

Outcome of neonatal surgeries in Nnewi, Nigeria

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Background A surgical neonate is a challenge, especially in developing countries such as Nigeria, where neonatal surgical practice is still evolving. Mortality is still high compared with developed nations. Data from developing countries on this emerging aspect of paediatric surgery, however, are scarce. We reviewed all neonatal surgical cases that were managed at the Nnamdi Azikiwe University Teaching Hospital Nnewi, a tertiary institution located in the South Eastern region of Nigeria, with a view of determining the outcome.

Patients and methods This was a retrospective review of Hospital records of infants aged 0–28 days who were treated at the Special Baby Care Unit of the hospital from January 2009 to June 2012.

Results Out of 1863 babies admitted to the Special Care Baby Unit of the hospital, 147 (8%) were surgical cases. There were 91 males and 56 females (M:F=1.6:1). The mean weight of the babies was 2.5 kg (range=0.1–4.3 kg). Thirty-two babies (16.9%) were premature. The most frequent indication for admission is gastrointestinal conditions, accounting for 78.2% of all neonatal surgeries. The most common procedure carried out was intestinal anastomosis and repair (36%). One hundred and thirteen neonates (76.9%) presented beyond 48 h of onset of symptoms. Of the delayed cases, 65% sought medical attention early at the primary and secondary health centres, but referral was delayed from periods ranging from 2 to 21

days (mean=5 days). Only 15 of the neonates had a valid prenatal ultrasound diagnosis. In only three of the cases were the mothers referred for planned delivery and specialist care. Infective conditions (sepsis, surgical site infection, respiratory tract infections) accounted for 45.4% of morbidity. Mortality was higher in the late presenters, premature babies, babies with weight less than 2.5 kg and in thoracic surgeries. Overall, 41 neonates died, yielding a mortality of 27.9%.

Conclusion The high morbidity and mortality from neonatal surgeries still persists. Factors that negatively affect the outcome include late presentation, prematurity, low birth weight and thoracic surgeries. Enhanced prenatal diagnosis, early patient referral, further personnel training and improvement in facilities will improve outcome. *Ann Pediatr Surg* 11:132–135 © 2015 Annals of Pediatric Surgery.

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Introduction

Management of a surgical neonate poses an enormous challenge both to the neonate and to the paediatric surgeon, especially in developing countries, where neonatal surgery is still evolving.

The stress of illness and surgical intervention is significant on newborns undergoing several transformational changes for extrauterine adaptation. This burden is greater in premature and low birth weight babies. Increased understanding of the neonatal physiology, prenatal diagnosis, better anaesthesia, improved neonatal intensive care and development of neonatal centres have enabled intervention measures that have resulted in a marked rise in neonatal surgery survival from about 28% in 1949 to more than 95% currently [1–3].

In Nigeria, like in most developing countries, neonatal surgery is still in its early stage.

Mortality is still high compared with developed countries [4–6]. This is because of paucity of personnel and facilities, unavailability of prenatal diagnosis, delayed presentation, transportation under unfavourable conditions and absence of neonatal intensive care facilities [7,8].

Data from developing countries on this emerging aspect of paediatric surgery are still scarce.

We reviewed all neonatal surgical cases that were managed at the Nnamdi Azikiwe University Teaching Hospital Nnewi, a tertiary institution located in the South Eastern region of Nigeria, with the aim of determining the presentation and outcome.

Patients and methods

Hospital records of infants aged 0–28 days who presented at the Special Baby Care Unit of the hospital from January 2009 to June 2012 were retrospectively reviewed and analysed. Neonates who had undergone circumcision were excluded from the review.

Data on prenatal care, age at presentation, sex, weight, clinical condition on arrival, surgical pathology, treatment offered, complications and outcome were obtained. Simple statistical analysis was used to compute the results.

Results

During the three and half year period of review, 1863 babies were admitted to the Special Care Baby Unit of the hospital. One hundred and forty-seven (8%) of these

were surgical cases. There were 91 males and 56 females, with a male to female ratio of 1.6 : 1. The mean weight of the neonates was 2.5 kg (range 1.1–4.3 kg).

Thirty-two babies (16.9%) were premature.

The most frequent indication for admission was gastrointestinal conditions (78.2%).

Intestinal atresia was the most common pathology 25 (17%). Of those with atresia, 13 had duodenal atresia, 10 had jejunoileal atresia (JIA) and two had colonic atresia.

Thirteen of the neonates with anorectal malformation were of the high or intermediate type, five were low malformations and three had cloaca. Omphalocele (13.6%) was the third most common pathology. Three of the omphalocele were ruptured at presentation. Of the neonates with oesophageal atresia, one was isolated oesophageal atresia, whereas the rest were oesophageal atresia with associated distal fistula.

Three of the neonates with malrotation and midgut volvulus had gangrene involving 60–85% of midgut.

Table 1 outlines the relative frequencies of the various disorders treated.

Surgical procedures

Gastrointestinal surgeries formed the bulk of the surgical procedures within the study period. The most common procedure carried out was intestinal anastomosis (18.9%).

Duodenal atresia was treated by duodeno-duodenostomy (n = 6) or duodenojejunosomy (n = 8). Two neonates with type 1 JIA were treated by enterotomy and excision of membrane. One of them was subjected to a repeat surgery (resection of the dilated proximal jejunum and jejunoileal anastomosis) because of a prolonged persistent vomiting as a result of poor motility of the dilated segment. All other

Table 1 Case distribution and frequencies

Diagnosis	Number patients (%)
Digestive system	
Intestinal atresia	25 (17.0)
Anorectal malformation	21 (14.3)
Omphalocele	20 (13.6)
Intestinal perforations	13 (8.8)
Gastroschisis	11 (7.5)
Malrotation of the gut	7 (4.8)
Oesophageal atresia	5 (3.4)
Hirschsprung's disease	5 (3.4)
Obstructed inguinal hernia	4 (2.7)
Obstructive jaundice	3 (2.0)
Congenital liver cyst	1 (0.7)
Urogenital	
Posterior urethral valve	7 (4.8)
Ectopia vesicae	2 (1.4)
Cloacal extrophy	2 (1.4)
Prune belly syndrome	2 (1.4)
Neonatal testicular torsion	2 (1.4)
Vaginal atresia	1 (0.7)
Musculoskeletal	
Abscesses	6 (4.1)
Congenital cutis aplasia	2 (1.4)
Tumours	
Sacrococcygeal teratoma	4 (2.7)
Cystic hygroma	2 (1.4)
Cervical teratoma	2 (1.4)
Total	147 (100.0)

Table 2 Procedures carried out with associated mortality

Procedure	Number of procedures	Mortality (n)	Case specific (%)	Total mortality (%)
Gastrointestinal				
Intestinal anastomoses	31	7	22.6	17.1
Colostomy	27	4	14.8	9.8
Gastroschisis repair	11	6	54.5	14.6
Primary closure of gastrointestinal perforation	9	4	44.4	9.8
Ladd's procedure	7	1	14.3	2.4
Repair of ruptured omphalocele	5	4	80	9.8
Gastrostomy	5	1	20	2.4
Ileostomy	5	2	40	4.9
Anoplasty	4	1	25	2.4
Biliary tract surgery	2	1	50	2.4
Excision of liver cyst	1	0	0	0
Urological				
Valvotomy	7	0	0	0
Early cloacal extrophy repair	2	0	0	0
Functional closure of ectopia vesicae	2	0	0	0
Orchiopexy	2	0	0	0
Cutaneous ureterostomy	2	0	0	0
Vesicostomy	2	0	0	0
Thoracic				
Primary repair of tracheo oesophageal fistula	3	3	100	7.3
Others				
Conservative management	22	6	27.3	14.6
Excision of teratoma	8	1	12.5	2.4
Herniotomy	7	0	0	0
Total	164	41		100

cases of JIA underwent excision of the dilated proximal part and primary end-to-end anastomosis.

Omphalocele were managed conservatively and the resultant ventral hernia was repaired after neonatal age. Of those with ruptured omphalocele or gastroschisis, closure was achieved using a skin flap (n = 5), primary fascial closure (n = 3), improvised silo with intravenous fluid or drainage bag (n = 3) and polypropylene mesh (n = 3).

Early in the study period, three neonates with oesophageal atresia were managed by early primary repair within the first week of life. However, the last two were managed by constructing an initial feeding gastrostomy, intermittent proximal pouch suctioning and delayed primary closure performed after 6 weeks.

Colostomy was performed in neonates with high and intermediate anorectal malformation (n = 17), intestinal perforations (n = 5), cloacal extrophy (n = 2) and a repeat surgery for failed intestinal anastomosis (n = 3).

Table 2 shows the summary of the surgical procedures carried with associated mortality rates.

Outcome parameters

One hundred and thirteen neonates (76.9%) presented beyond 48 h of onset of symptoms.

Of the delayed cases, 65% sought medical attention early at the primary and secondary health centres, but referral was delayed from periods ranging from 2 to 21 days (mean = 5 days). Majority of these neonates present in conditions of varying levels of physiologic compromise.

Table 3 Complications

Complication	Number of patients (%)
Anaesthesia related	34 (26.0)
Surgical site infection	26 (19.9)
Sepsis	16 (12.2)
Malnutrition (clinical)	13 (9.9)
Respiratory tract infection	12 (9.2)
Stress gastritis	8 (6.1)
Aspiration	8 (6.1)
Skin excoriation	6 (4.6)
Acute renal failure	6 (4.6)
Enterocutaneous fistula	2 (1.5)
Total	131 (100)

Table 4 Comparison of mortality from several outcome variables

Parameters	Number of patients	Dead	Mortality (%)
Presentation (h)			
< 48	34	9	26.5
> 48	113	32	28.3
Gestational age (weeks)			
< 38	32	11	34.4
≥ 38	115	30	26.1
Weight (kg)			
≤ 1.5	5	3	60
1.6–2.5	49	18	36.7
> 2.5	93	20	21.5
Body system affected			
Gastrointestinal	110	31	28.1
Genitourinary	16	0	0
Skin and musculoskeletal	16	0	0
Thoracic	5	3	60.0

Nine (26.5%) of the early presenters and 32 (28.3%) of the late presenters died.

Only 15 of the neonates had a valid prenatal ultrasound diagnosis. However, only in three (gastroschisis) was the mother referred for planned delivery and specialist care. All three survived.

Neonatal thoracic surgery led to the highest mortality rate. Three babies with primary oesophageal repair died of respiratory complications. Subsequent babies were managed by delayed primary repair.

Infective conditions (sepsis, surgical site infection, respiratory tract infections) accounted for the greater number of morbidity ($n = 54$, 45.4%), followed by anaesthesia-related complications ($n = 34$, 28.6%) (Table 3). Sixteen babies had more than one complication. The other outcome parameters are shown in Table 4 Overall, 41 neonates died, yielding a mortality of 27.9%.

Discussion

Delayed presentation of surgical neonates to the paediatric surgical unit is a preventable factor with a negative impact on survival [8]. Like several other reports from other parts of Nigeria, majority of our cases presented late (76.9%), with varying metabolic and physiologic derangements [4,5]. Several reasons for the late presentation include delivery at home and distance greater than 50 km from the hospital, with the attendant poor road network and poor transport system [4,7].

We observed that most of the delays in referral to us were caused by private general practitioners who often misdiagnose and keep the babies for variable lengths of period and only refer when the clinical condition deteriorates. When referred, the babies are often transported to the unit carried by the mother or relation, unaccompanied and unsupervised by any healthcare worker. In our study, the mortality rate was higher in the late presenters. The marginal difference may be attributed to adequate resuscitation before surgery.

With recent advances in medical technology, many congenital anomalies can be discovered *in utero*. This enables in-utero transportation of the foetus to a centre with obstetric and neonatal service for a planned delivery and early intervention. Although prenatal diagnosis would have been potentially possible in about 70% of our cases, only 15 (14%) presented a valid prenatal ultrasound report. Despite the wide availability of ultrasound machine, this low efficiency most likely may be because of poor skills and inexperience of foetal scan by the sonologists, who, in most cases, are obstetricians. Survival was good for the few cases that were diagnosed prenatally and the mother referred for a planned delivery in our centre.

Neonates are at an increased risk of infection because of their compromised immune system. Sepsis is a common complication among surgical neonates [7,8]. Late presentation, intubations and invasive procedures increase the risk of sepsis. Osifo and Ovueni [8] documented established sepsis in 55.3% of neonates presenting late in their series. In our study, infective conditions (45.4%) accounted for the greatest number of morbidities. Apart from the delayed presentation, we can also attribute this high figure to the overcrowded nature and poor ventilation of our special care baby room.

Anaesthesia in neonates in developing countries is still a persisting challenge. Lack of trained personnel, equipment and facilities are factors militating against safe anaesthesia in newborns, thus increasing morbidity and mortalities [9]. Unavailability of functional ventilators and monitors has made surgeries for oesophageal atresia, abdominal wall defects and congenital diaphragm a nightmare for neonatal surgeons in developing countries. In resource-poor settings, regional anaesthesia in the form of spinal, caudal and epidural anaesthesia has been recommended [4,9]. Because of the lack of personnel with experience in these methods, most of our abdominal surgeries were performed with local infiltration with bupivacaine (0.125%) and light face mask general anaesthesia with ketamine or halothane [10]. Also, all intact omphalocele were managed conservatively and the resultant ventral hernia was repaired from 6 months of age. Oesophageal atresia were also managed by initial feeding gastrostomy and upper pouch suctioning, thus allowing delayed repair after 6 weeks.

The overall mortality of 27.9%, although comparable with several other reports from the country [4,5,7], is high compared with the rates from developed countries, which is currently less than 10% [1,11].

Mortality was higher in the premature, low birth weight babies and in those who underwent thoracic surgeries.

Contributing to the majority of deaths from abdominal surgery is anastomotic failure from necrotizing enterocolitis, bowel perforations and gastroschisis repair. Many neonates with gastroschisis present late with nonviable eviscerated gut and in a septic state. Delay in closure occurs sometimes as most parents are unable to buy either the Dacron mesh for silo construction in time or parenteral nutrition when required. This is worsened by the nationwide policy of cash payment before provision of services in government-run hospitals.

Survival of surgical neonates also depends on the availability of state-of-the-art equipment and facilities. Although surgical technique has changed very little over the years, critical to a good outcome of surgical neonates is a standard perioperative care. Our centre lacks a neonatal intensive care unit and facilities for total parenteral nutrition. This may explain the low number of premature babies treated, many of whom may not have survived to be referred to the unit. Also, the high morbidity and mortality rate from malnutrition is directly related to the unavailability of total parenteral nutrition.

Conclusion

The high morbidity and mortality from neonatal surgeries still persists. Factors that negatively affect outcome include late presentation, prematurity, low birth weight and thoracic surgeries. These can be ameliorated by encouraging prenatal screening and early referral of suspected affected babies and mother to a centre with neonatal surgical care. Also, further training of neonatal surgery-related personnel, development of a neonatal intensive care unit and provision of parenteral nutrition are imperative to improve survival. Establishment of

regional paediatric centres with a focus on key personnel and facilities will also considerably impact on the survival of the critical cases.

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Conflicts of interest

There are no conflicts of interest.

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