Risk factors and Outcome of Neonates on Ventilatory Support in Misurata Central Hospital

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Introduction:

Before the 1960s newborn infants with severe lung disease, usually due to respiratory distress syndrome (RDS), had a very high mortality rate(1).

Mechanical ventilation (MV) was introduced in the 1960s to correct hypoxaemia and respiratory acidosis in infants who were likely to die. MV is now standard treatment for infants with severe RDS but the degree to which this made a contribution to the outcome of such infants compared is uncertain. Mechanical ventilatory support is required by a large number of neonates in respiratory failure. However, its use in preterm infants is frequently associated with acute complications and long-term respiratory sequelae(1),(2).

Neonates with life-threatening conditions require the critical care services provided by modern neonatal intensive care units (NICU). Ventilatory support is essential for NICU care(3,4,5,6).

Neonatal mortality rate is defined as the number of deaths during the first 28 completed days of life per 1000 live births in a given year or a given period(7).

Problem Statement:

More than half of the approximately 7.5 million infant deaths in the world occur in the first four weeks after birth(8).

Ninety-eight percent of these neonatal deaths occur in developing regions, 28% in least developed countries(8).

Overall, there are 30 neonatal deaths per 1000 live births; 5 per 1000 in developed and 33 per 1000 in developing regions, and 42 per 1000 in least developed countries(8).

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This means that, in developing regions, the risk of death in the neonatal period is more than six times that of developed countries; in the least developed countries, it is more than eight times(8).

Main causes of Neonatal Mortality (9):

Causes among preterm neonates

1- severe immaturity

2- respiratory distress syndrome

3- intraventricular haemorrhge

4- congenital anomaly

5- infections

6- necrotizing enterocolitis

Causes among full-term neonates:

1- congenital anomaly

2- birth asphyxia

3- infections

4- meconium aspiration

5- persistent pulmonary hypertension

Preterm infants with respiratory distress syndrome present immediately or soon after birth with worsening respiratory distress. If untreated, infants may become fatigued, apnoeic, and hypoxic. They may progress to respiratory failure and will need assisted ventilation. Preterm infants with respiratory distress syndrome often require a period of assisted ventilator support. The aim of ventilation is to treat the hypoxaemia and hypercarbia associated with respiratory distress syndrome while minimising ventilator associated lung trauma and oxygen toxicity(11).

Not many studies are published about neonates on ventilator support, in this part of Libya.

The present research was carried out to study the risk factors and outcome of ventilator support among neonates admitted in Misurata central hospital

Objectives (Aims of study)

1. To study the risk factors for ventilator support among neonates admitted in neonatal ICU of misurata central hospital , to identify incidence and complication of those babies.

2. To study the outcome of ventilator support among these patients and this will reflect the level of care in our unit.

MATERIALS AND METHODS:

1. **Study design**: descriptive study based on hospital files.
2. **Study settings:** Neonatal ICU of misurata central hospital.
3. **Study period:** 1st July to 30th Nov 2008.
4. **Study population:** All 40 neonates who were admitted in neonatal ICU and were managed by ventilator support.
5. **Study variables:** Age of neonates at the time of admission, sex, gestational age at the time of birth, underlying medical conditions, birth weight, mode of delivery, duration of ventilator support and outcome were studied.
6. **Method of data collection:** Data were collected from hospital files by based on a prepared format.
7. **Analysis of data:** Data were tabulated by frequency distribution tables and analyzed using proportions and chi square tests

RESULTS

Age distribution of neonates at the time of admission

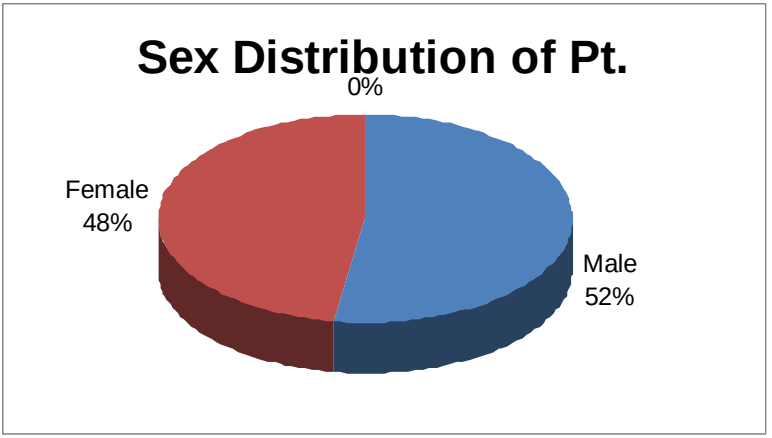
All the 40 neonates were admitted in neonatal ICU on the first day of their birth.

Sex distribution of neonates at the time of admission.

Table 1: Sex distribution of neonates

	No.	%
Male	21	52.5
Female	19	47.5
Total	40	100.0

Males were more affected than females.

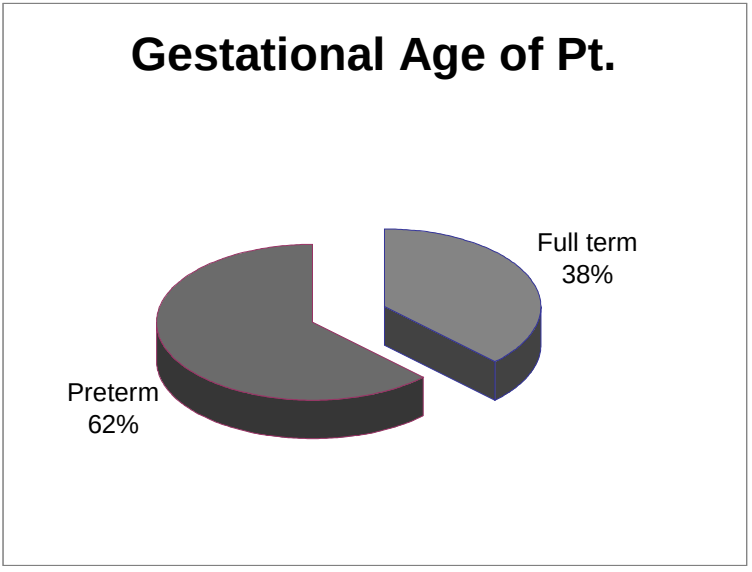


Distribution of patients based on gestational age at birth.

Table 2 : Distribution of Patients based on gestational age at birth

Gestational Age at Birth	No.	%
Full Term	15	37.5
Preterm	25	62.5
Total	40	100

62.5% of neonates in the present study are born preterm.



Distribution of neonates based on underlying medical condition.

Table 3: Distribution of neonate based on underlying medical condition

Underlying Medical Conditions	No	%
RDS	20	48.7%
N.sepsis	13	31.7%
CHD	5	12.19%
Neonatal seizure	6	14.6%
Asphyxia	6	14.6%
IDM	3	7.3%
Meconium aspiration	3	7.3%
Others	5	

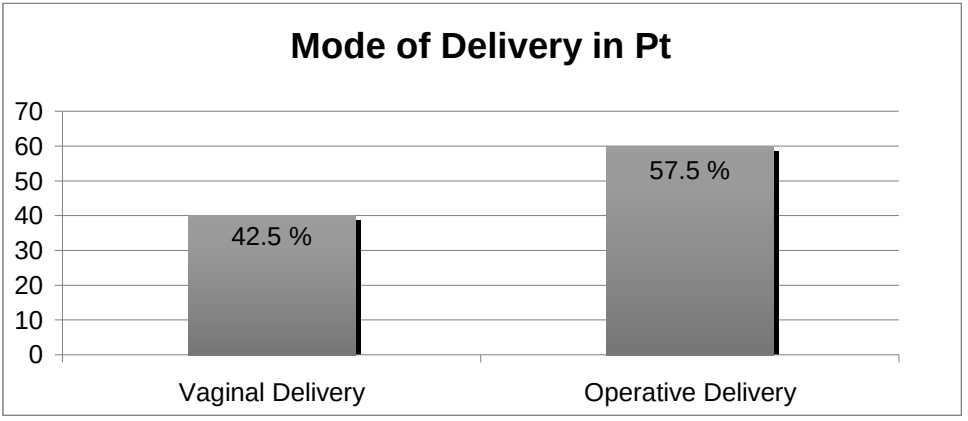
Main underlying medical causes for ventilator support were RDS (48.7%) and neonatal sepsis (31.7%).

Distribution of neonates based on mode of delivery.

Table 4: Distribution of neonates based on mode of delivery

Mode of Delivery	No.	%
FTNVD	17	42.5 %
Operative delivery	23	57.5 %
Total	40	100 %

57.5 % of neonates were delivered as a result of caesarian section.



Distribution of neonates based on birth weight.

Table 5: Distribution of neonates based on birth weight

Birth weight	No.	%
< 1.5 kg	7	17.5
1.5 - 2.49 kg	13	32.0
2.5 - 3.49 kg	16	40
> 3.5	4	10.0
Total	40	100.0

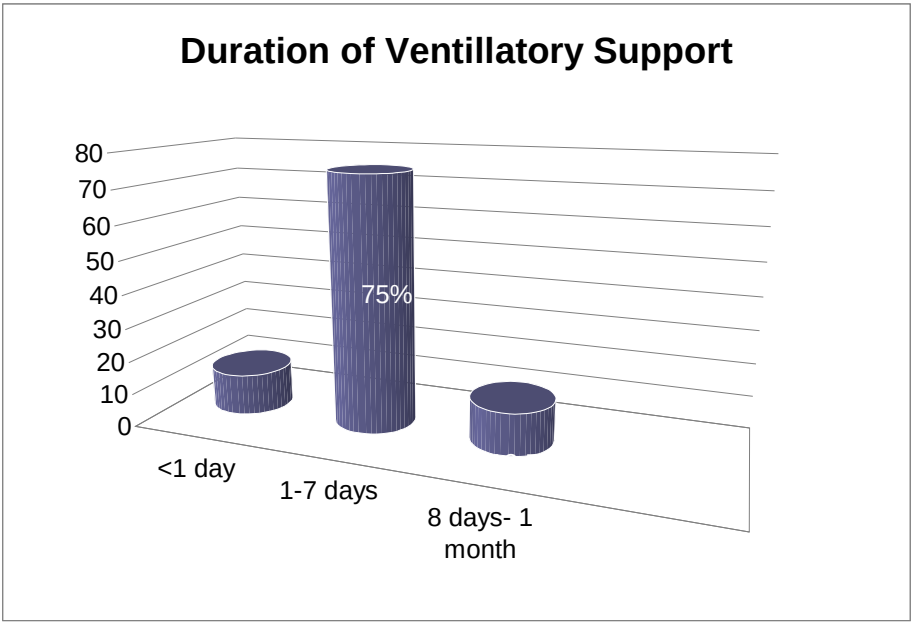
47.5% of cases were having low birth weight (< 2.5 kg).

Distribution of neonates based on duration of ventilator support.

Table 6: Distribution of neonates based on duration of ventilator support

Duration of Ventilator Support	No.	%
< 1 day	5	12.5
1-7 days	30	75.0
8 days – 1 month	5	12.5
Total	40	100.0

Majority of the neonates (87.5%) were given ventilator support for a period of less than 7 days.

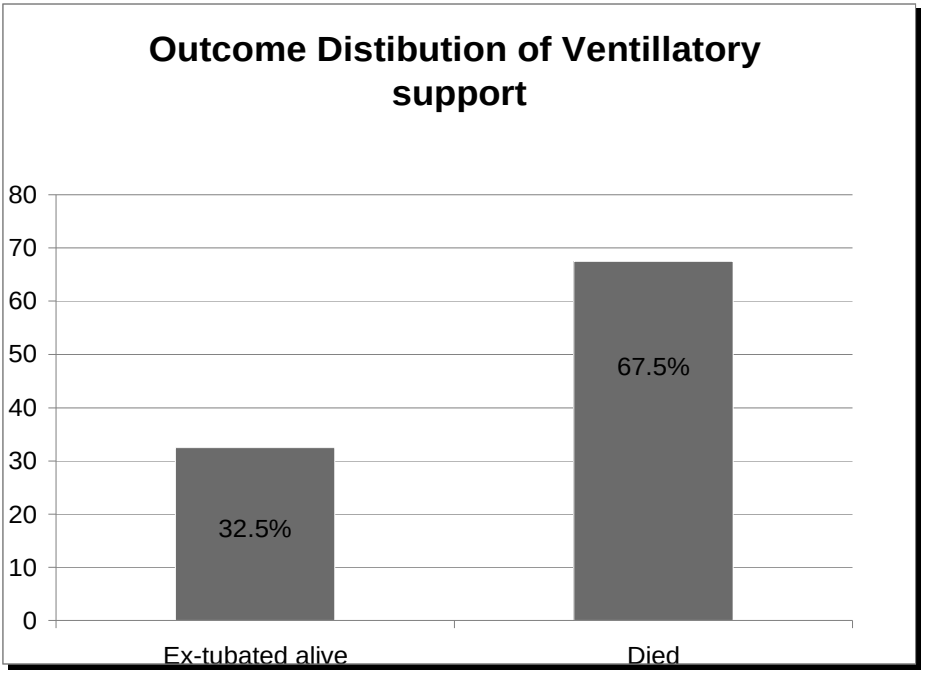


Distribution of neonates based on outcome of ventilator support.

Table 7: Distribution of neonates based on outcome of ventilator support

Outcome	No.	%
Extubated Alive	13	32.5
Died	27	67.5
Total	40	100.0

67.5% of neonates in the present study died.



Birth weight of neonates and outcome of ventilator support.

Table 8: Birth weight of neonates and outcome of ventilator support

Birth weight	Outcome of ventilator support		Total
	Ex- tubated Alive	Died	
< 1.5 kg	1	6	7
1.5 - 2.49 kg	4	9	13
2.5 - 3.49 kg	5	11	16
> 3.5	3	1	4
Total	13	27	40

Mode of delivery of neonates and outcome of ventilator support.

Table 9: Mode of delivery of neonate and outcome of ventilatory support

Mode of Delivery	Outcome of ventilator support		Total
	Ex-tubated alive	Died	
Vaginal Delivery	5	11	16
Operative Delivery	8	16	24
Total	13	27	40

Result:

Total number of delivery in Misurata central hospital in given period were 3616, total number of admission in same period were 1013, number of patients kept in ventilator were 40 patients (most of them were preterm 27 patients (68.2%) and 13 patients were full term.

Duration of mechanical ventilator were 23 patients < 1day duration (56%), 12 patients were from 2 – 7 days (29%) and 6 patients from 7 to one month (14.6%).

In regard to relation between mechanical ventilator and birth weight of babies:

7 (17%) were < 1.5 kg , 13 (34%) were 1.5 – 2.4 kg, 16 (39%) were 2.5-3.4 kg and 4 (9.7%) were > 3.5kg.

The commonest risk factor for mechanical ventilator were RDS in 20 patients (48.7%), then sepsis 13 (31.7%), CHD and congenital anomalies.

Out come of babies kept on ventilator were 13 (32.5%) discharge and were 27 (67.5%) expired.

Most of patients less then 1.5 kg were expired.

Discussion:

In the present study all neonates were admitted on the first day of their birth, in the neonatal ICU for ventilator support.

Mechanical Ventilation in neonates is needed for the following condition: Apnea, hyaline membrane disease, pneumonia, congestive heart failure, meconium aspiration and persistent pulmonary hypertention (12).

In studies done in various parts of the world, Neonates with life-threatening conditions require the critical care services provided by modern neonatal intensive care units (NICU). Ventilator support is an essential component of NICU care (3,4,5,6).

In the present study males were affected more than females.

In a study done by Jenny Fraser et al, Male sex was found to be a risk factor for respiratory distress syndrome (13) and in another study done by Bryan H et al, male and female neonates were equally at risk for respiratory distress syndrome and for ventilator support (14).

In the present study most of neonates were born preterm.

A large proportion of premature infants presents with acute respiratory failure after birth and require mechanical ventilator support (15).

In a study done by Cunha GS et al, one of the most important risk factor for broncho pulmonary dysplasia was prematurity (16).

According to Atasay B et al, the risk of needing ventilator support according to antenatal risk factors is described for preterm neonates. Gestational age and absence of labour were found to be the major determinants of risk (17).

In the present study, 75% of neonates were given ventilator support for a period of 1 week.

Duration of ventilation varies with the nature of disease. A significant improvement is associated with the patient's ability to take over > 60 to 70 % of the work of breathing (18).

Hyaline membrane disease needs 3 days to 1 week of ventilator support, for improvement. ARDS needs an average, 10 days to 3 weeks and pneumonia requires an average, 5 to 7 days (18).

In the present study 48.7% of neonates were given ventilator support for RDS and 31.7% of neonates were given ventilator support for neonatal sepsis.

RDS occurs primarily in premature infants and the risk of developing RDS increases with caesarean section and birth asphyxia (19).

Sepsis is an inflammatory response to an infectious process which may result from maternal genital tract infection, frequent intra amniotic infections, immune dysfunction or frequent venous access and endotracheal intubation (20).

According to the study by Korhonen P et al respiratory distress syndrome, small birth weight and intrauterine growth retardation were the more important risk factors of BPD among premature infant (21).

In a study done by Fanaroff AA et al, late onset septicemia is common in very low birth weight infants, and the rate is inversely proportional to gestational age and birth weight. Septicemia is more common in males (22).

In the present study main indications for ventilator support were sepsis (31.7%) , RDS(48.7%) , asphyxia (14,6%).

In a study done by Krishnan et al, among 68 neonates who were managed with ventilator support, main indications for ventilation were infections (30.9%), hyaline membrane disease (23.5%), problems related to asphyxia (16.2%), apnea of prematurity (14.7%) (23).

In the present study, the most of neonates were delivered by caesarean section.and this because caesarean delivery more risky than vaginal delivery.

According to Jenny Fraser et al, delivery by Caesarean section is an important risk factor for respiratory distress syndrome among neonates (13).

Complication of caesarean section are transient tachypnea, hyaline membrane disease, hypoxic ischemic encephalopathy, complications of anaesthesia and analgesia (24).

In the present study, 47.5% of cases were having low birth weight. And out com correlate with birth weight out of 7 <1.5 kg babies only one baby alive but in babies 1.5 –2.49 kg 4 babies out of 9 babies.

LBW is caused by preterm birth, IUGR, or both and is a major cause for neonatal mortality (25).

According to a study by Holmsgaard KW the main risk factors present at birth for adverse outcome among neonates admitted in neonatal ICU for ventilator support, were low birth weight and male sex (26).

total out com were 13 babies alive (32.5) and 27 (67.5) expired. and this result still not good in comparison with good center in world

one study in same department two years back which shows only 3% of babies were alive after ventilater care. but this year study shows 32% of babies were alive .and this ten times improvement in the result explained by:

opening new department which more wide than the previous one and this lead to decrease in nosocomial infection.

using surfactant in 8 babies with RDS.

And 6 babies of them were alive.

Conclusions and recommendations:

Out come of baby expose to mechanical ventilator depend on weight of baby, gestational age, primary diagnosis, and use of surfactant in preterm babies.

The majority of babies kept in mechanical ventilator are secondary to preterm baby, birth asphyxia, anomalies and sepsis which usually increased in presence of maternal risk factors, so improving maternal care will decrease need for mechanical ventilator also reducing number of preterm delivery and preventing and improve recognition and management of birth asphyxia, sepsis and other risk factor will improve the out come.

Also presence of qualified doctors and nurses, clean delivery room, clean wide with many room, full facilities neonatal unit (including instrument, antibiotic, surfactant,…) will sure improve the out come of mechanical ventilator.

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