

ORIGINAL ARTICLE

**PATTERN AND OUTCOME OF NEONATAL SURGICAL CASES
AT TIKUR ANBESSA UNIVERSITY TEACHING HOSPITAL,
ADDIS ABABA, ETHIOPIA**

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ABSTRACT

Introduction: *The survival of neonates with surgical conditions has greatly improved in developed countries, but still remains poor in developing countries. Available evidence suggests that this is due to several challenges encountered in neonates requiring surgical care. The aim of this study was to determine causes and outcomes of neonatal surgical admissions.*

Patients and Methods: *retrospective review of medical records of neonates who were admitted and treated at Tikur Anbessa Hospital between January 1, 2010 and December 31, 2014. Data were analyzed using descriptive statistics and association between variables measured using regression analysis on SPSS version 16 statistical software.*

Results: *There were a total of 652 surgical neonatal admissions during the study period of which 396 were males, 252 females and 4 with indeterminate genitalia. The male to female ratio was 1.6:1. Majority of the cases 562 (86.2%) had congenital malformation. Lesions of the gastrointestinal tract 282(43.3%), mainly Anorectal malformations followed by abdominal wall defects. Two-third (66.6%) of the cases were surgically managed. Nearly one-quarter of them died. The proportion who died ranged from 0.03% for Hirschsprung's disease to 73.2% for esophageal atresia. The immediate causes of death among these series of neonates were ascribed to septic shock and respiratory failure.*

Conclusion: *Neonatal surgical admission is common in the Hospital. The overall number of deaths in this series of neonatal surgical cases was high. The type of principal diagnosis and the age of the neonates at admission were significantly associated with outcome. Creating awareness about neonatal surgical conditions may help to improve the current poor result.*

Key word: *surgical neonate, principal diagnosis, outcome.*

INTRODUCTION

The neonatal population constitutes a considerable proportion of admissions to the surgical wards and this puts a burden on health facilities (1). Of the 20 countries with the highest neonatal mortality rates, 80% are in Sub-Saharan Africa (2). The major causes of neonatal deaths are birth asphyxia, prematurity and severe infections (3-5). Little is known about the burden of neonatal surgical conditions on the overall neonatal mortality. The leading causes of neonatal surgical admissions are congenital anomalies, surgical infections, and trauma (6). A plausible way of

decreasing the burden of childhood illnesses is the prevention and early treatment of neonatal surgical conditions, many of which result in disability or death when left untreated (7).

Surgical intervention in the newborn poses a major challenge worldwide (8, 9). In the developed world, there has been steady improvement in outcome of neonatal surgical cases as indicated by the low occurrence of death owing to a number of factors. These mainly include better understanding of fetal pathophysiology, sophisticated surgical neonatal intensive care units, better transport facility, availability of facilities like parenteral nutrition and highly skilled personnel (8, 10-12).

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There are still major gaps in surgical care of neonates in developing countries. Neonatal surgery is still troubled with a number of problems in this settings, including late presentation and lack of medical facilities and human resources (13), thereby, rendering newborn surgery an intervention that is associated with unacceptably high morbidity and increased number of deaths. Neonatal surgery is often considered a low priority in healthcare budget planning and allocation in developing countries primarily due to the high burden of childhood illnesses, including other neonatal diseases. Pediatric surgery has often been viewed as too expensive and a nonessential service and it has been excluded from most child health programs. In many of the developing countries, congenital anomalies go unrepaired, treatable injuries result in lifelong disabilities, and children die easily of correctable surgical problems (14).

PATIENTS AND METHODS

A cross-sectional analytical study based on review patient clinical records of neonates presenting with surgical condition and managed at pediatric surgical unit of Tikur Anbessa Teaching Hospital between January 1, 2010 and December 31, 2014. We collected data from patients' clinical records on a pre-prepared format which included age at presentation, sex and address of the neonate, principal diagnosis, duration of presenting problem and hospital stay, and treatment given and outcome. The data were entered, cleaned and analyzed using SPSS version 16 statistical software. We conducted descriptive analysis including computation of frequency distribution and proportions and used texts, tables, figures and summary statistics to describe the variables.

Both bivariate and multivariate logistic regression analyses were used to assess the strength of association between dependent and independent variables. Bivariate analyses were conducted to see the fre-

quency distribution and to test whether there is association between dependent variables and selected independent variables. Factors significantly associated with the outcome (dependent) variable at P value of 0.05 and less in bivariate analysis were identified and these as well as variables with p-value of less than 0.20 were included in the multivariate analysis. The regression model was built with backward elimination (backward LR) and P-values 0.05 and less were considered statistically significant.

After ethical clearance obtained from Research and Publication Committee of the department, all applicable institutional regulations for ethical practice were followed in conducting the study.

RESULTS

A total of 652 neonates between 0 and 28 days of age comprising of 396 males, 252 females and 4 with indeterminate genitalia were seen during the study period. All (561), except for 91 records with incomplete data (e.g. unknown outcome) which were excluded from the study, were analyzed. The patients came from different part of the country, 394 (60.4%) came from Addis Ababa and the remaining 258 (39.6%) came from other regions of the country. The number of cases admitted and managed increased over the years starting with 85 cases in 2010 and reaching 200 by 2014 (Table 1).

Among the total neonatal surgical conditions seen in the study group nearly one-half (43.3%) of the cases were gastrointestinal lesions. Other cases were abdominal wall defects (15.5%), esophageal atresia with or without fistula (12.6%), craniospinal defects (11.8%), head and neck malformations (4.6%), musculoskeletal conditions (3.7%), surgical infections (2.6%), genitourinary diagnosis (1.8%) and other various clinical conditions (4.1%). (Table 2).

Table 1: Frequency distribution of the neonatal surgical diagnoses by year and age at admission, Tikur Anbessa Hospital, Addis Ababa; Jan. 1, 2010 to Dec 31, 2014 (n=652)

Year and age admission			Principal diagnosis									Total
			GIT	Tracheo- eso- phageal	Abdomi- nal defect	wall	Head & Neck	GUT	Cranio- spinal	Muskulo- skeletal	Surgical infect- ions	
2014	Age (days)	0-5	39	18	27	7	3	16	9	0	2	121
		6-10	23	7	0	0	2	1	0	1	1	35
		11-15	5	1	3	0	0	1	0	1	1	12
		16-20	4	0	2	0	0	0	0	2	1	9
		21-25	9	0	1	0	1	0	0	2	1	14
		≥26	6	0	0	0	1	0	0	2	0	9
		Total	86	26	33	7	7	18	9	8	6	200
2013	Age (days)	0-5	39	12	11	1	0	2	4	0	6	75
		6-10	12	4	1	0	0	0	1	0	0	18
		11-15	7	1	3	0	1	0	0	0	0	12
		16-20	3	0	1	0	1	0	0	0	1	6
		21-25	2	1	0	0	1	0	0	2	2	8
		≥26	6	0	0	0	0	0	0	0	0	6
		Total	69	18	16	1	3	2	5	2	9	125
2012	Age (days)	0-5	32	13	19	9	0	19	7	0	2	101
		6-10	9	3	0	0	0	0	0	0	3	15
		11-15	7	1	2	0	0	0	0	0	1	11
		16-20	3	0	1	0	0	0	0	0	0	4
		21-25	5	1	0	0	0	1	0	0	1	8
		≥26	4	0	0	0	0	0	0	0	0	4
		Total	60	18	22	9	0	20	7	0	7	143
2011	Age (days)	0-5	17	5	11	7	0	14	2	1	1	58
		6-10	9	3	2	0	0	1	0	0	2	17
		11-15	1	2	1	0	0	0	0	1	1	6
		16-20	2	1	0	0	0	0	0	4	0	7
		21-25	6	1	0	0	1	0	0	0	0	8
		≥26	2	0	0	1	0	0	0	0	0	3
		Total	37	12	14	8	1	15	2	6	4	99
2010	Age (days)	0-5	23	2	12	4	0	22	1	0	0	64
		6-10	1	3	1	0	1	0	0	0	0	6
		11-15	0	2	2	1	0	0	0	0	0	5
		16-20	3	0	0	0	0	0	0	1	0	4
		21-25	1	0	0	0	0	0	0	0	1	2
		≥26	2	1	1	0	0	0	0	0	0	4
		Total	30	8	16	5	1	22	1	1	1	85
Grand total			282	82	101	30	12	77	24	17	27	652

Table 2: Frequency distribution of the clinical diagnoses by sex of neonates at Tikur Anbessa Hospital, Addis Ababa, Jan. 1, 2010 to December 31, 2014 (n=652)

	Clinical diagnosis	Sex*		Frequency	Percent
		M	F		
GIT	Anorectal malformations	95	27	124	19.0
	Intestinal atresia	20	24	44	6.7
	Hirschsprung's Disease	29	10	39	6.0
	Hypertrophic Pyloric Stenosis	36	7	43	6.6
	Meconium ileus	5	3	8	1.2
	Necrotising enterocolitis	4	2	6	0.9
	Malrotation	11	2	13	2.0
	Others	3	2	5	0.7
Total		202	78	282	43.3
Abdominal Wall defect	Omphalocele	31	37	68	10.4
	Gastroschisis	7	11	18	2.8
	Bladder extrophy	7	5	13	2.0
	Cloacal extrophy	0	1	2	0.3
Total		45	54	101	15.5
	Esophageal atresia with or without fistula	41	41	82	12.6
Head and neck	Cleft lip & or cleft palate	9	15	24	3.7
	Choanal atresia	2	0	2	0.3
	Cystic hygromas	4	0	4	0.6
Total		15	15	30	4.6
GUT	Posterior urethral valve	2	0	2	0.3
	Pelviureteric junction obstruction	2	0	2	0.3
	Others	8	0	8	1.2
Total		12	0	12	1.8
Craneospinal	Spina bifida	20	26	46	7.1
	Meningiomyelocele	16	10	26	4.0
	Encephalocele	1	1	2	0.3
	Skull fracture	1	1	2	0.3
	Hydrocephalus	0	1	1	0.2
Total		38	39	77	11.8
Musculoskeletal	Long bone fractures	10	2	12	1.8
	Clubfoot	4	2	6	0.9
	DDH	2	1	3	0.5
	Clavicular fracture	0	2	2	0.3
	Shoulder dislocation	1	0	1	0.2
Total		17	7	24	3.7
Surgical infections		9	8	17	2.6
Miscellaneous		17	10	27	4.1
Grand total	*4 with indeterminate sex included	396	252	652	100

The majority, 86.2% (n=562) of the cases had congenital diagnoses and the remaining 13.8% (n=90) were having acquired surgical conditions. Among the acquired surgical conditions Idiopathic Hypertrophic Pyloric Stenosis, Necrotising enterocolitis, intussusception and spontaneous jejunal perforation were among the documented cases in the gastrointestinal tract. In the genitourinary system, testicular torsion, post circumcision bleeding and post circumcision urethral injury were identified. Acquired conditions in the musculoskeletal system included iatrogenic long bone fractures, clavicular fractures and shoulder dislocation sustained during delivery. Other miscellaneous acquired surgical conditions included surgical infections (septic joint, Pyomyosities, necrotizing fasciitis, scrotal abscess), incarcerated inguinal hernia, pneumothorax, and primary peritonitis.

Among the total of 652 neonates 434 (66.6%) underwent surgical management; of this six neonates were having repeated operation. Conservative management was given to 67 (10.3%) of the neonates. About 95 (14.6%) of the neonates with craniospinal defects, head and neck lesions and musculoskeletal problems were referred to other health facilities. Among the total of 652 neonates 489 (75%) discharged improved, 159 (24.4%) died and the remaining four were discharged against medical advice (DAMA).

Fifty four neonates were extremely ill at arrival and died during resuscitation and stabilization accounting for 34% of the neonates who died. Surgical management was associated with 21% mortality (91 of the 434) and none of the six cases who were re-operated survived. Twelve of 67 (18.0%) of the neonates who had conservative management died. Among the 93 referred neonates two (2.1%) died before they left the hospital (Figure 1).

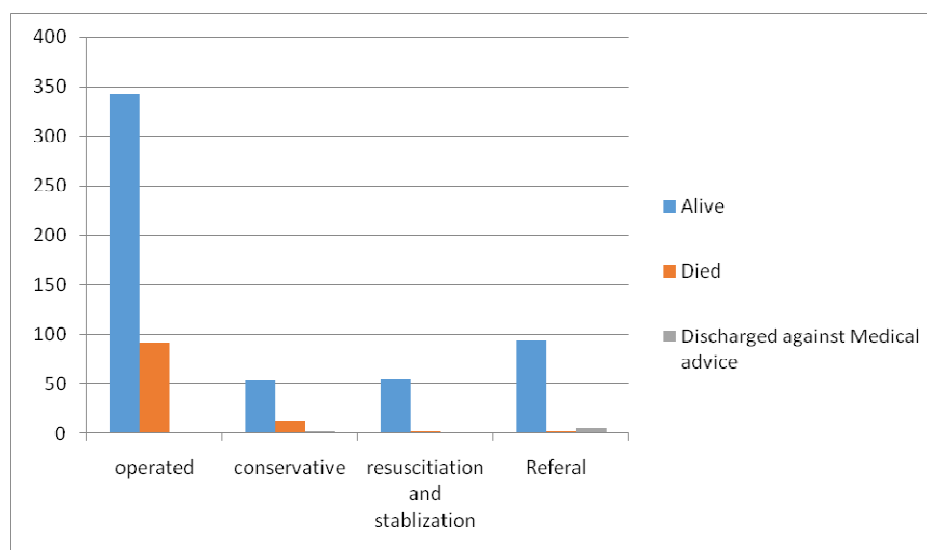


Figure 1: Distribution of outcome by treatment provided among neonates with surgical conditions, Tikur Anbesa Hospital, Addis Ababa; Jan. 1, 2010 to December 31, 2014 (n=652)

Among those 394 cases who came from Addis Ababa 20.6% died and the 258 cases who came from other regions 29.5% died. The proportion of those who died when analyzed by principal diagnosis at admission ranged from zero to 73.2%. Among gastrointestinal lesions, NEC was associated with 50% of the deaths, malrotation with 46.2%, intestinal atresia with 31.8%, meconium ileus with 25%, IHPS with 0.05%, and Hirschsprung's Disease with 0.03%. There was no death among cases with intussusception, jejunal web and patent omphalomesenteric duct.

The proportion neonatal deaths associated with the diagnoses in other systems were 60/ 82 (73.2%) with

tracheoesophageal fistula, 33/101(32.7%) with abdominal wall defect 1/12 (23.1%) with genitourinary lesions, 1/30 (3.3%) with head and neck lesions, 3/17 (23.1%) with surgical infections, 4/10 (40%) with congenital diaphragmatic hernia. There were no deaths from lesions in the musculoskeletal system (Figure 2).

Respiratory failure and septic shock with multiple organ dysfunction syndromes were documented immediate cause of death in 40% and 25% of the cases, respectively. In the remaining 35% of cases, the immediate cause of death was not documented.

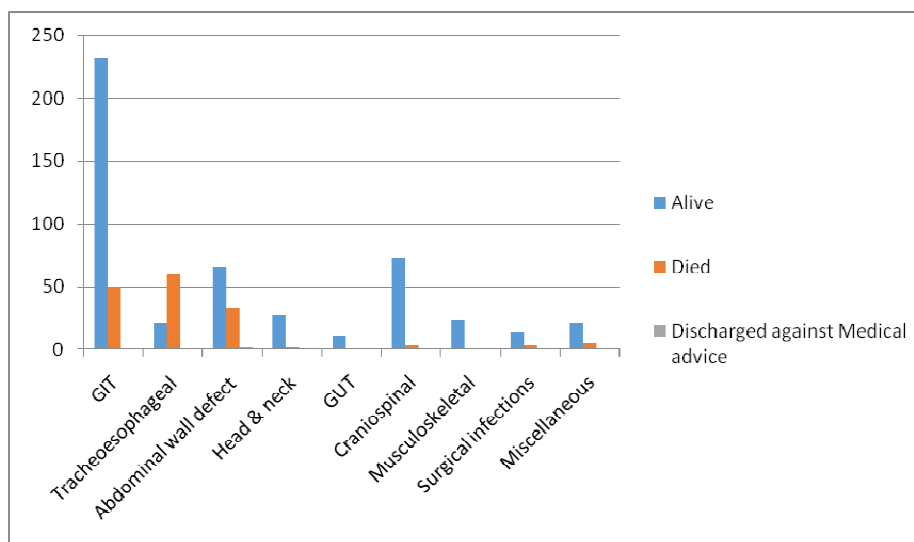


Figure 2: Distribution of outcome by principal diagnosis among neonates with surgical conditions, Tikur Anbesa Hospital, Addis Ababa; December 2014. (n=652).

There was statistically significant association between outcome and age of the neonate. Neonates older than 20 days of age had better outcome than neonates under the age of 5 days in the study period [Adjusted -OR= 0.170; 95 % CI, (0.47, 0.62)].

There was also statistically significant association between outcome and principal diagnosis. Neonates

who was diagnosed to have Esophageal atresia with or without fistula and abdominal wall defect had higher mortality compared to neonates with other clinical diagnosis with [Adjusted -OR= 12.19; 95 % CI, (6.72, 22.11)] and [Adjusted -OR= 1.78; 95 % CI, (1.04, 3.02)] respectively (Table 3).

Table 3: Correlates of outcome with age of the neonate, residence, principal diagnosis and treatment given at Tikur Anbesa Hospital Addis Ababa, Jan.1, 2010 to Dec. 31, 2014. (n=652)

variable	Category	Outcome		COR 95% C.I.	AOR 95% C.I.	P value AOR
		Improved n=493	Died n= 159			
Age of the neonate	0-5 day	309	110	1.00	1.00	0.00
	6-10 day	67	24	8.90(1.19-66.46)	584(315-1.085)	0.089
	11-15 day	31	15	8.95(1.50-69.73)	842(453-1.959)	0.873
	16-20 day	24	6	12.09(1.49-97.96)	623(222-1.746)	0.368
	20-25 day	37	3	6.25(0.70-55.83)	0.170(0.47-0.620)*	0.007
	>=26	25	1	20.27(0.19-20.61)	0.101(0.013-0.814)*	0.031
Residence	Addis Ababa	311	83	1.00	1.00	1.00
	Out of Addis Ababa	182	76	1.56(1.09-2.24)	1.38(0.893-2.13)	0.014
Nature of the Problem	Congenital	412	150	1.00	1.00	1.00
	acquired	81	9	0.30(0.15-0.62)	0.967(0.36-2.55)	0.946
Principal diagnosis	GIT	232	50	1.00	1.00	1.00
	Tracheo esophageal	22	60	12.65(7.11-22.51)	12.19(6.72-22.11)**	0.00
	Abdominal wall defect	68	33	2.25(1.34-3.77)	1.78(1.04-3.02)*	0.033
	Head & Neck	28	2	0.33(0.07-1.43)	0.254(0.058-1.11)	0.069
	Genitourinary	11	1	0.42(.053-3.34)	0.55(0.068-4.565)	0.58
	Craneospinal	73	4	0.25(0.89-0.72)	0.192(0.066-0.55)*	0.002
	Musculoskeletal	24	0	0.00(0.0-0.0)	0.00(0.00-0.00)	0.99
	Surgical infection	14	3	0.994(0.27-3.59)	1.531(0.371-6.314)	0.55
	miscellaneous	21	6	1.32(0.50-3.45)	1.429(0.536-3.814)	0.47

*Statistically significant at P< 0.2

**Statistically significant at P< 0.05

DISCUSSION

In this study, the vast majority of the neonatal surgical conditions were congenital (86.2%). This figure is comparable to Ugwu (16) from Nigeria who reported 88.7% but higher than 77.2% a report done from south Sudan (17). Some 43.3% neonatal surgical conditions in this study were mainly gastrointestinal which is similar to Ugwu et al as he reported 43.7% ;but this figure is lower than that reported from University of Uyo Teaching Hospital south Nigeria, which was 57.7% (18). However, the study in university of Uyo was mainly concerning emergency neonatal surgical conditions in contrast to our population which included both elective and emergency cases, a factor which explains the difference in findings in the Nigerian and our study.

The overall mortality of neonates with surgical conditions in our study was 24.4%, a figure much higher than reported figures from developed countries where survival is close to 100%. This difference is due to poor basic health facilities, unavailability of total parental nutrition, poor transportation, and weak care and monitoring facilities limiting prompt diagnosis and surgical intervention. Comparing death outcomes reported by a study from south Sudan revealed a proportion of 12.4% which is much lower than what has been observed in our study. This lower proportion reported from south Sudan might be due to the rural nature of the health facilities which were admitting less complicated cases and referring most critical and difficult cases to tertiary centers.

Other studies from sub-Saharan Africa, have reported higher proportions of deaths than what we have identified in our study, ranging from 35.5% by Osifo et al. from the University of Teaching Hospital in Nigeria to 62.2% by Ilori et al. from south Nigeria (15, 18).

In our study, most of the immediate causes of deaths of neonates with surgical conditions were ascribed to sepsis and respiratory failure, but because of the scarcity of blood cultures and arterial blood gas measurement facilities, the specific causes of death could be difficult to identify and the causes might very well be due to a combination of factors like infections, dehydrations, hypothermia and other conditions as revealed by other similar studies (15, 16). Significant association was observed between principal diagnoses and age of the neonate and the outcome. As in other studies (15,17) esophageal atresia with or without fistula was a principal diagnosis with highest proportion of deaths, which was in the order of 73.2%.

Conclusion and recommendations: Surgical neonatal conditions are quite common and congenital anomalies accounted for the majority of surgical diagnosis in the newborns. Commonest disorders were those of the gastrointestinal system. Overall, the number/proportion of deaths among neonates with surgical conditions managed in hospitals was very high. We recommend provision of education to community health workers about neonatal surgical conditions and awareness generation at the community level. Care providers at primary health care units need to be trained on early referral, initial resuscitation and safe neonatal transport.. There is also a need to improve neonatal care facilities and the number of skilled care providers to improve interventions and outcomes of neonates with surgical conditions.

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