Original Article

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Spectrum of Disease and Outcome in Neonates admitted in NICU in Federal Government Polyclinic (FGPC), Islamabad According to ICD-11

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ABSTRACT

Objective: To determine the spectrum of diseases and outcome of neonates admitted in NICU of Federal Government Polyclinic (PGMI), according to ICD-11.

Methodology: This cross-sectional retrospective study was conducted in neonatal intensive care unit of Federal Government Polyclinic (FGPC), Islamabad for a period of 12 months from 1st January 2022 to 31st December 2022 and included 894 neonates inborn and outpatient admitted in the study period. Demographic and clinical data about neonates (age, gender, weight, disease and outcome) was collected from hospital records and was analyzed by SPSS version 23 and tabulated according to the international classification of diseases 11(ICD-11) of WHO.

Results: During the study period 894 neonates were admitted.795(88.9%) were discharged, 83(9.3%) neonates expired.538(60.2%) were males and 354(39.6%) were females. The common causes of admission in NICU were disorders related to length of gestation or fetal growth263(29.4%), respiratory disorders 243(27.2%), infections of newborn231(25.8%) and hemorrhagic or hematological disorders 59(6.65). The common causes of mortality in NICU were disorders related to length of gestation or fetal growth48(5.4%), respiratory disorders 16(1.8%), infections of newborn 11(1.2%) and developmental anomalies5(0.6%).

Conclusion: Disorders related to length of gestation or fetal growth, respiratory disorders and infections of new born are the common causes of admission and mortality in the NICU. The morbidity and mortality data should be presented by International classification of diseases so that there is a uniform language internationally, helping in identifying and analyzing health trends and in turn reducing morbidity and mortality of neonates.

Keywords: Neonates, spectrum, prematurity, sepsis, ICD-11.

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Introduction

The first month of life is the most sensitive period for survival and half of all under 5 deaths occur in this period[1].In the neonatal period many of the physiological adjustments essential for life outside the uterus are completed.[2] Among 140 million babies born every year 2.7 million die during the neonatal age.[3] Neonatal diseases are the 5th most common cause of death worldwide and occur due to birth asphyxia, sepsis and birth complications/birth trauma.[4]In Pakistan, the neonatal mortality rate is 46 per 1000 live births.[5]The neonatal mortality rate of a country reflects the quality of the prenatal, intrapartum and neonatal care available.[6]

According to a UNICEF report preterm births (35%), infections (24%) and birth asphyxia (24%) account for 83% of all neonatal deaths worldwide.[7]According to a

study in China, the most common diseases in neonatal intensive care unit were jaundice (22.01%) followed by respiratory diseases (18.45%), neurological diseases (17.54%) and cardiovascular diseases (14.13%).[8]

In Pakistan, in a study done by Yasmeen et al common causes for admission in neonatal intensive care unit were found to be birth asphyxia (31.89%) followed by prematurity (26.36%) and neonatal sepsis (16.91%).[9] In a study conducted in Karachi the main causes of neonatal deaths were sepsis (23.8%), prematurity (18.4%), respiratory distress and pneumonia (15.2%).[10] In Pakistan and other developing countries most deaths are due to inadequate health care facilities and illiteracy which are preventable .[11]

There is a need to increase the number of neonatal health care facilities at national level in third world countries so that a large number of preventable neonatal deaths can be avoided.[12] Most of the neonatal deaths can be avoided by providing safe and quality care by skilled health professionals along with supportive environment, community-based approaches and well-developed health systems.[13]

ICD-11 is the eleventh revision of the international classification of diseases. For recording health information and causes of death it is the global standard and was approved by the World Health Assembly in 2019. It is the basis for identifying and analyzing global health trends and statistics and provides a universal language which enables health professionals around the world to share information.[14] The disease spectrum and causes of death in this study have been classified and categorized according to the ICD-11 of WHO to provide standardized data universally which is essential for understanding disease patterns and enables prevention, treatment and the allocation of resources accordingly, improving health services and in turn reducing neonatal morbidity and mortality. This article is first in which the local data has been presented according to ICD-11.

Methodology

This cross-sectional retrospective study was done in neonatal intensive care unit of Federal Government Polyclinic, Islamabad for a period of 12 months from 1st January 2022 to 31stDecember,2022. Approval was taken from the hospital ethical committee (FGPC .1/12/2020/Ethical Committee, dated 13th Feb. 2023). All neonates inborn and outpatients admitted in neonatal intensive care unit were included. As there is no paediatric surgical facility so no post-surgical neonate was included in the study. All the neonates admitted in the study period were included and not a single case was excluded as all the relevant data was available. All information including age of neonate, gender of newborn, mode of delivery, gestation, weight of newborn, diagnosis, days of hospitalization and outcome of neonate were collected from the hospital record. All data was analyzed by IBM Statistical Package of Social Sciences SPSS 23. Mean and standard deviation were collected for age of newborn, weight of newborn, gestation and length of hospital stay of neonate. Frequencies and percentages were collected for gender of neonate, mode of delivery, disease outcome and causes of death of neonate.

All the data has been presented according to ICD-11 of WHO which is the global standard for recording health information. This classification uses different codes for each disease and can be accessed through the ICD-11 reference guide of WHO.

Results

Table I shows that out of 894 neonates admitted, 78.5% were <1 day old, 54.5% were born at term, and 50.7% weighed 2.5-4 kg. Caesarean deliveries accounted for 55.9% of births. The discharge rate was 88.9%, while 9.3% expired.

Table I: Demographic details.

Age at admission		
Days	**N**	**%**
< 1 day	702	78.5
1-7 days	130	14.5
8-28 days	62	6.9
Total	894	100%
Gestation in Weeks		
24-36 wks.	377	42.2
37-40 weeks	487	54.5
>40 weeks	30	3.4
Total	894	100
Weight of neonates		
<0.75 kg	3	0.3
0.76-0.9 kg	13	1.5
1-1.4 kg	85	9.5
1.5-2.4 kg	331	37
2.5-4 kg	453	50.7
4 kg	9	1.0
Total	894	100
Duration of hospital stay of neonates:		
<1 day	26	2.9
1-7 days	671	75.1
8-28 days	197	22
Total	894	100
Mode of delivery of neonates:		
Spontaneous vertex delivery	394	44.1
Lower segment caesarean section.	500	55.9
Total	894	100
Outcome of neonates:		
Discharged	795	88.9

Expired	83	9.3
Referred	11	1.2
LAMA	5	0.6
Total	894	100

Table II indicates the leading causes of admission were disorders related to gestation or fetal growth (29.4%), respiratory disorders (27.2%), and infections (25.8%).

Table III reveals that 58.5% of neonatal deaths were due to disorders of gestation or fetal growth, followed by respiratory disorders (19.5%) and infections (13.4%).

Discussion

The neonatal mortality is the outcome of complex relationship between neonatal, maternal and healthcare related factors.[15]In this study 894 neonates admitted in the year 2022 in the neonatal intensive care unit of FGPC were studied.538 (60.2%) were males and 354(39.6%) were females. In a study done by Tette et al in Ghana 52.1% were male and 47.9%were female[16], similarly in a study done in India 54% were males and 40.46% were female [17]which showed that more male babies were admitted than female babies which was similar to our

Table II: Spectrum of diseases in newborns according to ICD-11 classification with codes.

Diseases	N	%	Valid percent	Cumulative percent
Disorders related to length of gestation or fetal growth: Low birth weight (KA 21.2), very low birth weight (KA 21.1), extremely low birth weight (KA 21.0), incredibly low birth weight (KA 21.01), extreme prematurity (KA 21.3) Respiratory distress (KB 23.0) Necrotizing enterocolitis (KB88) Pulmonary hemorrhage (KB28.Y) long gestation or high birth weight (KA22)	263	29.4	29.4	29.6
Respiratory disorders (KB20-KB2Z). Mild to moderate birth asphyxia HIE-HIE II(KB21.1), hypoxic ischemic encephalopathy III (KB 04), Congenital pneumonia (KB 24), Transient tachypnea of newborn (KB 23.1), meconium aspiration syndrome (KB26.0).	243	27.2	27.2	90.0
Infections of newborn: Sepsis (KA60), Neonatal meningitis (KA 65.4), urinary tract infection (KA65.2).	231	25.8	25.8	56.2
Hemorrhagic or hematological disorders: Neonatal hyperbilirubinemia (KA87),hemolytic disease of newborn(KA84), Rh isoimmunization (KA 84.0), ABO isoimmunization (KA 84.2).	59	6.6	6.6	62.8
Transitory endocrine or metabolic disorders: Hypoglycemia (KB61.2), Infant of diabetic mother (KB60.0), congenital adrenal hyperplasia (LC8Y).	46	5.1	5.1	95.2
Developmental anomalies: Hydrocephalus with myelomeningocele (LA 04/LB73.3), Dandy Walker malformation (LA06.0), Pulmonary hypoplasia(LA75.2), Arnold Chiari malformation type III(LA03), Pierre Robin syndrome(LA 56), Cleft lip(LA 40), cleft palate(LA42), imperforate anus(LA06.0),duodenal atresia(LB14), tracheoesophageal fistula(LB12.2), hydronephrosis(LB30), pelviureteric junction obstruction(LB31),talipes equinovarus(LB98)	40	4.5	4.5	4.5
Birth injury: Intracranial bleed (KA 40)	6	0.7	0.7	30.3
Newborn affected by maternal factors or complications of pregnancy, labour and delivery: Meconium stained liquor (KA05.8).	2	0.2	0.2	0.2
Neurological disorders.	01	0.1	0.1	62.9
Digestive system.	01	0.1	0.1	95.3
Genitourinary system.	01	0.1	0.1	95.4
Disorders involving integument.	01	0.1	0.1	95.5
Cardiovascular system: Persistent pulmonary hypertension of newborn(PPHN)(KB42), patent ductus arteriosus of prematurity(KB48),patent ductus arteriosus(PDA)(LA8B.4),Transposition of great arteries(TGA)((LA85.1),Double outlet right ventricle(DORV(LA85.2),Tetrology of Fallot(TOF)(LA88.2),ventricular septal defect(VSD)(LA88.4),Truncus arteriosus(TA)(LA85.4)	0	0	0	0
Disturbances of temperature regulation.	0	0	0	0
Disorders in perinatal period unspecified.	0	0	0	0
Total	894	100	100	

study and may be due to different factors like genetic, immunologic and hormonal. Sex differences in genetic and biological makeup make male neonates more susceptible to diseases as they are biologically weak.

There is an increasing number of caesarean sections as depicted in our study emphasizing the need of improving our obstetric services and management to decrease the rate of caesarean deliveries.

Table III: Causes of death in neonates according to ICD-11 classification with codes.

Sr. no.	Causes of death	N	%	Valid Percent	Cumulative percent
1.	**Disorders related to length of gestation or fetal growth:**	48	5.4	58.5	58.5
a.	Prematurity: Low birth weight (KA21.2), Very low birth weight (KA21.1), Extremely low birth weight (KA21.0), Incredibly low birth weight (KA21.01), Extreme prematurity (KA21.3).				
b.	Respiratory distress (KB23.0).				
c.	Necrotizing enterocolitis (KB88)				
d.	Pulmonary hemorrhage (KB28.Y).				
2.	**Respiratory disorders:** Hypoxic ischemic encephalopathy III(KB04), Birth asphyxia (KB21.0), Congenital Pneumonia (KB24), Meconium aspiration syndrome (KB26.0).	16	1.8	19.5	92.7
3.	**Infections of newborn:** Sepsis (KA60), Neonatal meningitis (KA65.4).	11	1.2	13.4	73.2
4	**Developmental anomalies:** Hydrocephalus with myelomeningocele (LA04/LB73.2), Dandy Walker malformation (LA06.0), Pulmonary hypoplasia (LA75.2), Arnold Chiari malformation type III (LA03)	5	0.6	6.1	100
5	**Birth injury:** Intracranial bleed (KA40).	1	0.1	1.2	59.8
6	**Genitourinary disorders**	1	0.1	1.2	93.9
	Total	82	9.2	100.	

In our study702(78.5%) neonates were <24 hours,130(14.5%) were 1-7 days old and 62(6.9%) were 8-28 days old. In a study done by Umar et al in Abbottabad 59.50 % neonates were < 24 hrs of age while 40.50%were 1 day or more,[12] which shows that the first day of life is the most critical period for the neonates as most complications occur immediately after birth or within 24 hours of life of a neonate. There is a need to improve the healthcare services and management of newborns especially the first 24 hours of life as most complications occur during this period. The international guidelines should be implemented in letter and spirit to improve the neonatal care.

In our study 453(50.7%) neonates were between 2.5kg- 4 kg at admission as shown in table 1 whereas a study by Sur K et al done in India showed that 3.9% of babies were <1 kg, 8.9% were between 1-1.5 kg ,45.1%were between 1.5-2.5kg and 42 .1% >2.5 kg[18] which showed that around half of admitted neonates were of normal weight.

About 55.9% of neonates were born by caesarean section whereas 44.1% were born by spontaneous vertex delivery in our study whereas a study in China also showed babies born by caesarean section to be 64.68% whereas spontaneous vertex delivery 35.3%[8], indicating that more neonates delivered by caesarean deliveries were admitted.

In our study 54.5% were term babies whereas 42.2%were preterm babies whereas a study by Sadia et al showed term babies to be 73.64% while pre term were 26.35%[9] which was a similar finding but with even higher percentage of term babies admitted. The study shows that a large percentage of children are born premature and need immediate neonatal intensive care in many cases, emphasizing the urgent need of increasing our NICU services and their management along with skilled healthcare professionals trained in managing these neonates.

The hospital stay of neonates in our study was less than 24 hours in 2.9%, in 75.1% was between 1-7 days and in 22% was between 8-28 days. Kanimozhi et al showed in a study in India the hospital stay to be <24 hours in 0.94%,1-5 days in 56.58%,6-10 days in 23.8%, 11-30 days in 17.1%[19] indicating that most of the neonates had hospital stay from 1-7 days in the NICU. As the sick neonates need more days of hospitalization, therefore adequate neonatal intensive care units should be available.

88.9% were discharged ,9.3% babies expired, 1.2% were referred to other specialities while 0.6% babies did not complete treatment and left against medical advice in our study while a study by Sur K et al showed that 95.1% were discharged, 3.6% expired while 0.4% were

transferred to other facility[18]. The mortality rate in our study was higher than this study whereas a study by Sadia et al in Pakistan showed mortality of 10.6%, which was near to our mortality.[9] while a study by Umar et al in Abbottabad showed higher mortality of about 20.1%[12] than our study, stressing upon improving our neonatal health services.

The most common causes of admission in NICU in our study were disorders related to length of gestation or fetal growth (29.4%), respiratory disorders (27.2%), infections of newborn (25.8%), while a study by Sadia et al showed birth asphyxia (31.89%) followed by prematurity (26.36%) and neonatal sepsis (16.91%) to be commonest causes of admission[9]. Study by Umar et al in Abbottabad showed infections, preterm births followed by transient tachypnea of newborn as the commonest causes of admission in nicu.[12] A study by Demisse et al conducted in Ethiopia showed hypothermia, sepsis, prematurity, polycythemia, hypoglycemia, MAS and asphyxia as common causes of admission[2]. A study in Ghana by Tette et al showed neonatal sepsis (37.3%) as the commonest cause of admission followed by birth asphyxia (15.1%) and prematurity in (13.2%),[16] showing less cases of prematurity than in our study. The commonest cause of admission in most studies were preterm births, neonatal sepsis and birth asphyxia with a little variation in the proportion of cases whereas in a study in China by Xie F et al neonatal jaundice was 22.01%, respiratory system 18.45% while neurological diseases were 17.54%,[8] which showed that commonest cause of admission was neonatal jaundice which was in contrast to the other studies. 82 neonates expired in the NICU during our study period in the NICU.

The commonest causes of death in our study were disorders related to length of gestation or fetal growth (58.5%), respiratory disorders (19.5%), infections of newborn (13.4%) as mentioned in table III. A study in Abbottabad by Umar et al showed neonatal sepsis and prematurity as the two leading causes of death.[12] Another study in Pakistan by Sadia et al showed highest deaths due to prematurity (39.32%) followed by asphyxia neonatorum (30.68%) and neonatal sepsis (15.38%)[9] .A study in Ghana showed prematurity(26.8%) as the commonest cause of death followed by neonatal sepsis(26.30%) and birth asphyxia(20.7%)[16] showing that worldwide most neonatal deaths are due to preventable causes and can be prevented by improving neonatal healthcare services. The data related to diseases has been presented in a standardized and universally accepted International classification of diseases of WHO so that there is a universal language to share health information and identifying and analyzing global health trends which in turn will help us in proper planning and implementation of uniform health policies improving patient survival.

Conclusion

Disorders related to length of gestation or fetal growth, respiratory disorders and infections of newborn are the most common causes of admission and mortality in the neonatal intensive care unit. The clinical data should be standardized universally and presented according to International classification of WHO with few modifications which is essential for understanding disease patterns and enables planning, prevention, treatment and allocation of resources, improving health services and in turn reducing morbidity and mortality.

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