

Obstetrical outcomes amongst preterm singleton births

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ABSTRACT

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

Methods: A retrospective review of hospital case notes of maternity data and neonatal mortality data was carried out on all singleton preterm deliveries from 26 to <37 completed weeks between 1996 and 1999 to investigate neonatal death.

Results: There were 20,758 live-born singleton deliveries over the study period, of which 638 were preterm (3%). 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 obstetric management when elective preterm delivery is considered, and for providing prognostic guidance following preterm delivery.

Keywords: Neonatal mortality, birth weight, gestational age, role of antibiotics, corticosteroids.

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Preterm birth is one of the most important causes for both neonatal morbidity and mortality and long-term disability.^{1,2} Approximately 80% of all perinatal deaths in any population are attributed to preterm birth. Despite a wide variety of intervention and many advances in perinatal and neonatal care over the past decade, the incidence of preterm birth has not declined.^{3,4} In fact prematurity has increased in recent years.⁵ Pregnant women with subfertility and clinically defined infertility are more prone to preterm delivery, even in the absence of infertility treatment. Preterm births are a major cause of prolonged neonatal and hospital stays. The cost for care of the preterm infant in developed countries is staggering. The estimated annual direct health care cost in the United States is approximately \$26

billion. Preterm birth results either from spontaneous preterm labor or preterm premature rupture of membranes in approximately 75% of cases. The remainder results from indicated delivery for maternal or fetal cause. Women at high risk for preterm delivery frequently demonstrate risk factors including low socioeconomic status and lack of access to medical information and care.^{6,7}

Methods. Between January 1st, 1996 and December 30th, 1999, 638 women with preterm labor were managed at Princess Badee'a Teaching Hospital, Jordan. All singleton preterm (26-<37 completed weeks) deliveries in North Jordan resulting in a live birth over a 4-year period were

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Table 1 - Patient demographic data.

Maternal characteristic	Mean \pm SD
Maternal age (year)	27.86 \pm 5.47
Parity	2.40 \pm 1.89
Nulliparous	206 (32%)
Para 1-3	292 (46%)
Para >3	140 (22%)
Gestational age at delivery (wk)	34.30 \pm 2.67
Birth weight (g)	2370 \pm 590
Urinary tract infection this pregnancy	160 (25%)
Previous preterm at labor	120 (20%)
Previous preterm birth	108 (17%)
No. of preterm PROM <34 (wk)	250 (39%)
<28 weeks	65 (10%)
28 - <32 weeks	90 (14%)
32 - <34 weeks	95 (15%)
No prenatal care	95 (15%)
wk - week; PROM - premature rupture of membranes; no. - number; SD - standard deviation	

identified. Gestational age was estimated from menstrual and ultrasound dates. Birth weight was measured on the day of delivery and divided into 250g strata. The neonatal mortality rate was estimated for birth weight and gestational age groups. Factors such as a birth weight <500g and lethal abnormalities were excluded from the study. Various parameters were reviewed, including gestational age, birth weight, presence of infection, previous preterm labor, proven rupture of the membranes, Apgar score, mode of delivery, and neonatal outcome. The use of

dexamethasone and prophylactic antibiotics was used more in the last years than in previous years, probably reflecting a better neonatal outcome. Methods of prevention or delaying the occurrence of preterm labor and delivery were carried out, including cervical cerclage, hospital bed rest, the use of tocolytic drugs and timed delivery. The results were analysed by the student t test to compare means of the normally distributed data. Differences were considered to be significant for P value <0.05.

Results. There were 20,758 singleton deliveries over the study period, of which 638 (3%) were preterm. Table 1 shows the patient demographic data. Table 2 shows the frequency of presentation and mode of delivery. Within the preterm group, there were 26 deaths, giving an overall neonatal mortality rate of 42/1000 live births. There were 18 stillbirths giving an overall perinatal mortality rate 69/1000 total births. Neonatal mortality was greater with low gestational age and birth weight (Table 3). However, the neonatal mortality was consistently higher in the iatrogenically delivered group, compared with those in spontaneous labor. Table 4 shows stillbirths, neonatal mortality and the main causes of death. The main cause of stillbirths was due to fetal abnormalities 12 (66%), and the main cause of neonatal mortality was respiratory distress syndrome 16 (61%). The percentage of all neonatal deaths due to fetal abnormality increased with increasing gestational age. Table 5 shows that malpresentation, previous cesarean section, pregnancy induced hypertension, and fetal distress were the main indications for cesarean section. There was a significant increase in the proportion of babies delivered spontaneously over the study period. One hundred and forty women (22%) with singleton

Table 2 - Frequency of presentation and mode of delivery.

Presentation	Total		Vaginal				Cesarean Section	
	Number	%	Spontaneous		Instrumental		Number	%
Vertex	458	72	366	80%	44	10%	48	10
Breech	158	25	130	82%			28	18
Complete breech	98	62	80	82%			18	11
Frank breech	54	34	50	93%			4	2.5
Footling breech	6	4					6	4
Transverse lie	12	2					12	100
Cord presentation	10	1.5					10	100
TOTAL	638		496		44		98	

Table 3 - Perinatal deaths by birthweight and gestational age.

Gestational age	Total		Survival		Stillbirth		Neonatal death		Perinatal death	
	Number	%	Number	%	Number	%	Number	%	Number	%
26 - 29	54	8.0	46	85	0	0	8	15.0	8	15.0
30 - 31	44	7.0	36	82	2	5.0	6	14.0	8	19.0
32 - 33	100	16.0	90	90	4	4.0	6	6.0	10	10.0
34 - 35	160	25.0	152	95	4	2.5	4	2.5	8	5.0
36 - 37	280	44.0	270	96	8	3.0	2	1.0	10	4.0
TOTAL	638	100.0	594		18		26		44	
Birth weight (g)										
500 - 749	4	1.0	4	100	0	0.0	0	0.0	0	0.0
750 - 999	10	1.0	6	60	0	0.0	4	40.0	4	40.0
1000 - 1249	4	1.0	2	50	0	0.0	2	50.0	2	50.0
1250 - 1499	24	4.0	18	75	2	8.0	4	17.0	6	25.0
1500 - 1749	56	9.0	42	75	4	7.0	10	18.0	14	25.0
1750 - 1999	64	10.0	60	94	2	3.0	2	3.0	4	6.0
2000 - 2249	86	13.0	86	100	0	0.0	0	0.0	0	0.0
2250 - 2499	78	12.0	70	90	6	8.0	2	3.0	8	10.0
2500 - 2749	146	23.0	144	99	2	1.0	0	0.0	2	1.0
2750 - 2999	64	10.0	60	94	2	3.0	2	3.0	4	6.0
3000 - 3249	68	11.0	68	100	0	0.0	0	0.0	0	0.0
3250 - 3499	22	3.0	22	100	0	0.0	0	0.0	0	0.0
3500 - 3749	12	2.0	12	100	0	0.0	0	0.0	0	0.0
TOTAL	638	100.0	594	93	18	3.0	26	4.0	44	7.0

pregnancies with threatened idiopathic preterm labor and intact membranes at 26 to 34 weeks' gestation were treated with ampicillin and metronidazole. This was associated with a significant prolongation of pregnancy (30 days vs. 17 days, $P < 0.05$), higher gestational age at delivery (36 weeks vs. 34 weeks), decreased incidence of preterm birth (38% vs. 52%), and lower rate of admission to special care baby unit (35% vs. 56%), when compared with the none treated group. Two hundred and fifty patients (39%) with preterm premature rupture of membranes (PROM) less than 34 weeks were treated by corticosteroids after treatment for a minimum of 12 hours with ampicillin, a significant reduction in the incidence of

RDS were observed in the steroid group (128 (20%) vs. 223 (35%). Seventy-eight patients (12%) were treated with tocolysis. None of the tocolytics had been shown to reduce perinatal mortality or neonatal morbidity.

Discussion. Preterm delivery occurs in approximately 11% of all births in the United States and is a major factor contributing to infant perinatal morbidity and mortality, accounting for up to 80% of perinatal deaths. The estimated annual direct health care cost in the United States is approximately \$26 billion. Preterm birth results either from spontaneous

Table 4 - Stillbirths, neonatal mortality and main causes of death.

Mortality	Number	%
Stillbirths	18	3.0
Multiple congenital anomalies	12	2.0
Uncontrolled diabetes	2	0.5
Severe preeclampsia	2	0.5
Placental abruption	2	0.5
Death at <7 days	20	3.0
Perinatal mortality	44	7.0
Neonatal mortality	26	4.0
Causes of death		
Respiratory Distress Syndrome	16	2.5
Pulmonary hypoplasia	2	0.5
Other respiratory difficulties	2	0.5
Infection	6	1.0

Table 5 - Indications of cesarean section.

Indications of cesarean section	Number	%
Previous cesarean section	18	18
Pregnancy induced hypertension	14	14
Placental abruption	6	6
Placenta previa	2	2
Fetal distress	12	12
Failure to progress	4	4
Footling breech	6	6
Transverse lie	12	12
Breech	14	14
Cord prolapse	10	10
TOTAL	98	98

preterm labor or spontaneous preterm PROM in approximately 75% of cases. The remainder results from indicated delivery for maternal or fetal causes. Despite a wide variety of interventions directed at women in preterm labor or at risk for preterm delivery, the incidence of prematurity has increased by 17% over the past 15 years.⁷ Women at high risk for preterm delivery frequently demonstrate risk factors including low socioeconomic status and a lack of access to medical information and care.^{4,8} Women presenting for early prenatal care have been shown to have a better pregnancy outcome. Population based prematurity prevention programs have been instituted with mixed success.^{9,10} They have been generally applied to high risk groups, and have been centered around early detection and treatment of preterm labor. While this approach has some merit, it may be that it is too late to have a clinical impact once labor occurs. Should any pregnancy in preterm labor be treated? The answer is definitely yes. Here the treatment includes numerous interventions, including ascertainment of diagnosis, assessments of the maternal and fetal conditions, and evaluation of important prognostic variables such as the number of fetuses, the state of the membranes, the gestational age, the parity and cervical changes. Admission by itself with close monitoring, assessment of maternal and fetal well being, bed rest and possibly hydration have been shown to arrest preterm labor for sometimes among up to 50% of all admissions.⁸⁻¹⁰ Treatment with ampicillin and metronidazole in women with threatened idiopathic preterm labor significantly prolonged the gestation, but had no effects on maternal and neonatal infectious morbidity. Similar to the Jens Svare study,¹¹ our results suggest that treating preterm PROM patients with a broad – spectrum antibiotic before corticosteroids decreases respiratory distress syndrome without apparent adverse sequelae. Consistent with a study carried out by Lewis et al.¹² Scientific evidence had demonstrated that the relative effectiveness of all tested available tocolytics agents is almost similar in respect to prolongation of pregnancy by 48 hours up to 7 days.^{13,14} To make an informed decision, the obstetrician, and parents require an accurate understanding of fetal survival and of neurologic morbidity in survivors.^{8,13,14} As our major goal was to analyze outcome for infants of preterm birth from the obstetricians perspective, we had to add stillbirths to our data, which included only live births. In this retrospective study, the cesarean delivery failed to confer any benefit for babies under 1500g.^{15,16} Nevertheless, in one subgroup of others, those with severe pre-eclampsia, cesarean delivery conferred a significant benefit over induction of labor.¹⁷ The mode of delivery of preterm breech presentation is controversial. Most authors in retrospective studies have reported an apparent benefit of cesarean over vaginal delivery for the premature breech. In our study, for the singleton

preterm breech, the trend for an improved outcome for those delivered by cesarean did not reach statistical significance (7% by cesarean section Vs. 9% by vaginal delivery). Our study provides the guide to consider neonatal mortality using both birth weight and gestational age. These figures will be of use in obstetric management when elective preterm delivery is considered, and for providing prognostic postnatal guidance.¹⁸ A number of approaches to prevention have been promoted, although none has emerged as clearly effective. These approaches include intensive patient education programs, cervical sonography, home uterine activity monitoring, prophylactic tocolysis, modifications of daily activities, and the liberal use of cerclage.

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