

Perinatal Mortality Amongst North Jordanian – Preterm Singleton Births (1996–1998)

Saed M. Ziadeh

ABSTRACT

Objective: The purpose of this study was to review the preterm singleton neonatal mortality based on birthweight and gestational age at delivery.

Design: Retrospective review of hospital case notes of maternity data and neonatal mortality data.

Population: All singleton preterm deliveries from 28 to <37 completed weeks between 1996–1998.

Main outcome Measure: Neonatal death

Results: There were 27,758 live-born singleton deliveries over the study period, of which 319 were preterm (1.15%). The overall neonatal mortality in the preterm group was 42/1000.

The neonatal mortality rate fell with advancing gestational age from 174/1000 live births at 28 weeks to 37/1000 live births at <37 completed weeks of gestation.

The neonatal mortality rate also fell with increasing birth-weight from 285/1000 live births of 1000g to 14/1000 live births at 2500g. There was a significant increase in the proportion of babies delivered spontaneously.

Conclusion: This study has demonstrated neonatal mortality using gestational age and birth weight. The results will be of use in management when elective preterm delivery is needed.

Key words: Neonatal mortality, birth weight, gestational age.

INTRODUCTION

Preterm birth is a leading cause of neonatal mortality in many countries (second only to birth defects), and preterm labor is the cause of most preterm births¹. Neonatal intensive care has improved the survival rate for babies at the cusp of viability, but it also has increased the proportion of survivors with disabilities². The incidence of multiple births also has increased along with the associated risk of preterm delivery³. Interventions to delay preterm delivery in these settings have not shown conclusive effectiveness. Because

the morbidity of babies born after 34–35 weeks of gestation has diminished, most efforts to identify preterm deliveries have focused on deliveries before this age.

Preterm labor is defined as regular contractions associated with cervical change before the completion of 37 weeks of gestation. Spontaneous preterm birth includes preterm labor, preterm spontaneous rupture of membranes, and cervical incompetence; it does not include indicated preterm delivery for maternal or fetal conditions⁴. Preterm delivery accounted for 11.8% of births in the United States in 1999; this figure has increased steadily from 9.4% in 1981⁵.

The pathophysiologic events that trigger preterm parturition are largely unknown but may include decidual hemorrhage (abruption), mechanical factors (uterine overdistention or cervical incompetence), and hormonal changes (perhaps mediated by fetal or maternal stress)^{6–8}. In addition, several bacterial infections have been associated with preterm labor. Commonly identified organisms are *Ureaplasma urealyticum*, *Mycoplasma hominis*, *Gardnerella*.

Department of Obstetrics and Gynaecology,
Jordan University of Science and Technology,
Amman,
Jordan.

Correspondance :
Dr. Saed M. Zaideh,
Jabal El-Hussein,
P.O. Box 922666,
Amman,
Jordan

Vaginalis, *Peptostreptococcus* and *Bacteroides species*⁹. Because these bacteria usually are of low virulence, it is unclear whether they are truly etiologic or are associated with an acute inflammatory response of another aetiology.

The reported incidence worldwide of preterm delivery varies between 4% and 11%, mostly reflecting differences in the populations examined and national differences in the definition of stillbirths and neonatal mortality¹⁰. During the past two decades, the incidence of preterm delivery has remained unchanged; however the survival of very preterm infants has improved dramatically owing to advances in fetal and neonatal care as well as in the antenatal care and the timing of obstetric interventions.

Extremely low birth weight infants, weighing <1,000g require very special care to survive and are at increased risk of being disabled and mentally retarded¹¹. Furthermore, the survival of the preterm infant seems to depend on active perinatal management and on a positive attitude towards Caesarean delivery for these low birth weight fetuses. Many risk factors are known for preterm births including the mother's socio-economic status and other maternal factors such as low weight increase, a deficient cervix, uterine malformation preterm rupture of membranes, increased muscle activity in the uterus, genital infections as mentioned above, as well as multiple births¹²⁻¹⁴. Social factors, maternal age and adverse previous pregnancy outcome are suggested to be more strongly associated with preterm deliveries¹⁵.

However, in many cases the causes of preterm births are not well defined. So far, few studies have assessed the epidemiology of preterm births, hence the demand for a population based analysis of these cases. It is considered that such early deliveries are the major cause of neonatal mortality and long term disability¹⁶⁻¹⁸.

There are several studies showing the variation in neonatal mortality with either birth rate or gestational age at delivery¹⁸⁻²⁰. A more useful assessment can be obtained by using gestational age together with birth weight and a large number of deliveries is required to estimate the neonatal mortality for fetal weight and gestational age group.

MATERIALS AND METHODS

Between 1st January 1996 and 30th December 1998, 319 women with preterm labor were identified and treated at the Princess Badee'a Teaching Hospital, Jordan. All singleton preterm (28 < 37 weeks gestation) deliveries in North Jordan resulting in livebirths over

this 3-year period were examined. Infants with congenital abnormalities known before delivery were excluded from this study.

The period of gestation was taken from the hospital's Register of Births which is calculated from the first day of the last menstrual period and usually confirmed by second trimester ultrasound. A livebirth was defined as one who breathed or showed any evidence of life such as beating of the heart or definite movement of voluntary muscles. The birth weight of the infants were measured on the day of delivery and divided into 250g strata for analysis.

The neonatal mortality rate was estimated for birth weight and gestational age groups. Any lethal abnormality was also excluded from the neonatal database. Tocolytic agents were not used because all of our patients were admitted to the hospital with cervical dilatation more than 5cm.

Clinical data were recorded on the newborn babies which included gestational age at delivery, birth weight, Apgar score, mode of delivery and neonatal outcome. Maternal characteristics and pregnancy complications and known cause of neonatal death were also included for analysis. Results from these collected data were analyzed by the students' t-test to compare means of normally distributed data. Statistical differences were considered to be significant <0.05.

RESULTS

1. There were 27,758 singleton deliveries over the study period, of which 319 (1.15%) were preterm.
2. The mean age of women was 27.8 years (S.D 5.5) of which 32.3% of these women were primiparous. The mean gestational age was 34.3 weeks (S.D 2.67), and the mean birth weight was 2370g. (S.D.590g). (Table 1).
3. Of these preterm deliveries, 183 (80%) were spontaneous vertex deliveries, 22 (9.6%) were instrumental deliveries, and 24 (10.4%) caesarean section. The remaining were breech presentation 79 (24.8%), transverse lie 6 (1.9%), and cord presentation 5 (1.5%) as indicated in Table 2.
4. There were 13 neonatal deaths giving an overall neonatal mortality rate of 42/1000 livebirths. There were 9 stillbirths giving perinatal mortality rate 69/1000 total births. Neonatal mortality was greater with birth-weight and gestational age as illustrated in Table 3.
5. Table 4 shows that the main cause of stillbirths which in our series of women was due to fetal

abnormalities 6 (66%) and the main cause of neonatal mortality was respiratory distress syndrome (RDS) in 8 or 61% of the cases.

6. Obstetric interventions were the most important identified factor which contributed to changes in preterm birth rates. We introduced such interventions including preterm caesarean deliveries to prevent in utero deaths or further maternal complications.

7. Table 5 indicates that mal-presentation (36.7%), previous caesarean section (18.3%), pregnancy induced hypertension (14.3%), and fetal distress were the main indications for caesarean section.

8. There was a significant increase in the proportion of babies delivered spontaneously over the study period.

TABLE 1

Maternal characteristics and duration of pregnancies

Maternal Characteristics	Mean+SD
Maternal age (years) Parity	27.86 ± 5.47 2.4 ± 1.89
Para 0 Para 1 Para 2 Para 3 Para > 3	103(32.3%) 48(15%) 42(13.16%) 36(11.28%) 70(21.9%)
Gestational age at delivery Birth weight (g)	34.30 ± 5.67 2370 ± 590
Apgar score At 1 min At 5 min	6.43 ± 1.91 7.89 ± 1.86

TABLE 2

Frequency of presentation and Mode of delivery

Presentation	Total		Vaginal			Caesarean Section		
	n	%	Spontaneous	Instrumental	n	%		
Vertex	229	71.8	183	80	22	9.6%	24	10.4
Breech	79	24.8	65	82.3			14	17.7
Complete br.	49	62	40	81.6			9	11.4
Frank br.	27	34	25	92.6			2	7.4
Footling br.	3	4					3	100
Transverse lie	6	1.9					6	100
Cord presentation	5	1.5					5	100
Total	319		248		22		49	

TABLE 3
Perinatal Deaths by Birthweight & Gestational Age

G.A	Total		Survival		S.B		neonatal death		perinatal death	
	n	%	n	%	n	%	n	%	n	%
28-29	27	8.46	23	85.18	0	0	4	14.8	4	14.8
30-31	22	6.90	18	81.8	1	4.54	3	13.6	4	18.18
32-33	50	15.68	45	90	2	4	3	6	5	10
34-35	80	25.08	76	95	2	2.5	2	2.5	4	5
36-37	140	43.88	135	96.4	4	2.85	1	0.7	5	3.57
Total	319	100	297	93.10	9	2.82	13	4.08	22	6.88
Birth weight (g)										
500-749	2	0.63	2	100	0	0	0	0	0	0
750-999	5	1.56	3	60	0	0	2	40	2	40
1000-1249	2	0.63	1	50	0	0	1	50	1	50
1250-1499	12	3.76	9	75	1	8.3	2	16.6	3	25
1500-1749	28	8.77	21	75	2	7.1	5	17.8	7	25
1750-1999	32	10.03	30	93.7	1	3.1	1	3.1	2	6.2
2000-2249	43	13.48	43	100	0	0	0	0	0	0
2250-2499	39	12.22	35	89.7	3	7.7	1	2.56	4	10.25
2500-2749	73	22.88	72	98.6	1	1.36	0	0	1	1.36
2750-2999	32	10.03	30	93.7	1	3.1	1	3.1	2	6.2
3000-3249	34	10.65	34	100	0	0	0	0	0	0
3250-3499	11	3.44	11	100	0	0	0	0	0	0
3500-3749	6	1.88	6	100	0	0	0	0	0	0
Total	319	100	297	93.10	9	2.82	13	4.08	22	6.88

TABLE 4
Stillbirths, neonatal mortality and main causes of death

Mortality	N
Stillbirths (S.B.)	9
Multiple congenital anomalies	6
Uncontrolled diabetes	1
Severe PET	1
Placental abruption	1
Death at <7 days	10
Perinatal mortality	22
Neonatal mortality	13
Causes of death	N
RDS	8
Pulmonary hypoplasia	1
Other respiratory difficulties	1
Infection	3

TABLE 5

Indications of C.S	N	%
1 prev C.S.	9	18.37
2 PET	7	14.29
3 placental abruption	3	6.12
4 placenta previa	1	2.04
5 Fetal distress	6	12.24
6 Failure to progress	2	4.08
7 Footling breech	3	6.12
8 Transverse lie	6	12.25
9 Breech	7	14.29
10 Cord prolapse	5	10.20
Total	49	100

DISCUSSION

Preterm delivery with its associated morbidity and mortality still represents one of the major unsolved problems in obstetrics and gynecology. The causes of preterm delivery may be broadly divided into three groups. These are: indicated preterm deliveries, premature rupture of membranes in the preterm gestation, and preterm labor.

Indicated preterm deliveries are usually the result of various medical or surgical complications in the mother or fetus that create an unfavorable intrauterine environment for the fetus or a dangerous environment for the mother. In these cases, the fetus is delivered to prevent morbidity or mortality of mother or fetus from occurring regardless of gestational age. These conditions commonly include severe preeclampsia, chronic hypertension, diabetes, placenta previa, or placental abruption. Indicated preterm deliveries often account for 20–30% of all preterm births. They therefore account for a significant proportion of the mortality and morbidity with preterm births. To decrease the occurrence of preterm deliveries in this population, advances must be made in the management of the medical condition that creates the dangerous environment for mother and fetus.

The remaining 70–80% of preterm deliveries are caused by preterm premature rupture of the membranes or by preterm labor. These two conditions, although usually considered separate, are probably more closely associated than we often realize. It is quite common for preterm labor to result in rupture of the membranes and most patients with rupture of the membranes proceed quickly to preterm labor. It is likely that common mechanisms initiate one or both of these complications in any specific pregnancy.

Obviously, preterm deliveries present a problem because of the severe neonatal complications that often occur afterwards. These complications are worse for the smaller newborn with earlier gestational age. These complications include death, respiratory distress syndrome, intraventricular hemorrhage, sepsis, and necrotizing enterocolitis. During the past 20 to 30 years, there has been a significant improvement in the survival rate of small neonates.

Infants of low birth weight, usually born extremely premature. Improvements in care for premature infants have a considerable potential for lowering perinatal mortality. To make an informed decision, the obstetrician and parents require an accurate understanding of fetal survival and of neurologic morbidity in survivors. It is unjustifiable to subject the mother to hazards of caesarean delivery when the possibility of an acceptable pediatric outcome is remote.

Because our major goal was to analyze outcome for infants of preterm birth from the obstetrician's perspective, we had to include cases of stillbirths to our data, which included only live births. However, the inclusion of stillbirths made no difference to the conclusions regarding obstetric interventions of birth but remain a real outcome to the obstetrician and the family. The failure of caesarean delivery to confer any benefit in this retrospective study under 1500g was also observed by other investigators^{21,23,24}.

Nevertheless, in one subgroup of mothers— those with severe preeclampsia- caesarean delivery conferred a significant benefit over induction of labor²².

The mode of delivery of the preterm breech presentation is controversial. Most authors in retrospective studies have reported an apparent benefit of caesarean over vaginal delivery for the premature breech. Unfortunately, the lack of randomization in these studies implies some selection bias. In the present study, for the singleton preterm breech, the trend for an improved outcome for those delivered by caesarean did not reach statistical significance (7.4% by C.S. VS 9.2% vaginally).

Our study provides the guide to the neonatal mortality for any given preterm weight/ gestational age combination²⁶.

It is possible to improve the neonatal outcome by antenatal administration of steroids, improved care, the use of tocolytics, and the increase in iatrogenically delivered babies²⁵.

It is evident from this and other studies that preterm birth is a major cause of neonatal mortality and long-term disability¹⁶⁻¹⁷. The rates of preterm birth also have increased in many countries over the past decade. This increase in preterm deliveries could be largely attributed to changes in the frequency of multiple births, obstetric interventions, maternal complications and the use of ultrasound based estimates of gestational age.

There are in addition several studies indicating variations in neonatal mortality with either birth weight or gestational age at delivery¹⁸⁻²⁰. A more useful assessment could therefore be made by using gestational age together with birth weight, and a large sample size may be required to estimate with significant accuracy the neonatal mortality with fetal weight and gestational age.

It is therefore evident that despite social, scientific and technological improvement the prevention of preterm birth with its attendant morbidity, mortality and economic consequences remains a major challenge.

Recent controlled trials of provider-planned social and community support have not achieved their goals of reducing the incidence of preterm birth²⁷. Risk prediction using criteria such as socioeconomic status and a history of preterm birth or perinatal wastage, has not been as useful as expected²⁸. Modifications to high risk scoring systems are probably necessary to meet local conditions if they are to be useful predictors of perinatal mortality²⁹.

There are both direct and indirect factors which can be correlated with preterm birth. These factors can be grouped into causative, contributory, associative, predictive or idiopathic. Examples of causative factors include major antepartum haemorrhage and lethal congenital abnormalities, and pregnancy-induced hypertension and premature rupture of the

membranes are contributory factors. Maternal conditions are often associated with preterm birth and multiple pregnancy is generally considered as predictive. Idiopathic preterm birth follows the spontaneous onset of preterm labor for which no specific cause has been identified.

The aetiology of preterm birth is heterogenous and several maternal or pregnancy complications limiting fetal growth and influencing the likelihood of adverse events in more mature fetuses, could also affect fetal growth and birth weight in preterm infants³⁰. As it is unlikely that any single obstetric intervention will be able to reduce the causes of preterm deliveries, research must continue to find potential markers to predict premature rupture of membranes and spontaneous preterm labor.

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