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Neonatal Mortality Rate in the Special Care Baby Unit

(SCBU) at Gharian Teaching Hospital

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ABSTRACT

The aim of this retrospective study was to determine the incidence and risk factors of neonatal mortality among cases admitted to SCBU at Gharian Teaching Hospital . The study included all admitted newborn cases to the Special Care Baby Unit (SCBU) over one year period from January to December 2009, they were 1267 newborns. Records about Gestational age, sex, birth weight, , mode of delivery, early or late neonatal deaths, duration of stay, main cause of admission and outcome of patients were taken. Results of study revealed that: mortality rate among studied newborns was (4.57%) from the total number of admitted newborns, the higher rate was observed among: premature newborns (70.69 %), cases suffering from respiratory problems (39.66%), birth asphyxia (25.86%), congenital malformations (20.69%) and also among artificially ventilated patients (80%). It is concluded that neonatal mortality is quite common at our SCBU with a rate of (4.57%).

Key Words

Newborn, Mortality rate, Preterm, Artificial ventilation.

INTRODUCTION:-

Neonatal mortality is a reflection of the effectiveness of obstetric and neonatal services in any particular community [1]. It contributes to about two thirds of infant mortality worldwide and most of these occur in the first week of life [2]. Worldwide, the major causes of early neonatal deaths are birth asphyxia, birth trauma, infections, prematurity and malformations, while sepsis, pneumonia, meningitis, diarrhoeal disease and tetanus account for most of the mortality during the rest of the neonatal period [2]. The neonatal mortality rate is defined as number of neonatal deaths per 1000 live births. Across the globe neonatal mortality rates range from 5 per 1000 in developed countries to 50 per 1000 in the least developed countries; early neonatal mortality represents about 75% of neonatal mortality [3]. Globally,

approximately 7.5 million infants die annually, more than half of these deaths occur during the neonatal period and 98% of the neonatal deaths occur in the developing regions [3]. High neonatal mortality rate remains a problem in developing countries where the economic situation and poor planning of health services have led to little appreciable advancement in neonatal care [4]. This is in contrast to what obtains in developed countries where the technological advances in neonatal intensive care have brought about reductions in mortality among the newborns [5]. These advances include perinatal monitoring of maternal and fetal well-being and thermoregulation. Neonatal medical services as a paediatric subspeciality were established on a wide scale in Libya in 1985. The first report on morbidity and mortality rates in Libyan neonates in Algala Children and Obstetric Hospital was issued in 1990 [6]. The perinatal mortality rate at that time was 26.3 per 1000 total births, which was high compared to western European and North American countries. The major causes of neonatal deaths in Tripoli during the early 1990s were premature birth and its complications, low birth weight, congenital malformations, infections, perinatal asphyxia and birth trauma. The SCBU at Gharian Teaching Hospital has evolved as a unique unit that provides services for all newborns of high risk pregnancies together with critical and emergency neonatal cases delivered at the hospital, despite the effort to provide excellent care at this unit, mortality and complications continue to occur. So the aim of this study was to determine the incidence and risk factors of neonatal mortality rate (NMR) among cases admitted to the SCUB at Gharian Teaching Hospital in an attempt to evaluate the quality of care at the unit and to minimize or prevent subsequent deaths.

SUBJECTS AND METHODS :-

This was a retrospective study from the records of newborns admitted to the SCUB at Gharian Teaching Hospital during the period from January to December 2009. The SCBU provides services for newborns of high risk pregnancies together with emergency neonatal care of infants delivered inside the hospital. The quality of man power inside the unit over 24 hours was divided into two shifts each shift included 2 doctors, 2 nurses. The unit is followed up daily by a pediatric specialists, and the total number of incubators were 12 incubators. Records were collected from the admission files including: sociodemographic data regarding: gestational age, sex, residence, date of birth (DOB), primary diagnosis, birth weight, duration of stay inside the unit, use of mechanical ventilation and outcome of patients whether alive or died and the cause of death.

STATISTICAL ANALYSIS:-

Data in this study were Statistically presented and analyzed using SPSS software statistical package version 10 (SPSS, Chicago, IL). Data were expressed as Numbers and percentage and tested by X^2. A P-value less than 0.05 were considered significantly.

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Results

Table (1): characteristics of studied newborns

Parameter	Total number 1267 newborn	
	No	**%**
Gestationa Age		
- < 37 weeks	280	22.09
- > 37 weeks	987	78.91
Sex:		
- Male	570	44.98
- Female	697	55.02
Mode of delivery		
- NVD	1217	96.05
- CS& instrumental	50	3.95
Cause of admission		
- Respiratory distress	519	40.96
- Birth asphyxia	278	21.94
- Cong. Anomalies	125	9.87
- Infections	93	7.34
- IDM	120	9.47
- Others (Hyperbilirubinemia, bleeding……etc	132	10.42
Use of mechanical ventilation:		
- Ventilated	10	00.07
- Not ventilated	1257	99.93
Outcomes:		
- Alive	1209	95.43

- Dead	58	4.57

NVD: normal vaginal delivery CS: caesarian section

IDM: infant of diabetic mother

Table (2) Mortality outcome among studied cases according to gestational age & sex

Outcome / Parameter	Total Number	Dead No	Dead %	Alive No	Alive %	X	p
Gestational age							
< 37 weeks	65	41	70.69	239	16.78		
> 37 weeks	1202	17	29.31	1185	83.22	102.19	< 0.001
Sex:							
Male	570	30	51.72	540	35.86		
Female	697	28	48.28	966	64.41	1.087	> 0.05

Table (3): Mortality outcome among studied cases according to cause of admission

Causes of admission	Total	Dead No	Dead %	Alive No	Alive %	X^2	P
Resp. distress	519	23	39.66	496	41.03		
Birth asphyxia	278	15	25.86	263	21.75		
Congenital anomalies	125	12	20.69	113	9.35		
Infections	93	5	8.62	88	7.28		

IDM	120	0	0.00	120	9.93		
Others	132	3	5.17	129	10.67	15.167	<0.001

IDM: infant of diabetic mother

Table (4) Mortality outcome among studied cases according to use of mechanical ventillation

Outcome / Parameter	Total No.	Dead No.	Dead %	Alive No.	Alive %	X^2	P
Use of mechanical Ventilation:							
-Ventilated	10	8	8.00	2	20.00		
- Not ventilated	1257	50	3.98	1207	96.02	114.48	< 0.001

RESULTS:-

This retrospective study was carried out over a period of one year and included 1267 newborns admitted to the SCBU. The main number of cases/ month were (105.58), and per day (3.51). The total number of incubators inside the unit was 12 incubators and the main number of cases per incubator per month was (8.75). The mean duration of stay was 11.2 days. The characteristics of studied cases are summarized in Table (1):- The proportion of male to female in the sample was (44.98% versus 55.02%), 22.09% were prematures less than 37 week, Most newborns (96.05%) were products of normal vaginal deliveries. Regarding cause of admission (41.03%) of cases were due to respiratory distress, (21.75%) admitted because of birth asphyxia, (9.35%) had congenital anomalies & syndromatic diseases, (9.93%) were infants of diabetic mothers and (10.67%) were due to other illnesses e.g. hyperbilirubinemia, bleeding tendencies …….etc.

Among our cases 10 cases (0.075%) were exposed to artificial ventilation, all were prematures. Out of 1267 cases admitted to the SCBU over one year over one year 58 cases were died with an overall mortality rate (4.57%).

Table (2) displayed the mortality outcome among studied cases according to gestational age & sex. The incidence of mortality was increased as the gestational age decreased being (70.69%) among premature infants less than 37 weeks, and (29.31%) among full term infants more than 37 weeks, the difference was statistically significant (P< 0.001). However regarding sex there was no statistical difference between sexes and the mortality rate was statistically non significant (P> 0.05).

Table (3) showed the mortality outcome among studied cases according to cause of admission, the incidence of mortality is increased among cases admitted with respiratory distress (39.66%), birth asphyxia (25.86%), congenital anomalies (20.69%), and infections (8.82%). The differences were statically significant (P< 0.001).
Table (4) showed: More deleterious outcome with the use of mechanical ventilation where mortality rate was 80% among ventilated cases compared to 3.98% among non ventilated newborn (P<0.001)

DISCUSSION*:*

It is important to review the pattern of diseases and neonatal deaths at regular intervals so the planning of neonatal care can be improved [7, 8, 9]. In our study the overall death rate was 4.75% among the inborn neonates admitted to the SCBU of Gharian teaching hospital during the study period; the same results were reported in a regional referral hospital in Sudan where also only inborn neonates were included [10]. In a recent study done in the SCBU of the Tripoli children's hospital a mortality rate of 22.1% was reported [11],because they included also the outborn babies in their study. A study from Nigeria reported overall mortality of 25.5%; 20.3% among inborn neonates and 64.2% among outborn neonates [12]. A study from Bangladesh [13] reported 8% mortality in inborn neonates and 25.6% in outborn neonates. But in the United States of America a mortality rate of 0.8% was reported among inborn neonates [14]. This illustrates that while neonatal mortality in developed countries has fallen dramatically, developing countries continue to experience unacceptably high neonatal mortality. The variations in mortality probably reflect local and national differences in care pattern of newborn babies.

Our study revealed that respiratory distress and prematurity were the most important risk factors for neonatal mortality (39.66% and 25.86% respectively). RDS is a well known very frequent complication of prematurity due to lung immaturity, and babies with RDS had the highest case fatality in our study, which is also reported elsewhere [15,16,17,18]. The high case fatality in infants with RDS reflects the inadequate care of these neonates in developing countries [19, 20].

About 70.69% of the neonatal deaths were premature newborns. Deaths among the extremely low birth weight and very low birth weight infants were largely attributed to respiratory insufficiency. The mortality rates of very low and extremely low birth weight neonates are still high in most of the developed countries [21]. But the overall survival rate for very low birth weight newborns in Japan was around 90% [22]. This improvement of survival of such infants reflects the improvement in medical care [23] and better knowledge of the pathophysiology of the neonal medicine [24]. Very low birth weight is a preventable risk factor of neonatal deaths and the decline in very low birth weight births will result in a decline of neonatal deaths in general [23]. In our study there was strong association between neonatal mortality and gestational age where mortality rate is strongly increased with the decrease in gestational age and maturity.

Management of premature babies requires highly specialized equipment, highly trained personnel and financial support [24, 25]. In countries where ventilation technology and the use of surfactant as a preventive

measure have been implemented, the survival rate of premature babies has improved [25]. Some specific and simple measures has been identified which could be implemented to reduce deaths related to low birth weight and preterm in low income countries [26, 27, 28]. These include prophylactic use of steroids during premature labor,strict hygienic conditions, antibiotic use for premature rupture of membrane, early breast feeding, treatment of infection, hospital-based kangaroo mother care, prevention of hypothermia, feeding and nutritional support. A recent meta-analysis review found that hospital-based Kangaroo mother care (skin-to-skin contact) implemented within the first week of life for stable preterm and low birth weight neonates was effective and could reduce neonatal mortality up to 51% [29].

In this study male newborns had higher mortality rate than females (51.72% versus 48.28%) but this was not statistically significant, which concurs with previous reports which indicate that sex is not a significant predictor of mortality [30, 31, 32].

Congenital malformations are an important contributor to neonatal mortality (20.69%); the death rate was highest among those infants with neural tube defects, complex congenital heart diseases, chromosomal and other genetic anomalies. Some congenital anomalies are preventable [23, 33], such as neural tube defects that can be prevented by using folic acid during the preconception period [33]. Consanguineous marriage, extreme maternal age (over 40 years or very young mothers), socio-environmental factors and chronic maternal disease such as diabetes are all factors associated with a higher incidence of congenital anomalies [6, 34, 35]. Although the consanguinity rate in this study was not known, the traditional pattern of consanguineous marriage in Arab and Islamic countries, including ours, may influence the frequency of autosomal recessive conditions and the incidence of congenital anomalies [34, 36]. Many congenital anomalies can be treated surgically but we lack the facilities for the management such as the lack of total parenteral nutrition,the well trained neonatal surgeons and a qualified nurses in neonatal care. The frequent use of nasogastric and endotracheal tubes leave babies highly susceptible to infections, especially among prematures.

Mortality due to infection in this study was low (8.62%) compared to the global pattern as well as the pattern in low income countries [37, 15, 13,38]. The low number of deaths due to infection might in part be explained by the inclusion of only inborn neonates, since appropriate treatment of infection or suspected infection can start with a minimum of time delay after delivery. Recent reports [39] showed that, the use of Gentamycin and Cloxacillin instead of Gentamycin and Ampicillin for neonatal infections may have played a role in increased survival in infected neonates. A similar change in antibiotic treatment in Nigeria resulted in a 32% reduction in mortality associated with septicemia [16]. The routine transfer to NCU of all neonates at risk of infection or suspected infection due to premature/prolonged rupture of membrane for antibiotic prophylaxis [40], might also have contributed to low mortality due to infection in this setting. It has been previously shown that babies of mothers with premature/prolonged rupture of membranes had a 2 fold risk of being transferred to NCU for antibiotic prophylaxis due to risk of infection [40].

Birth asphyxia was a common cause of neonatal mortality among our cases (25.86%), this was in consistent with, the global pattern and studies from many universities and tertiary care hospitals [42, 12, 38]. One explanation of the high number of deaths due to asphyxia in our data may be the definition criteria for asphyxia that we used, which included some of the preterm babies. Of particular interest is the high number of deaths attributable to asphyxia in our study (quarter of all deaths) because they may represent a potential for prevention.A good Antenatal care is lacking in our community which increases the number of asphyxiated babies.A basic training on newborn resuscitation, skills and proper newborn resuscitation immediately after birth, has proved to reduce mortality among babies born with birth asphyxia up to 40% [16, 26]. A recent study in six developing countries showed that training on essential newborn Care which includes training on basic resuscitation had no effect on early neonatal mortality. However, there was a significant reduction in the rate of stillbirths primarily fresh, most likely as an effect of resuscitation of babies who would have been misclassified as stillbirths before training [19]. On the other hand, there was no additional effect of training in the Neonatal Resuscitation Program once the Essential Newborn Care training was already in place [19].

In this study neonatal mortality was significantly higher among ventilated cases (80%) compared with non-ventilated ones. This is in agreement with a study by Magid et al. who reported that the mortality rate among ventilated patients was 87.5% [43]. Mechanical ventilation, while frequently life-saving is also associated with numerous iatrogenic complications and some of which are themselves life-threatening, such as ventilator-associated pneumonia of patients ventilated for longer than 48 hours,Tension pneumothorax, lung collapse, decreased cardiac output, hypotension and death [44].

CONCLUSION &RECOMMENDATION*:*

Neonatal mortality is quite common at our SCBU with a rate of (4.57%) and it is significantly associated with prematurity, respiratory distress, birth asphyxia, congenital malformations and use of mechanical ventilation. We strongly recommended to improve the quality & quantity of man power with continuous supervision, training and improve facilities e.g artificial ventilatory support, Surfactant administration for premature, strict hygiene and good Infection Control program inside the SCBU.

Strategies directed towards strengthening screening and identification of mothers at risk and early referral mechanisms for care and support is strongly needed. Care of premature babies should include thermal care, feeding and nutritional support, as well as prevention and treatment of infections. Decline in neonatal mortality might have been hampered by insufficient feedback mechanisms within the hospital. Therefore, all deaths occurring in the hospital whether maternal or newborn should be reviewed and discussed between obstetricians and pediatricians; the cause identified, preventive measures worked out, and feedback given to all the staff involved within the institution as well as surrounding health facilities through existing outreach programs. Regular review of neonatal deaths using simple classifications within a particular setting will help to understand the magnitude of the problem and review the strategies for better improvement. Reviews

should be directed towards identifying areas where screening, prevention and therapeutic interventions need to be strengthened. Further efforts should be done to develop registration systems in order to collect information that can be used to understand maternal and newborn health outcomes and serve as guidance for further preventive measures.

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