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Original Article

Neonatal Surgical and Medical Outcomes in Cases Admitted in Neonatal Intensive Care Unit, Minia University Hospital During the Period from 2021 to 2023: A Retrospective Analytic Study

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Abstract

Background: Providing care for preterm, neonates with high risk and neonates with surgical causes are challenging. **Aim of the work:** To provide an insight on types of surgical and medical problems encountered in our NICU and to determine the mortality of neonates with surgical conditions admitted to our NICU and comparing them with neonates with medical conditions. **Methods**: A retrospective analytical study conducted at NICU, Minia university children hospital from January 2021 to June 2023. Neonates either with non-surgical or surgical causes were included. All data of the included neonates were collected including detailed history and laboratory investigations. They were classified into two groups: non-surgical causes and surgical causes. **Results:** The results revealed 1862 neonates were admitted, 1719 cases were admitted due to non-surgical causes, 306 of them died while 1413 lived and 143 cases were admitted due to surgical causes, 38 of them died while 105 lived. The gestational age, birth weight, hemoglobin, platelets count, total bilirubin, direct bilirubin and indirect bilirubin were significantly decreased in neonates who died (P-value 0.0001, 0.001, 0.002, 0.0001, 0.0001, 0.0001, 0.0001 respectively), but, they had statistically significant increase regarding the hospital stay and blood component transfusion (P-value 0.0001 for all). The mean age and hospital stay were higher in neonates with surgical conditions and had statistically significant difference (P-value 0.0001 for both), the gestational age had statistically significant difference (P-value 0.001) with more preterm neonates in cases without surgery, platelets count was lower in neonates with medical conditions (P-value 0.01), Neonates with surgical conditions had higher significant blood component requirements than neonates with medical conditions. **Conclusion:** The most important factors reflected on the neonatal outcome in this study are gestational age, birth weight and the hospital stay.

Key words: Risk factors, cholestasis, neonates, parenteral nutrition

Introduction

Neonatal period is the period from birth up to the first 28 days of life. This period is featured by the transition to the extra uterine life, rapid growth and development. It is considered the most hazardous period, compared to the first year of child life [1].

The causes of NICUs admission may be due to non-surgical causes and surgical causes. The commonest primary diagnoses of non-surgical causes were prematurity with respiratory diseases, sepsis, and perinatal asphyxia, meconium aspiration syndrome and jaundice [2].

Congenital malformations are the main indications for surgical intervention in neonates, with subsequent considerable proportion of neonates admitted to the neonatal intensive care unit requiring surgical intervention. Surgery of a neonate is quite sensitive, advanced, and delicate. these are mostly correctable with surgery, but if not recognized and treated, it will lead to the death of the affected newborn [3].

Neonatal surgical conditions are unique because some require early diagnosis, prompt surgery and postoperative care to improve the survival and outcome. In addition, neonates who are in need of surgical intervention require mechanical ventilation for longer periods than those with non-surgical causes with subsequent increase duration of hospitalization. Moreover, surgical site infection may develop according to the site of operation [4]. The dominating causes of neonatal deaths are preterm (35%), birth asphyxia (20%), pneumonia (16%), sepsis (15%), and other causes (<10%), these are also the leading reasons for NICU admission for providing them critical care. Unfortunately, these neonates are at great risk of acquiring infections which have a detrimental effect on the recovery and the length of stay in NICUs [5].

The total mortality rates for admissions to neonatal intensive care units (NICUs)

are reported to be 4-46% in developed countries, but the rates were higher in developing countries (0.2-64.4%). Although five mortality rates showed significant reduction, but this reduction occurs slowly [6].

Neonates admitted to NICUs require multiple blood transfusions for many reasons such as anemia of prematurity, jaundice or any neonatal bleeding issues. This transfusion restores the blood volume and improves cardiac output with subsequent better oxygen delivery to tissues. Most NICUs have adopted packed red blood cells transfusion protocols to reduce transfusions number to severe ill neonates. The most common cause for platelets transfusion is thrombocytopenia. Fresh frozen plasma is transfused in neonates with significant coagulopathy as in cases of vitamin K deficiency and sepsis [7].

Aim of the work: The aim of this study is to provide an insight on types of surgical and medical problems encountered in our NICU and to determine the mortality of neonates with surgical and medical conditions.

Patients and Methods

The present study is retrospective carried out at the Neonatal Intensive Care Unit, Faculty of Medicine, Minia University children hospital in the period from January 2021 to June 2023. The included neonates were classified into two groups:

Group-1 (Neonates with medical conditions): This group include all cases admitted to the NICU with non-surgical causes as respiratory distress, hypoglycemia and infant of diabetic mother, neonatal jaundice, sepsis, poor suckling or refusal of feeding, pneumonia, meconium aspiration, convulsion, hypoxic ischemic encephalopathy (HIE), low birth weight and IUGR, bleeding tendency, immune thrombocytopenic purpura, delayed passage of meconium, anemia, dehydration, cyanosis and septic arthritis

Group-2 (Neonates with surgical conditions): This group includes all cases admitted to the NICU for preoperative

preparation and postoperative follow up of the following; imperforate anus, tracheoesophageal fistula, inguinal hernia, hydrocephalus, hirschsprung disease, intestinal obstruction, necrotizing enterocolitis, exomphalos minor, exomphalos major, pneumoperitoneum, gastroschisis, cleft lip and palate, duodenal atresia, meningocele, congenital hypertrophic pyloric stenosis (CHPS), perforated viscus, jujenal atresia, ileal atresia, testicular torsion, omphalocele, malrotation, congenital diaphragmatic hernia , PUJ obstruction and dural sinus thrombosis.

The inclusion criteria were neonates (from birth to 28 days age) and both sex, neonates with medical diseases, neonates with congenital anomalies that needs surgical interference. Whereas neonates Aged >28 days were excluded from the study.

All included neonate's data were collected from hospital patient's file including: Thorough history taking including; Name, age, birth weight, full term or pre term, sex, date of admission, date of discharge, hospital stay, mode of delivery, blood component transfusion (packed RBCs, platelets, Fresh frozen Plasma) and diagnosis and treatment. Laboratory investigations including: CBC, CRP, total bilirubin (direct bilirubin and indirect bilirubin) and blood culture.

Ethical considerations of the study

This study was approved by ethical committee, Faculty of Medicine, Minia University (approval No: 686/ 2023). Protect the participants anonymity and confidentiality, avoiding using deceptive practice. The participants were given the right to withdraw from our research. A written consent from the patient's care giver were obtained.

Statistical analysis

Data entry and analysis was done using SPSS software program version 21 figures using Microsoft excel. Quantitative data presented as range mean, standard deviation and median.

Qualitative data were presented as frequency distribution. Independent sample t test, Chisquare test and Z test were used to test the significant difference. Logistic regression analysis was done and odds ratio was calculated and P-value of less than 0.05 considered as cutoff for significance.

Results

Out of 1862 cases admitted to NICU during the study period from January 2021 to June 2023 in the age group from birth to 28 days old ,1719 cases were admitted due to non-surgical causes and 143 cases were admitted due to surgical causes.

The primary diagnosis at admission out of these 1862 cases was as follow: 931 cases were admitted with respiratory disorders like RDS, meconium aspiration and pneumonia ,680 cases with GIT diseases, 99 cases with endocrinal diseases, 41 cases with CNS diseases,7 cases with hematological diseases,5 cases with renal diseases and 99 cases with other disorders as sepsis, poor suckling, intra uterine growth retardation (low birth weight) and cyanosis.

The outcome of the studied neonates was 1518 lived neonates, 6.9% of them required surgical intervention, while 93.1% didn't need surgery. Neonates who died were 344, 11% of them required surgical intervention, while 89% didn't need surgery,71.2% of the died neonates were admitted due to respiratory diseases, 17.2% had GIT diseases, 1.7% had CNS diseases, 1.5% had endocrinal diseases,0.6% had hematological diseases and 7.8% had other causes as low birth weight and poor suckling.

Comparison between neonates treated medically and surgically regards their data

Table 1: showed that there was statistically significant difference between neonates without surgery and with surgery regarding their age, gestational age, hospital stay, PLT, T. Bil, D. Bil and Ind. Bil (p=0.0001*, 0.001*,0.0001*,0.01*,0.0001*,0.01*,0.0

001* respectively) while there was no statistically significant difference regarding sex, birth weight, mode of delivery, Hb, WBCs and CRP.

Table 2: showed that there was highly statistically significant difference between neonates without surgery and with surgery regarding the diagnosis (p:0.0001*).

Blood component transfusion in neonates with surgical conditions had a highly statistically significant increase in requirement for transfusion more than those with medical conditions (p:0.0001* for all) (Table 3).

Relation of neonate's data and their outcome

The outcomes in the current study reported 344 (18.5%) of the studied neonates died as shown in (figure 1).

Table 4: showed comparison between died and live neonates regarding general characters and revealed that there was statistically significant decrease in died group than live neonates regarding the gestational age (p:0.0001), birth weight (p:0.001), HB (0.002), PLT (p:0.0001), T. Bil (p:0.0001), D. Bil (p:0.0001) and Ind. Bil (p:0.0001), while there was statistically significant increase regarding hospital stay (p:0.0001). There was no statistically significant difference between died and live neonates regarding age, sex, mode of delivery, WBCs and CRP.

As regards blood component transfusion, there was highly statistically significant increase in died group than live neonates (p:0.0001) as illustrated in (table 5).

Factors related to the neonate's outcome among those treated medically and surgically

The current study showed that there was highly statistically significant relation between the outcome in neonates with medical conditions as regard the gestational age, birth weight and hospital stay (p :0.001). While there was no statistically significant relation between the outcome in neonates with surgical conditions as regard the general characters (table 6).

Also, there was statistically significant relation between the outcome in neonates with medical conditions as regard the HB (p :0.01), PLT (p :0.0001), T. Bil (p :0.0001), D. Bil (p :0.0001) and Ind. Bil (p :0.0001). While there was no statistically significant relation between the outcome in neonates with surgical conditions and laboratory data (table 7).

As regards blood component transfusion, the results showed that there was highly statistically significant relation between outcome in neonates with medical condtions and transfusion of packed RBCs, Platelets and FFP (p :0.0001 for all). While there was statistically significant relation between outcome in neonates with surgical conditions and transfusion of Platelets and FFP (p :0.007, 0.002 respectively) as shown in (table 8).

Table (1): Comparison between neonates with and without surgery as regard their general characters and laboratory data.

Item		Medical conditions n=1719	Surgical conditions n=143	P value
Age (days)	Range	1-28	1-28	**0.0001***
	Mean ±SD	3.1±5.1	6.2±8.5	
	Median	1	2	
Sex	Male	978(56.9%)	93(65%)	**0.05**
	Female	741(43.1%)	50(35%)	
Gestational age	Full term	944(54.9%)	101(70.6%)	**0.001***
	preterm	775(45.1%)	42(29.4%)	
Birth weight (kg)	Range	0.60-5.5	1.1-3.6	**0.1**
	Mean ±SD	2.4±0.7	2.5±0.5	
	Median	2.5	2.6	
Hospital stay(day)	Range	0-65	0-65	**0.0001***
	Mean ±SD	7.9±8.6	13.02±12.7	
	Median	5	10	
Mode of delivery	CS	1581(92%)	133(93%)	**0.6**
	NVD	138(8%)	10(7%)	
HB (g/dl)	Range	6-23.6	6-20.3	**0.4**
	Mean ±SD	13.9±2.6	14.09±2.8	
	Median	14	13.8	
WBCS (Thousands/cmm)	Range	1-33.8	3.2-30.8	**0.08**
	Mean ±SD	10.1±4.8	10.8±4.8	
	Median	8.9	10.7	
PLT (Thousands/cmm)	Range	19-606	4-598	**0.01***
	Mean ±SD	2480.4±105.7	258.2±114.8	
	Median	296	265	
CRP (mg/dl)	Range	6-96	6-96	**0.7**
	Mean ±SD	51.2±40.8	49.9±39.8	
	Median	24	36	
T. Bil (mg/dl)	Range	0.5-55.5	0.9-20.2	**0.0001***
	Mean ±SD	10.7±6.2	7.6±4.6	
	Median	10	7.10	
D. Bil (mg/dl)	Range	0.1-15.1	0.1-1.6	**0.01***
	Mean ±SD	0.9±0.6	0.7±0.4	
	Median	1	0.9	
Ind. Bil (mg/dl)	Range	0.1-40.3	0-16.1	**0.0001***
	Mean ±SD	9.7±5.1	6.7±3.5	
	Median	9	6.6	

CS (cesarian section), NVD (normal vaginal delivery), HB (hemoglobin), PLT (platelet), CRP (C reactive protein), T. Bil (total bilirubin), D. Bil (direct bilirubin), Ind. Bil (indirect bilirubin), RBCs (red blood cells)

Table (2): Comparison between neonates with and without surgery as regard their diagnosis.

Item	Medical conditions n=1719	Surgical conditions n=143	P value
CNS diseases	22	19	0.0001*
	1.3%	13.3%	
GIT diseases	585	95	
	34.0%	66.4%	
Chest diseases	911	20	
	53.0%	14.0%	
Endocrinal diseases	98	1	
	5.7%	0.7%	
Hematological diseases	7	0	
	0.4%	0.0%	
Renal diseases	4	1	
	0.2%	0.7%	
Others	92	7	
	5.4%	4.9%	

Table (3): Comparison between neonates with and without surgery as regard their requirement to blood component transfusion

Blood transfusion	Medical conditions n=1719	Surgical conditions n=143	P value
Packed RBCs	542(31.5%)	75(52.4%)	0.0001*
Platelets	170(9.9%)	25(17.5%)	0.0001*
FFP	130(37.8%)	91(63.6%)	0.0001*

Table (4): Comparison between died and live neonates as regard their general character and laboratory data.

Data		Died N=344	Live N=1518	P value
Age (days)	Range	0-28	0-28	**0.5**
	Mean ±SD	3.2±5.9	3.4±5.4	
	Median	1	1	
Sex	Male	203(59%)	868(57.2%)	**0.5**
	Female	141(41%)	650(42.8%)	
Gestational age (week)	Full term	124(36%)	921(60.7%)	**0.0001***
	Preterm	220(64%)	597(39.3%)	
Birth weight (kg)	Range	0.60-5.5	0.7-5	**0.001***
	Mean ±SD	2.4±0.7	2.5±0.6	
	Median	2	2.6	
Hospital stay (days)	Range	0-65	0-65	**0.0001***
	Mean ±SD	10.2±10.5	7.9±8.7	
	Median	7	5	
Mode of delivery	CS	320(93%)	1394(91.8%)	**0.4**
	NVD	24(7%)	124(8.2%)	
HB (g/dl)	Range	6-22	6-23.6	**0.002***
	Mean ±SD	13.5±3.04	14.02±2.5	
	Median	13.5	14	
WBCS (Thousands/cmm)	Range	1-33.7	2-33.8	**0.9**
	Mean ±SD	10.2-5.1	10.1±4.7	
	Median	9	8.9	
PLT (Thousands/cmm)	Range	4-550	48-606	**0.0001***
	Mean ±SD	249.3±109.4	285.4±104.8	
	Median	253	299	
CRP (mg/dl)	Range	6-96	6-96	**0.3**
	Mean ±SD	53.6±38.9	50.1±40.8	
	Median	48	24	
T. Bil (mg/dl)	Range	0.9-26.1	0.5-55.5	**0.0001***
	Mean ±SD	7.3±4.4	11.1±6.3	
	Median	6.4	10.3	
D. Bil (mg/dl)	Range	0.1-6.2	0.1-15.1	**0.0001***
	Mean ±SD	0.7±0.6	0.9±0.6	
	Median	0.8	1	
Ind. Bil (mg/dl)	Range	0.7-21.6	0-40.3	**0.0001***
	Mean ±SD	7.3±3.5	9.9±5.2	
	Median	6.2	9.1	

CS (caesarean section), NVD (normal vaginal delivery), HB (hemoglobin), WBCs (white blood cells), PLT (platelets), CRP (c reactive protein), T. Bil (total bilirubin), D. Bil (direct bilirubin), Ind. Bil (indirect bilirubin)

Table (5): comparison of blood component transfusion among died and lived neonates

Blood transfusion	Died N=344	Live N=1518	P value
Packed RBCs	188(54.7%)	429(28.3%)	0.0001*
Platelets	88(25.6%)	107(7%)	0.0001*
FFP	214(62.2%)	295(19.4%)	0.0001*

RBCs (red blood cells), FFP (fresh frozen plasma)

Table (6): The relation between general characters among medical and surgical groups of neonates and their outcome

Data	Medical conditions		P value	Surgical conditions		P value
	Died N=306	Live N=1413		Died N=38	Live N=105	
Age (days)	3.03±5.81	3.2±5.011	0.6	4.9±5.93.5	6.7±9.22	**0.2**
Sex						
Male	177(57.8%	801(56.7%)	0.7	26(68.4%	67(63.8%	**0.6**
Female	129(42.2%)	612(43.3%)		12(31.6%)	38(36.2%)	
Gestational age(weeks)						
Full term	98(32%)	845(59.9%)	0.001*	26(68.4%	75(71.4%	**0.8**
preterm	208(68%)	567(40.1%)		12(31.6%)	30(28.6%)	
Birth weight (kg)	1.9±7.31.9	2.5±0.72.6	0.001*	2.4±0.42.6	2.6±0.52.7	**0.2**
Hospital stay (days)	9.9±9.97	7.5±8.25	0.001*	12.3±14.56	13.2±12.110	**0.7**
Mode of delivery						
CS	284(92.9%)	1297(91.8%)	0.5	36(94.7%)	97(92.4%)	**0.4**
NVD	22(7.2%)	116(18.2%)		2(5.3%)	8(7.6%)	

CS (cesarian section), NVD (normal vaginal delivery).

Table (7): the relation between laboratory data among medical and surgical groups of neonates and their outcome

Data	Medical conditions		P value	Surgical conditions		P value
	Died n=306	Live n=1413		Died n=38	Live n=105	
HB (g/dl)	13.4±3.05 13.5	14.01±2.5 14	0.01*	13.9±3.02 13.6	14.1±2.8 14.1	**0.5**
WBCS (Thousands/cmm)	10.2±5.3 9	10.1±4.7 8.9	0.9	9.9±4.06 9.05	11.1±5.6 10.8	**0.2**
PLT (Thousands/cmm)	250.2±106.4 253	287.1±104.5 299	0.0001*	242.1±135.1 238	264.05±106.6 273	**0.2**
CRP (mg/dl)	53.3±38.7 6	50.4±41.1 0	0.4	55.1±41.5 12	47.8±39.4 12	**0.4**
T. Bil (mg/dl)	7.4±4.5 6.5	11.3±6.3 10.3	0.0001*	6.3±4.2 6	8.1±4.6 7.9	**0.07**
D. Bil (mg/dl)	0.7±0.6 0.8	0.9±0.6 1	0.0001*	0.6±0.4 0.8	0.8±0.4 1	**0.1**
Ind. Bil (mg/dl)	7.6±3.6 6.8	10.1±5.5 9.1	0.0001*	5.4±3.01 5.5	7.2±3.6 7.2	**0.05**

HB (hemoglobin), PLT (platelet), CRP (C reactive protein) T. Bil (total bilirubin), D. Bil (direct bilirubin), Ind. Bil (indirect bilirubin)

Table (8): The relation between blood component transfusion among neonates with and without surgery and their outcome.

Data	Medical conditions		P value	Surgical conditions		P value
	Died n=306	Live n=1413		Died n=38	Live n=105	
packed RBCs	167(54.6)	375(26.5%)	0.0001*	21(55.3%)	54(51.4%)	**0.6**
Platelets	76(24.8%)	94(6.7%)	0.0001*	12(31.6%)	13(12.4%)	**0.007***
FFP	182(59.5%)	236(16.7%)	0.0001*	32(84.2%)	59(56.2%)	**0.002***

RBCs (red blood cells), FFP (fresh frozen plasma)

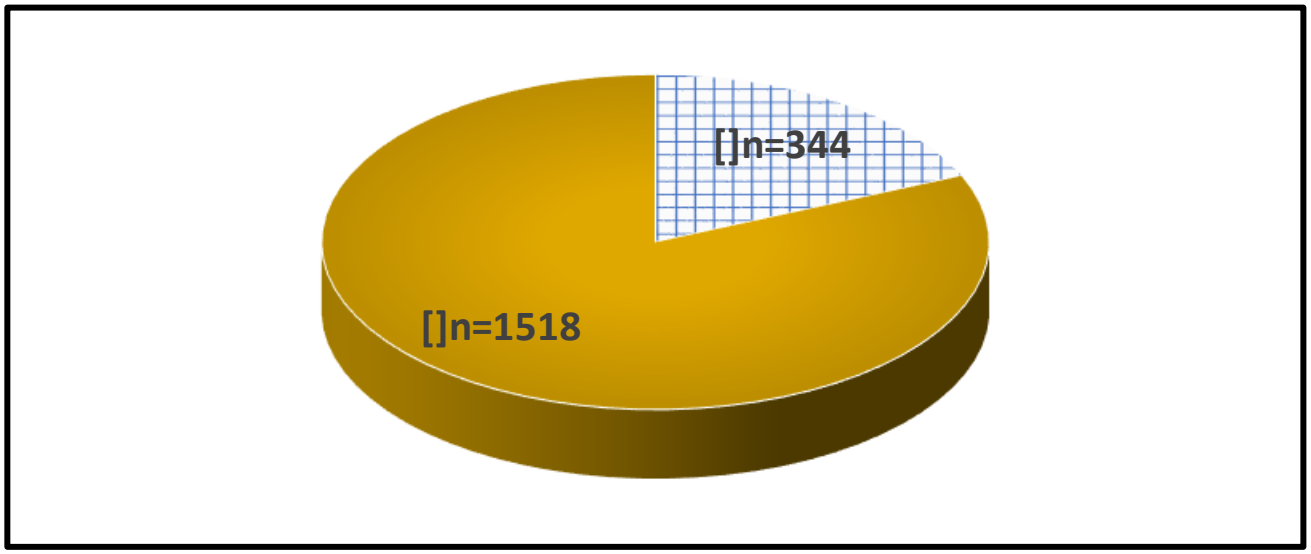

Figure (1): Outcomes of the studied neonates.

Discussion

There are many medical causes of NICU admission including low birth weight, birth asphyxia, sepsis, jaundice and other conditions requiring intensive monitoring and care [8]**.**

Neonates need surgical intervention such as GIT surgical cases including gastroschisis, imperforate anus, hirschsprung disease and intestinal obstruction, respiratory surgical cases including tracheoesophageal fistula and congenital diaphragmatic hernia are also admitted to NICUs. However, the burden of neonatal surgical conditions is not well documented in low- to middle-income countries [9]. Therefore, the objective of our study is to provide an insight on types of surgical and medical problems encountered in NICU and to determine the mortality of neonates with surgical and medical conditions treated in NICU.

The results revealed that there was statistically difference between neonates without surgery and with surgery regarding their age, gestational age, hospital stay, PLT, T. Bil, D. Bil and Ind. Bil, while there was no statistically significant difference regarding their sex,

birth weight, mode of delivery, Hb, WBCs and CRP**.** In the same line, Olsson et al. [10] who reported that there was no statistically significant difference between the surgically treated neonates and non-surgically treated neonates' groups regarding sex (gender) and birth weight. Otherwise, there was no statistically significant difference between the studied groups regarding the gestational age**.** Also, Ullrich et al. [11] reported that whether or not neonates had surgery varied significantly by age.

Regarding diagnosis, the most common cause in neonates with surgery was GIT diseases causes (66.4%) followed by chest diseases (14%) then CNS diseases (13.3%). This is in agreement with Ghanshyam et al. [12] who studied 138 surgical neonates admitted to their newborn care unit in India, and found that the commonest neonatal surgical condition was constituted by gastrointestinal system (39.13%) followed by CNS causes (23.36%).

While the commonest non-surgical causes included in this study were chest diseases (53%) followed by GIT disease causes (34%), these results disagree with Al-Momani [13] who conducted a retrospective study on the neonates admitted to the NICU in Jordan and revealed that the common causes of admission were sepsis (27.3%), followed by respiratory distress syndrome (24.9%) and asphyxia (13.1%). This difference may be attributed to different geography between both studies.

Our results revealed that neonates with surgery significantly had more requirement for blood component transfusion, there was highly statistically significant increase in requirement for blood component transfusion than neonates without surgery and these results go in the same direction with Bharadwaj et al. [14] who mentioned that pediatrics underwent surgeries are associated with blood loss which should be replaced with appropriate quantity of

blood and blood components should be arranged.

Concerning the outcome, the current study revealed that 344 neonates (18.5%) died, this is nearly in accordance with Withers et al. [15] who reported that (21.74%) of the studied neonates died in the study. On the other hand, Metwally & Saleh [16] reported overall mortality of 6.9%, this difference in mortality rates can be explained by the different facilities in each place.

On comparison between died and live neonates as regard their characters, our results showed that there was statistically significant low gestational age in the died group , low birth weight and long duration of hospital stay, as regard their laboratory data there was statistically significant decrease in died group than live neonates regarding HB , PLT , T. Bil , D. Bil and Ind. Bil , there was no statistically significant difference between died and live neonates regarding age, sex, mode of delivery, WBCs and CRP**.** This came in accordance with Elassal et al. [17] who reported that there was no statistically significant difference between live and died neonates regarding the age and weight.

The study of Shayo et al. [18] reported that there was statistically significant decrease in died group than live neonates regarding their gestational age and birth weight. Otherwise, they reported that there was statistically significant difference between died group and live neonates regarding CS delivery and gender.

Similarly, Tembo et al. [19] reported that there was statistically significant decrease in died neonates regarding the gestational age compared to live neonates, also, there was statistically significant difference between live and died neonates regarding low birth weight. Otherwise, they reported that there was statistically significant difference between live and died neonates regarding the mode of delivery, age and sex.

On the other hand, Moshiro et al. [20] reported that there was no statistically

significant difference between live and died neonates regarding the birth weight and the gestational age. This difference may be due to they conducted their study on smaller sample size (671 neonates) compared to ours.

On comparison of blood component transfusion among died and live neonates, the current study showed that there was highly statistically significant increase in need for packed RBCs (54.7%), platelet (25.6%) and FFP (62.2%) transfusion in died neonates**.** Along with our results, Wang et al. [21] who reported that risk of death within 1 month of age was still increased with increased number of RBC transfusions. As well, Hasan et al. [22] who concluded that emergency neonatal surgery contributes to a significant proportion of neonatal mortality with increased demand to RBCs transfusion.

Regarding the relation between general characters and outcomes in neonates without surgery, the current study stated that gestational age, birth weight and hospital stay had highly statistically significant relation, these results partially go in the same direction with Al_Momani [13] who found that gestational age, weight of the baby at birth, and the quick clinical assessment were the strongest predictors of non-surgical neonatal outcomes.

On the other hand, there was no significant relation between general characters and outcomes in neonates with surgery, these findings differ from Saggers et al. [4] who reviewed the records of 923 neonates with surgical causes admitted to NICU in south Africa and revealed the presence of late-onset sepsis, with Gram-negative organisms, lesser gestational age and lower birth weight were significantly associated with poor outcomes.

The results regarding relation of laboratory parameters and outcomes revealed that Hb, PLT, T. Bil, Ind. Bil, and D. Bil were significantly associated with outcomes in neonates without surgery, on the other hand laboratory

findings were not significantly related to outcomes in neonates with surgery, these findings are partially comparable with Bhale et al. [23] who showed that CRP, TLC and direct bilirubin were significant predictors of sepsis with subsequent increase the mortality outcomes.

Also, there was highly statistically significant relation between outcome in neonates without surgery and transfusion of packed RBCs, platelets and FFP. While there was statistically significant relation between outcome in neonates with surgery and transfusion of Platelets and FFP. Our results supported by Olsson et al. [10] who reported that there was highly statistically significant increase in neonate with surgery than without surgery regarding their requirement for blood component transfusion.

Conclusions

We conclude on the basis of these results of the studied neonates admitted to our NICU that respiratory diseases are the commonest cause of neonatal deaths, whereas GIT diseases then respiratory diseases are the commonest diagnosis found in both neonates with medical and surgical conditions. In addition, blood component transfusion was significantly high in died neonates and neonates with surgical conditions compared to their matched groups. Gestational age, birth weight and hospital stay were significantly related to the outcome in neonates with medical conditions.

So, we recommend more attention should be given for neonates with surgical conditions who need blood products transfusion or mechanically ventilated.

Data availability

The dataset used in the current study is available from the corresponding author on request.

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Author's contributions

All authors contributed to the study conception and design. Material preparation, data collection. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

Conflict of interest

The authors declare that they have no conflict of interest

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