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Original Research Article

Burden and spectrum of neonatal surgical diseases in a tertiary hospital: a decade experience

Prashanth Madapura Virupakshappa[1]*, Nidhi Rajendra[2]

[1]Department of Pediatrics, Ramaiah Medical College and Hospital, MSRIT, Bangalore, Karnataka, India
[2]Department of Pediatrics, Dr. B. R. Ambedkar Medical College and Hospital, KG Halli, Bangalore, Karnataka, India

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***Correspondence:**
Dr. Prashanth Madapura Virupakshappa,
E-mail: mvprashanth65@gmail.com

ABSTRACT

Background: Surgical emergencies in the newborns are an important and integral part of neonatal admissions in any tertiary Neonatal intensive care units. Surgical emergencies in the newborn constitute congenital anomalies and acquired neonatal emergencies. It is necessary to know the burden of these illnesses and their spectrum by regular auditing the data available to understand the relative incidence and outcome of these neonatal emergencies. Aims and objective of the study is to determine the spectrum of the different neonatal surgical emergencies (congenital and acquired) admitted, operated and managed in a tertiary NICU from June 2001 to May 2011(10 yrs) in a medical college teaching hospital in South India
Methods: The data was collected by retrospectively auditing the hospital pediatric and neonatal admission registry, neonatal surgical registry, admission case sheets from June 2001 to June 2011 (10 yrs). Data was analysed. Only confirmed post-operative surgical diagnosis were considered for inclusion in the study.
Results: Of the 13,118 newborns admitted in the NICU in 10 years, 601 cases (4.6%) were surgical neonates which were treated in the unit. 83.5% of surgical neonates were operated for congenital surgical disorders. Gastrointestinal anomalies (50%) were the leading causes of neonatal surgical emergencies. Anorectal malformations (18.5%), idiopathic hypertrophic pyloric stenosis (10.6%) and esophageal atresia with/without tracheo-esophageal fistula (8.7%) were the leading surgical causes which needed immediate surgical intervention in the newborn period. 28 different spectrum of cases were operated including 15 rarer once (<1% incidence each).
Conclusions: Surgical new-borns comprises of an important and integral part of neonatal admissions (4.6/100 neonatal admissions). The incidence of the rarer diseases constitutes 8% of the total surgical cases. Gastrointestinal anomalies are the leading causes requiring surgical interventions in the immediate newborn period. It is worthy to understand the spectrum of illnesses in any tertiary unit by regularly auditing the data available.

Keywords: Anorectal malformation, Congenital anomalies, Esophageal atresia, Neonatal surgery, Neural tube defects, Posterior urethral valve

INTRODUCTION

The neonatal population constitutes a considerable proportion of admissions to the surgical wards and this has a significant burden on health facilities. The major causes of neonatal deaths are birth asphyxia, prematurity and severe infections. Little is known about the burden of neonatal surgical conditions on the overall neonatal mortality. Surgical emergencies in the newborns are an important and integral part of neonatal admissions in any tertiary Neonatal intensive care unit. Congenital malformations (CM) are structural defects of prenatal origin that result from defective embryogenesis, develop

in approximately 3% of newborns and have been estimated to lead to 15% of perinatal mortality in India.[1]

Several Congenital Anomalies amenable to surgery will, if not recognized and adequately treated, lead to the death of the infant within a few days after birth. These conditions constitute surgical emergencies of the newborn. It is necessary to understand the burden of these illnesses and their spectrum by regular auditing the data available in the NICU. This also helps to know the relative incidence of these neonatal surgical illnesses.

The aims and objective of the study is to determine the spectrum and outcome of the different neonatal surgical emergencies (congenital and acquired) admitted, operated and managed in an tertiary NICU from June 2001 to June 2011(10 yrs) of a medical teaching hospital in South India by an retrospective audit of the available data.

METHODS

This is a retrospective analysis of the data collected by auditing the hospital pediatric and neonatal admission registry, neonatal surgical registry, admission case sheets from June 2001 to June 2011 (10 yrs) in Bapuji Child health Institute and research centre, JJM Medical college, Davangere, Karnataka. The statistics of the admissions was obtained by collecting the data from the hospital registry which is depicted Data was collected by analyzing each case sheet of the neonates who were admitted and treated for surgical illnesses. These neonates were categorized as congenital neonatal surgical diseases and acquired surgical diseases. The other data collected include mean age of admission to the neonatal intensive care unit, male to female ratio, complications and morbidities encountered during the hospitalization. Confirmed diagnosis as documented in the case record was obtained. The diagnosis was established either clinically by the operating surgeon (intraoperatively) or by the histopathological reports attached to the case records.

Inclusion criteria

Neonatal cases (Perinatal period. i.e. Newborns born more than 28 weeks gestational age and are less than 28 days post-natal age) with confirmed and proven surgical diagnosis were considered for inclusion in the study. The diagnosis was established either pre-operative or intraoperative or post operatively with relevant clinical, biochemical, radiological and histopathological findings described in standard text books.

Exclusion criteria

- Neonates with suspected surgical illnesses with unestablished or unproven surgical diagnosis either by clinical or histopathological methods were excluded from the study.
- Surgical neonates who left against medical advice(LAMA) before surgery were also excluded.

Scientific and ethical clearance for this study was taken from institutional ethical review board before the study. Identity of the newborns were kept undisclosed during the study.

RESULTS

During the 10 years study period, as per the hospital admission and discharge register 13,118 neonates were admitted in the neonatal intensive care unit. 641 neonates were admitted with probable surgical diagnosis (Inborn-227 cases, outborn-414 cases). During the course of evaluation, 40 cases did not have surgical diagnosis and were managed medically. 601 neonates were diagnosed to have surgical diseases. The admissions in the hospital varied each year from 514 to 1881 in number. Male to female ratio was 1.7:1. Mean birthweight of the babies (1000-4000gm) was 2200gm. Mean age of admission was 4.5 days (inborn and outborns included).

Table 1: Annual statistics of pediatric, neonatal and surgical neonatal admissions.

	Total No. of admissions in pediatrics	Total no. of NICU admissions	Surgical cases operated in newborn period (Male-376, Female-225)
2001 (Jan-Dec)	2676	514	30(5.8%)
2002	5881	1287	66 (5.7%)
2003	5509	930	70 (7.5%)
2004	5040	839	60 (7.1%)
2005	5936	894	45 (5%)
2006	6854	1288	70 (5.4%)
2007	6700	1366	65 (4.7%)
2008	7914	1491	60 (4.1%)
2009	8352	1772	63 (3.6%)
2010	9303	1881	34 (1.8%)
2011	3823	906	30 (3.3%)
10 years	67992	13118	601(4.58%)

Table 2: Spectrum of neonatal surgical cases admitted and treated.

Surgical cases (established diagnosis)	Total cases-601
Anorectal malformations (high/intermediate/low- 60%/19%/21% respectively)	18.5% (112 cases)
Idiopathic hypertrophic pyloric stenosis	10.6% (64 cases)
CDH, Eventration of diaphragm (ED)	8.9% (54 cases)
Esophageal atresia with/without tracheo esophageal fistula	8.7% (52 cases)
Congenital intestinal obstruction like duodenal atresia (25%), Jejunal atresia (40%), ileal atresia (14%), combined /multiple atretic segments (14%), large bowel (7%) obstruction	6.8% (41 cases)
Acquired causes of acute abdomen (NEC, SIO, perforation, peritonitis)	6.1% (37 cases)
Neural tube defects, hydrocephalus	6.1% (37 cases)
Malrotation with/out volvulus	5% (30 cases)
Septic arthritis	4.1% (24 cases)
Hirschsprung's disease	3.9% (23 cases)
Renal disorders (PUV, PUJ obst, hydronephrosis)	3.1% (19 cases)
Isolated congenital fistulae (rectovesical, anovestibular, anocutaneous)	3.3% (20 cases)
Anterior abdominal wall defects (Gastroschisis, omphalocele)	2.5% (15 cases)
Meconium plug syndrome	1.6% (10 cases)
Tongue tie	1.3% (8 cases)
Annular pancreas	1.1% (7 cases)
Ladds bands	1% (6 cases)
Umbilical anomalies, infected cephal hematoma, congenital cystic adenomatoid malformation, sacrococcygeal teratoma, exostrophy of bladder, inguinal hernia, mesentric and bronchogenic cyst	4% (0.5% each) (3 Cases each)
Cystic hygroma, undescended testis, cloacal exstrophy, persistant cloaca, ludwigs angina, gastric perforation	1% (1 case each)

4.58% of the total Neonatal admissions were diagnosed with surgical diseases, both congenital and acquired. Details of the admissions are mentioned in table 1 (annual statistics) and table 2(spectrum of neonatal surgical diseases in 10 years).

Most common neonatal surgical diseases encountered during the study period were with congenital gastrointestinal illnesses like anorectal malformations (112 cases), Idiopathic Hypertrophic Pyloric Stenosis (64 cases), Esophageal atresia with/without Tracheo Esophageal fistula (52 cases), Congenital intestinal obstruction (41 cases) and Hirschsprungs disease (23 cases).

Anorectal malformations constituted (112 cases) 18.5% of total admissions. 28 cases were diagnosed to have perineal fistula in female babies. 35% of the babies had associated genitourinary anomalies. All of them had surgical intervention in the form of colostomy with fistulectomy (if present) during the neonatal period. Post-operative complications include septicaemia (blood stream infection) in 8 cases, wound dehiscence in 5 cases, mucosal prolapse in 24 cases and mortality in 5 cases (4.5%). Babies who died during immediate post-operative period (<7 days of post-operative period) had congenital heart diseases (VSD, PDA). The level of obstruction in Anorectal malformations(ARM) i.e. High ARM, intermediate and low ARM was diagnosed after the surgery in 60% ,19% and 21% respectively.

Esophageal atresia with/without Tracheo Esophageal fistula(TEF) were diagnosed in 52 cases. 12 cases were diagnosed antenatally. Most common type is type IIIB (44 cases,84%) followed by pure esophageal atresia (8 cases). Author did not encounter H type and other variants during the neonatal period. 21 newborns died in the neonatal period with the mortality of 40%, of which 6 babies died < 7days of post-operative period. 12 neonates were on prolonged mechanical ventilation (>7days) during post-operative period. No neonates were discharged on home-based oxygen therapy.

Congenital intestinal obstruction like Duodenal atresia (25%), Jejunal atresia (40%), ileal atresia (14%), combined/multiple atretic segments (14%), large bowel (7%) obstruction was diagnosed in 41 cases (6.8%) of the total surgical admissions in NICU. Neonates with bilious vomiting, abdominal distension, unable to pass meconium or stools during first 72 hrs of life, feed intolerance and radiological finding like 'double bubble' sign were used to diagnose small bowel obstruction. 18 cases (43%) were outborns. Downs syndrome was diagnosed in 7 cases (17%). Associated anomalies were seen in 16 cases (39%) which include annular pancreas, omphalocele, cardiac anomalies, renal abnormalities and skeletal abnormalities. 14 babies (34%) died during the post-operative period (<28 days). Immediate post-operative complications encountered were sepsis (28 cases, 68%), ventilator associated pneumonia (6 cases,15%) and congestive cardiac failure (5 cases,12 %).

The diagnosis of Idiopathic Hypertrophic Pyloric Stenosis was confirmed in 64 cases (10.6%). Male to female ratio was 3:1. Mean age of admission to the hospital was 13.5 days. All 65 cases were surgically managed and were discharged successfully with no mortality during the hospitalization.

Congenital diaphragmatic hernia and eventration of diaphragm (ED) was diagnosed in 54 cases (8.9%) which comprised of 44% of outborn which were referred at the mean age of 2.4 days to the unit. Male to female ratio was 2:1. Most common presentation was tachypnoea, cyanosis and respiratory failure and desaturation in pulse oximetry. Chest X-ray and computed tomography scan (14 cases) were done for confirmation of the diagnosis. 47 babies were on mechanical ventilation preoperatively. 26 neonates (48%) died during post-operative period of which septicemia was diagnosed in 18 neonates. Mean discharge days for survived infants was 22 days (7-28 days).

Acquired causes of acute abdomen (37 cases, 6.1%)in neonatal period recognized and diagnosed were necrotizing enterocolitis (stage 3 only), Spontaneous intestinal obstruction, perforation with or without peritonitis and Meckels diverticulum (intraoperative diagnosis). 30 (81%) infants died in the intra and post-operative period. Seven infants survived at discharge. Seventeen cases were diagnosed as septicaemia with proven blood stream infection in culture studies.

Malrotation of the gut with or without volvulus was diagnosed in 30 cases (5%) during the study period with male to female ratio was 1.5:1. Mean age of presentation was 13 days (3-28 days). Most common presentation was bilious vomiting and abdominal distension.12 cases (40%) had both malrotation and midgut volvulus out of which 9 infants died. Total mortality was 46%(14 infants).

Hirschsprungs disease was diagnosed in 23 cases (3.9%) of which 15 cases were short segment, 5 cases were long segment and 3 were total colonic types. Male to female ratio was 2.8:1. Mortality rate was 26% (6 cases) in this group.

Septic arthritis was diagnosed in 24 cases (4.1%). Arthrotomy was done in 22 cases. Knee was involved in 17 cases. Proven blood stream infection was present in 14 cases (58%). All infants survived at discharge.

Congenital renal diseases like Posterior urethral valve (PUV), Pelvi-uretric junction obstruction, Hydronephrosis were among the surgical neonates with urological issues accounting for 19 cases.9 cases of PUV were operated. Mean age of presentation was 4.5 days (range 3-28 days). All 9 cases had altered renal function tests in the form of increased Serum Creatinine and Blood urea nitrogen levels. Most common presenting feature was oliguria with increasing creatinine levels in the serum. 2 infants died due to respiratory failure.7 cases of PUJ obstruction were diagnosed and operated. 3 cases of hydronephrosis were admitted with urosepsis and treated in medical line of management.

Anterior abdominal wall defects (Gastroschisis, omphalocele) were diagnosed in 15 cases. All cases were managed surgically. 4 infants died of Gastrointestinal perforation in gastroschisis.

Twenty-eight different varieties of cases were operated including 15 rarer once (<1% incidence each Eg: Ladds bands, Umbilical anomalies, infected cephal hematoma, Congenital Cystic Adenomatoid Malformation, Sacrococcygeal teratoma, Exostrophy of bladder, Inguinal Hernia, mesentric and bronchogenic cyst, Cystic hygroma, undescended testis, cloacal exstrophy, persistant cloaca, ludwigs angina and gastric perforation).

Neural tube defects and congenital hydrocephalus was diagnosed in 37 cases (6.1%). Isolated congenital obstructive hydrocephalus was diagnosed and treated with ventriculo peritoneal shunt in 7 cases. Neural tube defects include meningomyelocele(MMC), meningocoele (MC) and spina bifida. Lumbosacral was the most common type (19 cases, 51%).

DISCUSSION

The neonatal population constitutes a considerable proportion of admission to the ward and adds to the mortality, morbidity and puts the burden on health facilities. The leading cause of neonatal surgical admissions are congenital anomalies, surgical infections and trauma.[2]In many of the developing and underdeveloped nations, the congenital anomalies go undetected during fetal life, go unrepaired during postnatal life due to poor infrastructure, non-availability of resources and low financial resources intern adding a significant contribution to neonatal mortality rates.

Most common congenital anomalies found in present study was intestinal atresia i.e. Anorectal malformations/ARM (18.8%) and small intestinal atresia (6.8%). Few of the studies did show similar trend with the anorectal malformations and intestinal atresia being the most common congenital anomalies admitted and treated in neonatal intensive care unit in developing and African countries.[1-6] The incidence of Gastrointestinal tract atresia including esophageal atresia was variable (25-50%) in different studies. Mortality rate in ARM was 4.5% in present study which is comparable to any other study done in developing nation.[1,2] Mortality rate in congenital small intestinal obstruction in present study was 34%. The mortality associated with intestinal obstruction ranges from 21-45% in developing countries and it is <15% in European countries.[5] Mortality in different units varies due to the variable surgical expertise, post-operative care and incidence of sepsis in the respective neonatal unit. Survival of neonates shows

better outcome with patients with lower gastrointestinal tract atresia(ARM) in most of the study.[7] The post-operative complications observed in the present study was similar to the study done by others.[8]

Congenital Diaphragmatic Hernia (CDH) and Eventration of diaphragm (ED) was diagnosed in 54 cases (8.9%) in present study which has lower incidence when compared to other studies.[8] The mortality due to CDH in other centres of developing countries and Africa was similar to present study (35-48 %).[1] The mortality rates in CDH in developed nations like in European countries like Portuguese (6.4%) and Korea (6.7%), Japan (7.5%) and Saudi Arabia (12.28%).[2,8] Better antenatal screening of congenital anomalies like CDH, advanced NICU, pre and post-operative care and better surgical expertise in developed nations has reduced the mortality rates in CDH and other neonatal surgical illnesses. CDH has severe form of complications due to co-existing pulmonary hypoplasia and pulmonary hypertension which has led to high mortality in most of the studies done in developing nations.[9] Other important predictors of the mortality are time of referral and time of admission. Delay in admission and stabilization of vitals will result in severe pulmonary hypertension and metabolic acidosis leading to high mortality in CDH.[10]

The diagnosis of Idiopathic Hypertrophic Pyloric Stenosis(IHPS) was confirmed in 64 cases (10.6%) of which 54 cases (84%) were outborn. The diagnosis of IHPS was established with clinical symptoms of persistant projectile vomiting after feeds, palpable mass in the upper abdomen, metabolic alkalosis in blood gases and confirmed with ultrasound abdomen before posting for surgery. All had pyloromyotomy with no mortality. The outcome is similar to the other centres.[1]

Acquired causes of acute abdomen (37 cases, 6.1%) n in neonatal period had high mortality (81%) in necrotizing enterocolitis (stage 3), intestinal perforation, peritonitis due associated sepsis (45%), prematurity in necrotizing enterocolitis and shock. The risk factors and outcome in these illness is similar in other studies.[2,3,9-11] Malrotation of the gut with or without volvulus was diagnosed in 30 cases (5%) which is comparable to other studies.[2,5] Mortality in present study was high (46%) due to late referrals and associated septic shock. Hirschsprungs disease was diagnosed in 23 cases (3.9%) with the lesser incidence in present study compared to others.[5,6,8] This was probably due to delayed presentation of short segment type i.e. later than 4 weeks which we excluded the infants >28 days old. Mortality was observed in view of colonic perforation causing peritonitis and septic shock.

Congenital renal diseases like Posterior urethral valve(PUV), Pelvi-uretric junction obstruction, Hydronephrosis accounted for 19 cases (3.1%). 12 cases were antenatally suspected during antenatal ultrasound. All the cases were operated and discharged. 5 cases had urosepsis and received antibiotics for 2 weeks.Similar results were obtained in other studies.[1,2,4,7]

Umbilical anomalies, infected cephal hematoma, congenital cystic adenomatoid malformation, Sacrococcygeal teratoma, Exostrophy of bladder, Inguinal Hernia, mesentric and bronchogenic cyst comprised of 4% (3 cases each) of total surgical admissions. These were the rarer neonatal surgical diseases where most of the studies in India subcontinent have not documented. Sacrocoygeal teratoma was operated at 2 stages and was discharged. Other rare diseases which were operated include cystic hygroma, undescended testis, cloacal exstrophy, persistant cloaca, ludwigs angina, gastric perforation constitute 1% (1 case each) of the total surgical admissions.

CONCLUSION

Surgical newborns comprises of an important part of neonatal admissions (4.6/100) in a referral hospital. The incidence of the rarer diseases constitutes 8% of surgical cases. Gastrointestinal anomalies are the leading causes requiring surgical interventions in the newborn period. It is worthy to understand the spectrum of illnesses in any tertiary unit by regularly auditing the data available. Several congenital anomalies amenable to surgery will, if not recognized and adequately treated, lead to the death of the infant within a few days after birth. Anorectal malformations (18.5%), idiopathic hypertrophic pyloric stenosis (10.6%) and esophageal atresia with/without tracheo-esophageal fistula (8.7%) were the leading surgical causes which needed immediate surgical interventions in the newborn period. 28 different varieties of cases were operated including 15 rarer once (<1% incidence each).

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