

Epidemiologic Risk Factors for Preterm Delivery

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Abstract

Background: Prematurity remains the most significant cause of neonatal morbidity and mortality. Knowing which group of women is at risk for developing preterm labor will define a target population for better prenatal care and prevention modalities.

Objective: To examine whether preterm delivery rates are associated with ethnicity, age, parity, and style of living.

Methods: We conducted a longitudinal case series examining obstetric and demographic data of 17,493 deliveries that occurred between June 1994 and May 1999. All deliveries were performed in the obstetric department of HaEmek Medical Center (Afula, Israel), which serves as a referral center. The main outcome measures were preterm delivery, as related to the women's ethnicity, age parity, and style of living – namely, town, village, or kibbutz.

Results: The overall preterm delivery rate was 8.5%. The preterm delivery rate in non-Jewish women (10.5%) was higher than in Jewish women (7.1%) ($P < 0.00001$). The preterm delivery rate in women younger than 20 or older than 40 (12.5%) was much higher than in women between the ages of 21 and 40 (8.0%) ($P < 0.00001$). Grand-multipara women (> 8) had a higher preterm delivery rate (13.8%) than less parous women (8.5%) ($P < 0.012$). Style of living was also associated with the preterm delivery rate ($P < 0.00001$): kibbutz 5.5%, Jewish towns 7.8%, non-Jewish towns 8.7%, Jewish villages 6.7%, and non-Jewish villages 11.0%.

Conclusions: Style of living, ethnicity, age and parity are statistically significant risk factors for preterm delivery in our area. These factors provide a more definable target population for better prenatal care.

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Despite substantial advances in perinatal care, prematurity remains the most significant cause of neonatal morbidity and mortality in otherwise normal newborns [1,2]. Approximately a third of all preterm deliveries are due to adverse maternal or fetal complications that warrant early delivery, such as hypertension, antepartum hemorrhage, diabetes, or fetal growth retardation [3]. The other two-thirds, categorized as “spontaneous,” prompted many investigators to search for etiologies and epidemiologies leading to preterm deliveries [4]. Although prevention of preterm delivery is possible [5,6], it remains constant at approximately 9% of births (7). Attempts to decrease the incidence of preterm deliveries by eliminating a single risk factor have had mixed results [8,9]. Focus has been placed on programs to identify high risk patients by the use of various scoring systems [6,10,11], while other specifically designed programs have used health education, social support, or tocolytics, with varying results [5,10–12].

We undertook the present study to determine the preterm delivery rates in women of different ethnicity, age, parity and style of living.

Material and Methods

Population characteristics, delivery outcome and preterm delivery information were obtained from a computerized obstetric record system of women who delivered in the Department of Obstetrics at HaEmek Medical Center (Afula, Israel), which is a secondary referral care center for the Jezreel Valley and northern Israel. The study sample included all deliveries at 24 or more gestational weeks between June 1994 and May 1999.

Preterm delivery was defined as delivery of a live singleton neonate between 24 and 36 completed gestational weeks. Gestational age was determined by one or more of the following criteria: a) last menstrual date in a regularly menstruating woman combined with a compatible second-trimester sonographic examination, b) first-trimester sonographic examination, and c) two or more consecutive second-trimester sonographic examinations with appropriate fetal growth. Dubovitch scoring was performed in all neonates to confirm dating. Only preterm spontaneous deliveries were included.

Analysis regarded parity and demographic variables: age, styles of living, and ethnicity. The deliveries were categorized as Jewish or non-Jewish, and divided according to style of living, parity, and age. Style of living was divided into five groups: Jewish or non-Jewish towns, Jewish or non-Jewish villages, or kibbutz (only Jewish).

Statistical significance between Jewish and non-Jewish preterm delivery rates was analyzed with the two-tailed Fisher's exact test. To examine the possible effects and interaction between the different maternal styles of living, we used the Bonferroni test (modified chi-square test). Stepwise multiple regression analysis was used to analyze the interaction between growing parity, maternal age, and the rate of preterm delivery. A P value below 0.05 was considered statistically significant.

Results

During the 5 years of the study 17,497 deliveries were recorded. The overall preterm delivery rate was 8.5% (1,492 deliveries). Jewish women had 10,290 deliveries, of which 733 (7.1%) were preterm; and non-Jewish women had 7,207 deliveries of which 759 (10.5%) were preterm. The statistical difference between Jewish and non-Jewish preterm deliveries was extremely significant ($P < 0.00001$) [Table 1]. The maternal age groups – from 16 to above 46 years old – and the preterm delivery rate are shown in Table 2. The age of 499 women could not be determined. The preterm delivery rate correlated linearly but was not statistically significant with maternal age ($r = 0.057$). Nevertheless, 15,842 deliveries were recorded in the 21–40 age group, of which 1,267 (8.0%) were preterm, as compared to 1,156 deliveries in the other age group of which 145 (12.5%) were

Table 1. Incidence of perterm deliveries according to women's ethnicity, age and parity

	Total	PTD	Incidence (%)	Total	PTD	Incidence (%)	P value
	Jewish			Non-Jewish			
Age (yr)	10,290	733	7.1	7,207	759	10.5	<0.00001
	21–40			≤20–41			
Parity	15,842	1,267	8.0	1,156	145	12.5	<0.00001
	1–8			>8			
	17,302	1,465	8.5	195	27	13.8	<0.012

PTD = preterm delivery

Table 2. Distribution of preterm delivery according to women's ages

Age (yr)	Total deliveries	No. of PTD	Percent of PTD
16–20	835	104	12.5
21–25	4,908	390	7.9
26–30	5,426	443	8.2
31–35	3,846	287	7.5
36–40	1,715	150	8.7
41–45	268	38	14.2
≥45	15	3	20
Total	17,013	1,415	8.3

Table 3. Distribution of preterm delivery according to parity of women

Parity	Total deliveries	No. of PTD	Percent of PTD
0	4,415	467	10.6
1	4,148	340	8.2
2	3,735	258	6.9
3	2,506	181	7.2
4	1,164	109	9.4
5	630	59	9.4
6	352	24	6.8
7	217	16	7.4
8	135	11	8.1
9	96	11	11.4
10	57	9	15.8
11	23	3	13.0
12	19	4	21.1
Total	17,497	1,492	8.5

Table 4. Distribution of preterm delivery according to style of living

Style of living	Total deliveries	No. of PTD	Percent of PTD
Kibbutz (Jewish)	1,648	90	5.5
Jewish town	7,314	568	7.8
Minority town	2,629	228	8.7
Jewish village	1,310	88	6.7
Minority village	4,584	506	11.0
Total	17,485	1,408	8.5

preterm. This difference is extremely significant ($P < 0.00001$) [Table 2].

The maternal parity and preterm delivery rate are presented in Table 3. Preterm delivery rate correlated linearly with parity ($r = 0.13$, $P < 0.00001$). Therefore, we studied the distribution in order to find a "parity threshold." In the 1 to 8 parity group we recorded 17,302 deliveries, of which 1,465 (8.5%) were preterm, as compared to 195 deliveries in the above 8 parity group of which 27 (13.8%) were preterm. This difference was statistically significant ($P < 0.012$) [Table 1], with $r = 0.56$ between parity and maternal age, which is highly significant.

The style of living was not available in 12 cases. Table 4 displays the relationship between maternal style of living and preterm delivery rates. The statistical difference between preterm deliveries according to the five groups of maternal style of living was extremely significant (modified P value < 0.00001).

Discussion

Premature delivery is the leading cause of perinatal morbidity and mortality and is the main risk factor for adverse pregnancy outcome [1,2]. Premature infants have an increased risk of mental retardation, blindness, and bronchopulmonary dysplasia [13]. The cost to society in terms of acute and chronic medical care as well as long-term handicaps has made preterm delivery a serious subject for research. Although much optimism followed the introduction of many new tocolytic drugs, they have not led to a consistent decrease in the incidence of preterm delivery [14].

Several studies have identified risk factors associated with preterm delivery [2,4,15,16]. However, some of these studies did not distinguish between spontaneous and induced preterm deliveries, while in others, prematurity was based solely on a birth weight of less than 2,500 g. In spite of these limitations, a comparison of the findings from previous studies and our own is instructive and informative.

We found that non-Jewish women had a significantly increased risk for delivery of a premature infant as compared with Jewish women. The higher parity in non-Jewish groups (141 non-Jewish vs. 54 Jewish) in the above 8 parity group is only a partial explanation. The trend for higher preterm delivery rates concurs with the study by De Haas et al. [17], which observed that non-white women had a significantly increased risk for preterm deliveries as compared to white women. The analogy is that non-white women in the United States represent non-Jewish women, as do the Arabs, Christians, Druze and Bedouins in Israel. A recent study by Melamed et al. [18] showed that the Bedouins in southern Israel had a significantly higher incidence of preterm delivery.

The increased age of women giving birth has been identified as a risk factor for prematurity. Dramatic changes in the social role of women during the latter decades of the twentieth century have driven an impressive proportion of women to have babies after age 35. Tuck et al. [19] observed that the relative risk for delivery before 37 weeks in women over the age of 35 was increased fourfold as compared to women aged 20–25. As the incidence of many complications is more frequently encountered in older women, it

is not surprising that preterm delivery is also more common in older pregnant women.

It is also apparent that pregnancy in teenagers is common in all social, economic, national and racial groups. Most reports of births among teenagers indicate an increased risk of preterm delivery. Olausson and co-workers [20] found an increased risk of preterm delivery in teenagers that did not persist after the teenage period. Blankson and colleagues [21] observed unsatisfactory utilization of prenatal care and a high risk of adverse outcomes in teenagers. Two studies have identified an inverse relationship between the age of the women and risk of spontaneous preterm delivery [22,23]. Our study assessed a wide range of ages and found a high percentage of spontaneous preterm delivery in the extremes of women's reproductive years (under 21 and over 40).

Increased parity is another risk factor for preterm delivery. We found significantly higher rates of preterm delivery associated with parity greater than 8. Other studies [11,17,22] did not find a higher risk with increasing parity, but they examined a smaller number of deliveries [11,17] or a lower maximum parity [22].

The influence of social environment on preterm delivery was examined by dividing the women according to the style of living – towns, villages and kibbutz, with towns and villages divided further into Jewish and non-Jewish. Living on a kibbutz is unique in that the inhabitants live and work in these small communities run according to an equitable system of duties and income. The public medical care system is available on a daily basis in every community, and the hospital is within close proximity of all towns, villages and kibbutzim in our referral area. In the towns and villages the medical care system is available for regular visits only during the usual working hours. Unique to kibbutz life is the availability of a physician on a 24 hour basis (with no extra remuneration). This may provide a partial explanation for the significantly lower preterm delivery rate within the kibbutz network. Some support for this theory is offered by Boldman and Reed [24], who point out that a low density of available physicians is directly related to low birth weight infants. Krueger and Scholl [25] confirmed that inadequate prenatal care is associated with an increased risk of preterm delivery. Another finding was that only 2 of 1,648 deliveries on the kibbutz were in the extremes of women's reproductive years (one woman was in her 11th parity).

Prevention is naturally the best way to combat preterm delivery. The first requirement is to know which women or group of women are at risk for preterm labor. We chose to examine four risk factors that are known to the healthcare administrator at the first encounter (demographic variables such as ethnicity, age, style of living and parity, have been identified as risk factors for preterm delivery). Our findings provide a more definable target population requiring better prenatal care and/or a prevention modality.

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