome of surgical management of anorectal malformations at a tertiary care hospital in Tanzania

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Abstract

Background: Anorectal malformations (ARM) are common congenital abnormalities in most parts of the world and its management remains a challenge to surgeons practicing in resource-limited setting. This study aimed to describe the clinical profile and outcome of surgical management of ARMs at a Tanzanian tertiary care hospital.

Methods: This was a cross sectional study (with a follow up component) of patients with ARMs admitted to Bugando Medical Centre (BMC) between May 2014 and April 2017. The study included all patients with ARMs in the neonatal period, those reported for definitive surgery and patients for colostomy closure after definitive surgery. Data was collected using a pretested coded questionnaire.

Results: A total of 109 patients (M: F ratio= 1:1.4) were studied. The median age at diagnosis was 50 days. The majority of patients, 78 (71.6%) were less than a year old. Most of the patients, 91 (83.5%) had major clinical type of ARMs. Associated congenital anomalies were recorded in 18 (16.5%) patients. The majority of patients, 64(58.7%) reported to hospital late in acute intestinal obstruction. Most of patients in this study, 107(98.2%) were initially managed by a preliminary colostomy before definitive treatment. Out of 109 patients with ARMs, only 39 (33.0%) underwent definitive operations. Of the 107 patients who had preliminary colostomy, only 28(26.2%) had their colostomies closed at the end of study period. The overall complication and mortality rates were 47.7% and 16.0%, respectively. Delayed presentation (>48 hours), associated congenital anomalies, prolonged duration of operation. Surgical site infections were the main predictors of mortality ($p<0.001$). Good results using Kelly's scoring system were obtained in 83.3% of surviving patients.

Conclusion: Anorectal malformations are common in our setting. The major type of ARMs is commoner than the minor type. The outcome of surgery is good when the patients present early at birth. Therefore there is need for increasing community awareness and among all healthcare workers who handle neonates to effect early presentation and therefore prompt management.

Keywords: Anorectal malformations, patterns, outcome, surgical management, Tanzania

Introduction

Anorectal malformations (ARMs) represent a spectrum of congenital abnormalities involving the distal anus and rectum as well as the urinary and genital tracts (Peña, 1995; Upadhyaya *et al.*, 2008; Osilo *et al.*, 2014). Defects range from the very minor and easily treated with an excellent prognosis, to those that are complex, difficult to manage, associated with other anomalies, and carries a poor prognosis (Peña & Hong, 2000; Levitt & Peña, 2007; Osilo *et al.*, 2014). ARM is the commonest cause of neonatal intestinal obstruction and poses challenges to paediatricians and paediatric surgeons practicing in resource-limited countries (Moore *et al.*, 2008). Globally, ARM is one of the most common congenital

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anomalies with an incidence of approximately 1 in 5,000 live births (Ratan *et al.*, 2004; Ahmed *et al.*, 2005; Leva *et al.*, 2013), but the incidence appears to be higher in African setting (Moore *et al.*, 2008). Males are more affected than females and may occur as a single abnormality or a combination of abnormalities (Rintala & Lindah, 1999; Ahmed *et al.*, 2005; Leva *et al.*, 2013). ARMs have been reported to be associated with other congenital anomalies in up to 70% of cases (Ratan *et al.*, 2004; Ahmed *et al.*, 2005; Leva *et al.*, 2013). The final prognosis and quality of life for children with ARMs depend, to a large extent, on the presence and severity of these associated anomalies (Ratan *et al.*, 2004). Early diagnosis, management of associated anomalies, and efficient meticulous surgical repair provide patients the best chance for a good functional outcome (Thapa *et al.*, 2013).

The classification of ARMs is crucial in determining the most appropriate surgical approach for each case (Stoll *et al.*, 2007; Osilo *et al.*, 2014). Various methods of classification and surgical correction have been described and evolved over the years (Gupta, 2005). However, today, the criteria adopted by the Krickenbeck conference in 2005 are the gold standard for classification of ARMs (Holschneider *et al.*, 2005).

In developing countries such as Tanzania, the management of ARMs pose a diagnostic and therapeutic challenge. Late presentation with attendant complications, limited access to trained paediatric surgeons and the lack of facilities for prompt diagnosis of associated congenital anomalies characterize the poor management of this disease. The conventional approach to surgical repair of most ARMs involve a multi-stage repair, the initial colostomy creation followed by definitive pull-through and eventual colostomy closure (Thapa *et al.*, 2013). The surgical approach to repairing anorectal defects has changed dramatically since 1980s with the introduction of the posterior sagittal anorectoplasty (Peña & Devries, 1982; Peña, 1985; Osilo *et al.*, 2014). Posterior sagittal anorectoplasty is currently the most commonly utilized procedure for repairing ARMs (Devries & Peña, 1982; Peña, 1985; Osilo *et al.*, 2014). However, in low-income countries due to lack of trained paediatric surgeons and equipment in most of the centres, this procedure is performed only in specialized centres.

Despite the fact that ARMs are prevalent in Tanzania; little work on this subject has been done. This is partly due to a paucity of published local data regarding the subject under study and lack of community awareness on the importance of early reporting a new born child to hospital for early diagnosis and treatment. This study was carried out to describe the clinical profile and outcome of surgical treatment and to identify prognostic factors among patients with ARMs at Bugando Medical Centre in north-western Tanzania. The study also highlights the challenges associated with the care of these patients and appropriate solutions for improved outcomes.

Methods and patients

Study design and setting

This was a cross sectional study (with a follow up component) of patients with ARMs admitted to Bugando Medical Centre (BMC) between May 2014 and April 2017. The study was conducted in the emergency department, neonatal, paediatric, surgical wards and surgical clinics. Bugando Medical Centre is the only tertiary health institution serving the whole of the north-western part of Tanzania, serving a population of about 13 million. It is an 890 bed referral hospital located in Mwanza City on the southern border of Lake Victoria. It is also a teaching hospital for the Catholic University of Health and Allied Sciences (CUHAS).

Study population

The study included all patients presenting to BMC with anorectal malformations in the neonatal period, those reported for definitive surgery and patients for colostomy closure after definitive

surgery. Patients who died before surgical treatment were excluded from the study. The minimum sample size of this study was calculated using Yamane (1973) formula. Convenience sampling of patients who met the inclusion criteria was performed until the sample size was reached.

Recruitment of patients was done at Emergency Department, in the neonatal ward, in the paediatric medical and surgical wards and thereafter followed up at the paediatric surgical outpatient clinic. Patients who met the inclusion criteria were consecutively enrolled in the study. The diagnosis of ARM was made using a combination of clinical and radiological assessments and classified according to Krickenbeck classification (Holschneider *et al.*, 2005). Prone cross table lateral film was done in children without visible fistula to diagnose the types of ARM. Abdominal ultrasound was done to detect any other abdominal pathology associated with ARM. The echocardiography was done in patients suspected to have cardiac anomalies.

Preoperatively, all patients who presented with acute intestinal obstruction had intravenous fluids to correct fluid and electrolyte deficits; nasogastric suction and broad spectrum antibiotic coverage. After resuscitation all patients under general anaesthesia were subjected to either emergency diverting colostomy to decompress the bowel or primary anoplasty and anal dilation. Patients presenting electively also underwent similar treatment pattern. Definitive surgical procedures were performed in patients who had initial diverting colostomy, at least at the age of one year when the child is gaining weight, thriving well and having haemoglobin of at least 10 g/dl. Anoplasty was done in the neonatal period. The definitive pull-through operations included abdomino-perineal pull-through, posterior sagittal anorectoplasty (PSARP) and posterior sagittal anorectovaginourethroplasty (PSARVU) in patients with persistent cloacae. PSARP was performed according the procedure described by Peña and Devries (1982). Associated congenital malformations were treated accordingly.

Postoperatively patients were kept nil orally till return of bowel sounds and at that time nasogastric tubes were removed. Parenteral antibiotics were used for up to one week. Oral feeds and wound inspection/warm saline irrigation was commenced on the second post-operative day. Serial anal dilatation started on the seventh post-operative day was demonstrated to the parents who were to continue with it at home. The babies were thereafter discharged to follow-up at the surgical outpatient clinic. The programme of serial anal dilatation continued till the desired size of the neo-anus was reached. Colostomy closure was usually done 2-3 months after the definitive surgery in most of cases.

The results of the definitive pull through procedures were graded as good, fair or poor according to the Kelly's (1972) clinical score of continence which uses three basic parameters as follows; (A) Continence (Normal, no soiling = 2, Occasional accidents, faeces/flatus escape = 1, No control, frequent accidents = 0) (B) Staining (Always clean=2, Occasional staining = 1, Always stained =0) and (C) Sphincter (Strong and effective squeeze = 2, Weak and partial squeeze = 1, No contraction = 0). An overall score of 5-6 is considered good, 3-4 fair, and 0-2 poor.

Data collection

Data on each patient was collected and entered into a pretested coded questionnaire prepared for the study. Data entered in the questionnaire included: demographic profile (age, sex, area of residence), timing of diagnosis (given in hours or days of life), types of ARM and associated congenital anomalies, clinical presentation, treatment offered and treatment outcome (post-operative complications, length of hospital stay and mortality). Delayed diagnosis was defined as diagnosis made after 48 hours of life.

Data analysis

Data analysis was performed using statistical package for social sciences (SPSS) version 20.0 for Windows (SPSS, Chicago IL, USA). Chi-square (χ^2) test was used to test for the significance of association between the independent (predictor) and dependent (outcome) variables in the categorical variables. The level of significance was considered as $p < 0.05$. Study variables that were found to be statistically significant in univariate analysis were subjected to multivariate logistic regression analysis. Multivariate logistic regression analysis was used to determine predictor variables that predicted the postoperative complications, hospital stay and mortality. Patients were followed up for a period of three to six months or till death whichever is earlier

Ethical considerations

The approval to carry out the study was sought from the surgical department and the Joint CUHAS/BMC Research, Ethics and publication committee (CREC/178/2017). Permission to conduct the study was obtained from the hospital authority. In this study parents, guardian or informants had to sign an informed written consent for the study on behalf of their children. Parents, guardian or informants were assured that the information collected was maintained under strict confidentiality. The study did not interfere with the decision of the attending doctor.

Results

Socio-demographic characteristics

During the period of study, a total of 593 patients with major congenital malformations were managed at Bugando Medical Centre. Of these, 116 (19.6%) patients representing of cases were diagnosed and treated for ARMs. Out of 116 patients with ARMs, seven were excluded from the study due to failure to meet the inclusion criteria. Thus, 109 patients were available for the final analysis. Forty-five (41.2%) were males and 64 (58.7%) were females giving a male to female ratio of 1: 1.4. The age at diagnosis ranged between one day and 4 years with a median age of 50 days (interquartile range= 48 to 54 days). The majority of patients, 78(71.6%) were less than a year old. Ninety-four (86.2%) of the parents of these patients came from rural areas located a considerable distance from the hospital.

Krickenbeck classification and types of ARMs

According to the Krickenbeck classification of ARMs (Holschneider *et al.*, 2005), the majority of patients, 91(83.5%) had major clinical type of ARMs and 18 (16.5%) had minor clinical type (Table 1).

Table 1: Distribution of patients according to Krickenbeck classification of ARMs

Type of ARM	Major, n (%)	Minor, n (%)	Total, n (%)
Cloacae	3 (2.8)	0 (0.0)	3 (2.8)
Recto-vestibular fistula	35 (32.1)	0 (0.0)	35 (32.1)
Recto-vesicle fistula	5(4.6)	0(0.0)	5(4.6)
Imperforate anus (ARM without fistula)	8(7.3)	0(0.0)	8(7.3)
Anal stenosis	7(6.4)	0(0.0)	7(6.4)
Recto-vaginal fistula	0(0.0)	15(13.8)	15(13.8)
Recto-urethral Fistula	25(22.9)	0(0.0)	25(22.9)
• Bulbar fistula	13(11.9)	0(0.0)	13(11.9)
• Prostatic fistula	12 (11.0)	0(0.0)	12(11.0)
Perineal fistula	8(7.3)	0(0.0)	8(7.3)
H- type Fistula	0 (0.0)	1(0.9)	1(0.9)
Rectal atresia	0(0.0)	2 (1.8)	2 (1.8)
Total	91(83.5)	18(16.5)	109(100.0)

Associated congenital anomalies

Out of 109 patients in this study, 18 (16.5%) had other associated congenital anomalies. The major associated anomalies consisted of vertebral anomalies in 3(16.7%) patients, cardiovascular and musculoskeletal anomalies in 7(38.9%) and 8(44.4%) patients, respectively.

Clinical presentation

The majority of patients, 64 (58.7%) reported to hospital late (>24 hours) in acute intestinal obstruction. Female patients were more likely to present late compared to their male counterparts and this was statistically significant ($p = 0.004$). Failure to pass stool per anus and absence of anus were the most common clinical presentations (Table 2).

Table 2: Distribution of patients according to clinical presentation (N=109)

Clinical presentation	Frequency	Percentage
Failure to pass stool per anus	89	81.7
Absence of anus	82	75.2
Passage of stool from abnormal sites	74	67.9
Abdominal distention	68	62.4
Vomiting	22	20.2
Fever	18	16.5

Note: most patients had multiple responses

Surgical management

Most of patients in this study, 107 (98.2%) were initially managed by a preliminary colostomy before definitive treatment. Of these, 87 (81.3%) were placed in the sigmoid colon (sigmoid colostomy) and the remaining 20 (18.7%) in the transverse colon (transverse colostomy). The other parts of the colon were not involved. Out of 107 patients with colostomies, 79 (73.4%) had double barrelled colostomy, 20 (18.3%) had loop colostomy, 5 (4.6%) had end colostomy and 4 (3.7%) had spectacle type of colostomy. The majority of patients, 75 (68.8%) were operated on emergency basis and the remaining 34 (31.2%) were operated electively. The majority of colostomies were performed by junior doctors in 84.4% of cases (92 colostomies). Only 17 (15.6%) colostomies were performed by senior doctors (specialist/consultant surgeons). The two patients who had anoplasty done were operated on by senior doctors.

Out of 109 patients with ARMs, only 36 (33.0%) underwent definitive operations. The definitive operations included posterior sagittal anorectoplasty (PSARP) in 28 (77.8%) patients, abdomino-perineal pull-through in 6 (16.7%) patients, posterior sagittal anorectovaginourethroplasty (PSARVUP) in 3(8.3%) patients who had persistent cloacae. The remaining two (5.6%) patients were managed by primary anoplasty (in the neonatal period) and serial anal dilatation. All the definitive operations were performed by senior doctors.

Out of 107 patients who were managed by a preliminary colostomy, only 28 (26.2%) had their colostomies closed at the end of study period and the remaining 79(73.8%) colostomies were not yet closed; 56 as they were still waiting for definitive treatment, 18 died before colostomy closure and 5 were lost to follow up. The majority of colostomies, 20 (71.4%) were closed intraperitoneally and the remaining 8(28.6%) were closed extraperitoneally. Colostomy closure was performed by complete resection of the colostomy site and end to end anastomosis done in 22 (78.6%) patients and by surgical debridement of the colostomy edge and simple closure of the opening in the colon in 6 (21.4%) patients. The majority of colostomy closure was performed by junior doctors in 24 (85.7%) patients and the remaining 4 (14.3%) patients had their colostomy closure done by senior doctors (specialist/

consultant surgeons). The time interval from definitive pull through to colostomy closure ranged from 1 month to 8 months with a median of 3 months (interquartile, 2 to 6 months).

Treatment outcome

Of the 109 patients, 52 developed postoperative complications giving a complication rate of 47.7%. These were classified as colostomy-related complications, complications related to definitive operations, complications related to colostomy closure and general postoperative complications. A total of 34 colostomy-related complications were recorded in 107 patients with colostomy giving a complication rate of 31.8%. Of these, colostomy prolapse was the most common complication related to colostomy formation (Table 3).

Table 1: Distribution of patients according to colostomy-related complications (N=34)

Colostomy related complications	Frequency	Percentage
Prolapse	11	32.4
Skin excoriation	9	26.5
Bleeding	5	14.7
Retraction	3	8.8
Stenosis	2	5.9
Para-stomal hernia	2	5.9
Necrosis	1	2.9
Intestinal obstruction	1	2.9

Malnutrition with failure to thrive was observed in all (20) patients who had transverse colostomy. Colostomy revision was needed in 18 colostomies (52.9%). Of these, eleven of them had prolapsed, three had skin excoriation, two had stenosis, two had parastomal hernia and one had necrosis and intestinal obstruction each respectively. The complication rate was significantly common in transverse colostomy than in sigmoid colostomy (16.8% versus 2.5%; $p < 0.001$). Colostomy-related complication rate was also found to be significantly higher in colostomies performed by junior doctors than in those colostomies performed by senior doctors (specialist/consultants) ($p < 0.001$). The overall colostomy-related complication rate in this study was also found to be statistically significantly higher in loop than in double barrel colostomies (25.2% versus 4.6%; $p < 0.001$).

Out of 52 postoperative complications, 12 (23.1%) were related to definitive operations. Of these, surgical site infection (SSI) was the most common complication accounting for 41.7% of cases (Figure 1).

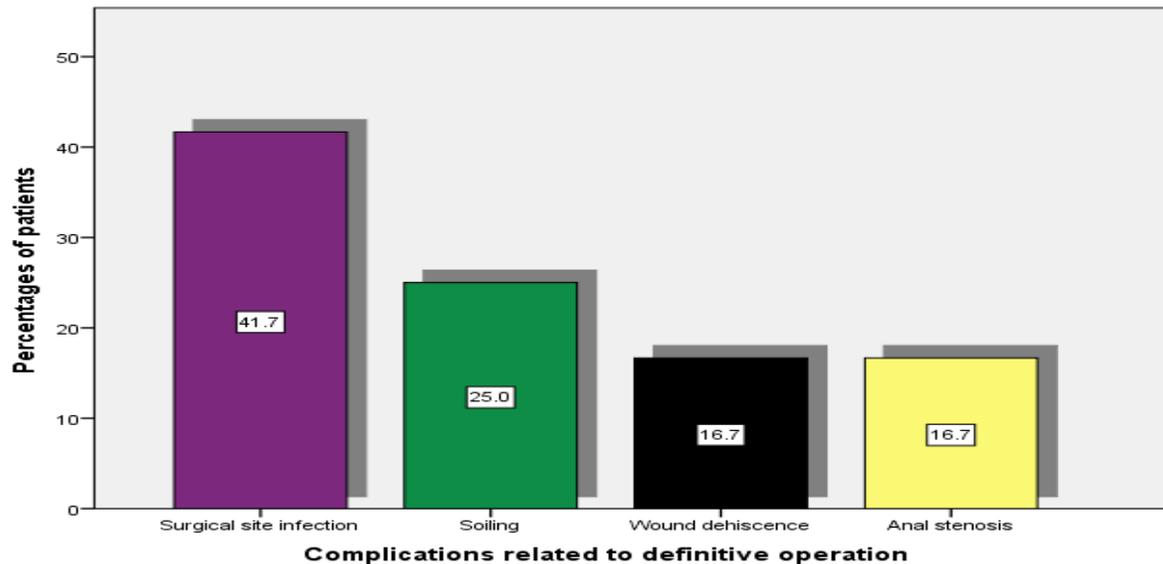


Figure 1: Distribution of patients according to complications related to definitive operations

Complications related to colostomy closure (4) and general postoperative complications (2) were observed among the in 28 patients. Complications related to colostomy closure were surgical site infection, wound dehiscence and enterocutaneous fistula. General postoperative complications were associated with urinary tract infections (1) and aspiration pneumonia (1).

The overall length of hospital stay (LOS) after colostomy formation ranged from 4 days to 18 days with a median of 6 days (interquartile range, 4 to 8 days). The overall median duration of hospitalization following definitive pull through was 20 days (interquartile range, 18 to 22) days (range 1 day to 48 days). The overall length of hospital stay following colostomy closure ranged from 1 to 16 days with a median of 7 days (interquartile range, 5 to 10 days). Patients who developed complications stayed longer in the hospital and this was statistically significant ($p < 0.001$).

In this study, a total of 18 patients died giving a mortality rate of 16%. Out of the 18 deaths, eight were due to complications related to colostomy formation, seven due to complications related to definitive treatment and three were due to complications related to colostomy closure. According to multivariate logistic regression, delayed presentation (>24 hours) (OR = 2.9, 95% CI (1.4-4.7), $p = 0.021$), associated congenital anomalies (OR = 1.9, 95% CI (1.1-5.2), $p = 0.001$), prolonged duration of operation >3 hours (OR = 6.7, 95% CI (3.8-10.2), $p = 0.012$), surgical site infection (OR=5.5, 95% CI (3.1-8.9), $p = 0.000$) were the main predictors of mortality. Out of ninety one survivors, 89 (97.8%) patients were discharged well. Two (2.2%) patients were discharged against medical advice. No patient reported to have permanent disabilities. Of the 36 patients who had definitive treatment, 33 (91.7%) were available for follow up for three to twelve months after discharge and the remaining 3 (8.3%) patients were lost to follow up. According to the Kelly's clinical score of continence, out of 36 survivors who had definitive operation, 30 (83.3%) had good results with fully continent of stools after surgery, two (5.6%) had fair results and the remaining one (2.8%) had poor results.

Discussion

ARMs remains one of the most common group of anomalies in Tanzania (Mashuda *et al.*, 2014). In this study, anorectal malformations accounted for 19.6% of the cases with congenital abnormalities admitted during the period of study, a figure which is low compared to 24.7% that has been reported in Uganda by Birabwa-Male (2004). In Nigeria, ARM has been identified as the third most common cause of neonatal intestinal obstruction (Moore *et al.*, 2008). We could not establish the reason for this difference. The female preponderance in this study agrees with what was reported by Birabwa-Male (2004) in Uganda, but contrasts with what is reported in literature where males predominate (Rintala & Lindah, 1999; Ahmed *et al.*, 2005; Leva *et al.*, 2013). Bhargava *et al.* (2006) in India reported that ARM occurred equally among males and females. We could not find in literature the reasons for this gender differences and this warrants further investigation.

ARMs have been reported to range from minor easily treated defects that have an excellent functional prognosis to complex defects that are difficult to manage (Peña & Hong, 2000; Levitt & Peña, 2007; Osilo *et al.*, 2014). The classification of ARMs is of paramount importance in order to properly group the malformations with a view to improve its management (Stoll *et al.*, 2007; Osilo *et al.*, 2014). The classification of this disease attempts to group together ARMs that have common diagnostic, therapeutic, and prognostic features (Gupta, 2005; Holschneider *et al.*, 2005). In our study, ARMs were classified as major and minor clinical types (Holschneider *et al.*, 2005). The major clinical type of ARMs was most prevalent, which is in consonance with global experience (Holschneider *et al.*, 2005).

Associated congenital anomalies in neonates with anorectal malformation assume significance, as survival and prognosis depends upon the number and severity of the associated anomalies (Ahmed *et al.*, 2005; Leva *et al.*, 2013). Various studies have reported the incidence of associated anomalies with ARM to be 30 to 70% cases (Ratan *et al.*, 2004; Ahmed *et al.*, 2005; Leva *et al.*, 2013). In the present study, the associated congenital anomalies were recorded in 16.5% of patients, a figure which is significantly lower than that reported by Makanga *et al.* (2007) in Rwanda. This low incidence of associated congenital anomalies in our study may be due to the fact that our ARM patients were not routinely screened for associated anomalies soon after their admission. This may be contributed by lack of screening facilities in our emergency services as a result most of associated congenital anomalies in our study were diagnosed clinically.

In agreement with other studies in low-income countries (Birabwa-Male, 2004; Makanga *et al.*, 2007), more than half of patients in the current study reported to hospital late in acute intestinal obstruction which required emergency surgical intervention. This can be explained by the fact that more than 85% of the parents of these patients came from the rural areas located a considerable distance from the study site which is in keeping with what was reported by Makanga *et al.* (2007) in Rwanda. This observation has an implication on accessibility to health care facilities and awareness of the disease. Also, ignorance and inability to afford hospital fees may explain the choices that are made by the parents.

Colostomy has long been a common preliminary treatment in the surgical management of many congenital and acquired conditions of gastrointestinal tract among children, and many are done on an emergency basis (Liu *et al.*, 2004; Sheikh *et al.*, 2006). Preliminary colostomy is a lifesaving procedure and plays a vital role in the management of wide range of congenital and acquired gastrointestinal conditions in paediatric population (Patwardhan *et al.*, 2001; Peña *et al.*, 2006; Ameh *et al.*, 2006; Osifo *et al.*, 2008; Chalya *et al.*, 2011). Consistency with other studies in developing countries (Ameh *et al.*, 2006; Osifo *et al.*, 2008), the majority of patients in this study were managed by a preliminary colostomy before definitive treatment and more than two third were operated on emergency basis. The practice of surgical operation under protective colostomy is useful as it can reduce the rate of postoperative complications and perhaps allow for satisfactory sphincter

function/continence and therefore excellent aesthetics (Osifo *et al.*, 2008). Palliative colostomy allowed for adequate weight gain and stabilization of the patients for later successful definitive operations. In our study, only one third of patients had definitive operations done at the end of the study. The low incidence of definitive operations in our study may be due to the fact that the majority of patients were less than a year and definitive surgery was usually performed at the age of 1 year. Also death before definitive treatment and loss to follow up may have contributed to the low incidence of definitive operations in our study.

Although three stage surgeries have been in practice in the management of ARMs and have been known to be most effective in preventing complications, recently many authors have opted for primary PSARP (Peña & Devries, 1982; Peña, 1985; Ratan *et al.*, 2004; Osilo *et al.*, 2014). Mirshemirani *et al.* (2007) in their series of 30 new-borns with ARM underwent primary PSARP and showed it to be safe and effective in new-borns. At Bugando Medical Centre, we are not yet able to do primary PSARP in patients with high and intermediate ARM as most of the cases come late, dehydrated, and abdominal distension. Moreover post-operative care for primary PSARP is still difficult due to high chance of wound infection. Though the definitive surgery PSARP in advanced centres are done at early infancy, in our centre we prefer to perform PSARP at around one year of age as the chances of sepsis is higher in early age and the anatomy is clearer while separating fistula. Colostomy closure is done after adequate size of anus is reached with anal dilation as many cases come in follow-up without regular anal dilation.

The presence of complications has an impact on the final outcome of patients presenting with ARM. In this study, the overall complication rate was found to be 47.7%, a figure which is higher than that reported by other authors (Adejuyigbe *et al.*, 2004; Uba *et al.*, 2006; Khan *et al.*, 2011). The reason for the high overall complication rate in this study may be attributed to late presentation as a result of the majority of patients came to hospital in poor general condition. In our series, the majority of complications were related to colostomy formation. The high rate of colostomy related complications in our study can be explained by the fact that the vast majority of colostomies were performed by junior doctors who may have little experience in colostomy formation. In this study, the mortality rate was 16.0%. This figure is higher than that has been reported by others (Adejuyigbe *et al.*, 2004; Uba *et al.*, 2006; Khan *et al.*, 2011). The high mortality rate in this study was attributed to delayed presentation, presence of associated congenital anomalies, prolonged duration of operation (> 3 hours) and surgical site infections. Addressing these factors responsible for high mortality in our patients is mandatory to be able to reduce mortality associated with this disease.

According to the Kelly's clinical score of continence, more than three quarter of our patients had good results with fully continent of stools after definitive surgery. Although we do not have facilities such as anorectal manometer for measuring sphincter function in these patients clinical history and examination revealed that most of our patients are continent. Soiling was a major late complication of both procedures observed during the follow up period. But it has been observed that the problem tended to lessen as the child grew older and with careful dietary selection. However, since our duration of follow up was limited to only three years, we could not estimate the long term outcome of treatment. This calls for further studies particularly at our centre to assess the long term outcome of treatment of this disease.

In conclusion, anorectal malformations are common in the study area. The major type of ARMs is commoner than the minor type. The outcome of surgery is good when the patients present early at birth. Therefore there is need for increasing community awareness and among all healthcare workers who handle neonates to effect early presentation and therefore prompt management

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