

Risk factors associated with preterm deliveries in Pohnpei, 1995

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Abstract

Studies in Pohnpei have shown an increase in the preterm delivery (PTD) rate from 1.3% in 1990 to 4.2% in 1994. Determining the causes of PTD can help in preventing PTD and lead to a decrease in infant morbidity and mortality.

A case control study was conducted to investigate the risk factors contributing to PTD in Pohnpei during 1995. Two hundred forty five (245) women who delivered during 1995 at Pohnpei State Hospital (PSH) were included in the study, 92 cases and 153 controls. Cases were those women who had at least two parameters (last menstrual period, ultra sound, quickening, or fundal height) measuring their fetal age of gestation to be 20 to 36 weeks gestation. Controls were picked sequentially, every 7th woman from the same logbook, who had at least two parameters measuring age of gestation to be 37 or more weeks.

The rate of PTD in PSH in 1995 was 8.4%. An association was found with residence:

those who had PTD were more often from Sokehs and less often from Kolonia. Other factors associated with PTD deliveries were grandmultiparity, birth spacing of less than 2 years, lower weight in the mother, poorer weight gain, and few ANC visits. There was a borderline association with smoking. No association was found between PTD and age, marital status, or educational level of the mother.

The rate of PTD is increasing in Pohnpei. Several factors have been found to be associated with preterm deliveries.

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Regular ANC visits, proper diet and nutrition, and family planning programs should be targeted for improvement, to address the risk factors associated with PTD in this study.

Introduction

In developed countries such as the US, despite intensive investigation and the existence of advanced technology, preterm deliveries remain the leading cause of infant morbidity and mortality³. As the Federated States of Micronesia (FSM) is still a developing country, appropriate facilities and means of dealing with preterm infants are not readily available, thus the morbidity and mortality among this group must be much higher than that of developed countries. Previous studies conducted in Pohnpei State Hospital (PSH) reported that 1.3% of 468 total deliveries in a 10 month period in 1990, and 4.2% of 996 total deliveries in 1994, were preterm^{2,3}.

Many studies have been published regarding preterm deliveries and contributing risk factors. In 1995 the PTD rate in three North Carolina counties for 1980 was 7.9% of all births⁴. Preterm deliveries are more common in the US than in any other industrialized nation, are particularly high among the American black population, and are the primary reason for the relatively high infant morbidity and mortality rate in the US⁵. Risk factors that have been associated with preterm deliveries include nulliparity,

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grandmultiparity, a prior preterm delivery, maternal illness, anemia, extreme age of the mother, educational level of the mother, poor social environment, smoking, alcohol use, employment during pregnancy, and multiple gestation^{6,7}. PTD is also more common among women with previous fetal loss, with inadequate weight gain in the current pregnancy, and with late antenatal clinic (ANC) booking^{8,9}. A study done in Mexico found that the incidence of premature deliveries and of births with intrauterine growth retardation could be expected to decline if women could attend an adequate number of antenatal visits¹⁰. A case-control study in Pohnpei in 1994 found that PTD was more likely to occur in those who were less than 20 years old, who were nulliparous, who smoked, or who had previous PTD².

The current study was to determine the rate of PTD at PSH in 1995, identify major risk factors contributing to PTD, and compare the results with that of a previous study² to determine any change in risk factors for PTD.

Methodology

A case control study was conducted at PSH. The cases and controls was drawn from those registered in the PSH Labor and Delivery Room (L&D) log book in January 1 to December 31, 1995. Potential cases were all women who were recorded in the L&D log book as having a fetal age of gestation (AOG) at delivery of 20 to 36 weeks. Those whose AOG was not recorded were also picked for chart review as potential cases. Controls were selected sequentially from the same logbook, every seventh patient listed.

Once identified, charts of cases and controls were reviewed, and the selection criteria were applied. To meet the criteria for cases, a patient had to have at least two parameters recorded at some time during her pregnancy, whether last menstrual period (LMP), ultrasound (U-S), fundal height (FH), or quickening (Q), indicating the pregnancy to be 20 to 36 weeks gestation at the time of delivery. To meet the criteria for selection as a control, a patient had to have an AOG of 37 weeks or more at delivery using the same parameters.

Charts of the cases and controls were reviewed using a data collection form. Variable included were: residence, age, marital status, educational level, and occupation; the number of ANC visits, gravidity and parity of the current pregnancy, interval of time from the most recent delivery to the current one, and prior history of PTD, fetal demise, or neonatal death; and a history of substance use, including cigarette smoking, alcohol, and sakau (kava) or other drugs. In addition, information was gathered regarding a history of acute or chronic illnesses, and medications taken during pregnancy. Blood pressure and weight measurements taken during ANC visits were also recorded: weight at first ANC and at last ANC visit before delivery were noted. Laboratory tests during the first

ANC were recorded, specifically hematocrit level, results of urinalysis, and any other tests done such as pap smear, gonorrhoea culture, or serum HBsAg determination.

Data were analysed using the EPI-INFO6 program. Two-by-two tables were used to compare cases and controls, and to determine odds ratios, as a measure of association between each of the variables and PTD.

Results

There were 1,097 deliveries from January 1, 1995 to December 31, 1995 recorded in the PSH L&D log book. Of these, 135 potential cases were drawn, having either an AOG of less than 37 weeks. Fifty four (54) of these were excluded on chart review: 48 did not meet the case criteria, 4 had missing charts and 2 had inadequate information in their charts. Potential controls, with an AOG of 37 weeks gestation or more, totalled 153, and all charts were found. Eleven of these were discovered at chart review to have at least two parameters placing the AOG at delivery between 20 and 37 weeks gestation; these were added to the cases, bringing the total number of cases to 92. After elimination, each of these eleven controls was then replaced by the next registered patient in the log book. The final study population consisted of 92 cases and 153 controls.

Ninety two or 8.4% of the 1,097 deliveries in 1995 were preterm deliveries, which is double the 4.2% PTD rate reported in 1994. Table 1 displays, by municipality, the rates of all deliveries (with the number of reproductive-aged women used as a denominator), and the rates of preterm deliveries (with the total number of deliveries as the denominator). Kitti municipality had the highest overall delivery rate for 1995, 21.6 % per year, yet had the lowest PTD rate (5.8 %). Sokehs municipality, which ranked fourth in terms of overall delivery rate (13.2 %), had the highest PTD rate (14.2 %).

Risk factors for PTD were assessed by comparing cases with controls (Table 2). No significant difference between

Table I. Delivery rate and preterm delivery rate, by municipality, Pohnpei, 1995

Municipality	Female population aged 15 - 44	Number of deliveries	Delivery rate %	Number of preterm deliveries	Preterm delivery rate per 100 births
Kitti	1,116	241	21.6	14	5.8
Kolonia	1,737	176	10.1	14	8.0
Madoleni	1,036	181	17.5	14	7.7
Nett	1,398	173	12.4	14	8.1
Sokehs	1,440	190	13.2	27	14.2
Uh	771	136	17.6	9	6.6
Total	7,489	1,097	14.6	92	8.4

Table 2. Variables, cases and controls

Variables	Cases No. (%)	Controls No. (%)	Odds ratio	Confidence interval	p-value
Substance use	<i>n</i> = 92	<i>n</i> = 152			
<i>Smoking</i>	22 (23.9)	22 (14.5)	1.86	0.91 - 3.77	0.06
<i>Alcohol (ETOH)</i>	6 (6.5)	12 (7.9)	0.81	0.26 - 2.45	0.69
<i>Sakau</i>	9 (9.8)	7 (4.6)	2.25	0.73 - 6.99	0.11
Parity	<i>n</i> = 92	<i>n</i> = 153			
<i>Primiparous</i>	32 (34.7)	51 (33.3)	1.07	0.74 - 1.46	0.82
<i>Multiparous</i>	48 (52.2)	98 (64.1)	0.61	0.35 - 1.07	0.07
<i>Grandmultiparous</i>	12 (13.0)	4 (2.6)	5.59	1.60 - 21.31	0.00
Birth spacing interval < 2 yrs	23/58 (39.7)	20/102 (19.6)	2.69	1.24 - 5.89	0.01
History of neonatal death	4/91 (4.4)	1/153 (0.7)	6.99	0.72 - 166.83	0.07
History of pre-term delivery	8/87 (9.2)	6/153 (3.9)	2.48	0.75 - 8.30	0.09
ANC < 3 visits	42/90 (46.7)	43/153 (28.1)	4.70	1.25 - 4.00	0.00
Trauma	4/92 (4.3)	0/153	undef	-	0.02
Analysis of variance					
Average weight mean(lbs)	142.8	157.7	-	-	0.00
Average weight gain (lbs)	8.6	15.9	-	-	0.00

cases and controls was found in their educational level attained, occupation, or age at the time of delivery. Smoking was nearly twice as likely in cases as in controls; sakau (*kava*) more than twice as common among the cases as the controls, though the association was not statistically significant.

Subjects were grouped by parity into nulliparous, multiparous (1-5 previous deliveries), and grandmultiparous (more than 5 previous deliveries). There was no association between nulliparity and PTD. However, those who delivered preterm were 5.5 times more likely to be grandmultiparous than those who delivered term. An interval of less than 2 years from the last delivery was about 3 times more likely among the cases than among the controls. A history of prior PTD was more common in cases than controls, though this was not statistically significant.

Analysis of prepartum and intrapartum risk factors showed that cases were over 4.5 times as likely to have had fewer than 3 ANC visits than were controls. Trauma occurred in 4 of the cases and none of the controls. Acute and chronic diseases and prolonged rupture of membranes were no more likely in the cases than in the controls.

Weight and blood pressure measurements during pregnancy were also analyzed. (The weights recorded on the initial and final ANC visits were averaged for purposes of this analysis). The mean weight of cases was 142.8 pounds; of controls, 157.7 pounds, a statistically significance difference (Wilcoxon two-sample test, $p = 0.002$). Mean weight gain from first to last ANC visit was 8.6 pounds in the cases, and 15.9 pounds in controls, a statistically significant difference (Wilcoxon two-sample test, $p = 0.00$). Blood pressure measurements were similar in cases and controls.

There were no significant differences between cases and controls for any of the laboratory studies done during ANC visits.

Discussion

Findings from this study suggests PTD is more likely in women from Sokehs municipality, and less likely in women from Kolonia. It showed no association between mother's age and PTD. Smoking was not a significant risk factor for PTD, due probably to the small sample size. Grouping

together all mothers with any reported substance use did not increase the degree of association between any substance use and PTD.

This study found no association between nulliparity and PTD. PTD was found more frequently in grandmultiparous women, consistent with the literature reports. The study also showed that a birth interval of less than two years from the most recent delivery was associated with PTD. A prior history of fetal demise was found in this study to have no association with PTD. The association between PTD and a history of neonatal death was of borderline statistical significance.

The analysis showed that more women delivering preterm reported a history of trauma prior to delivery, mostly a history of slipping and falling down. What should be kept in mind is that women delivering at term are probably less likely to be asked about a history of trauma than are women delivering preterm.

As in the literature, this study found an association between low ANC visits and PTD: those who had preterm deliveries were over four times more likely to have had fewer than 3 ANC visits during their pregnancies. Since those who deliver preterm have a shorter length of time to attend ANC than those who carry to term, and hence less of an opportunity to accumulate a sufficient number of ANC visits, the data was reanalyzed by including the number of ANC visits in the control group only up to their 36th week of gestation. The association between PTD and having fewer than 3 ANC visits persisted nevertheless.

This study found a statistically significant difference between the average body weight of cases and controls, as well as a difference in average weight gain between the cases and controls. In an attempt to decrease the bias in measuring weight gain in those with only 1 or 2 visits, as well as to eliminate the confounding inherent in the fact that those with PTD were more likely to have had fewer than 3 ANC visits, those with fewer than 3 ANC visits were eliminated, and the data on weight gain reanalyzed. On reanalysis, the mean weight gain in cases was 13.9 pounds, in controls 18.3 pounds, still statistically significantly different by the Wilcoxon two-sample test ($p = 0.03$). Chronic or acute diseases in pregnant mothers were found in this study not to be associated with PTD.

Comparing risk factors assessed in 1994 and 1995, both studies found no association between PTD and alcohol use or marital status. Both studies found an association of PTD

with the mother's parity. In contrast, the 1994 study found no association of PTD with weight gain during pregnancy, or with birth interval, while this study did.

The log book of the Obstetrics ward at PSH, usually more reliable in recording gestational age of all patients admitted and discharged was not available for review. A number of charts of cases had inadequate information, thus had to be eliminated from the study. Of major concern was that those without ANC visits had to be excluded from the study, since

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determination of gestational age based on assessment during pregnancy were used as the inclusion criteria. Also those who attended ANC in the peripheral dispensaries had to be excluded, as information on their pregnancies was not recorded in their hospital charts. Another concern was in that only those who delivered in the hospital and were registered in the L&D log book had a chance to be selected. Home deliveries reg-

istered in the home delivery log book at L&D did not have AOG listed and were not included in the study.

Conclusion

The doubled rate of preterm birth is alarming and should be of major concern. Based on the results of this study, women at greater risk of delivering preterm are those residing in Sokehs, grandmultiparous women, with a birth interval of less than 2 years, fewer than 3 ANC visits, lower body weight or poor weight gain during pregnancy, and possibly those who smoke. Intervention programs should target regular attendance at ANC, proper diet and nutrition, and avoidance of cigarette use during pregnancy. Family planning programs should attempt to assure compliance with family planning methods for at least two years following delivery. Stricter application of criteria for assessing gestational age at the time of delivery should also be emphasized. The association of PTD with residence in Sokehs municipality is a subject for further investigation.

Acknowledgement

We would like to thank the L&D nurses, the nursing supervisors and medical records staff, and Dr. Jan Pryor, for their help in completing this study.

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“ Life is short, the art long, opportunity fleeting, experience treacherous, judgement difficult. The physician must be ready, not only to do his duty himself, but also to secure the co-operation of the patient, of the attendants and of externals. ”

Hippocrates (c. 460 - 357 BC)

Aphorisms 1,1