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Original Article

Analysis of Situation and Pattern of Diseases of the Neonates Admitted in Department of Pediatric Surgery of a Medical College Hospital

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Abstract

Background: Neonatal surgery (NS) is an extremely challenging leading edge of pediatric surgery. In our country NS death were 8% due to treatable congenital anomalies. The objectives of study were to observe yearly admission of NS patients, age of presentation, anthropometric records, prenatal record and types of congenital anomalies, and mortality of treated neonates.

Materials and Methods: This cross-sectional study was conducted on 337 admitted neonates to assess the state of 70 consecutive NS patients admitted in the Pediatric Surgery ward. Birth weight was compared with randomly selected and sex matched 154 were neonatology neonates (NN), and 113 delivered un-admitted healthy neonates of the labor-ward (LN). The variables observed were number of neonatal surgical patients admitted, age of presentation, birth and admission weight, prenatal ultrasonogram for fetal anomalies and the types of anomalies, outcome (mortality) of neonatal surgery.

Results: The mean age of surgical neonates at the time of admission was 5·7 ± 6·39 (1-25) days. Mean birth weight of surgical and neonatology neonates was 2·66 ± 0·76 (1·5-4·5) kg and 2·24 ± 0·71 (0·9-4) kg respectively. The difference was significant ($p < 0·01$). The mean admission weight of the surgical and neonatology neonates were 2·57 ± 0·66 (1·4-4·1) kg and 2·25 ± 0·62 (0·8-4·1) kg respectively showing significant difference ($p < 0·01$). Ten percent of NS patients and 38.3% of NN patients had records of prenatal ultrasonogram, and their reports were normal fetus. The difference was significant ($Z = 4.36$). Eighty seven percent NS patients and 49% NNs were delivered at home and the difference was significant ($Z = 4.49$). Major surgical problem were anorectal malformation (48.6%) and neonatal intestinal obstruction (20%). The treatments given to the patient admitted in the pediatric surgery ward were emergency laparotomy with resection-anastomosis, ileostomy, and transverse loop colostomy in 29 (41·3%), anoplasty 21 (30%), incision and drainage of abscess 5 (7·1%), and conservative treatment 15 (21·43%). The mortality rate of neonatal surgical and neonatology patients was 12·9% and 13% respectively.

Conclusion: The number of NS patients (work load) indicated the necessity of establishment of a NS unit which could be viable. The mortality of NS patients were due to low birth weight, and delivery at home causing transport delay from birth place to the pediatric surgery ward because of lack of prenatal awareness of presence of congenital anomalies. Anorectal malformation is the commonest congenital anomaly, followed by neonatal intestinal obstruction. Emergency laparotomy was the major surgical intervention offered. To improve the survival of the NS patients, prenatal diagnosis of the congenital anomaly, mandatory delivery at defined hospital, rapid transport of the surgical neonates born away from hospital, and establishment of a NS unit in tertiary level hospitals were indicated.

Keywords: *Neonatal surgery workload and mortality, neonatal surgery unit feasibility.*

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Introduction

Neonatal mortality rate is declining in Bangladesh creating possibility to improve the well-being of infants and children leading to a talented, efficient and a healthy next generation. The infant mortality rates were 48.18, 45.75, 43.32, 41.28, and 39.25 per 1,000 live births from 2006 to 2010 and 29.37, 28.11, 26.85, 25.79, and 24.73 per 1,000 live births from 2016 to

2020 respectively, indicating steady decline.[1] US infant neonatal and postnatal mortality rate was 6.05 per 1,000 live births in 2011.[2] One Bangladeshi study indicated that estimated neonatal death at the year 2010 was 102,000, of which 8% were due to curable congenital anomalies.[3] Development of awareness of congenital anomalies among pregnant mother, establishment of a neonatal intensive care support, mandatory delivery of pregnancy with congenital anomalies at the facility, and rapid transport of the surgical neonates born away from facilities to the neonatal surgery ward, may contribute to more survival of newborns.

The department of Pediatric Surgery of Sher-e-Bangla Medical College Hospital (SBMCH) started functioning from October, 1999. This department is the only regional center for pediatric surgical patients. From the very beginning, this department hosted progressively increasing number of patients. The number of admissions in the pediatric surgery unit (obtain from admission registrar) was 597, 753, 815, 914, and 1024 per year from 2000 to 2006 respectively. Most of the pediatric surgical patients can be managed with facilities already existing in this institution, except for the neonatal surgical patients. Researchers hypothesized that establishment of a neonatal surgical unit in this tertiary level educational hospital, mandatory delivery of selected cases at this institutional facility, and rapid transport of the surgical neonates born outside the facility, might contribute to neonatal survival. A neonatal surgery unit is yet to be established at SBMCH. This study will help the planners and policy makers to assess the current load and status of the neonatal surgical patients admitted in SBMCH, and development of personnel and instrument for establishment of a neonatal surgery unit.[4] It is emphasized, that neonates born with malformation requiring emergency surgery, have high mortality and morbidity rate due to: failure or delay in diagnosis, delayed transport and inadequate emergency treatment, failure to gather these cases in one hospital, and in one specified ward.[5] The objectives of this study were to observe (1) number of neonatal surgical patients admitted in the Pediatric Surgery department of SBMCH in a year, (2) the age of presentation, (3) record of birth and admission weight, (4) awareness of the congenital condition before delivery by prenatal ultrasonogram, (5) type of anomalies presenting, (6) the treatment outcome (mortality). Till now no reference of similar information is available in any of the Medical Journals in Bangladesh.

Methodology

This cross-sectional study was conducted on 70 consecutive neonatal surgical patients (Group-SN) admitted in the Pediatric Surgery ward of SBMCH, Barisal, Bangladesh, from August, 2006 to July, 2007. All were admitted in the pediatric surgery ward of SBMCH and age ranging from 1 to 28 days was included. The neonates having congenital cardiac anomalies and those predicted to require ventilator support were excluded from this study. Written consents were obtained from primary care giver of the neonates and data were collected form infant admission registrar.

Age matched 154 admitted neonates were selected randomly on monthly basis from neonatology unit of SBMCH to compare weight and mortality (Group-NN). To compare birth weight 113 healthy neonates delivered (but not admitted) at labor ward of SBMCH were selected randomly on monthly basis (Group-LN).

Data were collected using pre-tested check list (12 cases of SN group and 28 subjects from NN group). One female surgical neonate weighing 3·2 kg died of septicemia who presented at the age of 8 days with high variety of anorectal malformation.

The check list included date of admission of the patient, name, age in day, and sex. Birth weight of the patient was noted. Admission weight of the patient was recorded. Parents or guardians were asked whether birth weight was recorded or not. If the neonate had documented birth weight it was recorded. The neonates having birth weight records were categorized as extremely low birth weight when the weight is <1 kg, very low when in between 1·01 to 1.50 kg, moderately low when 1·51 to 2·50 kg, and normal when >2.50 kg. Record of prenatal Ultrasonogram was observed and comment of any fetal anomaly was noted. Place of delivery either home or hospital was recorded. Name of congenital anomaly diagnosed, disease of the neonate admitted in the neonatology ward, and any co-morbid diseases observed were noted. Finally treatment given to the surgical and neonatology neonates were noted either in the form of conservative or surgical treatment. The outcome of treatment was noted as cured, improved, left hospital without notice or death.

After processing and cleaning, the data was analyzed to assess the significance with Z-test, T-test, ANOVA, and Post Hoc Test where appropriate using SPSS 24 software with 95% level of significance. The means were expressed as mean ± SD (minimum-maximum).

Results

Total number of cases was 337. The number of cases from the SN group was 70, NN group 154 and LN group was 113. In SN group male was 53 (75·7%) and female 17 (24·3%) and male female ratio 3·1:1. In NN group 83 (53·9%) males and 71 (46·1%) females and male to female ratio was 1·17:1. In LN group 62 (54·9%) males and 51 (45·1%) females and male to female ratio 1·2:1 (Table 1).

Table I. Sex distribution of the Neonates (n = 337).

Group	Total	Male (Percent)	Female (Percent)
Surgical Neonates	70	53 (75·7)	17 (24·3)
Neonatology Neonates	154	83 (53·9)	71 (46·1)
Neonates of the Labor Wards	113	62 (54·9)	51 (45·1)

The mean age of admission of SN group was 5·70 ± 6·39 (1-25) days and NN group 6·20 ± 6·00 (1-27) days. The difference is insignificance (T-test, p > 0·10).

Mean admission weight (n = 337) of SN group was 2·57 ± 0·66 (1·4-4·5) kg and those of NN group was 2·25 ± 0·62 (0·8-4·1) kg. The admission weight of both group follows normal distribution curves and the differences of mean admission weight is significant (T-test, p < 0·01, 95% Confidence interval 2·4165 to 2·7321 and 2·1524 to 2·3515).

Record of birth weight (n = 211) of SN group was present in 14 (20%) and absent in 56 (80%). In NN group record of birth weight was present in 84 (54·5%) and absent in 70 (45·5%) neonates. All neonates of LN group had birth weight records. The difference of birth weight between SN and NN group was significant (T-test, p < 0·01, 95% Confidence interval 2·4165 to 2·7321 and 2·1524 to 2·3515).

The mean birth weight of SN group (n =14) was 2·66 ± 0·76 (1·5-4·50) kg, of NN group (n = 84) was 2·24 ± 0·71 (0·9-4) kg, and those of LN group was 2·95 ± 0·59 (1·5-4·5) kg. Birth weight distribution of the three groups was normal. Significant difference of birth weight was observed in between groups (ANOVA, p < 0·01). The difference of birth weight was significant between SN and NN group (Post Hoc Test, p < 0·01, mean difference is significant at the 0·05 level), and between NN and LN group (Post Hoc Test, p = 0·01, mean difference was significant at the 0·05 level). No significant difference was observed between SN and LN group (Post Hoc Test, p = 0·123, mean difference is significant at the 0·05 level).

Table 2. *Birth weight Category (n = 211).*

Group	Birth weight category	Frequency	Percent
Surgical neonates (n = 14)	Extremely low birth weight	0	0
	Very low birth weight	1	7·4
	Moderately low birth weight	4	28·57
	Normal birth weight	9	64·29
Neonatology neonates (n = 84)	Extremely low birth weight	3	3·57
	Very low birth weight	14	16·67
	Moderately low birth weight	33	39·29
	Normal birth weight	34	40·48
Labor ward neonates (n = 113)	Extremely low birth weight	0	0
	Very low birth weight	2	1·8
	Moderately low birth weight	31	27·4
	Normal birth weight	80	70·8

(One-Sample t Test, p <0.01)

In SN group there was no neonate belonged to extremely low birth weight category, 1 (7·14%) was very low birth weight, 4 (28·57%) were moderately low birth weight, 9 (64·29%) were normal birth weight and 56 (80%) neonates could not be categorized due to absence of birth weight record (Table 3). In NN group 3 (3·57%) neonates were with extremely low birth weight category, 14 (16·67%) were very low birth weight, 33 (39·29%) were moderately low birth weight, 34 (40·48%) were in normal birth weight category, and 70 (45·45%) neonates could not be categorized due absence of birth weight record (Table 3). In LN group there was no neonate with extremely low birth weight category, 2 (1·8%) were very low birth weight, 31 (27·4%) were moderately low birth weight, and 80 (70·8%) were in normal birth weight category (Table 3).

Table 3. Records of prenatal Ultrasonogram.

Group		Frequency	Percent
Surgical neonates	Done	7	10
(n = 70)	Not done	63	90
Neonatology neonate	Done	59	38·3
(n = 154)	Not done	95	61·7
Labor ward neonate	Done	98	86·7
(n = 113)	Not done	15	13·3

(Z = 4·36, significant at 99% confidence limit.)

In SN group prenatal Ultrasonogram (Table 4) done in 7 (10%) cases with no surgical anomaly detected and not done in 63 (90%) cases. In NN group prenatal Ultrasonogram done in 59 (38·3%) cases with no surgical anomaly detected and Ultrasonogram not done in 95 (61·7%) cases. The difference was highly significant (Z = 4.36, highly significant at 99% confidence limit).

In SN group delivery conducted at home was 61 (87·1%) and at hospital were 9 (12·9%). In NN group 69 (44·8%) neonates delivered at home and 85 (55·2%) delivered at hospital (Table 4). The difference was highly significant (Z = 4.49. highly significant at 99% confidence limit).

In SN group number of cases with anorectal anomaly (ARM) were 34 (48·6%), neonatal intestinal obstruction 14 (20%), and 6 (8·6%) were abscess (Table 5)

Table 4. Place of delivery.

Group	Home delivery (Percent)	Hospital delivery (Percent)
Surgical neonate	61 (87·1)	9 (12·9)
Neonatology neonate	69 (44·8)	85 (55·2)

(Z = 4·49, significant at 99% confidence limit)

Table 5. Distribution of disease pattern of the surgical neonates.

Serial no	Name of the disease	Frequency	Percent
1	Anorectal anomaly	34	48·6
2	Neonatal intestinal obstruction	14	20
3	Hirschsprung's disease	2	2·9
4	Neural Tube Defects	2	2·9
5	Gastroschisis	2	2·9
6	Exomphalos major	2	2·9
7	Cloacal exstrophy	2	2·9
8	Club foot	1	1·4
9	Cellulitis and abscess	6	8·6
10	Necrotizing enterocolitis with perforation	2	2·9
11	Aneuria	2	2·9
12	Imperforated hymen	1	1·4

ARM was observed as anocutaneous fistula 18 (52·94%), stenosed anus 4 (11·76%), anovestibular fistula 2 (5·88%), rectovaginal fistula 1 (2·94%), ARM without fistula 3 (8·82%), rectourethral fistula 5 (14·72%), and rectal atresia was 1 (2·94%).

Neonatal intestinal obstruction was observed as meconium ileus 8 (57·15%), ileal atresia 4 (28·57%), jejunal atresia 1 (7·14%), and meconium plug syndrome 1 (7·14%).

Treatment received in SN group was emergency laparotomy 4 (5·7%), emergency laparotomy with transverse loop colostomy 12(17·1%), emergency laparotomy with loop ileostomy 12 (17·1%), emergency laparotomy with resection and primary anastomosis 1 (1·4%), anoplasty 21 (30%), and incision and drainage 5 (7·1%) and conservative 15 (21·43%).

In SN group mortality was 9 (12·9%) of them 7 (77·78%) males and 2 (22·22%) females none had birth weight record. Five (55·56%) cases had comorbid conditions and 5 (55·56%) cases had neonatal intestinal obstruction. In NN group mortality was 20 (13%) of them 14 (70%) males and 6 (39%) females. Thirty five percent patients had comorbid conditions and major causes of death were birth asphyxia 8 (40%), low birth weight 6 (30%), and septicemia 3 (15%). In SN death group mean age at the time of admission was 4·44 ± 4·13 (1-14) days and in NN group was 3·5 ± 1·26 (1-22) days (small sample size for statistical analysis). In dead SN group mean admission weight was 2·12 ± 0·55 (1.5-3) kg and those of NN group was 1·88 ± 0.54 (0·8-3) kg (small sample size for statistical analysis).

Place of delivery of death SN group (n = 9) was at home of 8 (88·89%) and hospital was 1 (11·11%), and of death NN group was at home 11 (55%) and hospital 9 (45%). Sample size is small for data analysis.

Discussion

Seventy admitted neonates were treated in the pediatric surgery ward of SBMCH in the one year indicating sufficient workload for sustainability of a neonatal surgery ward of them 50 (71.43%) neonates underwent emergency operation under general anesthesia with endotracheal intubation. This volume of surgical neonates admitted and treated indicated the rationality of establishment of a neonatal surgery center. The number of neonatal surgeries performed annually in different centers of the major cities of India ranged from 60 to 351[6].

In this study majority of the cases demonstrated late presentation. Majority of the surgical neonates (84·29%) presented one day after birth. In sub-Saharan countries mean age of presentation ranges from 2 days to 3.7 days but mean interval between admission and surgical intervention being 4·9 ± 6·2 days[7]. Primary emphasis should be on shortened transport time to the neonatal surgery center, prenatal diagnosis and subsequent maternal transfers to specific hospital because of the mothers are the best transport incubators for the upcoming babies[8].

Record of birth weight was presented in few cases of surgical and neonatology neonates. This was possibly due to the fact that most of the delivery is conducted at home. Only few cases of the surgical neonates (20%) had record of birth weight thus it was difficult to draw any conclusion about the distribution of birth weight and its impact on outcome of surgical treatment. Analysis of birth weight record of the neonates indicated that 28·57% of the surgical neonates (n = 14), 59·52% neonatology neonates (n = 84) and 29.2% labor ward neonates (n = 113) belonged to low birth weight category. In USA incidence of low birth weight wass 6·8%[9].

Admission weight of neonates admitted were within low birth weight category in both surgical (32·85%) and neonatology neonates (53·90%). Though mean admission weight of the surgical neonates observed within normal distribution high mortality was observed in low birth weight group of surgical neonates (55·56%) and neonatology neonates (65%). Similar type of result was also observed in other study[5]. Comorbid conditions were observed in 44·44% dead baby of admitted surgical neonates. High mortality due to presence of comorbid diseases also observed in other study[5].

In surgical neonates 10% had prenatal ultrasonogram report with no detectable surgical anomaly. The primary emphasis of prenatal ultrasonogram should be identification of congenital anomalies so that best outcome of a major congenital surgical problem could be expected[9].

Majority of surgical neonates (87%) were delivered at home. In one Bangladeshi study it was evident that in 2000 delivery at home was 91% and in 2010 decreased to 71%[3]. The baby with congenital

anomalies born at hospital can be transported quickly to the neonatal surgery center but those born at home are rarely sent directly to the neonatal surgery center leading to treatment delay and worse outcome.[9]

In this study incidence of anorectal anomaly, neonatal intestinal obstruction due to meconium ileus and atresia, Hirschsprung disease, Exomphalos and Gastroschisis, neural tube defects, and cloacal exstrophy were observed and managed in SBMCH were similar to that of Indian Neonatal Surgical Centers.[7]

In this study SNs mortality was 12·9% and that of NNs 13%. The incidence was higher than that of other findings [9]. The mortality of NS patients in sub-Saharan countries ranged from 24% to 39·2% [7] was higher than our observation. The mean age of presentation of dead SN group was 4·44 ± 4·13 days and of dead NN group 3·55 ± 1·26 days. The mean admission weight of dead SN group (2·12 ± 0·55 kg) was lower than the overall admission weight of SN group (2·57 ± 0·66 kg) and mean admission weight of the dead NNs (1·88 ± 0·5 kg) was lower than that of overall admission weight of the NN group (2·25 ± 0·62 kg). In dead SN group majority were delivered at home (88·89%) like that of the overall home delivery of SN group (87·1%). But in dead NNs home delivery was 55% in contrast to that of overall incidence of death NNs (44·8%) of this study. It was our findings and no reference was available to compare.

Conclusion

This study explored the fact that establishment of a viable NS unit, mandatory delivery of all surgical neonates at hospital, development of a rapid transport system for neonates having congenital anomalies delivered away from the facility. Further researches are indicated to find out the causes of high incidence of low birth weight and how to improve birth weight of the surgical neonates.

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