

## Morbidity and Mortality among Premature New-borns Admitted in the Nursery Unit of Al-Kuwait University Hospital in Sanaa-Yemen

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### Abstract

**Introduction:** The incidence of preterm births is increasing worldwide, and Asia and Africa are the major contributors to the global preterm burden. Preterm babies have increased the risk of morbidity and mortality which is inversely related to both gestational age and birth weight. Objectives: To determine the common morbidities and mortalities of premature new-borns admitted to the nursery unit at Al-Kuwait hospital, Sana'a.

**Materials and Methods:** This is a retrospective descriptive study of Morbidities and mortalities of premature new-borns admitted to Al-Kuwait hospital Sana'a, Yemen from January 2014 to December 2015.

**Results:** Preterm babies contribute 35.3 % of the total admissions. Among the 244 preterm babies admitted, 74 (30.3%) babies were admitted due to low birth weight only, 57 (23.4) babies were IUGR, 59(24.2%) babies were admitted with respiratory problems and only 23 (9.4%) babies were admitted with infection Among the preterm babies admitted, (62.7%) were improved and discharged, (29.5%) were dead, (6.9%) were lift against medical advice (LAMA) and only (0.9%) babies were referred to another hospital. Out of 72 preterm babies who died, 44 babies were delivered low birth weight contributing 65.2% of the total preterm babies' death and the second cause of death was a respiratory problem with 14 that contributing 19.4 % of the total preterm babies' death, but only 5 preterm babies dead from an infection that contributing 6.9 % of the total preterm babies' death.

**Conclusions:** Preterm babies contribute a significant percentage of the total new-born admissions in the nursery unit at Al-Kuwait hospital, Sana'a. Without improving the preterm care reduction of neonatal mortality rate and thereby IMR will be a dream unaccomplished.

**Keywords:** Preterm, Mortality, Morbidity, Admission

### 1. Introduction

Live born infants delivered before 37 completed weeks (fewer than 259 days) from the 1st day of the last menstrual period are termed premature by the World Health Organization (WHO) [1]. The neonatal period is a highly vulnerable time for infants as they are completing many of the physiologic adjustments required for extra uterine existence. Preterm birth occurs for a variety of rea-

sons. Most preterm births happen spontaneously, but some are due to early induction of labour or caesarean birth, whether for medical or non-medical reasons.

Recent global estimates suggest that more than 1 in 10 or an estimated 15 million babies born in 2010 were preterm, of which more than 1 million died as a result of preterm birth and related com-

lications [2]. Preterm birth is common in high-risk pregnancies. Common causes of preterm birth include multiple pregnancies, infections, and chronic conditions such as diabetes and high blood pressure; however, often no cause is identified. There could also be a genetic influence. A better understanding of the causes and mechanisms will advance the development of solutions to prevent preterm birth [1].

### 1.1. Factors Related to Premature Birth And Low Birth Weight

It is difficult to separate completely the factors associated with prematurity from those associated with IUGR. A strong positive correlation exists between both preterm birth and IUGR. The etiology of preterm birth is multifactorial and involves a complex interaction between fetal, placental, uterine, and maternal factors. Premature birth of infants whose LBW is appropriate for their preterm gestational age is associated with medical conditions characterized by an inability of the uterus to retain the fetus, interference with the course of the pregnancy, premature rupture of the amniotic membranes or premature separation of the placenta, multifetal gestation, or an undetermined stimulus to effective uterine contractions before term. Overt or asymptomatic bacterial infection of the amniotic fluid and membranes (chorioamnionitis) may initiate preterm labor. Bacterial products may stimulate the production of local inflammatory mediators (interleukin-6, prostaglandins), which may induce premature uterine contractions or a local inflammatory response with focal amniotic membrane rupture. Appropriate antibiotic therapy reduces the risk of fetal infection and may prolong gestation. Most preterm births are “spontaneous” without an identifiable cause; genetic predisposition may increase the risk of prematurity. In one study, 6 genes were associated with prematurity [1].

### 1.2. Morbidities in Premature and Low Birth Weight Infants

Immaturity increases the severity but reduces the distinctiveness of the clinical manifestations of most neonatal diseases. Immature organ function, complications of therapy, and the specific disorders that caused the premature onset of labor to contribute to the neonatal morbidity and mortality associated with premature, LBW infants. Among VLBW infants, morbidity is inversely related to birth weight. Respiratory distress syndrome is noted in approximately 80% of infants weighing 501-750 g; in 65% of those weighing 751- 1,000 g; in 45% of those weighing 1,001-1,250 g; and in 25% of those weighing 1,251-1,500 g.

Severe intraventricular haemorrhage (IVH) is noted in approximately 25% of infants weighing 501-750 g; in 12% of those weighing 751-1,000 g; in 8% of those weighing 1,001,250 g; and in 3% of those weighing 1,251-1,500 g. Overall, the risk of late sepsis (24%), bronchopulmonary dysplasia (23%), severe IVH (11%), necrotizing enterocolitis (7%), and prolonged hospitalization (45-125 days) is high in VLBW infants. Problems associated with IUGR LBW infants are noted. Added problems are often superimposed on those noted if an infant with IUGR is also premature. Poor postnatal growth is an important problem for both preterm

and IUGR infants [1]. Over the past 2 decades, the LBW rate has increased primarily because of an increased number of preterm births registered as live births. Women whose first births are delivered before term are at increased risk for recurrent preterm delivery. The incidence of preterm births in the United States continues to rise and is partly a result of multiple gestation pregnancies and increased reporting as live births of the most immature babies. Although neonatal mortality rates (NMRs) have fallen globally between 1990 and 2009, the absolute numbers and rates of preterm birth have increased during this period [3,4]. More than 1 million infants die every year because they are born preterm, according to the report. Those who survive have an increased risk of morbidities such as cerebral palsy, blindness, and hearing loss.

In fact, the global concern about the burden of preterm birth has resulted in November 7th being earmarked as World Prematurity Day [5]. Increasing preterm birth could significantly militate against the achievement of Millennium Development Goal 4.5. Perhaps, in response to this threat, a goal to reduce preterm-specific mortality by 50% by 2025 has been set in the WHO’s “born too soon” report [6]. The high neonatal morbidity and mortality rates attest to the fragility of life during this period; of all deaths occurring in the first year of life in the United States, two-thirds are in the neonatal period. The annual rate of deaths during the first year is unequalled by the rate in any other period of life until the 7th decade.

More than 5% of deaths in children <5 years of age occur within the 1st month of life, with about half of the deaths attributable to prematurity. Approximately 8% of live-born neonates in the United States weigh <2,500 g; the rate for blacks is almost twice that for whites. Infants born weighing 1,501-2,500 g have a big chance of survival, but those weighing still less have significantly higher mortality. Intensive care has extended the period during which a VLBW infant is at increased risk of dying of complications of prematurity, such as bronchopulmonary dysplasia, necrotizing enterocolitis, and nosocomial infection.

The lower the birthweight, the higher the neonatal mortality; for any given birthweight, the shorter the gestational duration, the higher the neonatal mortality. The highest risk of neonatal and infant mortality occurs in infants who weigh <1,000 g at birth and whose gestation was <28 week [1]. In the United States, approximately 50% of all infant deaths occur in infants born after less than 27 weeks of gestation or infants weighing less than 1,000 g. The post-discharge mortality rate of LBW infants is higher than that of term infants during the first two years of life.

In addition, premature infants have an increased incidence of failure to thrive, sudden infant death syndrome, child abuse, and inadequate maternal-infant bonding. The biologic risk associated with poor cardiorespiratory regulation as a result of immaturity or complications of the underlying perinatal disease and the social risk associated with poverty also contributes to the high mortality

and morbidity of these infants. Congenital anomalies are present in approximately 3-7% of LBW infants. Premature birth in itself may adversely affect later development. The greater the immaturity and the lower the birth weight, the greater the likelihood of intellectual and neurologic deficit; as many as 50% of 500-750 g infants have a significant neurodevelopmental impairment (mental retardation, cerebral palsy, blindness, deafness). Small head circumference at birth may be related to a poor neurobehavioral prognosis.

Approximately one-third of preterm survivors suffer from severe long-term neurological disabilities such as cerebral palsy or mental retardation. Our research discusses the morbidities and the mortality of preterm new-borns admitted at a nursery in Al-Kuwait hospital, Sana'a which contains 10 incubators with acceptable health services and presence of some sides of defects such as no availability of mechanical ventilators and some drugs as a surfactant and there is limited surgical intervention. There are many studies about causes of admission of neonates, which low birth weight accounts of majority cause of admission followed by neonatal infections and the major cause of mortality among admission at nursery is prematurity followed by birth asphyxia then infection [6-9]. Improved care of preterm babies has resulted in reduced mortality in developed countries. This is not so in developing countries where the management of preterm birth babies is fraught with difficulties arising from scarcity of resources typified by poorly-equipped specialized new-born care units.

Consequently, the burden of the complications and mortality from preterm births remains a significant potential challenge to new-born health in resource-poor settings. The objective to study morbidities and outcomes of premature new-borns admitted in the nursery unit at Al-Kuwait hospital, Sana'a

## 2. Methods and Materials

### 2.1. Study Design

This is a retrospective descriptive study of Morbidities and Outcome of premature new-borns admitted in Al-Kuwait hospital Sana'a, Yemen.

### 2.2. Place of Study

The study was carried out at a neonatal unit in University Al-Kuwait university hospital, Sana'a, Yemen. It has 3 warmers, 10 incubators, no ventilators, and 8 infusion pumps. It is manned by 2 Paediatrician's, 6 Junior Residents, and 12 Staff Nurses.

### 2.3. Duration of Study

2 years period (From 1st January 2014 to 31st December 2015).

### 2.4. Sampling Method

All premature neonates were admitted to the Neonatal Unit of University Al-Kuwait hospital by using the nominal registers and

medical files of all preterm admissions in the nursery.

### 2.5. Inclusion Criteria

Premature new-borns (<37 weeks gestational age) with available data admitted in the Neonatal Unit.

### 2.6. Exclusion Criteria

Unavailable information files. Full-term new-borns (after 37 completed weeks gestational age).

### 2.7. Variables

The dependent variables of the study are morbidities and Outcomes of premature new-born admitted in the nursery of Al-Kuwait hospital, Sana'a.

### 2.8. Cause of Admission and Morbidity (Diagnosis)

#### 2.8.1. Outcome Variables

(Left Against Medical Advice) Cured, Referred, Dead, LAMA. Other independent variables of the study are the age of premature new-born in days, Sex of premature new-borns, body weight (kg) of premature new-borns (The birth weights were taken as the first recorded weight at birth for the inborn or the weight on admission for those born outside the hospital and presented within the first 24 hrs of life). Delivery mode NVD (normal vaginal delivery), Assisted vaginal delivery LSCS (lower segment caesarean section, duration of stay (days).

### 2.9. Variables Definitions

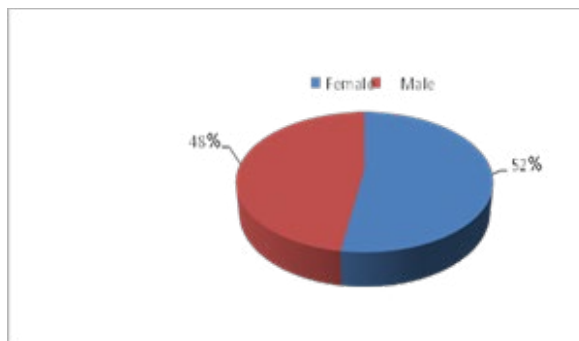
- **New-Born:** Any baby less than 28 days of age.
- **Premature:** Baby born with a gestational age of less than 37 completed weeks. (The gestational ages at birth were calculated using the mother's last menstrual period or early pregnancy ultrasound scan or modified Ballard scoring.
- **Full-Term:** Baby born with gestational age more than 37 completed weeks and less than 42 weeks.
- **Study Instrument/ Equipment:** Data collected from medical reports and patients files in neonatal unit by the variable forms and tables.

### 2.10. Data Analysis

The collected data and the results of this study were statistically analysed for tests of significance by using SPSS program version 20 and presented by the Excel program.

## 3. Results

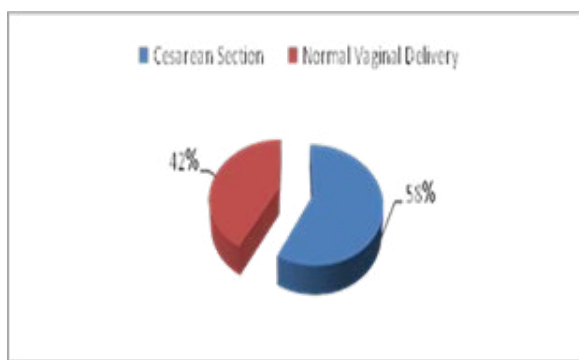
During the study period from January 2014 to December 2015, a total of 244 preterm babies were admitted to the neonatal unit at Al-Kuwait hospital. Out of 244 preterm babies that admitted in the neonatal unit, 128 babies were males' babies and the remaining 116 babies were females (Figure 1).



**Figure 1:** Distribution of Premature Admission According to Sex

Out of 692 babies (total admissions in 2014 and 2015), 244 babies were preterm babies contributing 35.3 % of the total admissions. Out of 109 babies (total preterm babies' admissions in 2015), 46 babies were delivered by Normal Vaginal Delivery contributing

42.2% of the total preterm babies' admissions in 2015 and the remaining 63 babies were delivered by Caesarean Section contributing 57.8% of the total preterm babies' admissions in 2015 (Figure 2).



**Figure 2:** Distribution of Premature Admission According to a Mode of Delivery

Out of 226 babies (preterm babies' admissions that taken their body weight), 42 (18.6%) babies were their body weight ranging from >2500 gm to 4000 gm, 140 (61.9%) babies were their body weight ranging from >1500 gm to 2500 gm, 32 (14.1 %) babies

were their body weight ranging from >1000 gm to 1500 gm and 12 (5.3 %) babies were their body weight less than 1000 gram (Table 1).

Body weight (gm)	Total	Percentage %
>2500 – 4000	42	18.6
>1500 – 2500	140	61.9
>1000 – 1500	32	14.1
< 1000	12	5.3
Total	226	100

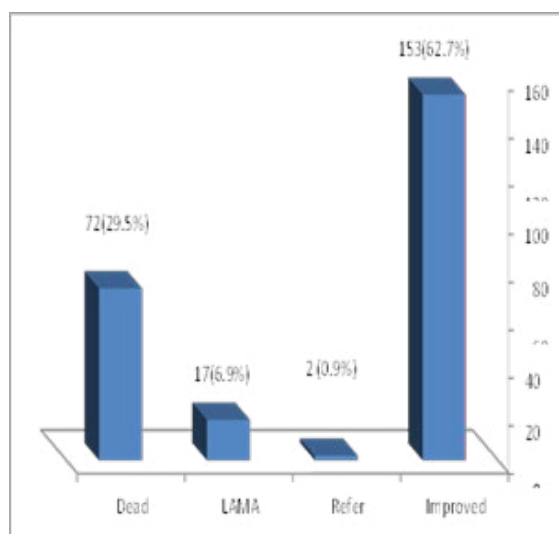
**Table 1:** Distribution of Premature Admission According to their Body Weight

Among the 244 preterm babies admitted, 74 (30.3%) babies were admitted due to low birth weight only, 57 (23.4) babies were IUGR, 59 (24.2%) babies were admitted with respiratory problems and only 23 (9.4%) babies were admitted with infection (Table 2).

Morbidities	Total	Percentage
LBW	74	30.3
IUGR	57	23.4
Respiratory	59	24.2
Infection	23	9.4
Mother problems	12	4.9
Endocrine	7	2.7
Precious baby	5	2.0
CNS	4	1.6
Congenital anomalies	2	0.8
Birth Trauma	1	0.4
Others	0	
Total	244	100

**Table 2: Morbidities in Admitted Preterm Babies**

Among the 244 preterm babies admitted, 153 (62.7%) babies were improved and discharged, 72 (29.5%) babies were dead, 17 (6.9%) babies were lifted against medical advice (LAMA) and only 2 (0.9%) babies were referred to other hospitals (Figure 3).



**Figure 3: Outcome of Preterm Admissions**

Out of 72 preterm babies who died, 44 babies were delivered low birth weight contributing 65.2% of the total preterm babies' death (about a third of them diagnosed as IUGR) and the second cause of death was respiratory problems with 14 that contributing 19.4 % of the total preterm babies' death, but only 5 preterm babies dead from an infection that contributing 6.9 % of the total preterm babies' death (Table 3).

Cause of death	Total	Percentage %
Infection	5	6.9
Respiratory	14	19.4
LBW	32*	65.3
IUGR	15	20.8
CNS (Birth asphyxia)	2	2.8
Rh -ve Mother	2	2.8
PET Mother	1	1.4
Congenital anomalies	1	1.4
Total No. of Death	72	100
* including IUGR		

**Table 3: Causes of Death in Preterm Babies**

### 3.1. Relation of Death in Preterm Babies to their Body Weight

Among the 42 preterm babies admitted with their body weight between (> 2500 gm to 4000 gm), only 6 (14.3 %) babies were dead while in 140 preterm babies admitted with their birth weight between (> 1500 gm to 2500 gm), 25 (17.9 %) babies were dead also out of 32 babies have admitted with their body weight between (>

1000 gm to 1500 gm), 29 (90.6%) babies were dead but all (12) babies were admitted with their bodyweight less than 1000 gm were dead (Table 4). More than half of all deaths (57%) in pre-mature babies in this hospital occurred among the VLBW babies (<1,500 gm).

Body weight	<1000	>1000- 1500	>1500- 2500	>2500- 4000	Total
Total Death	12	29	25	6	72
Total Cases	12	32	140	42	244
Percentage death to their body weight group	100%	90.6 %	17.9 %	14.3 %	29.5 %

**Table 4: Percentage of Death in Preterm Babies to their Body Weight**

The highest percentage of preterm admissions was noted during June and lowest during December (Table 5).

Month	Total No. of preterm admissions	Percentage of preterm admissions
January	21	42.9
February	16	28.6
March	17	27.4
April	15	27.8
May	20	37.0
June	25	49.0
July	24	46.6
August	19	30.6
September	21	32.8
October	22	35.5
November	29	42.6
December	15	23.1
Total	244	100%

**Table 5: Total and Month-Wise Preterm Admissions in Neonatal Unit 2014-2015**

#### 4. Discussion

The preterm admission rate in the neonatal unit at Al-Kuwait hospital, Sana'a in 2014 & 2015 is 35.3 %. A previous Indian study from Assam published before 17 years in the year 1998 had estimated a preterm admissions rate of 21.2% [10]. A South African study, which was published in the year 1999, reported a much higher rate of 54% as a preterm admission rate. [11]. The estimated prevalence of preterm admissions in a tertiary health center in South Nigeria is 24% [12]. In this study conducted by Kunle-Olowu et al., out of the 634 babies admitted to the Special Care Baby Unit during the study period of 3 years from January 2010 to October 2012, 152 (24%) were preterm [12]. The unit has 6 cots and 3 incubators and is manned by two Paediatrician's, Residents, and Nursing staff with an average ratio of one nurse to 6 patients.

Ugochukwu et al. from a special care baby unit of Nnewi reported a preterm admission rate of 18% over a total period of 29 months from May 1998 to October 2000 [13]. This unit consists of three wards designated for inborn babies, out born babies, and isolation. There are 17 cots, 1 infant warmer, 5 incubators, 2 oxygen cylinders, 5 phototherapy units, 1 apnea monitor, and 4 resuscitation kits. Our study has reported a lower caseload but higher preterm admission rate than the Rural Medical College Hospital study in India [14]. Our study has reported approximately. The same caseload but higher preterm admission rate than the tertiary health center in South Nigeria that conducted by Kunle-Olowu et al and the special care baby unit of Nnewi that conducted by Ugochukwu et al (Table 6).

Parameters	Our study	KunleOlowu <i>et al.</i>	Ugochukwu <i>et al</i>	Kuppusam y, <i>et al.</i>
Study period	2 years	3 years	29 months	12 months
Total admissions	692	634	699	2375
Total preterm admissions	244	152	133	735
Percentage of preterm admissions	35.3	24	19	30.95

**Table 6: Comparison of Our Study with Other Three Studies from Tertiary Care Centers**

In our study was the highest percentage of preterm admissions was noted during June and lowest during December while in the Rural Medical College Hospital study in India [14]. The highest percentage of preterm admissions was noted during January and lowest during June [14]. Low birth weight and IUGR were the commonest morbidities in preterm babies, these findings are similar to other studies [14]. Prematurity and low birth weight continue to be the major public health problems observed in our setting as is the case in many other developing countries [15]. Prematurity and its sequelae are the main cause for neonatal deaths (29.5% of all admitted premature babies and 10.4% of all admission) in Al-Kuwait Hospital but this is much less than in South Africa (51%) [16]. Almost more than half of all deaths in premature babies this hospital occurred among the VLBW babies (<1,500 gm). These findings are similar to other studies in Africa and low resource countries. [11,17]. A study from India reported that the perinatal mortality rate was 79.0 per 1,000. The highest perinatal death rates were for preterm and low birth weight babies, South Africa (51%) [16,18]. Almost more than half of all deaths in premature babies this hospital occurred among the VLBW babies (<1,500 gm). These findings are similar to other studies in Africa and low resource countries [11,17]. A study from India reported that the perinatal mortality rate was 79.0 per 1,000. The highest perinatal death rates were for preterm and low birth weight babies [18].

#### 5. Conclusions

Preterm babies contribute a significant percentage of the total new-born admissions in a neonatal unit of Al-Kuwait University hospital. Low birth weight, respiratory problems, and IUGR were the commonest morbidities in preterm babies in a neonatal unit of

Al-Kuwait University hospital. More than half of all deaths in premature babies occurred among the very low birth weight neonates (VLBW) babies. Without improving the preterm care reduction of neonatal mortality rate (NMR) and thereby infant mortality rate will be a dream unaccomplished. Augmentation of the existing infrastructure, therapeutic facilities, manpower and periodic training and review of the staff nurses is the need of the hour. Improving the survival of low birth weight neonates is a particular challenge for us in Yemen, and in other resource-poor countries. Even in developed countries, efforts to lower the rate of preterm labor and delivery have not been very successful.

#### Recommendations

Improvement in antenatal and neonatal services is being helpful in the reduction of neonatal mortality among premature admission. Health education about antenatal care and neonatal care is important in the prevention of neonatal admission and then decreases premature mortality. From time to time almost every site in Yemen conducting deliveries will be faced with some pregnant women in advanced preterm labor. Therefore, emphasis must be placed on the best possible basic care of these small infants. However, the majority of these sites are often operating in a climate of inadequate provision of equipment and well-trained health care workers. Kangaroo mother care (KMC) provides a cheap and effective answer to many of the problems posed by low birth weight infants.

#### Acknowledgment

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## Dedication

To my daughters (Sala, Sama, Alaa, and Lama) and all my family, and to all the children in my country.

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