East African Scholars Journal of Medicine and Surgery
Abbreviated Key Title: EAS J Med Surg
ISSN: 2663-1857 (Print) & ISSN: 2663-7332 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-5 | Issue-10 | Nov-2023 | DOI: 10.36349/easjms.2023.v05i10.007

Original Research Article

Surgical Management of Oro-Facial Clefts at a Tertiary Care Hospital in a Resource-Limited Setting: A Tanzanian Experience

Samson K. Ephraim[1], Cecilia Protas[1, 2*], Francis Tegete[3]

[1]Department of Otorhinolaryngology, Head & Neck Surgery, Bugando Medical Centre, Mwanza, Tanzania
[2]Department of Otorhinolaryngology, Head & Neck Surgery, Catholic University of Health and Allied Sciences, Mwanza, Tanzania
[3]Department of Plastic/reconstructive Surgery, Bugando Medical Centre, Mwanza, Tanzania

Article History
Received: 09.10.2023
Accepted: 14.11.2023
Published: 25.11.2023

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: ***Background*:** Orofacial clefts are the most common craniofacial anomalies in most parts of the world and its management remains a challenge to otorhinolaryngology, plastic/reconstructive, oral and maxillofacial surgeons practicing in resource limited countries. There is limited data on surgical management of these birth defects in Tanzania and Bugando Medical Centre (BMC) in particular. This study aimed to describe our own experience regarding the surgical management of orofacial clefts at BMC, a tertiary care hospital in Tanzania. ***Methods*:** This was a cross sectional study involving all children with orofacial clefts that were treated at BMC between February 2019 and June 2019. ***Results*:** A total of 98 patients with orofacial clefts were recruited. Males outnumbered males by a male to female ratio of 1.7:1. The majority of patients (64.3%) were within 12 months at presentation. The median ages at surgery in patients with cleft lip and those with cleft palate were 3 [IQR, 2 to 8] and 11(IQR, 7 to 18) months, respectively. Orofacial clefts in association with congenital anomalies were recorded in 5(5.1%) patients. More than half of patients (55.1%) had combined cleft lip and palate. Unilateral clefts, 77(78.5%) were more common and showed left side preponderance in 52(53.1%) patients. All patients underwent cleft surgery under general anesthesia. Millard rotation advancement flap repair and von-Langenbeck were the most common techniques of cleft lip and palate repair performed in 42(52.5%) and 30 (41.7%) patients, respectively. The overall complication rate was 14.3% and the most common postoperative complications were bleeding, palatal fistula, wound dehiscence and surgical site infections in 6(31.6%), 4(21.1%) and 3(15.8%) each respectively. No death was recorded in this study. Among the 98 patients operated, 79 were treated successfully giving an overall success rate of 80.6%. The success rate was significantly influenced by nutrition status (p= 0.010), co-existing congenital anomalies (p=0.023) and the width of the cleft (p=0.002). ***Conclusion*:** This study documented that the majority of patients with orofacial clefts presented to BMC within 12 months of life. More than eighty percent of patients were treated successfully. Malnutrition, co-existing congenital anomalies and cleft width > 10 mm were the main factors affecting the treatment success. Appropriate measures focusing at these factors are vital in order to deliver optimal care for these patients in this region.

Keywords: Orofacial clefts, surgical management, postoperative complications, treatment success, Tanzania.

INTRODUCTION

Orofacial clefts represent a spectrum of congenital orofacial anomalies which include cleft lip, combined cleft lip and palate, and cleft palate [1, 2], and accounts for 65% of all the congenital malformations of the head and the neck [2, 3]. Globally, the incidence of orofacial clefts varies from approximately 1 in 700 to 1 in 1000 live births in different populations around the world [1-3]. Higher incidence of orofacial clefts has been reported among Asians while low incidence has been reported among African populations [4]. It is, however, plausible that due to limited epidemiological data on orofacial clefts in African populations, the actual incidence might be much higher than what has been reported. In Tanzania, orofacial clefting is one of the

***Corresponding Author:** Cecilia Protas
Department of Otorhinolaryngology, Head & Neck Surgery, Bugando Medical Centre, Mwanza, Tanzania

most common congenital malformation of the oral and maxillofacial region that poses a therapeutic challenges resulting from shortage of the qualified otorhinolaryngology and plastic/reconstructive surgeons and other specialists, associated health problems at presentation, late presentation, lack of a multidisciplinary approach to care and financial burden on the affected individuals and families [3, 5]. At Bugando Medical Centre, orofacial clefts are a single commonest cause of admission in otorhinolaryngology and plastic/reconstructive wards and contribute significantly to increased surgical workload in the departments of Otorhinolaryngology and Plastic/reconstructive surgery [3, 6].

Orofacial clefts can have an impact on the health of children affecting feeding, speech, hearing, facial appearance, dentition and quality of life [7]. Early surgical repairs are aimed at improving appearance, speech, hearing, psychosocial development and avoiding impediments to social integration [7, 8]. However, in resource-limited setting the long time before consultation and/or surgery is common due to ignorance, inaccessibility and non-availability of specialized health services as well as financial constraints because most of the parents of the children presenting with clefts are poor [9].

The ideal management of orofacial clefts requires a multidisciplinary team approach, comprising plastic/reconstructive surgeons, oro-maxillofacial surgeons, speech therapists, and otolaryngologists, among others [10, 11]. The available evidence from several reports suggests that there is a strong relationship between positive treatment outcome and the availability of centralized care by a high quality dedicated multidisciplinary cleft team [11]. However, in most low and middle income countries like Tanzania, this management approach may be difficult to achieve due to several challenges including shortage of the qualified surgeons and other specialists as well as unavailability of equipped facilities resulting in inappropriate case management and sometimes many children with cleft lip and palate even remain untreated [3, 12].

In resource-limited countries such as Tanzania, the management of orofacial clefts poses a therapeutic challenge to otorhinolaryngology and plastic/reconstructive surgeons. Late presentation with attendant complications, limited access to qualified cleft surgeons and the lack of facilities for prompt diagnosis of associated congenital anomalies characterize the poor management of this disease [7, 9, 12].

Surgical intervention is the first step in the therapeutic approach of orofacial cleft treatment, and can reduce the aesthetic and functional sequelae. However, financial constraints put this surgical treatment out of reach for many children in developing countries [9, 13, 14]. Limited access to cleft surgery in resource-limited countries has led to the involvement of charity organizations (e.g. SMILE TRAIN, AMREF and mining companies) that provide training and financial support or clinicians and institutions to provide surgical procedures for patients with clefts of the lip and/or palate [9].

The outcome of cleft surgery is good when the patients present early at surgery [15, 16]. Late presentation has been reported in literature to be associated with poor surgical outcome and complications (such as bleeding, surgical site infections, wound dehiscence, fistula, hypertrophic scar etc) following cleft surgery [15, 16]. Previous studies have reported several factors that contribute to poor treatment outcome following cleft surgery [15-17]. Despite the fact that cleft surgery is a commonly performed procedure in tertiary care hospitals in Tanzania including BMC, data regarding the outcome of cleft surgery in our setting are limited. The few available data on this subject focused on the prevalence and associated risk factors for orofacial clefts. Currently, there is no study looked at the surgical outcomes of cleft surgery. This knowledge gap prompted the authors to conduct this study in this sub-region. This study aimed at describing our experience on surgical management of oro-facial clefts at Bugando Medical Centre; the only tertiary care and teaching hospital in a northwestern Tanzania.

METHODS AND PATIENTS

Study design and setting

We conducted a cross sectional study involving all children with orofacial clefts that were treated at Bugando Medical Centre (BMC) between February 2019 and July 2019. BMC is a consultant, tertiary care, Zonal and a teaching hospital for the Catholic University of Health and Allied Sciences (CUHAS) and has 1200 beds for patients' admission. It is located in Mwanza City along the shore of Lake Victoria, serving a population of approximately 18 million people from neighboring regions in northwestern Tanzania. At BMC patients with orofacial clefts are usually admitted and treated in the Otorhinolaryngological and Reconstructive /plastic wards of Bugando Medical Centre. Most patients with orofacial clefts in the surrounding regions are usually referred to this hospital as it is the only centre that offers surgical expertise to repair orofacial clefts on the north-western part of Tanzania.

Study population, eligibility criteria, sample size estimation and sampling procedure

All patients who were admitted and subsequently operated for orofacial clefts at BMC during the period of study were included in this study. Patients with atypical clefts and those who had attempted repair (secondary repair) were excluded from the study. The Yamane Taro formula [i.e. $n=N/1+Ne^2$, where; n=sample size; N= 102 (patients with orofacial clefts in 2016/2017) (from BMC database unpublished data) and e =marginal error, 0.05] was used to calculate the minimum sample size. Convenient sampling procedure for the patients

who met inclusion criteria were performed until the sample size was reached.

Recruitment of patients

Recruitment of patients to participate in the study was done in the Otorhinolaryngology and Reconstructive/plastic wards/clinics of Bugando Medical Centre. Patients who met inclusion criteria were, after an informed written consent sought from the patients, parents or guardians enrolled into the study.

Preoperatively, the details of patients in terms of history, clinical features and hematological investigations were recorded on the questionnaire. Routine surgical preoperative workup was done to all patients (who met the minimum criteria of age ≥10 weeks, weight ≥10 pounds (4.5 kg) with a hemoglobin concentration of 10 gm/dl and above, and free from upper respiratory tract infection) before scheduling for surgical operation. The timing of surgery for cleft lip was guided by the 'rule of 10' (age of 10 weeks, weight of 10 pounds and hemoglobin value of at least 10 g/dl). For cleft palate repair, all patients were aged at least 10 months. All patients were certified fit for surgery by the anesthetic team. It is the policy of the unit to admit patients 3 days preoperatively for counseling, instruction on feeding technique and taking of throat and nasal swabs for microbiology. Hematological investigations included full blood picture, Hemoglobin levels, grouping and cross-matching, coagulation profile, serum electrolytes, serum creatinine and urea. Nutrition status was measured using mid-upper-arm-circumference (MUAC) in children and Body Mass Index (BMI) in adults. MUAC was measured using a non-stretchable MUAC tape. Body Mass Index was calculated by dividing weight by height square and classified as underweight (BMI < 18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), Obese (BMI ≥ 30 kg/m^2). Preoperative prophylactic antibiotics (ceftriaxone 100 mg/kg body weight) and dexamethasone 0.4 mg/kg body weight were given intravenously.

Intraoperatively, all patients underwent cleft surgeries under general anesthesia provided by experienced anesthesiologists in the head and neck as well as pediatric anesthesia. Surgical repair was carried out by well experienced otorhinolaryngology and reconstructive/plastic surgeons, assisted by either senior registrars or surgical residents. The lead surgeon determined the surgical technique for each case.

Unilateral cleft lips were repaired by Millard rotation advancement, Tennison-Randall and Fisher techniques. Bilateral cleft lips were repaired by Millard forked flap technique. After suturing of the wound following cleft lip repair was complete, the skin wound was dressed with Sofra-Tulle gauze, over which dry gauze was placed, and plaster was applied over the dry gauze.

Clefts of the palate were repaired by Von Langenbeck technique and Bardach two flap palatoplasty. In our institution, single-staged palatoplasty was routinely done. As a standard procedure, the nasal layer was sutured with Vicryl 4-0. Intravelar veloplasty was done in all cases under magnification using Vicryl 3-0. The oral layer was sutured with Vicryl 3-0. Packs, if placed along lateral incisions, were removed on the 4th postoperative day. Most of the patients were discharged after pack removal if no postoperative complication is detected.

Postoperatively, sofra-Tulle gauze dressing was applied for the first 24 hours after cleaning with Hibitane-in-water. The wound was subsequently left open, followed by gentle daily cleansing with sterile normal saline applied with gauze swabs until all non-absorbable sutures were removed 7 days postoperatively. Absorbable sutures were left to resorb. Patients were reviewed regularly post-surgery and evaluated at postoperative days (POD) 3, POD7, and POD14 after repair. All wounds were evaluated on POD3, POD7, and POD14 for the presence of wound dehiscence, local wound infection (surgical site infections), and any other wound healing complications. Postoperatively, patients who had cleft lip repair were discharged after 5–7 days, while those who had palate repair were discharged after 10-14 days. Patients were followed up till discharge and thereafter for 4 weeks after discharge.

Definition of terms

Wound dehiscence was defined as spontaneous suture disruptions that were not the result of trauma such as scratching.

Palatal fistula was defined as a failure of healing or a breakdown in the primary surgical repair of the palate, resulting in an abnormal communication between the epithelial lining of the oral and nasal cavities. The fistula size was determined by using a calibrated and validated Vernier caliper.

Local wound infection (surgical site infections) was diagnosed when the wound contained purulent material and/or showed other clinical signs of infection (warmth, erythema, local tenderness).

Treatment success was defined as absence of complications after 6 days of repair i.e. no wound dehiscence, local wound infection (surgical site infections), fistula and any other wound healing complications.

Data collection

A pre tested coded questionnaire designed for the study was used to collect data. Information collected in the questionnaire included; demographic characteristics (age, sex, and area of residence), clinical characteristics (type of orofacial cleft, laterality, extent, nutritional status, associated congenital anomalies and

cleft width), treatment characteristics (timing of surgery, type of surgery and duration of surgery) and outcome variables (postoperative complications, treatment success and mortality).

Statistical data analysis

All collected data were statistically analyzed using STATA version 15. The median + Interquartile Range (IQR) and ranges were calculated for continuous variables whereas proportions and frequency tables were used to summarize categorical variables. Chi-square ($\chi 2$) and Fisher's exact tests (depending on the size of the data set) were used to test for the significance of association between the independent (predictor) and dependent (outcome) variables in the categorical variables. A p-value of < 0.05 was considered to constitute a statistically significant difference.

Ethical clearance

The study was approved by the Joint CUHAS/BMC Research, Ethics and Review Committee (ethical clearance number: CREC/347/219) before commencement of data collection. The permission to conduct the study was sought from BMC authority. A written informed consent/assent was obtained from all patients or their parents/guardian before enrollment in the study. Prior to this, detailed information and explanations of the study was provided to each patient or their parents/guardians. An opportunity to ask questions was ensured and appropriate clarifications were given to each patient or their parents/guardian before the commencement of the study. Opportunity to withdraw at any stage of the study was made known to each subject or their parents/guardian without victimization or denial of treatment.

RESULTS

Socio-demographic and clinical characteristics

A total of 102 patients underwent cleft lip and palate repair during the study period. Among these, 4 patients who failed to meet the inclusion criteria were excluded from the study. Thus, 98 patients (representing a response rate of 96.1%) were enrolled into the study. The youngest patient enrolled in this study was three months and the oldest was 8 years. The overall median age at presentation was 10(IQR, 8-12) months. The modal age range was 0-12 months, accounting for 64.3% of cases (Figure 1). The median age at surgery in patients with cleft lip was 3 [IQR, 2 to 8] months, whereas the median age at surgery in patients with cleft palate was 11 months (IQR, 7 to 18 months) and the majority of patients, 56 (77.8%) who underwent cleft palate surgeries were aged 12 months and below at surgery. There were 62 (63.3%) males and 36 (36.7%) females with a male to female ratio of 1.7:1. There was a male preponderance in all cleft types as shown in Figure 2 below. More than a half (59.2%) of patients came from the rural areas. Orofacial clefts in association with congenital anomalies were recorded in 5(5.1%) patients; of which congenital heart disease was the most common congenital anomalies accounting for 40% of cases (Figure 3). Table 1 below shows socio-demographic and clinical characteristics among patients with cleft lip and palate operated at BMC.

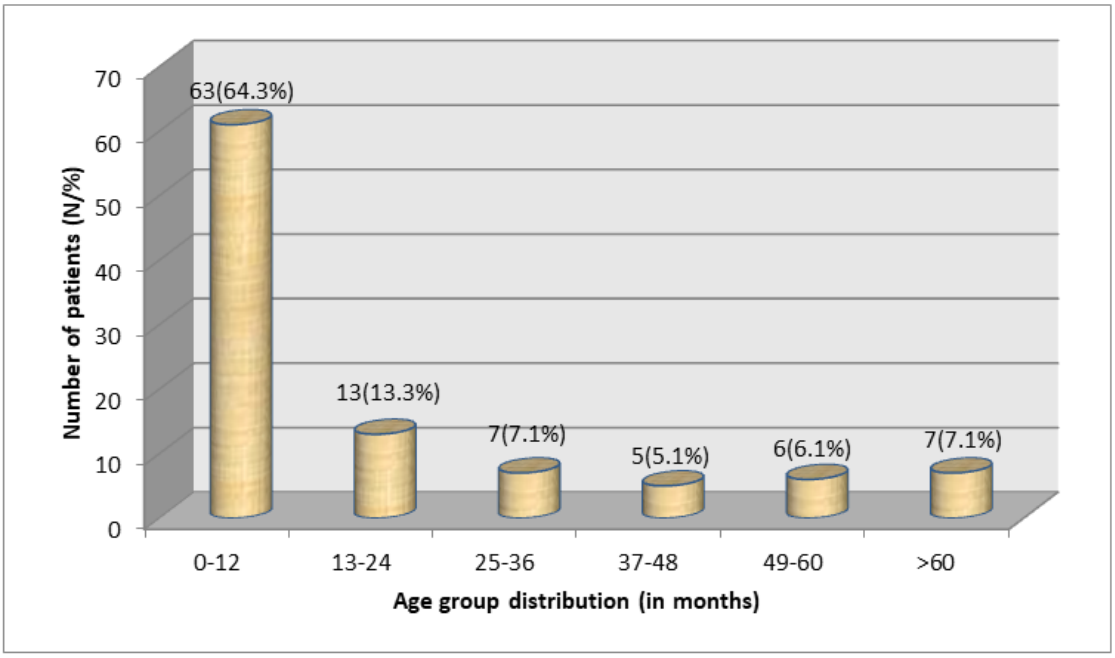

Figure 1: Age group distribution among patients with orofacial cleft operated at BMC

Table 1: Socio-demographic and clinical characteristics among patients with orofacial cleft operated at BMC

Patients characteristics	Number of patients	Percentage
Age (months)		
≤12	63	64.3
>12	35	35.7
Sex		
Males	62	63.3
Females	36	36.7
Area of residence		
Rural	58	59.2
Urban	40	40.8
Associated congenital anomalies		
Yes	4	4.1
No	94	95.9
Nutritional status		
Nourished	80	81.6
Malnourished	18	18.4
Oro-facial Cleft type		
Isolated cleft lip	26	26.5
Isolated cleft palate	18	18.4
Combined cleft lip and palate	54	55.1
Laterality of the cleft		
Left	52	53.1
Right	22	22.4
Bilateral	24	24.5
Extent of the cleft		
Incomplete	11	11.2
Complete	87	88.8
Width of cleft (mm)		
≤10	76	77.6
>10	22	22.4

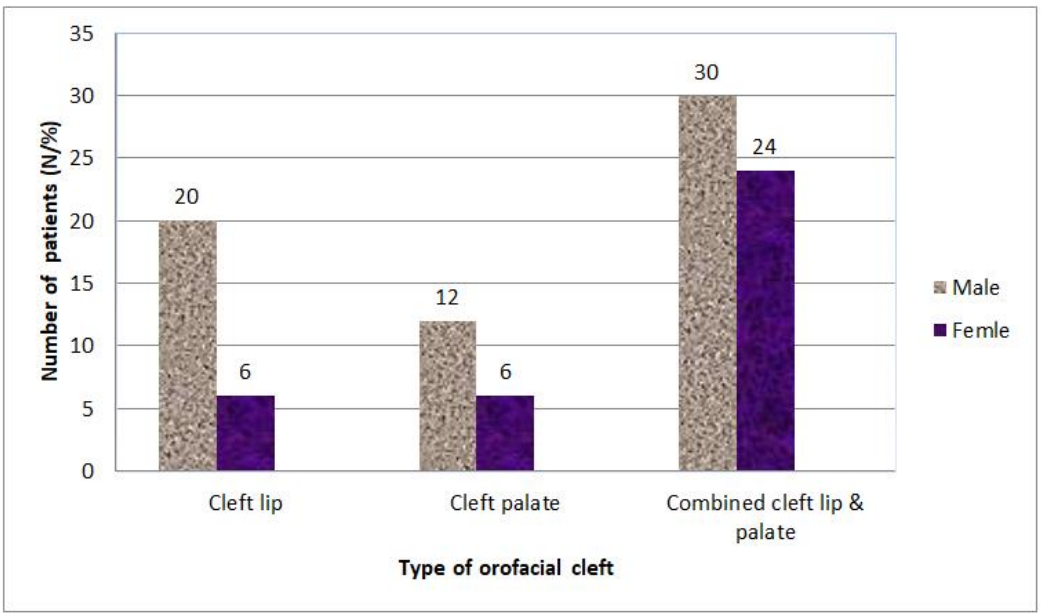

Figure 2: Distribution of cleft type by sex among patients with orofacial cleft operated at BMC

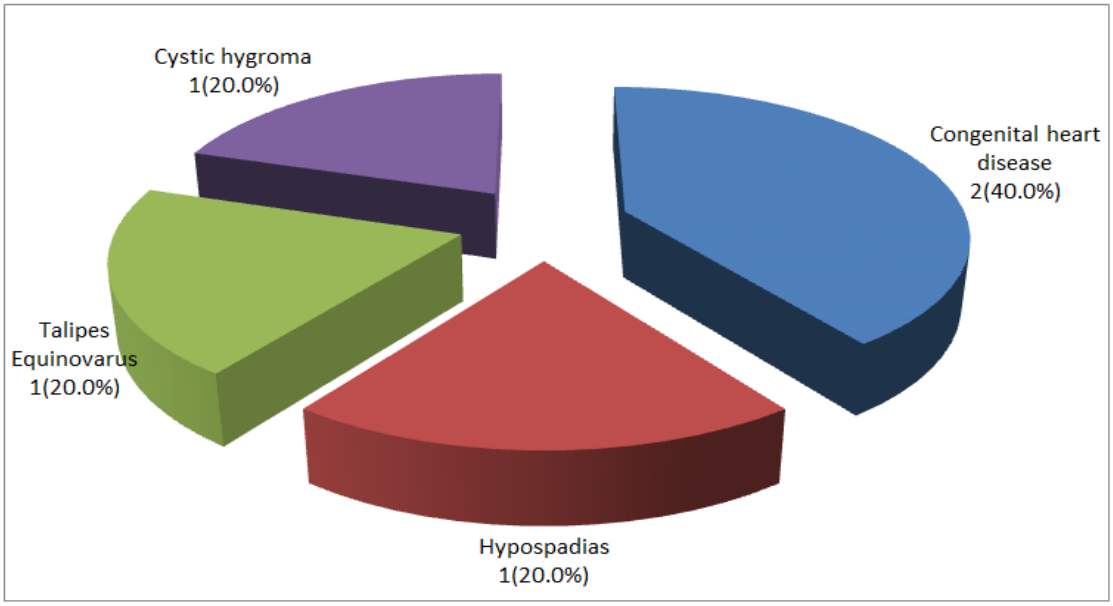

Figure 3: Distribution of patients according to associated congenital anomalies

Surgical treatment of orofacial cleft at BMC

In this study, a total of 152 cleft surgeries were performed in 98 patients. Of these, 80(52.6%) surgeries were for repairs of the cleft lip, either as isolated or in combination with cleft palate and 72(47.4%) were surgeries for primary repairs of the palate, either as isolated or in combination with cleft lip. All surgeries were carried out under general anesthesia. The majority of patients underwent cleft lip repair between 3 and 4 months.

Millard rotation advancement flap repair was the most common technique of cleft lip repair performed in 42(52.5%) cases as shown in Figure 4 below. The operative techniques performed for cleft palate included von-Langenbeck in 30 (41.7%) patients and combined von-Langenbeck and extended palatoplasty in the remaining 38(52.8%) patients. Bardach two flap palatoplasty was performed in only 4(5.5%) patients (Figure 5). The overall duration of operation ranged from 1 to 4 hours with a median of 2 [IQR, 1 to 3] hours.

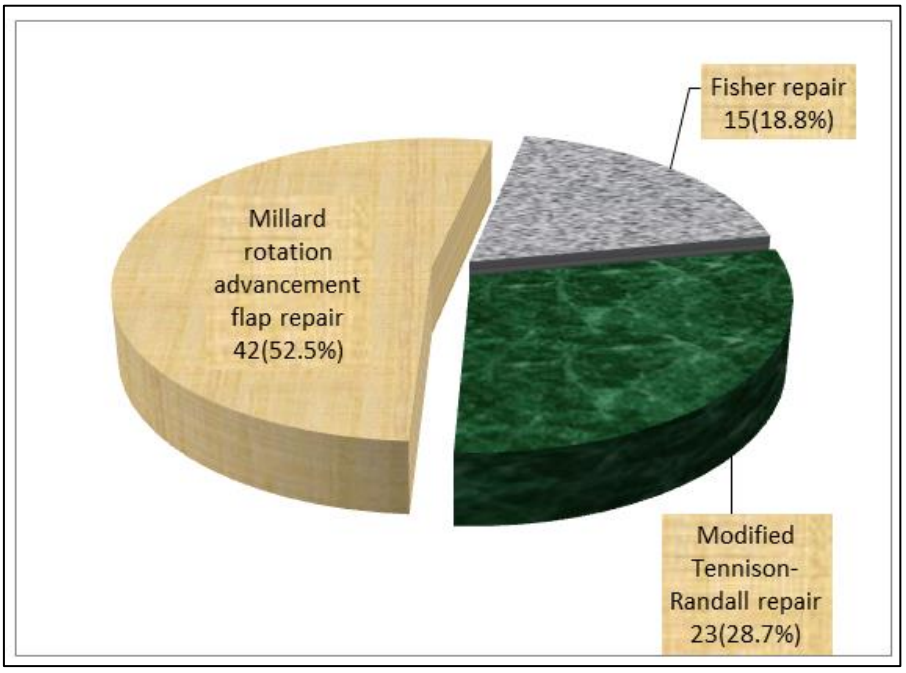

Figure 4: Type of surgical techniques among patients with cleft lip at BMC (N=80)

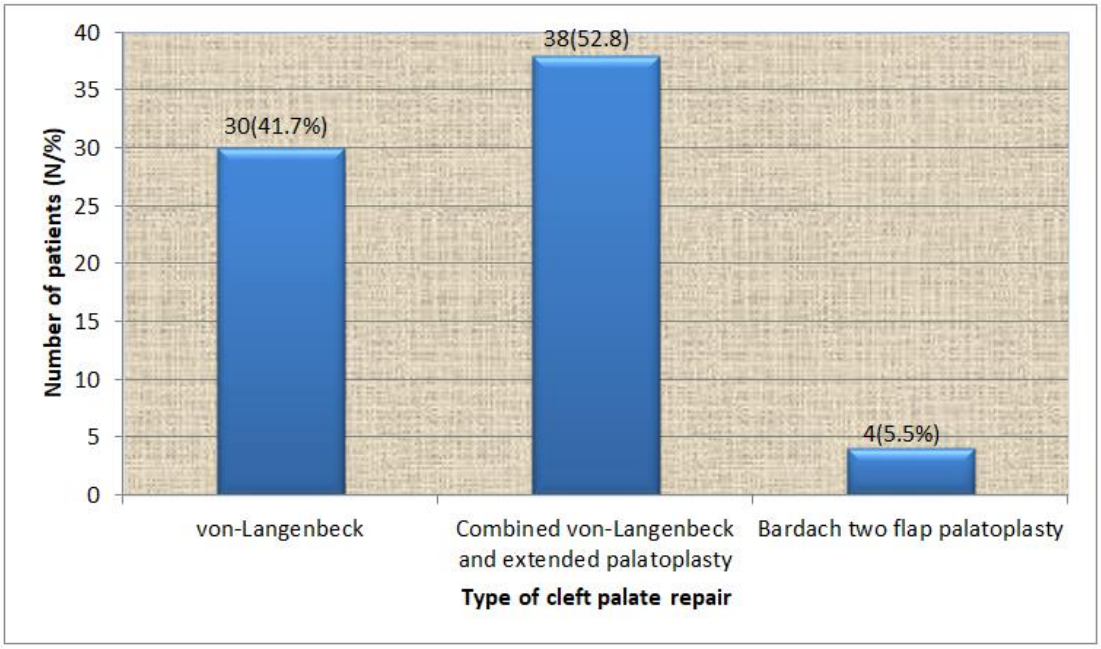

Figure 5: Type of surgical techniques among patients with cleft palate at BMC (N=72)

Surgical outcomes following orofacial cleft repair at BMC

Out of 98 patients enrolled in the study, 14 developed 19 complications following orofacial cleft repair, giving an overall complication rate of 14.3%. As shown in Figure 6 below, bleeding was the most common postoperative complications. Postoperative bleeding, surgical site infections and respiratory obstruction were managed conservatively whereas patients with palatal fistula and wound dehiscence were discharged home and scheduled for re-operation to be done three to six months after surgery. No death was recorded in this study. Among the 98 patients operated, 79 were treated successfully giving an overall success rate of 80.6%. The success rate was significantly influenced by nutrition status (p= 0.010), associated congenital anomalies (p=0.023) and the width of the cleft (p=0.002).

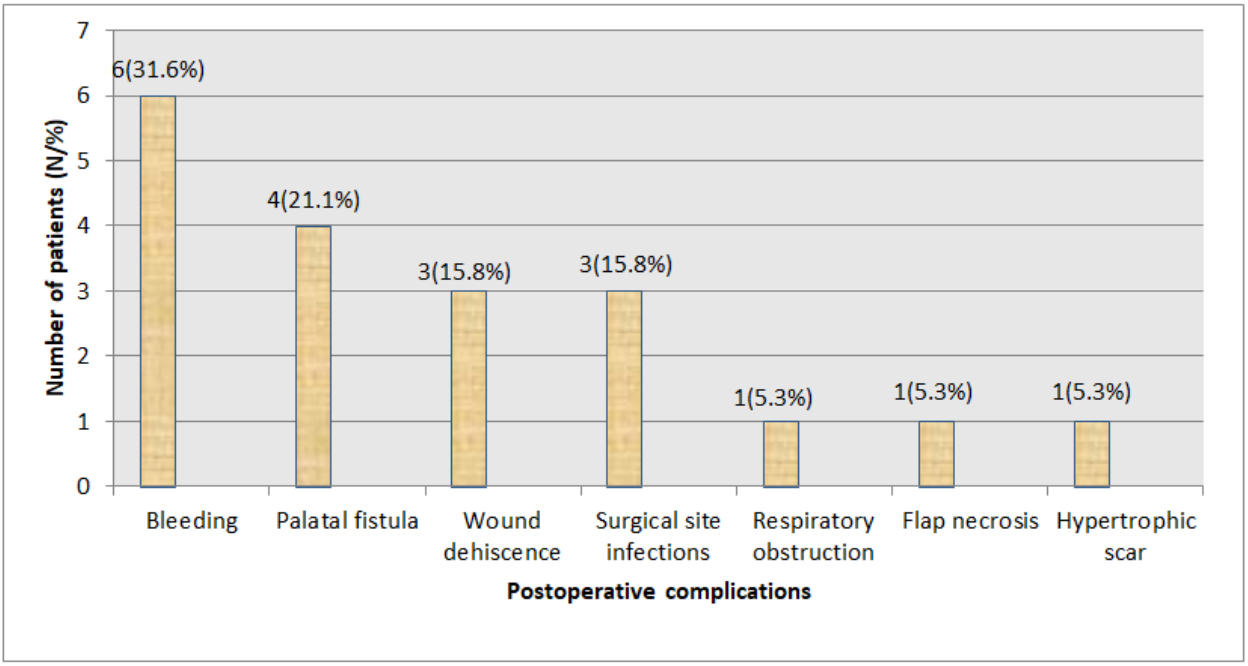

Figure 6: Postoperative complications following cleft lip and palate repair at BMC (N=19)

Table 2: Analysis of factors associated with treatment outcome among patients undergoing orofacial cleft surgeries at BMC

Independent variable	Treatment Success		Chi-square (X^2)	*p*-value
	Successful	Unsuccessful		
Age-group(month)				
≤12	48(76.2)	15(23.8)		
>12	33(94.3)	2(5.7)	0.743	0.541
Sex				
Male	50(80.6)	12(19.4)		
Female	31(86.1)	5(13.9)	0.006	0.765
Residence				
Urban	32(80.0)	8(20.0)		
Rural	49(84.5)	9(15.5)	0.086	0.128
Nutrition status				
Nourished	76(95.0)	4(5.0)		
Malnourished	5(27.8)	13(72.2)	7.943	**0.010**
Associated congenital anomalies				
Yes	1(25.0)	3(75.0)		
No	80(85.1)	14(14.9)	9.567	**0.023**
Width of Cleft(mm)				
≤ 10	71(93.4)	5(6.6)		
>10	10(45.5)	12(54.5)	6.773	**0.002**
Laterality of cleft				
Right	18(81.8)	4(18.2)		
Left	22(91.7)	2(8.3)		
Bilateral	41(78.8)	11(21.2)	2.228	0.831
Extent of Cleft				
Incomplete	10(90.9)	1(9.1)		
Complete	71(81.6)	16(18.4)	0.639	0.534
Duration of Surgery(hour)				
≤2	36(85.7)	6(14.3)		
>2	45(80.4)	11(19.6)	1.933	0.437

DISCUSSION

In this study, the gender distribution showed a male preponderance in all cleft types which is in keeping with other studies that have reported similar finding [3, 5, 6, 17-19], but at variance with most Caucasian studies in which isolated clefts of the palate occur more frequently in females [20, 21]. Our study also differs from previous reports from other parts of Africa which showed that females were more affected than males [22-24]. However, equal gender distribution was reported in a previous study by Ueda [25]. The reason for this gender differences is unclear and warrants further investigation.

In the present study, the majority of patients with orofacial clefts presented under the age of one year, a finding which does not support the hypothesis that in resource-limited countries, patients with orofacial clefts tend to present at later age due to unavailability of specialized medical facilities [9]. This early age at presentation in the present study agrees with what was found previously in a study which was done by Manyama *et al.*, [3] at the same hospital. Early age at presentation in this study may be attributed to increased public awareness regarding the disease, free cleft treatment available in the hospital and involvement of Charity organizations (e.g. AMREF, SMILE TRAIN and mining companies) that play a significant role in the delivery of surgical care in resource-limited countries where there are huge disparities in access to timely surgical care.

More than half of the patients with orofacial clefts in the present study came from the rural areas. This is consistent with previous reports from other studies done in resource-limited setting where the care of children born with congenital anomalies including orofacial clefts is neglected and there is neither a neonatal screening program nor a birth defect registry system [3, 5, 9, 26]. The finding that the majority of the afflicted patients came from rural backgrounds with limited access to skilled, surgical, and multidisciplinary cleft care calls for regular outreach programs to address the unmet needs of the orofacial cleft cases in various parts of the region.

Orofacial clefts have been documented in several studies to be associated with other congenital anomalies [3, 9, 26, 27]. Various studies have reported that the incidence of associated anomalies with orofacial clefts range from as low as 1.5% [28] to as high as 68.4% [29]. In the present study, the associated congenital anomalies were recorded in 5.1% of patients, a figure which is significantly lower than that reported from other

parts of the world [2]. The low incidence of associated congenital anomalies in our study agrees with previous studies done elsewhere [9, 30]. This low incidence of orofacial clefts in association with congenital anomalies in the present study can be explained by the fact that our patients with orofacial cleft were not routinely screened for associated anomalies soon after their admission, attributing this to lack of screening facilities in our centre as a result most of associated congenital anomalies in our study were diagnosed clinically. The co-existence of orofacial clefts with other congenital anomalies highlights the importance for clinicians to screen for associated congenital anomalies in these patients as the potential functional outcomes may be affected during treatment and rehabilitation.

It has been well documented in several studies that unilateral orofacial clefts usually predominate over bilateral clefts, and the left side is usually the most often affected [9, 31]. This observation is reflected in our study and that of Manyama *et al.*, [3] at the same hospital who also found that unilateral clefts were more common than bilateral clefts and unilateral clefts showed preponderance for the left side. The reason for the preponderance of left sided orofacial cleft is, however, yet to be established, but it is speculated to be due to the delayed development of the facial artery on the left side when compared with the right side in the human fetus 27. More than eighty percent of patients in this study had complete orofacial clefts. We could not establish the reason for this variation in the extent of orofacial cleft in this region. This observation calls for further investigation to explain this finding.

It is well documented that the optimum approach to the treatment of orofacial clefts requires a multidisciplinary team approach involving a pediatrician, otolaryngologist, plastic surgeon, orthodontist, specialist nurse and speech therapist to provide the best combined expertise to ensure that the correct interventions are carried out at an appropriate time and to ensure the best functional and aesthetic result [10, 11]. In the present study, the concept of multidisciplinary team approach was not practiced in the management of our patients probably due to inadequate number of the needed experts in the system to bring into the cleft care team. It is therefore suggested that a centralized approach should be undertaken to enhance training and provide adequate and comprehensive cleft care delivery.

Orofacial clefts generally require surgical repair. Often multiple surgeries are needed to reconstruct the cleft lip and palate [15]. It is well documented in literature that the timing of surgical intervention in patients with orofacial clefs depends on the age at presentation, available surgical expertise, and the type of cleft [9, 12, 15]; our results support this assertion. Early surgical repair of these birth defects is aimed at improving facial appearance, speech, hearing, psychosocial development and avoiding impediments to social integration [4]. It is widely accepted that cleft lip repair should be done in early infancy between 2 to 3 months of age [12, 15]. In the current study, we found that the majority of patients underwent cleft lip repair between 3 and 4 months. This finding is consistent with the age of between 2 to 3 months that is recommended in literature for the definitive cleft lip repair [12, 15]. The timing of cleft lip repair in this study was guided by the '*rule of tens'* and this helps to ensure there is adequate bulk of tissue and the child's fitness for surgery.

On the other hand, the timing of cleft palate repair has historically been a subject of some controversy. However, several studies have suggested that the repair of cleft palate should be done prior to the beginning of speech development usually before 18 months of age [9, 12, 15, 32]. Early timely closure of cleft palate has demonstrated improved speech outcome, while late closure of the cleft palate, although conferring better midfacial growth, has shown poor speech outcome [32]. In our study, the median age at cleft palate repair was eleven months which is within normal range described in literature [12, 15]. Early timely closure of orofacial clefts observed in this study may be a reflection of good improvements in the Tanzanian healthcare and health education systems in recent years, as well as the occasional availability of programs that support treatment of orofacial clefts (e.g. AMREF, SMILE TRAIN and mining companies) in this region. Another reason might be the availability of free cleft treatment in the hospital.

It is well documented in literature that the choice of technique for the repair of orofacial clefts depends on the severity and complexity of the cleft, the surgeon's experience and preference, and the patient's individual characteristics and goals [8, 32]. This observation is reflected in our study where the choice of procedure for the repair of cleft lip and palate based on the decision of the operating surgeon and related to the clinical presentation.

General anesthesia has previously been reported in literature to be the best method of anesthesia for cleft lip surgery [31, 33]. However, recent reports have indicated that, given the presence of associated congenital anomalies in these patients, the risks associated with general anesthesia, and the anatomical challenges, local anesthesia were found to bring good outcomes in some cases of cleft lip repair in patients aged >12 years [34, 35]. This approach has been demonstrated to be safe, cost effective, and not inimical to the surgical outcome. In this study, no cases of cleft lip repair were done under local anesthesia probably because no patients in this study were aged >12 years and the oldest patients were aged eight years old.

In keeping with previous African studies [13, 17, 31], the present study demonstrated a higher

proportion of cleft lip repair than cleft palate repair. The reasons for this observation may be due to higher number of patients with cleft lip than those with cleft palate. In addition, some workers reported that many patients and their families give more weight to esthetic than speech, hence, they present more for lip repair than that of palate [32]. This observation is reflected in our centre where some patients with combined cleft lip and palate who had previously underwent cleft clip repair did not come back for the cleft palate repair.

In this study, the Millard rotation advancement flap repair and Millard forked flap techniques were the most commonly performed techniques of repair for the unilateral and bilateral cleft lips respectively. This finding is similar to reports from other studies in low- and middle-income countries [7, 15, 17]. Millard rotation advancement flap repair is a widely performed procedure for the unilateral cleft lip repair [12, 15, 17]. The ultimate goals of Millard rotation advancement flap repair consists of tensionless closure, reappoximation of orbicularis oris, formation of cupid's bow, creation of the philtrum and repositioning of the nasal ala to a more symmetrical position [12, 17]. The use of Millard technique in cleft lip repair has been preferred by some workers owing to the ease of mastery, flexibility, and the minimal loss of lip tissue [7, 15]. However, Millard technique has been criticized for its propensity to cause vertical scarring [7, 17]. On the other hand, other workers have adopted Tennison-Randall technique in their cleft lip repair because of its geometrical predictability and reliability, consistency in decreasing vertical lip contraction, and its application in wide cleft [7]. However, one limitation of the Tennison-Randall lip repair is that a scar results across the philtrum in its lower third and, thus, it tends to produce a lip that is too long vertically [7]. In this series, Tennison-Randall technique was the second most commonly performed techniques of repair for the unilateral cleft lips. Fisher technique for the cleft lip repair is currently gaining popularity over the Millard rotation-advancement techniques [37, 38]. Fisher technique for the cleft lip repair was the least most common procedure in this study and showed good results.

Regarding repair of the cleft palate, more than forty percent of patients with orofacial clefts underwent cleft palate repair. The primary goals of cleft palate repair include closure of the communication between the oral and nasal cavities and construction of a functional velum that allows good speech production [39]. The operative techniques performed in the present study included von-Langenbeck and combined von-Langenbeck and extended palatoplasty in the majority of patients. In addition, Bardach two flap palatoplasty was performed in few cases.

Assessment of speech quality remains one of most important outcomes in successful cleft palate surgery [17]. However, because of the non-availability of trained speech therapist in our centre, speech could not be assessed in the present study.

Globally, presurgical manipulation of the cleft lip and palate in case of wide clefts or protruded premaxilla has continued to grow in popularity and acceptance [17]. These interventions, such as nasal–alveolar molding devices, adhesive tape and lip adhesion have a role in improving the alignment of the cleft lip and palate before the initial surgical repair and have been practiced in developed countries as the major means of handling the protruded premaxilla [15, 17]. In the present study, these devices were not used by any of our patients, probably due to lack of expertise for the production of the devices, lack of the knowledge of their uses by practitioners, and the challenge of the additional financial burden to the patients. Our study also demonstrated that secondary procedures such as alveolar bone grafting, orthognathic surgery, and surgery for the correction of velopharyngeal incompetence were not performed in any of our patients probably due to inability of our patients to pay for such procedures.

Several studies done in low and middle income countries have reported different postoperative complication rates after cleft surgery and range from 3% to 38% [39]. In this study, the overall complication rate following orofacial clefts was 14.3%, a figure which is comparable to 14.9% that was reported in a Nigerian study [17]. A high complication rate of 35.8% was also reported in another study in Nigeria [40]. The reasons for the low complication rate in our study may be attributed to the strict selection criteria, good preoperative screening of patients, good theatre/anesthetic and ward facilities, and competent surgical/medical staff of the hospital.

In the present study, postoperative bleeding was the most common complication observed following orofacial cleft surgery. This finding concurs with a Nigerian study which reported similar finding [40]. Profuse bleeding following cleft surgery do not usually occur, because there is no large major artery in this region, but it is serious due to it is interference with the airway especially during cleft palate and damage to the greater palatine artery [40]. In this study, postoperative bleeding did not warrant blood transfusion as the bleeding was controlled non-operatively by pressure pack and bone wax to the great palatine foramen. Bleeding following cleft surgery can be avoided with meticulous dissection, hemostasis, and closure.

The occurrence of palatal fistula following cleft palate repair varies from 0 to 63% as reported in literature and has been attributed to the surgical technique, expertise of the surgeon, large width of cleft palate, poor wound healing, tension or absence of multilayered closure, or infection of the operated site [32]. In this study, palatal fistula was the second most common complication following orofacial cleft repair

and accounted for 21.1% of cases, a figure which is within the reported figures of 0-63% [32]. The incidence of palatal fistula in the present study is high compared to 3.1% that was reported in a Nigerian study [40]. The reasons for the high incidence of palatal fistula in our study could not be objectively identified, though it can be speculated that the large width of some cleft palate may result in tension closure, which could have caused the palatal fistula. The management of palatal fistula varies from observation to surgical intervention [32, 41]. In the early time, the palatal fistula following palate repair could be observed and monitored for spontaneous narrowing or closure [41]. Non-operative treatment is also indicated for an asymptomatic fistula. It is recommended that surgical repair of the fistula should be delayed for 6-9 months before attempting any surgical option to allow proper wound healing [40, 41]. In the present study, patients with palatal fistula were discharged home and scheduled for re-operation to be done three to six months after surgery.

Postoperative complications of cleft lip and palate repair can also include wound dehiscence, in this case with patient interference disrupting the tight wound closure [17, 40]. Wound dehiscence, which ranked as the third most prevalent complication of orofacial cleft surgery in our study accounted for 15.8% of cases. This figure is high compared to 3.1% that was reported in one study in Nigeria [17]. Wound dehiscence or rupture of a wound has been attributed to increased pressure on the healing site caused by vomiting, coughing, or retention of debris [40]. This may lead to inadequate formation of granulation or disruption of the fragile blood vessels [32, 40]. We could not objectively identify the causes of wound dehiscence in the current study. However, it can be speculated that tension of wound closure, poor patient adherence to postoperative orders and surgical site infections may result in wound dehiscence. Patients with wound dehiscence required reoperations to be done three to six months after discharge.

In this study, the rate of surgical site infections following cleft lip and palate repair was 15.8%, a figure which is low compared to reports by others in resource-limited countries [16, 17]. The low incidence of surgical site infections following cleft lip and palate repair in this study may be due to the use of aseptic technique during surgery, as well as meticulous wound care postoperatively. Surgical site infection was managed by debridement and an extended antibiotic regimen.

Assessment of treatment outcomes following cleft surgery is vital in estimating the success of cleft management and quality improvement [16]. The overall treatment success of 84.9% demonstrated in this study clearly indicates a high overall good treatment outcome comparable to findings from cleft centers in high income countries [32, 41]. This finding may be a reflection of good experience and competence of the cleft team and strict patient selection criteria in this centre. Several factors have been reported in the literature to be associated with poor treatment outcome following cleft surgery [14, 15]. In the present study, the success rate was significantly influenced by nutrition status, associated congenital anomalies and the width of the cleft. Malnutrition has been reported in several studies to be associated with a negative treatment outcome after orofacial cleft repair [16, 17, 32, 41]. As reported in other studies in resource-limited countries [16, 32, 42, 43], this study demonstrated a strong association between malnutrition and poor treatment outcome. There is a growing body of literature linking malnutrition with various complications including poor wound healing, persistent wound drainage, and increased susceptibility to surgical site infections [42]. The mechanism by which malnutrition may result in increased rates of complications involves impairment of the immune system to fight infections due to reduced number of lymphocytes, and impairment of wound healing due to reduced collagen synthesis [42, 43].

It has been shown in several studies that the co-existence of orofacial clefts with other congenital anomalies is associated with poor treatment outcome after cleft surgery [44]. In the current study, the presence of orofacial clefts associated with other congenital anomalies was found to influence the success rate after orofacial cleft repair. Associated congenital anomalies like cyanotic heart disease with low oxygen level or genetic defect like epidermal dysplasia with poor skin quality are more likely to pose problems of wound healing. There may be associated syndromes especially with isolated cleft palate, like thymus dysfunction or Ca2+ deficiency which may interfere with tissue healing.

The width of the cleft has been reported in the literature to influence the success rate following orofacial cleft repair [39]. In this study, the presence of wider clefts (>10 mm) were found to be associated with poor cleft outcome. It is widely accepted that the repair of wider clefts is more difficult to close and may require skilled hands and these clefts are also more likely to result in wound dehiscence and fistula [41].

CONCLUSION

This study documented that the majority of patients with orofacial clefts presented to BMC within 12 months of life. More than eighty percent of patients were treated successfully. Malnutrition, co-existing congenital anomalies and cleft width > 10 mm were the main factors affecting the treatment success. It is therefore recommended that appropriate measures focusing at improving nutrition, routine screening of co-existing congenital anomalies and aggressive tissue mobilization during cleft surgery are required to achieve closure of the wide palatal cleft are vital in order to deliver optimal care for these patients in this region. Further study involving long term period is necessary in this region to be able to assess speech outcome.

ACKNOWLEDGEMENTS

The authors wish to acknowledge all those who were involved in the care of our study patients and those who took part in the preparation of this manuscript.

REFERENCES

1. Vyas, T., Gupta, P., Kumar, S., Gupta, R., Gupta, T., & Singh, H. P. (2020). Cleft of lip and palate: A review. *Journal of family medicine and primary care*, *9*(6), 2621.
2. Antoszewski, B., & Fijałkowska, M. (2016). Prevalence of cleft lip and/or palate in children from L odz between years 1981–2010. *Congenital anomalies*, *56*(2), 60-64.
3. Manyama, M., Rolian, C., Gilyoma, J., Magori, C. C., Mjema, K., Mazyala, E., ... & Hallgrimsson, B. (2011). An assessment of orofacial clefts in Tanzania. *BMC Oral health*, *11*(1), 1-6.
4. Borno, H. T., Hussein, E. A., Dudin, A., & Van Aalst, J. A. (2014). Incidence of cleft lip and palate in the palestinian territories: a retrospective study from the Makassed Hospital neonatal unit. *The Cleft Palate-Craniofacial Journal*, *51*(4), 472-475.
5. Beston, B., & Fabian, F. M. (2007). Birth prevalence of cleft lip and palate based on hospital records in Dar es Salaam, Tanzania. *Tanzania Dental Journal*, *14*(1), 30-33.
6. Buyu, Y., Manyama, M., Chandika, A., & Gilyoma, J. (2012). Orofacial clefts at Bugando Medical Centre: associated factors and postsurgical complications. *The Cleft palate-craniofacial journal*, *49*(6), 736-740.
7. Michael, A. I., Olorunfemi, G., Olusanya, A., & Oluwatosin, O. (2023). Trends of cleft surgeries and predictors of late primary surgery among children with cleft lip and palate at the University College Hospital, Nigeria: A retrospective cohort study. *Plos one*, *18*(1), e0274657.
8. American Cleft Palate-Craniofacial Association. (2018). Parameters for evaluation and treatment of patients with cleft lip/palate or other craniofacial differences. *Cleft Palate Craniofac J*, 55, 137-156.
9. Conway, J. C., Taub, P. J., Kling, R., Oberoi, K., Doucette, J., & Jabs, E. W. (2015). Ten-year experience of more than 35,000 orofacial clefts in Africa. *BMC pediatrics*, *15*(1), 1-9.
10. Robin, N. H., Baty, H., Franklin, J., Guyton, F. C., Mann, J., Woolley, A. L., ... & Grant, J. (2006). The multidisciplinary evaluation and management of cleft lip and palate. *Southern medical journal*, *99*(10), 1111-1121.
11. Sanada, T., Yamada, A., Imai, Y., Saito, C., Hozawa, K., Kochi, S., & Ishizawa, N. (2002). Multidisciplinary management for cleft lip and palate patients: a team approach from Tohoku University. *Japanese Journal of Plastic and Reconstructive Surgery*, *45*(2), 117-123.
12. Adeyemo, W. L., James, O., Adeyemi, M. O., Ogunlewe, M. O., Ladeinde, A. L., Butali, A., ... & Ugwumba, C. U. (2013). An evaluation of surgical outcome of bilateral cleft lip surgery using a modified Millard's (Fork Flap) technique. *African journal of paediatric surgery: AJPS*, *10*(4), 307-310.
13. Mossey, P. A., Shaw, W. C., Munger, R. G., Murray, J. C., Murthy, J., & Little, J. (2011). Global oral health inequalities: challenges in the prevention and management of orofacial clefts and potential solutions. *Advances in dental research*, *23*(2), 247-258.
14. Freitas, J. A. D. S., Garib, D. G., Oliveira, M., Lauris, R. D. C. M. C., Almeida, A. L. P. F. D., Neves, L. T., ... & Pinto, J. H. N. (2012). Rehabilitative treatment of cleft lip and palate: experience of the Hospital for Rehabilitation of Craniofacial Anomalies - USP (HRAC/USP). Part 1: overall aspects. *J Appl Oral Sci*, *20*(1), 9-15.
15. Abdurrazaq, T. O., Micheal, A. O., Lanre, A. W., Olugbenga, O. M., & Akin, L. L. (2013). Surgical outcome and complications following cleft lip and palate repair in a teaching hospital in Nigeria. *African Journal of Paediatric Surgery*, *10*(4), 345-357.
16. Adesina, O. A., Efunkoya, A. A., Omeje, K. U., & Idon, P. I. (2016). Postoperative complications from primary repair of cleft lip and palate in a semi-urban Nigerian teaching hospital. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*, *57*(3), 155-159.
17. Akinmoladun, V., Ademola, S., & Ademola, A. (2017). Management of cleft lip and palate in Nigeria: A survey. *Nigerian Journal of Clinical Practice*, *20*(11), 1355-1359.
18. Gundlach, K. K., & Christina, M. A. U. S. (2006). Epidemiological studies on the frequency of clefts in Europe and world-wide. *Journal of Cranio-Maxillofacial Surgery*, *34*, 1-2.
19. Butali, A., Adeyemo, W. L., Mossey, P. A., Olasoji, H. O., Onah, I. I., Adebola, A., ... & Awoyale, T. A. (2014). Prevalence of orofacial clefts in Nigeria. *The Cleft palate-craniofacial journal*, *51*(3), 320-325.
20. Croen, L. A., Shaw, G. M., Wasserman, C. R., & Tolarová, M. M. (1998). Racial and ethnic variations in the prevalence of orofacial clefts in California, 1983–1992. *American journal of medical genetics*, *79*(1), 42-47.
21. Shapira, Y., Lubit, E., Kuftinec, M. M., & Borell, G. (1999). The distribution of clefts of the primary and secondary palates by sex, type, and location. *The Angle Orthodontist*, *69*(6), 523-528.
22. Suleiman, A. M., Hamzah, S. T., Abusalab, M. A., & Samaan, K. T. (2005). Prevalence of cleft lip and palate in a hospital-based population in the Sudan. *International journal of paediatric dentistry*, *15*(3), 185-189.
23. Msamati, B. C., Igbigbi, P. S., & Chisi, J. E. (2000). The incidence of cleft lip, cleft palate, hydrocephalus and spina bifida at Queen Elizabeth

Central Hospital, Blantyre, Malawi. *The Central African journal of medicine*, *46*(11), 292-296.
24. Omo-Aghoja, V. W., Omo-Aghoja, L. O., Ugboko, V. I., Obuekwe, O. N., Saheeb, B. D. O., Feyi-Waboso, P., & Onowhakpor, A. (2010). Antenatal determinants of oro-facial clefts in Southern Nigeria. *African health sciences*, *10*(1), 31-39.
25. Ueda, T., Kadomatsu, K., & Morita, M. (2006). Study of cleft lip and/or palate, relation of cleft types with sex. *Showa Univ J Med Sci*, *66*(3), 194-199.
26. Odhiambo, A., Rotich, E. C., Chindia, M. L., Macigo, F. G., Ndavi, M., & Were, F. (2012). Craniofacial anomalies amongst births at two hospitals in Nairobi, Kenya. *International journal of oral and maxillofacial surgery*, *41*(5), 596-603.
27. Titus Osita Chukwuanukwu, T., Anthony Afiadigwe, E., I Apakama, A., Chukwuanukwu, R., Uchechukwu Nwankwo, E., & Ilokanuno Chinedu Nnaemeka, C. (2021). Epidemiology of cleft lip and palate in Nigeria: a data-based study. *International Journal of Scientific Research in Dental and Medical Sciences*, *3*(2), 73-77.
28. Shprintzen, R. J., Siegel-Sadewitz, V. L., Amato, J., Goldberg, R. B., Opitz, J. M., & Reynolds, J. F. (1985). Anomalies associated with cleft lip, cleft palate, or both. *American journal of medical genetics*, *20*(4), 585-595.
29. JENsEN, B. L., Kreiborg, S., Dahl, E., & Fogh-Andersen, P. (1988). Cleft lip and palate in Denmark, 1976-1981: epidemiology, variability, and early somatic development. *Cleft Palate J*, *25*(3), 258-269.
30. Onyango, J. F., & Noah, S. (2005). Pattern of clefts of the lip and palate managed over a three year period at a Nairobi hospital in Kenya. *East African medical journal*, *82*(12), 649-651.
31. Donkor, P., Bankas, D. O., Agbenorku, P., Plange-Rhule, G., & Ansah, S. K. (2007). Cleft lip and palate surgery in Kumasi, Ghana: 2001-2005. *Journal of Craniofacial Surgery*, *18*(6), 1376-1379.
32. Sitzman, T. J., & Marcus, J. R. (2014). Cleft lip and palate: Current surgical management. *Clinics in Plastic Surgery*, *41*(2), xi-xii.
33. Law, R. C., & de Klerk, C. (2014). Anaesthesia for Cleft Lip and Palate Surgery. *Medpharm*, (14), 27-30.
34. Akitoye, O. A., Fakuade, B. O., Owobu, T. O., Efunkoya, A. A., Adebola, A. R., & Ajike, S. O. (2018). Anaesthesia for cleft lip surgeries in a resource poor setting: techniques, outcome and safety. *Pan African Medical Journal*, *31*(1), 105.
35. Fontanals, M., Merritt, G., Sierra, P., & Echaniz, G. (2021). Anesthetic Considerations and Complications of Cleft Palate Repairs. What's New?. *Current Anesthesiology Reports*, *11*, 257-264.
36. Bandyopadhyay, K. H., & Paul, A. (2016). Postoperative analgesia for cleft lip and palate repair in children. *Journal of anaesthesiology, clinical pharmacology*, *32*(1), 5.
37. Patel, T. A., & Patel, K. G. (2019). Comparison of the fisher anatomical subunit and modified millard rotation-advancement cleft lip repairs. *Plastic and reconstructive surgery*, *144*(2), 238e-245e.
38. Fisher, D. M. (2005). Unilateral cleft lip repair: an anatomical subunit approximation technique. *Plastic and reconstructive surgery*, *116*(1), 61-71.
39. Stein, M. J., Zhang, Z., Fell, M., Mercer, N., & Malic, C. (2019). Determining postoperative outcomes after cleft palate repair: a systematic review and meta-analysis. *Journal of plastic, reconstructive & aesthetic surgery*, *72*(1), 85-91.
40. Kakar, A. U., Mundokhail, H. U., & Agha, B. A., & Mohammad, D. K. (2020). Determine the Frequency of Postoperative Complications in Patients Undergoing Primary Repair of Cleft Lip. *PJMS*, 505-506.
41. Diah, E., Lo, L., Yun, C., Wang, R., Wahyuni, L. K., & Chen, Y. (2007). Cleft oronasal fistula: a review of treatment results and a surgical management algorithm proposal. *Chang Gung medical journal*, *30*(6), 529-537.
42. Bishop, A., Witts, S., & Martin, T. (2018). The role of nutrition in successful wound healing. *J Community Nurs*, *32*(4), 44-50.
43. Cubitt, J., Hodges, A., Galiwango, G., & Van Lierde, K. (2012). Malnutrition in cleft lip and palate children in Uganda. *European Journal of Plastic Surgery*, *35*(4), 273-276.

Cite This Article: Samson K. Ephraim, Cecilia Protas, Francis Tegete (2023). Surgical Management of Oro-Facial Clefts at a Tertiary Care Hospital in a Resource-Limited Setting: A Tanzanian Experience. *East African Scholars J Med Surg*, *5*(10), 210-222.