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Clinical features and Outcome of Neonatal Conditions at El-Obeid Paediatric Specialized Hospital, Sudan

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Abstract

Background: Neonatal mortality accounts for 46% of under-five deaths worldwide. In Sudan, the neonatal mortality rate is 29.4 per 1000 live births. **Aim:** To determine the clinical characteristics and outcome of neonates admitted to El-Obeid Specialized Pediatrics Hospital in Western Sudan. **Methods:** Retrospective, descriptive hospital-based study. Data were collected from the medical records of newborns admitted to the hospital between January 2015 and July 2018. Relevant socio-demographic and clinical information was collected on a prepared standard form. Descriptive and analytical statistics were used to summarize the study variables. **Results**: A total of 1,662 neonates were enrolled during the specified period. About 56% of the cases were male. Neonatal sepsis was the most common clinical condition, occurring in 83.4% of cases. Most cases (88.3%) presented with fever and 28.7% had jaundice. The overall mortality was 2.3%, of which about a quarter occurred within the first week after birth. **Conclusion**: Neonatal morbidity and mortality still account for a large proportion of the burden of disease in children under 5 years of age. Identifying the risk factors associated with neonatal death is very important to guide the development of effective interventions to reduce neonatal mortality.

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Introduction:

The first 28 days of life are called the neonatal period. It consists of the early neonatal period, that is, the first seven days of life of an infant born alive, and the late neonatal period, that is, the period after the seventh day until the age of 28 days after birth. This is the period with the highest morbidity and mortality rates in developing countries [1]. Each year, about 4 million babies die in the neonatal period, and another 4 million are stillborn; 98% of these neonatal deaths occur in developing countries [2-4].

WHO estimates that 40-60% of neonatal deaths are potentially preventable and that more than 2 million newborns could be saved with cost-effective interventions. Although neonatal mortality rates have declined globally, the decline in neonatal mortality has been slower than the decline in under-five mortality. 2.9% decline per year compared to 2.1%. To improve neonatal mortality outcomes, more epidemiological studies are needed to provide more accurate data on the risk factors and causes of neonatal morbidity and mortality [3-6].

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Statistics on neonatal mortality vary widely in different parts of the world. Africa accounted for 33% of global neonatal mortality, with 75% of deaths occurring in the first 7 days of life. About 50% of these occurred within the first day. The highest neonatal mortality rate in 2017 was found in sub-Saharan Africa [2,7].

The early neonatal mortality rate in the neonatal intensive care unit in Sudan varies by hospital and ranges from 15% to 27.2% of the total newborns admitted [8-10].
Neonatal mortality is associated with male infants, advanced maternal age, family poverty and cesarean delivery. Antepartum and birth complications are critical for poor perinatal outcomes. Poverty is also a risk factor for neonatal death [2]. A Sudanese study did not follow these findings and there was no association between neonatal mortality and use of antenatal health services, whether or not delivery was assisted by health professionals, and whether delivery took place at home or in a hospital [11].

The leading causes of death worldwide are preterm birth, severe infections, tetanus, and complications from asphyxia [6]. In developing countries, infections account for 30% to 50% of all neonatal deaths. Pneumonia, tetanus, sepsis, and diarrhea are the most common causes of neonatal infections.

The most common reasons for admission to neonatal facilities in developing countries are infections and prematurity [12]. According to a study conducted at Omdurman Maternity Hospital in Sudan, the most common reasons for admission to the neonatal unit were prematurity, birth asphyxia, neonatal jaundice, congenital malformations, neonatal sepsis, and birth trauma or meconium aspiration syndrome [9]. Another study found that the most common diagnosis on admission was neonatal sepsis, followed by respiratory distress syndrome and neonatal jaundice.[8] In a study from Eretria, neonatal infections such as pneumonia and gastroenteritis accounted for 70% of newborns admitted to the neonatal intensive care unit [13]. The aim of this study was to determine the clinical features and outcome of neonates admitted at El-Obeid Specialized Pediatrics Hospital, Western Sudan.

Methodology:
Study design: This is a retrospective cohort study.

Inclusion and exclusion criteria: All admitted neonates in the study period with admission records were included in the study; other pediatric age groups were not included.

Data collection: The data was collected using the information found in the medical records of neonates admitted at the hospital in the period from January 2015 to July 2018. Relevant socio-demographic and clinical information was extracted on a predesigned standard form.

Data entry and analysis: Descriptive and analytic statistics were used to summarize the study variables. PSS program was used in the analysis of data, and the statistical p-value of a significant statistical rate was taken as less than 0.05

Results:
A total of 1,662 neonates were admitted during the specified period from period from January 2015 to July 2018. About 56% of the admitted cases were male and 44% were female, with a male-to-female ratio of 1.27. Neonatal sepsis as a main diagnosis was encountered in nearly half of the cases, 49.8% followed by neonatal jaundice in about one fourth of cases. the third common diagnosis was prematurity and related problems in 4.1% of the cases (there is a special unit of NICU in the pediatrics emergency hospital in the city). The diagnosis was not recorded in 1% of cases (Table 1).

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Table 1 ***Distribution of the admission diagnoses of the neonates in the study group***

Admission diagnosis	Frequency	Percent
Neonatal sepsis	827	49.8
Neonatal jaundice	425	25.6
Prematurity	68	4.1
Neonatal gastroenteritis	56	3.4
Neonatal convulsions (not associated with sepsis)	47	2.8
Full term low birth weight for feeding	45	2.7
Hemorrhagic disease of the newborn	26	1.6
Congenital heart disease	14	0.8
cephalohematoma	11	0.7
Down syndrome	9	0.54
Neural tube defects	9	0.54
Lactose intolerance	9	0.54
Birth asphyxia	8	0.5
Neonatal tetanus	8	0.5
Congenital pyloric stenosis	5	0.3
Hydrocephalus	4	0.25
Microcephaly	2	0.1
Other trisomy	2	0.1
Congenital adrenal hyperplasia	2	0.1
Colloidan baby	1	0.1
Other conditions	68	4.2
Unrecorded diagnosis	16	1
Total	1662	100%

As for the presenting symptoms, most cases (88.3%) presented with fever and 24.7% with jaundice,8.9% with vomiting,6.2%with diarrhea,5.2%with cough and 4.8% with generalized or focal convulsions (Figure 1).

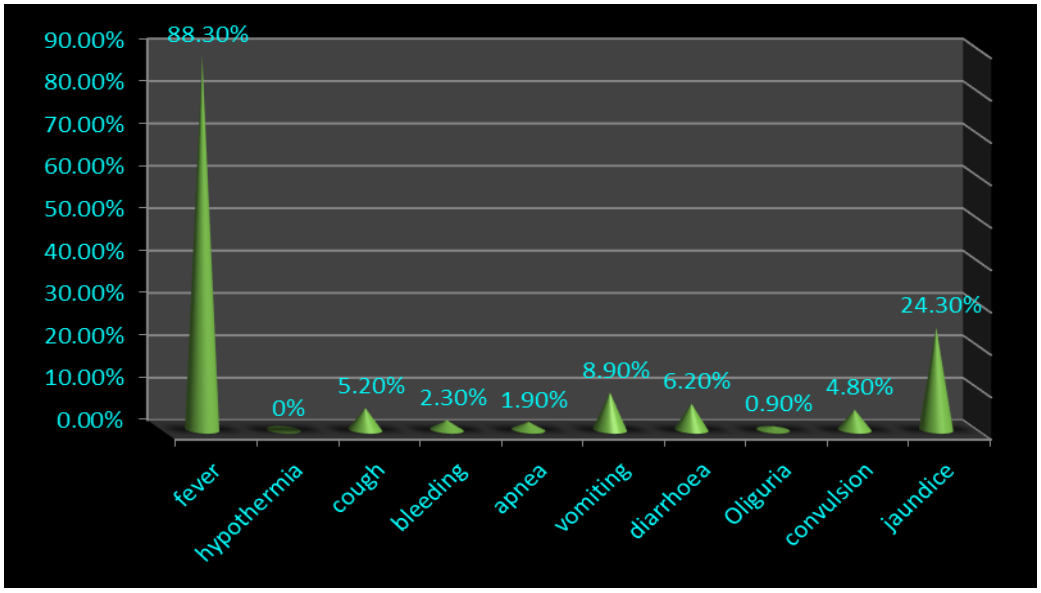

Figure 1 ***Distribution of the common presenting symptomatology in the group***

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Some of the presenting signs in this study group include signs of dehydration in nearly 2%, pallor in 1.5%, respiratory distress in 1.2% and skin rash in 0.6%. May be many signs were not documented in patient files and hence not appearing in the review (Figure 2).

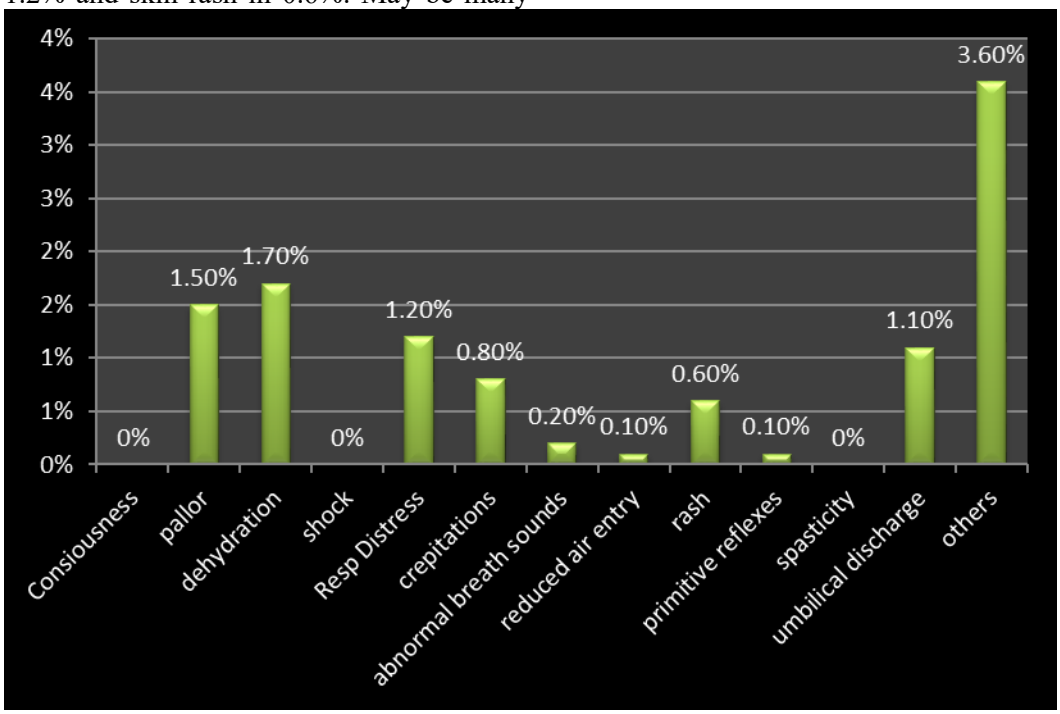

Figure 2 ***Distribution of the common presenting signs in the group***

Regarding the classification of the special types of neonatal sepsis apart from generalized frank septicemia, these include neonatal meningitis in 4.2 of the total patients, neonatal respiratory infections in 3.5% of the cases, urinary tract infections in 2.2%, neonatal skin infections in 1.3% and neonatal severe pustular conjunctivitis in about 1% of the total cases (Figure 3).

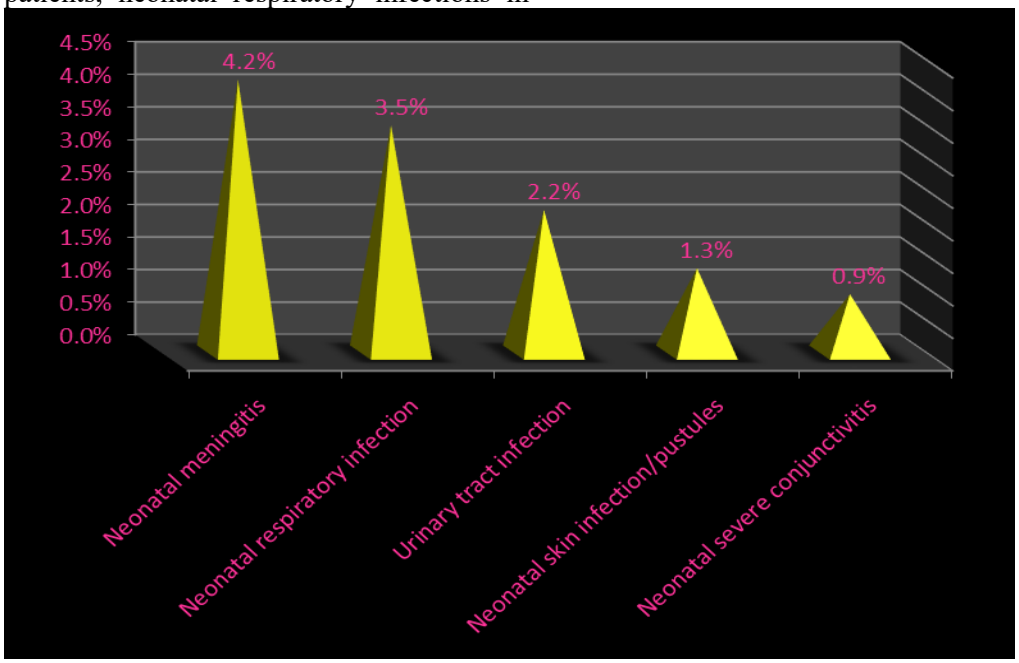

Figure 3 ***Distribution of some special types of neonatal sepsis in the admissions of the study group (N=827)***

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Isolated congenital heart disease not associated with chromosomal or other syndromes was suspected clinically and radiologically in 14 patients (0.8%) with the provisional diagnoses of transposition of the great arteries, large ventricular septal defects, Tetralogy of Fallot, patent ductus arteriosus, hypoplastic left heart, dilated cardiomyopathy, and others (Figure 4).

Nearly two-thirds (63.2%) of the 68 prematurity cases were due to respiratory distress syndrome,4 cases with necrotizing enterocolitis (5.9%), others with hemorrhagic disease of the newborn and other conditions (Table 2).

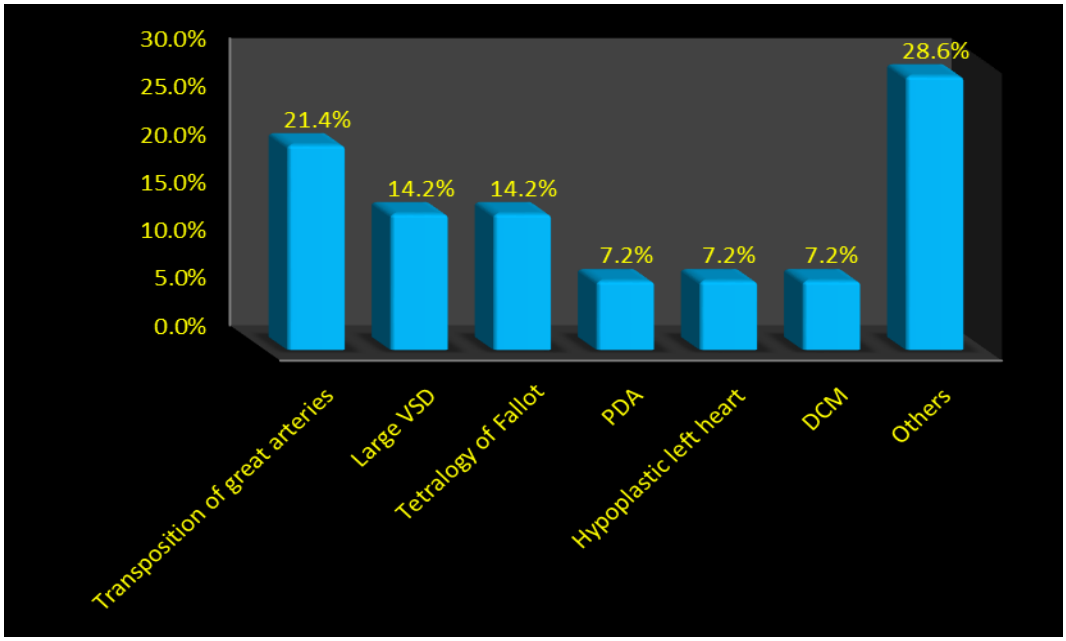

Figure 4 ***Distribution of provisional diagnosis of congenital HD in the study group (N=14)***

Table 2 ***Distribution of the prematurity admissions in the study group***

Diagnosis	Frequency	Percent
Prematurity with RDS	43	63.2
Prematurity with NEC	4	5.9
Prematurity with other conditions	21	30.9
Total	68	100%

The outcome of the admitted newborn patients was that most of the cases improved and discharged home (91.7%), 3.7% with self-discharge against the medical advice, 2% were referred to other units or to NICU and 0.3% with no documented data in the files (Figure 5). Overall Death rate was 38 cases, representing about 2.3% of all admitted neonates. More than a quarter of this mortality (26.3%) occurred within the first week of birth (early neonatal deaths) (Table 3).

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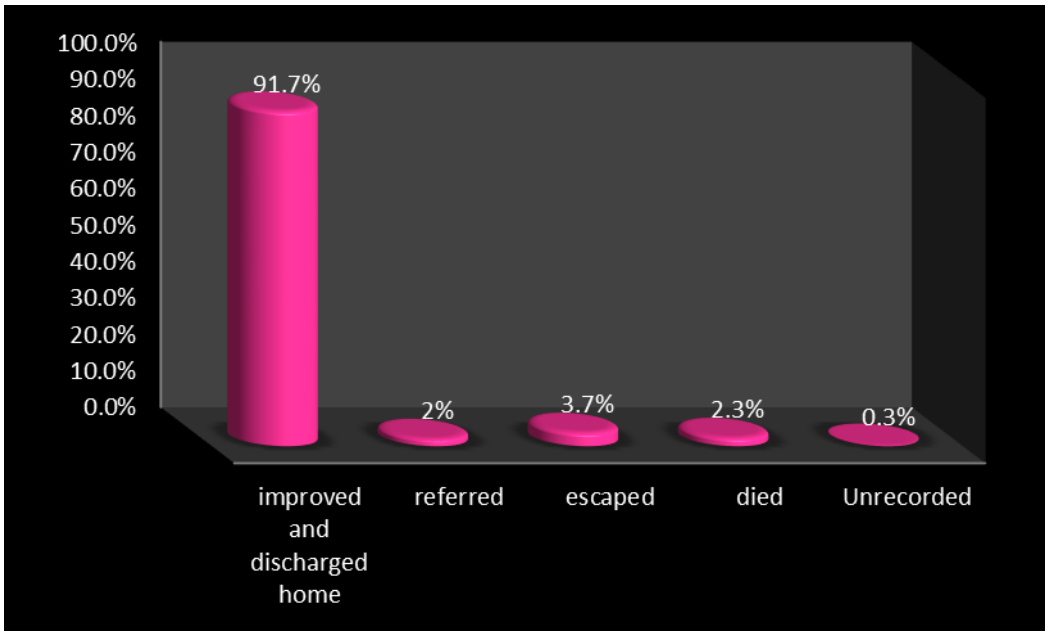

Figure 5 ***Distribution of the outcome of neonatal admissions to the hospital in the study group (N=1662)***

Table 3 ***Distribution of the deaths and age of death in the study group***

Age at death	Frequency	Percent
<-7 days	10	26.3
Other	28	73.7
Total	38	100.0

Regarding the drug therapy in the study group almost all patients received intravenous antibiotics (99.4%) antipyretics (paracetamol) was given in 70.9% of patients, anticonvulsants in 6%, antimalarial in 4.5%, oxygen therapy in 4.2% and phototherapy in 27.7% of the admitted neonates (Table 4).

Table 4 ***Distribution of the drug therapy in the study group***

Medication		Frequency	Percent
I.V Antibiotics	Yes	1569	99.4
	No	10	0.6
Antipyretics	Yes	1121	70.9
	No	460	29.1
Analgesics	Yes	1025	65.0
	No	553	35.0
Anticonvulsants	Yes	95	6.0
	No	1484	94.0
Anti malarial	Yes	68	4.5
	No	1432	95.5
Antiviral acyclovir	Yes	1	0.1
	No	1499	99.9
Oxygen therapy	Yes	70	4.2
	No	1589	95.8
Phototherapy	Yes	460	27.7
	No	1200	72.3
Other medications	Yes	540	32.6
	No	1118	67.4

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Statistically significant correlations were found between the outcome and the age of the neonate (p value 0.021), age and death outcome of admitted neonates (p value of 0.045), death and diagnosis of the neonate (p value 0.003). No significant correlation was found between outcome and each of the admission diagnosis, symptoms, nor signs at admission with p values of 0.073,0.65 and 0.57 respectively.

Discussion:

This is a retrospective, descriptive hospital-based study aimed at determining the clinical characteristics and outcome of neonates admitted to El-Obeid Specialized Pediatrics Hospital from January 2015 to July 2018. A total of 1,662 newborns were admitted during this period. About 56% of the cases were male. This finding is consistent with studies from Sudan and other developing countries [1,10,12,14]. Some attribute the preponderance of males to social aspects in the cultures of third world countries that prefer male children and therefore seek more medical care for their male babies than for females, but even in term babies in the UK, the Abgar score was lower in males [14,15].

Neonatal sepsis was the most common clinical condition in 83.4% of cases, followed by jaundice and prematurity. These findings are in agreement with many studies from Sudan. In a study conducted in the neonatal intensive care unit of Saad Abu Elella Teaching Hospital in Khartoum, neonatal sepsis was the most common diagnosis on admission, followed by respiratory distress syndrome and neonatal jaundice.[8] This was also the most common cause of admission to the neonatal unit of Wad Madani Hospital [16].

In other countries like Eritrea, where they are the second most common cause of neonatal admissions after pneumonia, neonatal infections account for a high percentage of admissions.[13] In Ethiopia, neonatal sepsis was found in 67.9% of cases.[14] In Pakistan, infections are the second most common cause of neonatal admissions after prematurity. Birth asphyxia was the third most common cause of admission, followed by neonatal jaundice. The most common causes of infections were sepsis (70.8%), pneumonia (12.6%), and acute gastroenteritis (8.22%) [12]. In our study, acute gastroenteritis accounted for only 3.4%, while neonatal meningitis and respiratory infections had a higher percentage.

In the United Kingdom, the most common reasons for admission were respiratory problems first and then suspected infection [15]. In other studies, such as in Jordan, sepsis accounted for only 1.2% of the reasons for admission, while prematurity and respiratory distress syndrome were the most common causes [17]. The higher incidence of infections in developing countries can be explained by low socioeconomic status and poor antenatal care. According to a Sudanese study, the causes of neonatal sepsis were premature rupture of membranes and maternal infection. The most common symptom was poor suckling, followed by fever in 43.8% [18]. In our study, fever was predominant with 88.3% of presenting symptoms.

The percentage of admissions for prematurity was 4.1% of total admissions. The percentage of admissions for prematurity was 4.1% of the total admissions. This is attributed to the presence of a separate neonatal intensive care unit equipped for preterm babies at El-Obied teaching hospital, and most preterm babies are admitted to that specialized unit. This percentage is considered low compared to the global incidence of preterm birth. In 2010, the global prevalence of preterm birth was reported to be 11.1% using data from 99 countries, ranging from 5% in some European countries to 18% in some African countries 60% of preterm births occur in sub-Saharan African or South Asian countries [19,20]. It is also lower than a previous study in Sudan, where the proportion of preterm births was 39.1% [9].

The most common comorbidity in preterm births is respiratory distress syndrome (RDS) at 63.2%, which is higher than expected in a study conducted at Soba hospital, where RDS accounted for 36% and was second only to jaundice [10]. A study conducted in

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Yemen to investigate the risk factors of respiratory distress syndrome concluded that most RDS cases occur in preterm infants,[21] which is due to the underdeveloped respiratory centers, immature lung function, and surfactant deficiency in preterm infants [1].

Isolated congenital heart disease (CHD) was clinically and radiologically suspected in 0.8% of the study population. This exactly coincides with the findings of a study in Jordan and Pakistan [12,14]. Another study in Punjab showed a higher incidence in a 3-year study where 1.5% of newborns were found to have CHD [22].

Preliminary CHD diagnoses include transposition of the great arteries, large ventricular septal defects, tetralogy of Fallot, patent ductus arteriosus, hypoplastic left heart, dilated cardiomyopathy, and others. This result contrasts with other studies in which ventricular septal defect was considered the most commonly diagnosed CHD [22-24].

The overall percentage of death in the study was 2.3%, which is close to the calculated mortality obtained from the 2010 Sudan Household Health Survey 2nd round data, which was 3% of live births [11]. However, this percentage is lower than previous Sudanese studies [8,16], which can be explained by the proportion of self-discharges (3.7%) and unrecorded cases (0.3%). About a quarter of deaths occurred within the first week after birth. Worldwide, about three-quarters of neonatal deaths occur in the first week after birth, and 25-45% of deaths occur in the first 24 hours of life [25,26]. After the first day, mortality decreases from 11.4% to 6% [13].

There is a statistically significant association between mortality and neonatal diagnosis (p-value 0.003). Globally, infections and prematurity are the leading causes of neonatal deaths [26,27]. In another Sudanese study, prematurity, low birth weight, and birth asphyxia were the leading causes of death [16].

Neonatal mortality occurs most frequently in developing countries and is largely preventable. Therefore, mortality can be reduced by early interventions, good antenatal care, and probably by implementing low-cost interventions such as community and home-based neonatal care, which are effective in Indian field trials [28].

Conclusion:

The most common causes of admission were sepsis, then jaundice, and prematurity. The most common comorbidity of prematurity was respiratory distress syndrome. Isolated congenital heart disease (CHD) was clinically and radiologically suspected in 0.8% of the study population. Surprisingly, transposition of the great arteries was the most common diagnosis of CHD. The overall mortality was 2.3% and approximately one quarter of deaths occurred within the first week after birth. Since El-Obeid Specialized Pediatrics Hospital admits a large number of newborns, a well-equipped neonatal intensive care unit with well-trained staff is needed to improve the outcomes of newborns admitted to this hospital.

Recommendations:

- A neonatal intensive care unit is strongly recommended as there is no neonatal intensive care unit at El-Obeid Specialized Pediatrics Hospital despite the large number of neonates admitted monthly. There is also a need for a pediatric unit for premature infants with incubators, necessary equipment, and trained staff.
- Most of the admitted cases have been diagnosed with neonatal infection or jaundice, hence the need for proper tools for management and accurate diagnoses such as blood and body fluid cultures and assessment of jaundice and its types.
- Patient records lack necessary information such as history and clinical examination and progress notes. To improve this, a standard form containing all the necessary information should be created and completed by all doctors and paramedical staff.

Ethical consideration: Informed formal consent was taken from the authority of El-Obied specialized pediatric hospital and the

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general manager of the hospital to use the hospital records in this study.

Conflict of interest: No conflict of interest is claimed by this study

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