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Original Research Article

The Clinical Patterns and Short Term Treatment Outcomes of Congenital Anterior Abdominal Wall Defects, at Bugando Medical Centre, Mwanza, Tanzania

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Abstract: ***Background*:** Congenital anterior abdominal wall defects (CAAWDs) are common congenital abnormalities and their management remain a diagnostic and therapeutic challenge to surgeons practicing in resource-limited setting. We aimed to describe the clinical patterns and short term treatment outcomes of CAAWDs at BMC. ***Methods***: This was a longitudinal prospective study that included all patients aged less than 18 years of age, admitted with CAAWDs at BMC during the period of study. Ethical approval to conduct the study was obtained from relevant authorities. Data was collected using a structured, coded and pretested questionnaire and analyzed using STATA version 15. ***Results*:** We enrolled a total of 130 patients (M: F ratio= 1.1: 1). The median age at diagnosis was 13.5 months. The majority of patients, 65 (50.0%) were aged ≤ 12 months old. Associated congenital anomalies were reported in 30.4% and 38.5% of cases of omphalocele and gastroschisis respectively. None of the patients had a prenatal diagnosis of CAAWDs. More than half of patients were treated surgically and the remaining were treated non-operatively. Complication rate was 40.8% and sepsis was the most frequent complication in 43% of cases. Prematurity ($p = 0.002$), low birth weight ($p <0.001$), gastroschisis ($p< 0.001$), ASA III ($p = 0.005$), treatment modality ($p < 0.001$) and presence of associated congenital anomalies ($p = 0.034$) were significantly associated with complications. The median length of hospital stay was 15 days and was significantly longer in patients with omphalocele ($p < 0.001$), associated congenital anomalies ($p= 0.001$), ASA class III ($p= 0.032$) and in patients who were treated non-surgically ($p < 0.001$). The overall mortality rate in this study was 30.0% and it was significantly associated with prematurity ($p<0.001$), low birth weight ($p < 0.001$), home delivery ($p = 0.025$), gastroschisis ($p<0.001$), treatment modality ($p < 0.001$), presence of associated congenital anomalies ($p < 0.001$) and ASA class III ($p = 0.027$). ***Conclusion*:** CAAWDs are common in our setting and the majority of patients presented late, with complications and poor general condition that resulted in poor outcome. The outcome of non-operative treatment is poor as majority of patients present late to our centre. Therefore, there is a need for increasing community awareness and among all healthcare workers who handle neonates to effect early presentation and therefore prompt management.

Keywords: Congenital Anterior Abdominal Wall Defects, Gastroschisis, Omphalocele, Ventral Hernia, Clinical Patterns, Short Term Treatment Outcomes.

INTRODUCTION

Background

Congenital anterior abdominal wall defects (CAAWDs) represent a wide spectrum of congenital abnormalities that allow abdominal contents to herniate (or protrude) through an unusual opening on the abdominal wall [1]. Defects range from a very small and easily treated with an excellent prognosis, to those that are large, complex, and difficult to manage, which may be associated with other anomalies, and carry a poor prognosis [1, 2]. CAAWDs remain a source of significant morbidity and mortality, despite the advances

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in neonatal and pediatric surgical care [2]. In many low and middle income countries (LMICs), the reported mortality is 30–100% [3-5], while in high-income countries (HICs), mortality in infants with major abdominal wall defects is less than 5% [6, 7].

Globally, the overall incidence is 6 cases per 10,000 births [1]. The incidence in sub-Saharan Africa region including Tanzania has is yet to be determined as no population-based studies of the region have been conducted [5-8]. Reports on the incidence of congenital anomalies in the developing world should be taken with caution, because there are no birth defect registries in most of these countries, there is deficiency in diagnostic capabilities and medical records are not reliable and this might increase the chances of underestimation. At BMC, congenital anterior abdominal wall defects are a common indication for pediatric surgical admission and contribute significantly to high morbidity and mortality [9].

The clinical patterns of congenital anterior abdominal wall defects present a wide range of congenital anomalies. The most common CAAWDs in this group are gastroschisis, omphalocele and ventral hernias (umbilical and inguinal) [10]. CAAWDs can be diagnosed in pregnancy by using obstetric ultrasonography assessment, and nowadays, the use of obstetric ultrasound has increased their rate of detection [11, 12]. Prenatal detection of these anomalies with ultrasound (US) is important for patient management, because they all differ greatly regarding associated structural anomalies and perinatal as well as neonatal morbidity and mortality [11-13].

The treatment of CAAWDs constitutes a great diagnostic and therapeutic challenge to pediatric surgeons practicing in resource-limited countries such as Tanzania. Late presentation with attendant complications, limited access to trained pediatric surgeons and lack of facilities for prompt diagnosis of associated congenital anomalies characterize the poor management of this disease. The management of CAAWDs is still a challenge in pediatric surgery due to viscera-abdominal disproportion, large defects of abdominal wall and immature abdominal cavity [8-14]. CAAWDs present a great challenge when it is large, ruptured, or associated with other anomalies [14].

The current treatment options of CAAWDs consist of surgical closure depending on the size of the defect [15]. In patients with small defects, primary closure may be easily accomplished, but when primary closure is not possible due to large defect, staged closure is a safe alternative creating a stable abdominal wall [15, 16]. However, in low-income countries due to lack of trained pediatric surgeons and equipment in most of the centres, the surgical procedures for these conditions are performed only in specialized centres.

The outcome of treatment of CAAWDs in LMICs is reported to be poor compared to the results of treatment to more developed countries [16]. This has been attributed to delayed presentation of disease coupled with lack of trained personnel and unavailability of diagnostic and therapeutic facilities, common features in resource-limited setting.

METHODS

Study Design and Duration

This was a longitudinal prospective study of patients with CAAWDs admitted and managed at Bugando Medical Centre (BMC) between September – 2021 and February –2022 (6 months).

Study Setting

The study was conducted in the neonatal and pediatric surgical wards of BMC. BMC is a consultant, tertiary and teaching hospital, for the Catholic University of Health and Allied Sciences-Bugando (CUHAS-Bugando). The hospital cares most of the congenital anomaly cases of the regions around Lake Victoria because of its capacity to offer specialized services. Participants were required to assent and their parents or care takers were required to provide written informed consent and had to be ≥18 years at the time of consent prior to enrollment. Study participants were prospectively enrolled between September – 2021 and February –2022 and each participant was followed up for outcomes to 30 days from admission.

Study Population and Eligibility Criteria

This study included all patients aged less than 18 years of age, admitted with CAAWDs at BMC during the period of study, who assented to the study and whose parents/caretakers signed a written informed consent form.

Sample Size Estimation and Sampling Technique

The minimum sample size was calculated using Yamane Taro (1973) formula [29], and the minimum sample size was 124 patients. Convenience sampling of patients who met the inclusion criteria was performed until the sample size was reached.

Data Collection

An interviewer based structured, coded and pre-tested questionnaire was administered to all study participants or their parents/caregivers if the participant was unable to communicate. The questionnaire captured socio-demographic information, mobile numbers, clinical type of CAAWDs, presence of associated congenital anomalies like gastrointestinal anomalies, defect parameters (size, nature of bowels, nature of sac or membrane), duration of symptoms before seeking care, duration of stay at referring facility, ode of surgery (Emergence/Elective), details of surgery (Type of procedure performed, duration of operation, rank of operating staff etc.)

Data Analysis:

Data were transferred from the questionnaires in full, and entered into Microsoft excel and then transferred to STATA version 15.0 (College Station, Texas, US) for analysis. Continuous variables were summarized and presented as means and standard deviation (SD) or medians with Interquartile Range (IQR). Categorical variables were summarized by proportions and frequency distribution tables. Pearson's Chi square test or Fisher's exact test were used to test for the significance of the association between the independent (predictor) and dependent (outcome) variables in the categorical variables. The length of hospital stay (LOS) was arbitrary categorized into ≤ 14 days and > 14 days (prolonged hospital stay). The level of significance of association was considered as $p < 0.05$ (5%).

RESULTS

Patient and Maternal Characteristics

During the study period, a total of 130 patients with CAAWD were recruited for eligibility of being enrolled into the study. No patient was excluded from the study. Thus, all 130 patients were available for the final analysis. Of the 130 patients, their ages ranged from 1-78 months with the median age of 13.5 [IQR 1-41] months. The majority of patients, 65(50.0%) were aged 12 months and below (Figure 1). Among the 130 patients, 68(52.3%) were males and 62(47.7%) were females giving a male to female ratio of 1.1: 1

Clinical Characteristics

In this study, ventral hernia was the most common diagnosis on admission accounting for 44.6% of cases (Figure 2). The majority of patients, (75.4%, 98/130) presented to hospital more than 24 hours since the illness.

Gastroschisis

Out of 130 patients with CAAWDs, 26(20.0%) had gastroschisis, with a mean defect size of 3± 0.71cm, majority of them were complex type with edematous and matted bowels. Associated anomalies mainly bowel atresia was noted in 10(30.5%) patients.

Omphalocele

There were 46(35.4%) patients diagnosed with omphalocele. Omphalocele minor were 30 (65.2%), while omphalocele major were 16 (34.8%), with a mean (±SD) size of the defect 5±1.46cm. There were 13 cases (28.3%) of syndromic omphalocele, 10(21.7%) of which were cardiac anomalies and 2(4.4%) Beckwith-Wiedemann.

Ventral Hernia

Out of 58 patients with ventral hernia, 25(43.1%) had umbilical hernia, 21(36.2%) had inguinal hernia, 6(10.3%) had epigastric hernia, 5(8.6%) had para-umbilical hernia and 1(1.7%) had incisional hernia. The majority of patients 40(69.0) had reducible hernias. The average hernia defect size (mean ± SD) was 4±1.08cm.

Operative Characteristics

Out of 130 recruited patients, 75(57.7%) patients underwent surgical treatment for CAAWDs and the remaining 55(42.3%) patients were treated non-operatively by reduction of herniated contents under Silo bag in patients with gastroschisis, while patients with omphalocoele were treated by antibiotics and dressing with Vaseline gauses and Zincast application. In all 75 patients who were operated. All patients with ventral hernias (58) were operated. Two patients out of 26 with gastroschisis, underwent operation, one underwent gastroschisis defect primary closure, the other one underwent reduction of the herniated contents under Silo bag then secondary closure was done. 15 patients out of 46 with omphalocoele were operated. Preoperatively all patients scheduled for surgery were assessed using the American Society of Anesthesiologists (ASA) pre-operative grading (Table 5) as follows; 65 (86.7%) patients had Grade I, 8(10.7%) patients had Grade II and 2(2.7%) patients had Grade III. Of those who underwent surgery, 16(21.3%) were operated on emergency basis while 59(78.7%) patients had an elective surgery. Figure 3 below shows distribution of patients according to the type of surgical procedures.

Treatment Outcomes and Associated Predicting Factors

Complications

Out of 130 patients included in the study, fifty-three developed 58 complications giving a complication rate of 40.8%. Of these, sepsis was the most common complication, accounting for 43% (Figure 4). Prematurity ($p = 0.002$), low birth weight ($p < 0.001$), gastroschisis ($p< 0.001$), treatment modality ($p < 0.001$) and presence of associated congenital anomalies ($p = 0.034$) were statistically significantly associated with complications.

Length of Hospital Stay (LOS)

The overall median duration of hospital stay in all the patients was 15 [(IQR, 11 -22 days) (range 2–45 days)]. The median duration of hospital stay in survivors was 32 [IQR, 26-38] days, compared to 8 days [IQR, 4-12 (mean 11.8 days in non-survivors) ($p = 0.015$)]. Table 7 below shows factors associated with prolonged LOS among patients with CAAWDs at BMC.

Mortality

In this study, a total of 39 patients died giving mortality rate of 30.0% with the highest case fatality among gastroschisis (92.3%) and omphalocele major (30.4%). Prematurity ($p<0.001$), low birth weight ($p < 0.001$), home delivery ($p = 0.025$), gastroschisis ($p<0.001$), treatment modality ($p < 0.001$), presence of associated congenital anomalies ($p < 0.001$) and ASA class III ($p = 0.027$) were statistically significantly associated with Mortality.

ADDITIONAL FILES

4.1 Patient and maternal characteristics

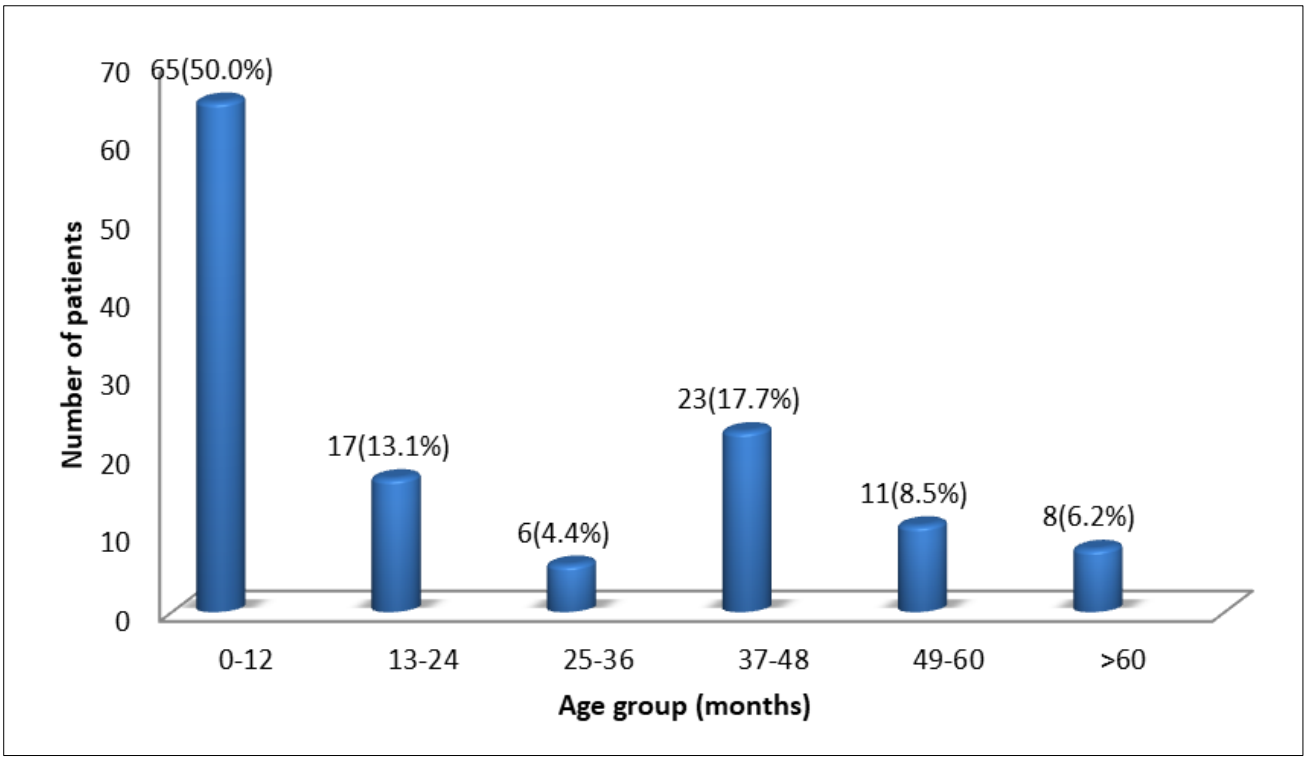

Figure 1: Age groups distribution among patients with CAAWDs

Table 1: Patient and maternal characteristics

Variables	Frequency	Percentage
Age group (Months)		
≤ 12	65	50.0
> 12	65	50.0
Sex		
Male	68	52.3
Female	62	47.7
Gestational age at birth(weeks)		
< 37	28	21.5
≥ 37	102	78.5
Birth weight (Kg)		
< 2.5	19	14.6
≥ 2.5	111	85.4
Place of Delivery		
Home	7	5.4
Dispensary	16	12.3
Health Centre	31	23.8
Hospital	76	58.5
Mode of delivery		
Vaginal	110	84.6
Caesarean	20	15.4
Prenatal obstetric ultrasound		
Done	4	3.1
Not done	126	96.9

4.2. Clinical Characteristics

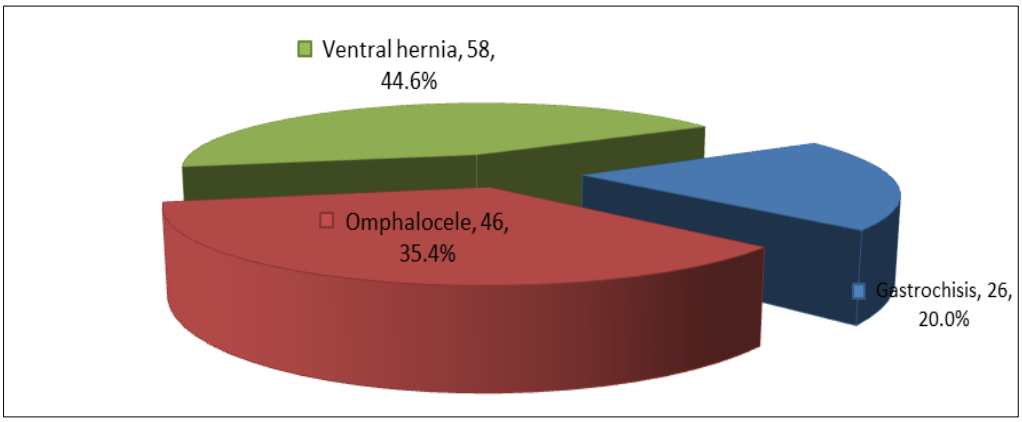

Figure 2: Distribution of patients according to diagnosis at diagnosis

Table 2: Clinical characteristics of patients with gastroschisis (N=26)

Variables	Frequency	Percentage
Nature of bowels		
Normal	3	11.5
Oedematous & matted	12	46.2
Gangrenous or necrotic	11	42.3
Gastroschisis type		
Isolated	3	11.5
Complicated or complex	23	88.5
Gastroschisis associated anomalies		
Bowel atresia	6	23.1
Intestinal malrotation	1	3.9
Undescended testis	3	11.5
Nil	16	61.5

Table 3: Clinical characteristics of patients with omphalocele (N=46)

Variables	Frequency	Percentage
Nature of sac or membrane		
Intact	24	52.2
Ruptured	1	2.2
Inflamed or infected	21	45.6
Omphalocele type		
Minor	30	65.2
Major	16	34.8
Omphalocele syndromicity		
Non syndromic	33	71.7
Syndromic	13	28.3
Omphalocele associated anomalies		
Beckwith-Wiedemann syndrome	2	4.4
Cardiac anomalies	10	21.7
GIT anomalies	1	2.2
Vascular anomalies (congenital hemangioma)	1	2.2
Nil	32	69.6

Table 4: Clinical characteristics of patients with ventral hernia (N=58)

Variables	Frequency	Percentage
Anatomical type of ventral hernia		
Umbilical	25	43.1
Para umbilical	5	8.6
Epigastric	6	10.3
Inguinal	21	36.2

Variables	Frequency	Percentage
Incisional	1	1.7
Clinical type of ventral hernia		
Reducible	40	69.0
Irreducible	11	19.0
Obstructed	2	3.5
Strangulated	5	8.6

4.4. Operative Characteristics

Table 5: American Society of Anaesthesiologists (ASA) Classification

ASA class	Description
I	Healthy individual with no systemic disease
II	Mild systemic disease not limiting activity
III	Severe systemic disease that limits activity but is not incapacitating
IV	Incapacitating systemic disease which is constantly life threatening
V	Moribund, not expected to survive 24 hours with or without operation

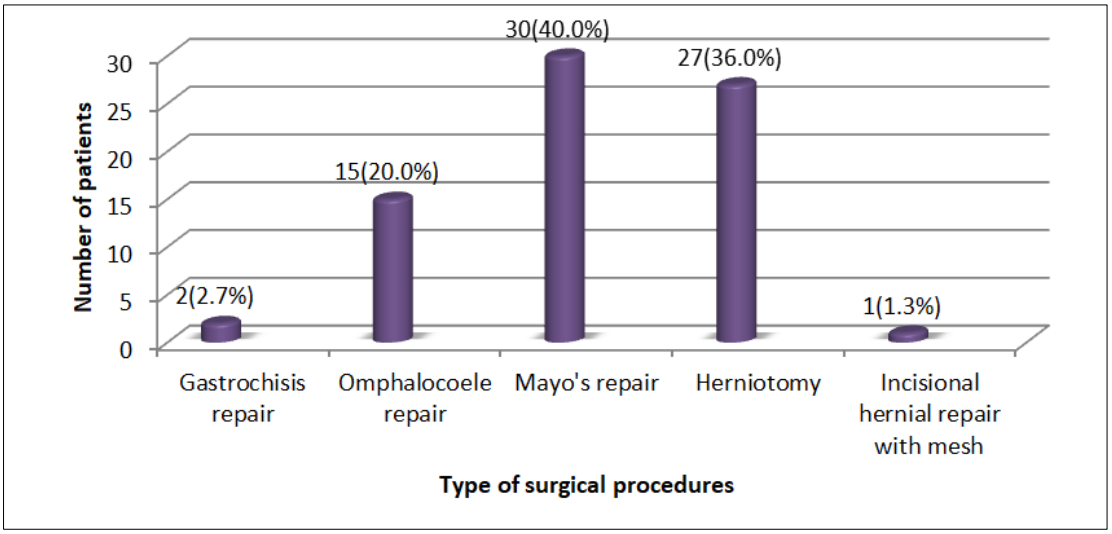

Figure 3: Distribution of patients according to the type of surgical procedures

4.5. Treatment Outcomes and Associated Predicting Factors

4. 5.1. Complications

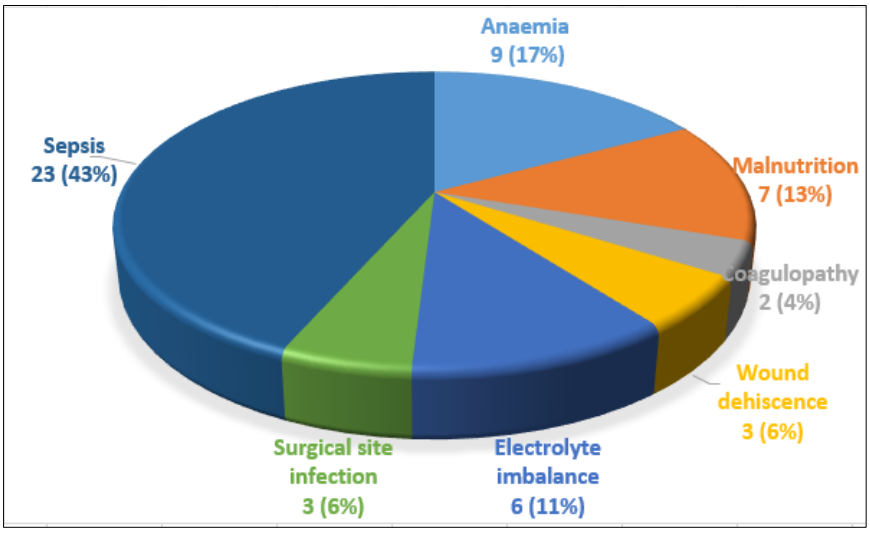

Figure 4: Distribution of patients according to the type of complications

Table 6: Distribution of complications according to clinical type of CAAWDs

CAAWDs	Gastroschisis (25/26)	Omphalocele (18/46)	Ventral hernia (10/58)
Complication	n (%)	n (%)	n (%)
Anaemia	5 (19.2)	3 (6.5)	1 (1.7)
Malnutrition	3 (11.5)	4 (8.7)	0 (0.0)
Coagulopathy	0 (0.0)	1 (2.2)	1 (1.7)
Wound dehiscence	0 (0.0)	1 (2.2)	2 (3.5)
Electrolyte imbalance	1 (3.8)	2 (4.3)	3 (5.2)
Surgical site infection	0 (0.0)	1 (2.2)	2 (3.5)
Sepsis	16 (61.5)	6 (13.0)	1 (1.7)

Table 7: Factors associated with Complication among patients with CAAWDs at BMC

Independent (predictor) variables	Complication		Chi-square	P value
	Yes	No		
	n (%)	n (%)		
Gestational age at birth(weeks)				
< 37	19(67.9)	9(32.1)		
≥ 37	34(33.3)	68(66.7)	10.8436	**0.002**
Birth Weight(kg)				
< 2.5	15(78.9)	4(21.1)		
≥ 2.5	38(34.2)	73(65.8)	13.4315	**<0.001**
Place of Birth				
Home	5(71.4)	2(28.6)		
Health Facility	48(39.0)	75(61.0)	2.8799	0.120
Mode of delivery				
Vaginal	45(40.9)	65(59.1)		
Caesarean	8(40.0)	12(60.0)	0.0058	1.0
Diagnosis				
Gastroschisis	25(96.1)	1(3.9)		
Omphalocele	24(52.2)	22(47.8)		
Ventral hernia	4(6.9)	54(93.1)	63.0628	**<0.001**
Treatment modality				
Operative	7(9.3)	68(90.7)		
Non operative	46(83.6)	9(16.4)	72.5460	**<0.001**
Timing of surgery (N=75)				
Emergency	4(25.0)	12(75.0)		
Elective	3(5.1)	56(94.9)	5.8993	**0.034**
Associated congenital anomaly				
Yes	20(83.3)	4(16.7)		
No	33(31.1)	73(68.9)	22.0829	**<0.001**

4.4.2 Length of Hospital Stay (LOS)

Table 8: Factors associated with LOS among patients with CAAWDS at BMC

Predictors	Length of Hospital Stay (days)		Chi-square	P value
	≤ 14	> 14		
	n (%)	n (%)		
Gestational age at birth(weeks)				
< 37	21(75.0)	7(25.0)		
≥ 37	75(73.5)	27(26.5)	0.0246	1.0
Birth Weight(kg)				
< 2.5	13(68.4)	6(31.6)		
≥ 2.5	83(73.8)	28(25.2)	0.5281	0.578
Place of Birth				
Home	6(85.7)	1(14.3)		
Health Facility	90(73.2)	33(26.8)	0.5396	0.675
Mode of delivery				
Vaginal	85(77.3)	25(22.7)		

Predictors	Length of Hospital Stay (days)		Chi-square	P value
	≤ 14	> 14		
	n (%)	n (%)		
Caesarean	11(55.0)	9(45.0)	4.3467	0.052
Diagnosis				
Gastroschisis	17(65.4)	9(34.6)		
Omphalocele	24(52.2)	22(47.8)		
Ventral hernia	55(94.8)	3(5.2)	25.3707	**<0.001**
Treatment modality				
Operative	69(92.0)	6(8.0)		
Non operative	27(49.1)	28(50.9)	30.2493	**<0.001**
Timing of surgery(N=75)				
Emergency	13(81.3)	3(18.7)		
Elective	56(94.9)	3(5.1)	3.1935	0.107
Associated congenital anomaly				
Yes	11(45.8)	13(54.2)		
No	85(80.2)	21(19.8)	11.9591	**0.001**

4.5.3. Mortality

Table 9: Factors associated with mortality among patients with CAAWDs at BMC

Predictors	Died		Chi-square	P value
	Yes	No		
	n (%)	n (%)		
Gestational age at birth(weeks)				
< 37	20(71.4)	8(28.6)		
≥ 37	19(18.6)	83(81.4)	29.1663	**<0.001**
Birth Weight(kg)				
< 2.5	15(78.9)	4(21.1)		
≥ 2.5	24(21.6)	87(78.4)	25.3871	**<0.001**
Place of Birth				
Home	5(71.4)	2(28.6)		
Health Facility	34(27.6)	89(72.4)	6.0467	**0.025**
Mode of delivery				
Vaginal	33(30.0)	77(70.0)		
Caesarean	6(30.0)	14(70.0)	<0.001	1.0
Diagnosis				
Gastroschisis	24(92.3)	2(7.7)		
Omphalocele	14(30.4)	32(69.6)		
Ventral hernia	1(1.7)	57(98.3)	70.1522	**<0.001**
Treatment modality				
Operative	1(1.3)	74(98.7)		
Non operative	38(69.1)	17(30.9)	69.3709	**<0.001**
Timing of surgery (N=75)				
Emergency	1(6.3)	15(93.7)		
Elective	0(0.0)	59(100.0)	3.7373	0.213
Associated congenital anomaly				
Yes	21(87.5)	3(12.5)		
No	18(17.0)	88(83.0)	46.3410	**<0.001**

Table 10: Factors associated with Outcomes among 75 Operated patients with CAADWs at BMC

Dependent variables	LOS			Mortality			Complication		
	≤ 14	> 14		Yes	No		Yes	No	
	n (%)	n (%)	P value	n (%)	n (%)	P value	n (%)	n (%)	P value
Timing of surgery									
Emergency	13(81.3)	3(18.7)		1(6.3)			4(25.0)	12(75.0)	
Elective	56(94.9)	3(5.1)	0.107	0(0.0)	59(100.0)	0.213	3(5.1)	56(94.9)	**0.034**

Dependent variables	LOS			Mortality			Complication		
	≤ 14	> 14		Yes	No		Yes	No	
	n (%)	n (%)	P value	n (%)	n (%)	P value	n (%)	n (%)	P value
Duration of operation									
≤ 2hrs	64(91.4)	6(8.6)		1(1.4)	69(98.6)		7(10.0)	63(90.0)	
> 2hrs	5(100.0)	0(0.0)	0.651	0(0.0)	5(100.0)	0.933	0(0.0)	5(100.0)	0.604
ASA Class									
I	62(95.4)	3(4.6)		0(0.0)	65(100.0)		3(4.6)	62(95.4)	
II	5(62.5)	3(37.5)		0(0.0)	8(100.0)		3(37.5)	5(62.5)	
III	2(100.0)	0(0.0)	**0.032**	1(50.0)	1(50.0)	**0.027**	1(50.0)	1(50.0)	**0.005**

DISCUSSION

Congenital anterior abdominal wall defects are among the major causes of neonatal and childhood morbidity and mortality in many countries around the world [1]. In this study, the median age at presentation was 13.5 months, which is contrary to findings in other studies where most of patients present to health facilities during neonatal period [14-21]. The finding of older age at presentation in the present study can be explained by the large number of patients with ventral hernia which are usually diagnosed later in life and usually present to health facilities only when their hernias become painful due to obstruction or strangulation. The male preponderance in this study agrees with what was reported by others [3-30], but contrasts with what is reported in literature where females predominate [4]. A study in Europe reported that CAADWs occurred equally among males and females [6]. We could not find in literature the reasons for this gender differences and this warrants further investigation.

In our study, only four (3.1%) patients had antenatal ultrasound scanning at least once during pregnancy. However, prenatal diagnosis was not made. This is similar to the finding of Abdur-Rahman *et al*., [30], who reported that despite the availability of antenatal ultrasound scanning in most centres in Nigeria, only one of seven cases of gastroschisis was diagnosed prenatally. However, ultrasound scanning is currently not recommended as part of the antenatal care package [31]. In our environment, we have observed that ultrasound often focuses on basic obstetrics parameters and evidence of fetal viability with little attention paid to the detection of congenital anomalies. The varying levels of reliability of some of the antenatal scans have also been identified as a potential problem [3]. We believe that improvement in prenatal diagnosis will improve the outcome, as proper planning for delivery and prompt post-partum care can be made.

Delayed presentation to tertiary pediatric surgery center is a major problem in the management of CAAWDs in low resource settings [32]. In the present study, in spite of the obvious anomalies such as gastroschisis and omphalocele, there was delay in presentation (as shown by age at presentation) because many of these children were delivered at peripheral health facilities of which most of them are in remote areas, or at home in remote villages, this is in agreement with other studies in most developing countries [3-14], late referral to our centre by healthcare workers at peripheral health facilities or may be due to lack of accessibility to health care facilities and awareness of the disease. Delayed presentation in the current study may have increased the morbidity and mortality, as factors like poor regulation of temperature and hydration status, improper care of the defect led to sepsis and vascular compromise of prolapsed gut during prolonged transportation, as observed in this and previous studies [5-34].

Associated congenital anomalies in patients with CAAWDs assume a great significance, as survival and prognosis depends upon the number and severity of the associated anomalies [35]. Various studies have reported the incidence of associated anomalies with CAAWDs to be 30 -70% [35-38]. In keeping with other studies [35-38], associated congenital anomalies in this study was reported in 30.4% and 38.5% of cases of omphalocele and gastroschisis respectively. These figures are lower than that reported in literature [36-38]. This low incidence of associated congenital anomalies in our study may be due to the fact that, our study had small sample size compared to other studies [36-38], thus giving low incidence of associated congenital anomalies, some of our CAAWDs 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 this study, the presence of associated congenital anomalies was associated with poor outcomes among patients with CAAWDs.

In this study, more than half of patients were treated surgically; this included all patients with ventral hernia, 15 patients with omphalocele and only 2 patients with gastroschisis. Fifty-five patients were treated non-operatively. The low rate of surgical intervention in these patients is attributed to, the recommended treatment modality for patients with gastroschisis and omphalocele which is non-surgical, except for the small exposed intestines and small defects, [23-28]. The low incidence of surgical management in patients with gastroschisis and those with omphalocele can also be explained by the

fact that most babies were not fit for primary closure under general anesthesia as the immediate post-admission care was centered on proper resuscitation. Presence of associated congenital anomalies (especially severe and complex congenital cardiac anomalies) in patients with omphalocele rendered some of patients unfit for immediate surgical closure, hence were managed conservatively by antibiotics and dressing with Vaseline gauses and Zincast application, to allow sac granulation. Also, the presence of significant bowel edema and concomitant risk of bowel ischemia/compartment syndrome precluded attempts at primary closure in patients with gastroschisis. These were treated non-operatively by reduction of herniated contents under Silo bag in patients with gastroschisis, while patients with omphalocoele were treated by antibiotics and dressing with Vaseline gauses and Zincast application, the late presentation to the pediatric surgeon, which is a reflection of the low level of health awareness in our community. The late presentation may lead to increasing edema of the bowel wall and increased risk of bowel ischemia/compartment syndrome which clearly reduces the chances of surgical treatment [39]. Intensive health education with a view of promoting increased health awareness and encouraging early presentation of patients to hospital will reduce the morbidity and mortality associated with the disease.

Non-availability of parenteral nutrition was a significant challenge encountered in this study. An international survey reported that only 19% of tertiary pediatric surgery centers in low-income countries had access to parenteral nutrition [43]. Wright and colleagues [44], rightfully noted that the challenges to the provision of parenteral nutrition in LMICs include lack of infrastructure and availability of neonate-specific parenteral nutrition bags, difficulty in achieving central venous access and shorter bench life of neonatal parenteral nutrition where available. Early enteral feeding has been proven to be beneficial in patients with CAAWDs. This will be especially important in our setting where parenteral nutrition is not readily available.

The presence of complications has an impact on the final outcome of patients presenting with CAAWDs [30]. In this study, the overall complication rate was found to be 40.8%, a figure which is lower than that reported by Oyinloye *et al*., [14], in Nigeria, but higher than that reported by other authors [12-28]. The reason for the high overall complication rate in this study may be attributed to prematurity, low birth weight, gastroschisis, non-surgical treatment modality, and presence of associated congenital anomalies. As reported in other studies [16-30], sepsis/surgical site infections were the most common complications in this study.

In the present study, the overall median duration of hospital stay was 15 days which is shorter than that reported by other authors [12-28], the shorter LOS in our study was skewed and became low or shorter by many patients with ventral hernia who most of them had LOS ranging between 2-6 days. Prolonged LOS in our study was observed in patients with omphalocele, in patients with associated congenital anomalies, in patients with ASA class III and in patients who were treated non-operatively. However, due to the poor socio-economic conditions in Tanzania, the duration of inpatient stay for our patients may be longer than expected.

In low- and middle-income countries (LMICS), mortality rates have been reported to range between 30 and 100% [46-50]. By contrast, survival rates in high-income countries are above 95% [51, 52]. In this study, the mortality was 30.0%, with the highest case fatality among patients with gastroschisis (92.3%), omphalocele major (30.4%) and ventral hernia (1.7%). Our mortality rate of 30.0% was comparable to 30.4% that was reported in a Nigerian study [30], lower than 98% that was reported in a Ugandan study [3], by Wesonga *et al*., but higher than that reported by other authors [12-52]. The high mortality rate in this study was attributed to prematurity, low birth weight, home delivery, complicated gastroschisis, ASA class III and presence of associated congenital anomalies. Addressing these factors responsible for high mortality in our patients is mandatory to be able to reduce mortality associated with this disease.

CONCLUSION

Congenital anterior abdominal wall defects remain the most common congenital anomalies seen in the pediatric surgical unit at Bugando Medical Centre and contribute significantly to high morbidity and mortality in our setting. The majority of patients present late when the disease becomes complicated and are in poor general condition, this contribute to poor outcome of this condition in our local setting. Antenatal ultrasound scan for prenatal diagnosis of CAAWDs is not commonly performed at BMC and in our local setting at large.

ABBREVIATIONS

BMC	Bugando Medical Centre
CAAWDs	Congenital Anterior Abdominal Wall Defects
CREC	CUHAS BMC Research and Ethics Committee
CUHAS	Catholic University of Health and Allied Science
ECHO	Echocardiography
E.H.M.S	Electronic Health Management System
E.M.D	Emergence Medicine Department
I.C.U	Intensive Care Unit
IPD	In Patient Department
IQR	Interquartile Range
LOS	Length of Hospital Stay
NICU	Neonatal Intensive Care Unit
PI	Principal Investigator
RA	Research Assistant

SD	Standard Deviation
US	Ultrasound
WHO	World Health Organization

Ethical Approval and Consent to Participate

The ethical clearance to conduct this study was sought from CUHAS/BMC research ethics and review committee (CREC/497/2021). The permission to conduct the study was sought from BMC authorities. All participants, parents/guardians were asked to sign a written informed consent/assent form before recruitment into the study. Those patients who underwent operation, their parents/caretakers signed an informed written consent form available at BMC for the procedure. Confidentiality was assured and the study did not interfere with the decision of the attending doctor, and the patient's refusal to consent or withdraw from the study did not alter or jeopardize their access to medical services.

Consent for Publication: Not applicable.

Availability of Data and Materials: All data generated/analyzed during this study are included in this manuscript.

Competing Interests: We declare no conflict of interest.

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Authors Contributions: HPM, AM and PLC conceptualized and designed the study, performed data analysis, interpreted the results and wrote the manuscript. HPM collected data.

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REFERENCES

1. Pakdaman R, Woodward PJ, Kennedy A. Complex abdominal wall defects: Appearances at prenatal imaging. Radiographics2015;35:636-49.
2. Klein MD. In: J L Grosfeld et al, eds. Congenital Defects of the Abdominal Wall. 6th ed. Philadelphia, PA: Elsevier Saunders;2012;1157–1171
3. Wesonga AS, Fitzgerald TN, Kabuye R et al. Gastroschisis in Uganda: for improved survival. J Pediatr Surg 2016; 51:1772–1777
4. Apfeld JC, Wren SM, Macheka N et al. Infant, maternal and geographic factors influencing gastroschisis related mortality in Zimbabwe. Surgery 2015; 158:1475–1480
5. Ameh EA, Chirdan LB. Ruptured exomphalos and gastroschisis: a retrospective analysis of morbidity and mortality in Nigerian children. Pediatr Surg Int 2000;16:23–25
6. Manson J, Ameh E, Canvassar N et al: A multi-centre comparison of management and outcome. Afr J Paediatr Surg 2012; 9:17–21
7. Ford K, Poenaru D, Moulot O et al. Gastroschisis: Bellwether for neonatal surgery capacity in low resource settings? J Pediatr Surg.https://doi.org/10.1016/j.pedsu rg. 2016.02.090
8. Uba AF, Chirdan LB. Omphalocoele and gastroschisis: Management in a developing country. Niger J Surg Res 2003;5:57-61.
9. Mashuda F, Zuechner A, Chalya PL, Kidenya BR, Manyama M. Pattern and factors associated with congenital anomalies among young infants admitted at Bugando Medical Centre, Mwanza, Tanzania. BMC Res Notes. 2014;7:195.
10. Mann S, Blinman TA, Douglas Wilson R. Prenatal and postnatal management of omphalocele. Prenat Diagn 2008; 28(7):626–632.
11. Drăgușin RC, Șorop-Florea M, Pătru CL, Zorilă L, Marinaș C, Cernea N, et al. Fetal Abdominal Wall Defects. Congenital Anomalies-From the Embryo to the Neonate: IntechOpen; 2017.
12. Melov SJ, Tsang I, Cohen R, Badawi N, Walker K, Soundappan SS, et al. Complexity of gastroschisis predicts outcome: epidemiology and experience in an Australian tertiary centre. BMC pregnancy and childbirth. 2018;18(1):1-9
13. Akinmoladun J, Lawal T, Bello O. Pattern of prenatal ultrasound diagnosed anterior abdominal wall defects at the University College Hospital, Ibadan, Nigeria: A pictorial essay. West African Journal of Radiology. 2019;26:43.
14. Oyinloye AO, Abubakar AM, Wabada S, Oyebanji LO. Challenges and Outcome of Management of Gastroschisis at a Tertiary Institution in North-Eastern Nigeria. Frontiers in surgery. 2020;7:8.
15. Islam S. Advances in surgery for abdominal wall defects: gastroschisis and omphalocele. Clin Perinatol. 2012;39(2):375–386
16. Anyanwu L-JC, Ade-Ajayi N, Rolle U. Major abdominal wall defects in the low- and middle-income setting: current status and priorities. Pediatric Surgery International. 2020;36(5):579-90
17. Bugando Medical Centre medical records database 2013-2020
18. Islam S. Clinical care outcomes in abdominal wall defects. Curr Opin Pediatr 2008;20:305-10.

19. Uba AF, Chirdan LB. Omphalocoele and gastroschisis: Management in a developing country. Niger J Surg Res 2003;5:57-61.
20. Egwaikhide E, Osifo D, Evbuomwan I. Management of omphalocele major. Niger J SurgSci 2005;15:71-3.
21. Weber TR, Au-Fliegner M, Downard CD, Fishman SJ. Abdominal wall defects. CurrOpin Pediatr 2002;14:491-7.
22. Capelle X, Schaaps JP, Foidart JM. Prenatal care and postnatal outcome for fetuses with laparoschisis. J Gynecol Obstet Biol Reprod 2007;36:486-95.
23. Bielicki IN, Somme S, Frongia G, Holland-Cunz SG, Vuille-Dit-Bille RN. Abdominal Wall Defects-Current Treatments. Children (Basel, Switzerland). 2021;8(2).
24. Wilson RD, Johnson MP. Congenital abdominal wall defects: an update. Fetal diagnosis and therapy. 2004;19(5):385-98.
25. Lao OB, Larison C, Garrison MM, Waldhausen JH, Goldin AB. Outcomes in neonates with gastroschisis in U.S. children's hospitals. American Journal of Perinatology. 2010;27(1):97-101.
26. Kuremu RT, Saula P, Kuradusenge P, Shitsinzi R. Management of gastroschisis: Kenyan perspective. East African Medical Journal. 2017;94(8):664-70.
27. Hwang PJ, Kousseff BG. Omphalocele and gastroschisis: an 18-year review study. Genetics in medicine: Journal of the American College of Medical Genetics. 2004;6(4):232-6
28. Sowande O, Anyanwu L-J, Inyang A, Ademuyiwa A. Syndromic exomphalos in Ile-Ife Nigeria: Management challenges. Archives of International Surgery. 2013;3(3):222-5.
29. Yamane T: Statistics: An Introductory Analysis. New York: Harper & Row; 1973.
30. Abdur-Rahman LO, Abdulrasheed NA, Adeniran JO. Challenges and outcomes of management of anterior abdominal wall defects in a Nigerian tertiary hospital. Afr J Paediatr Surg 2011;8:159-63.
31. Lincetto O, Mothebesoane-Anoh S, Gomex P, Munjanja S. Opportunities for Africa's Newborns. Antenatal Care. World Health Organisation. Available online at: http://www.who.int/pmnch/media/publications/africanewborns/en/index1.html (accessed March 12, 2019).
32. Boyd PA, Bhattacharjee A, Gould S, Manning N, Chamberlain P. Outcome of prenatally diagnosed anterior abdominal wall defects. Arch Dis Child Fetal Neonatal Ed 1998;78:209-213.
33. Kitchanan S, Patole SK, Muller R, Whitehall JS. Neonatal outcome of gastroschisis and exomphalos: A 10-year review. J Paediatr Child Health 2000;36:428-30.
34. Munkonge L. Challenges in the management of omphalocele at University Teaching Hospital, Zambia. East Cent Afr J Surg 2007;12:126-30.
35. Magnuson DK. Abdominal wall defects. In: Stringer MD, Oldham KT, Mouriquand PD, editors. Pediatric Surgery and Urology. Long term outcomes. Cambridge, New York: Cambridge University Press;2006. p. 270-85.
36. Langer JC. Gastroschisis and Omphalocele. Semin Pediatr Surg 1996;5:124-8.
37. Tsakayannis DE, Zurakowski D, Lillehei CW. Respiratory insuffi ciency at birth: A predictor of mortality for infants with omphalocele. J Pediatr Surg 1996;31:1088-90.
38. Dunn JC, Fonkalstrud EW. Improved survival of patients with omphalocele. Am J Surg 1997;173:284-7
39. Ross AR, Eaton S, Zani A, Ade-Ajayi N, Pierro A, Hall NJ. The role of preformed silos in the management of infants with gastroschisis: a systematic review and meta-analysis. Pediatr Surg Int. (2015) 31:473–83.
40. Pastor AC, Phillips JD, Fenton SJ, Meyers RL, Lamm AW, Raval MV, et al. Routine use of a SILASTIC spring-loaded silo for infants with gastroschisis: a multicentre randomized controlled trial. J Pediatr Surg. (2008) 43:1807–12.
41. Kunz SN, Tieder JS, Whitlock KJ, Jackson C, Avansino JR. Primary fascial closure versus staged closure with silo in patients with gastroschisis: a metaanalysis. J Pediatr Surg. (2013) 48:845–57
42. Hasan MS, Noor-ul Ferdous KM, Aziz A, Ayub A, Biswas PK. Outcome of gastroschisis in a developing country: where to focus? Glob J Med Res. (2017) 17:24–8.
43. Wright NJ, Zani A, Ade-Ajayi N. Epidemiology, management and outcome of gastroschisis in Sub-Saharan Africa: results of an international survey. Afr J Paediatr Surg. (2015) 12:1–6.
44. Wright NJ, Sekabira J, Ade-Ajayi N. Care of infants with gastroschisis in low-resource settings. Sem Pediatric Surg. (2018) 27:321–26.
45. DamaM, Rao U, Gollow I, BulsaraM, Rao S. Early commencement of enteral feeds in gastroschisis: a systematic review of literature. Eur J Pediatr Surg.(2017) 27:503–15.
46. Sekabira J, Hadley GP. Gastroschisis: A third world perspective. Pediatr Surg Int. (2009) 25:327–9.
47. Manson J, Ameh E, Canvassar N, Chen T, den Hoeve AV, Lever F, et al. Gastroschisis: A multi-center comparison of management and outcome. Afr J Paediatr Surg. (2012) 9:17–21.
48. Iliff PJ. Neonatal surgery in Harare Hospital. Cent Afr J Med. (1990) 36:11–5.

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