

Frequency and Associated Risk Factors of Preterm Birth in a General Hospital in Hidalgo, Mexico

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Abstract

Objective: To determine the frequency of premature birth (PB) and its associated risk factors in a general hospital in Tula, Mexico.

Methods: This was an observational, cross-sectional nested case-control study. Clinical records of pregnant women who came for prenatal care from January 2008 to December 2012 were evaluated. The variables analyzed were population, age, education, occupation, previous preterm birth, adequate prenatal care, and a history of: hospitalization before labor, multiple pregnancy, urinary tract infection (UTI), cervical vaginitis, premature rupture of membranes, and pre-eclampsia/eclampsia. Data were analyzed with descriptive statistics, bivariate analysis and, for the identification of differences between groups (cases and controls), a Chi-square test of independence was used with a significance level of $\alpha = 0.05$.

Results: A total of 13,750 pregnant women were evaluated in the medical unit; of these 1,036 had a preterm birth (7.5%). Four hundred thirty one medical records were analyzed, 138 with preterm birth and 293 without preterm birth. The factors associated with preterm birth in this series were less than five prenatal consultations, 61% (OR 8.0; $p < 0.05$); age < 18 years, 15.9% (OR 7.02; $p < 0.05$); prior hospitalization, 8.7% (OR 4.5; $p = 0.0013$); UTI in current pregnancy, 77.5% (OR 3.3; $p < 0.05$); and history of PB in previous pregnancy, 13% (OR 3.2; $p < 0.0012$).

Conclusion: It is necessary to implement measures to modify risk factors associated with PB to reduce its frequency.

Keywords: Pregnancy; Prenatal; Preterm Birth; Risk Factors; Obstetric Complications

Abbreviations

PB: Preterm Birth; OR: Odds Ratio; 95% CI: 95% Confidence Interval; APC: Adequate Prenatal Control; CV: Cervicovaginitis; UTI: Urinary Tract Infection; PROM: Premature Rupture of Membranes

Introduction

Preterm birth (PB) is an important clinicopathological problem in medicine in general and in perinatal medicine. This makes it a true challenge for physicians. PB is defined as a birth that occurs before 37 weeks of pregnancy [1]. It has been documented as an important determinant of neonatal morbidity and mortality that also has long-term adverse consequences in health for in children who survive, especially in their psychomotor neurological development. Its frequency varies in different series; however, a frequency between 5% and 15% has been documented in developed countries, while in developing countries this frequency can reach 40% [2]. PB is a syndrome with various and diverse etiologies ranging from infectious diseases to structural alterations of the uterine neck, genetic factors and metabolic and hemodynamic disorders.

Factors associated with PB have been classified as maternal factors, fetal factors, and socioeconomic factors. The most studied causes of PB have been infectious diseases; thus, urinary tract infection (UTI) in pregnancy has been associated in 45.8%; vaginal infection by specific microorganisms; e.g., group B *Streptococcus* infection in 4 to 37.6% [3,4] and vaginal infection with *C. trachomatis* in 4% [5]. Structural alterations of the cervix have been found in 39% [6]; psychosocial stress in 30% [7]; the pregnant adolescent in 0.5% [8]; the consumption of alcohol during pregnancy (OR = 7.9, 95% CI 0.95 - 65) [9]; and periodontal disease (OR = 4.19, 95% CI 1.28 - 13.7) [10,11], among many other factors [12]. PB is closely linked to neonatal mortality since a perinatal morbidity and mortality between 70 and 80%

has been documented [13]. This undoubtedly increases the cost of care for two reasons: one is that the number of women that need to be hospitalized before birth is very high with several days of hospital stay and the other is that children that are born before 37 weeks require more days of hospital stay, specialized personnel, and complex infrastructure.

The frequency of PB and its associated factors are unknown in the General Hospital of Tula. Therefore, a cross-sectional study to determine the frequency of PB and a nested case-control study to identify associated factors were performed. Determining the frequency of PB and its associated factors will be useful because it will allow the design of intervention strategies that will modify the factors found and eventually reduce the prevalence of this condition, a situation that will certainly improve the quality of care of the hospital. An additional benefit of this research is that a research line can be developed both in the Gynecology and Obstetrics Service and in the Pediatric service. This would allow the design and conduction of research protocols that analyze the problems related to PB from an obstetric and pediatric point of view, leading to the establishment public policies that can be applied in other medical units that care for pregnant patients and who share the same problem.

A lack of knowledge of the dynamics of PB in the General Hospital of Tula could be the reason for an important increase in perinatal morbidity and mortality as well as the lack of quality and the costs of care. An interdisciplinary analysis (administration, gynecology, epidemiology, research) of PB could help in understanding related problems in the medical unit. This could be useful for determining the epidemiological behavior of this condition and for using human, financial and infrastructure resources in a more efficient way, prioritizing those factors, identified by an epidemiological and statistical analysis, that eventually cause a greater risk of PB. This greater efficiency in the management of resources could reduce the frequency of PB through the modification of the risk factors detected, a situation that would directly benefit the mother-baby binomial and the medical unit. In the former with a lower perinatal morbidity and mortality and a better quality of life, and in the latter, with a reduction in costs of care and better use of available resources providing with this better quality of care for the patient. Therefore the objective of this study was to determine the frequency of PB in the General Hospital of Tula and its associated factors.

Material and Methods

This was a cross-sectional observational analytical study and a nested case-control study. Pregnant women who came for routine childbirth care to the General Hospital of Tula during January 2008 to December 2012 were studied. The analysis unit was women diagnosed with PB during this period; these were compared with pregnant women without a diagnosis of PB.

Sample size was determined with a proportion formula with a 95% confidence interval and a sample error of 5%. The sample was a total of 368 medical records, with 122 cases and 246 controls (ratio 1:2), unpaired.

The proportional distribution by year is shown in appendix 1. Sampling within each year was performed by simple random sampling. The variables analyzed were the following: type of population, urban or rural; patient age; education; occupation; PB (gestational age < 38 weeks); history of hospitalization before delivery; adequate prenatal control (APC) (≥ 5 medical visits); history of previous PB; survival of the infant; history of multiple pregnancy; history of UTI during pregnancy; history of cervicovaginitis (CV) during pregnancy; history of premature rupture of membranes (PROM) during pregnancy; and history of pre-eclampsia/eclampsia.

Inclusion criteria were clinical records of patients who birthed a child at the hospital, a history of PB (cases) or no history of PB (controls), a complete medical record, the patient data sheet which was required, coded and reviewed. Data were captured on a Microsoft Office® Excel spreadsheet and sent through the Web to the Health Research Coordination Office of the Health Services of Hidalgo where they were processed for analysis with the EPI-INFO Program version 7.0 of the World Health Organization (<http://www.who.int/ncds/surveillance/steps/resources/EpiInfo/en>). To calculate prevalence, the following formula was used: number of cases/population at risk x 100. Numerical variables were analyzed with descriptive statistics, categorical variables were analyzed with bivariate statistics to identify the associated risk factors, and for the identification of differences between groups (cases and controls), the χ^2 test of independence was used with a level of significance of $\alpha = 0.05$.

The research protocol was previously approved by the Research Committee and the Ethics Committee of the Health Services of Hidalgo classifying it as a no-risk study.

Results

During the study period, a total of 13,750 more pregnant women came to the medical unit for birth care. Of these, 1,036 had a premature birth with a calculated frequency of 7.5%; later, a proportional sample of 138 medical records of premature birth and 239 without premature birth (racial 1:2) was obtained with a total of 431 medical records analyzed (Table 1).

| Year | Cases | Controls |
|-------|-------|----------|
| 2008 | 27 | 58 |
| 2009 | 28 | 59 |
| 2010 | 27 | 58 |
| 2011 | 28 | 59 |
| 2012 | 28 | 59 |
| Total | 138 | 293 |

Table 1: Proportional distribution of cases according to year.

Of the study population, 96% were residents of the state of Hidalgo and 4% were from the state of Mexico, 70% were from rural communities and 30% from urban communities. Regarding age, 16.7% of the women in the study had less than 18 years (Figure 1). With regard to education, complete basic education was the most frequent (58.7%) and only a small proportion (1.1%) was illiterate. With regard to occupation, a large majority were housewives (97%).

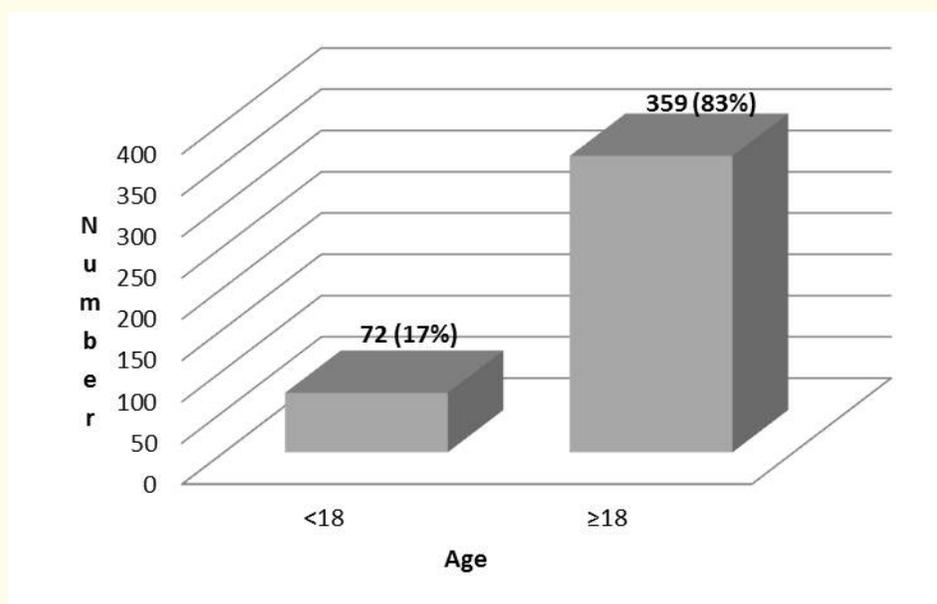


Figure 1: Age distribution of participating pregnant women.

A history of prior hospitalization for obstetrical reasons during the current pregnancy was found in 4% of women. There was APC in 39% of the participants and 61% had less than five medical consultations. PB in a previous pregnancy was present in 8% of the participants and multiple pregnancy occurred in only 2% of the women (Figure 2). Some previous histories of interest during this study were: a history of UTI during pregnancy which occurred in 59%; CV in 65%, PRM in 24%, and pre-eclampsia/eclampsia in 5% (Figure 3).

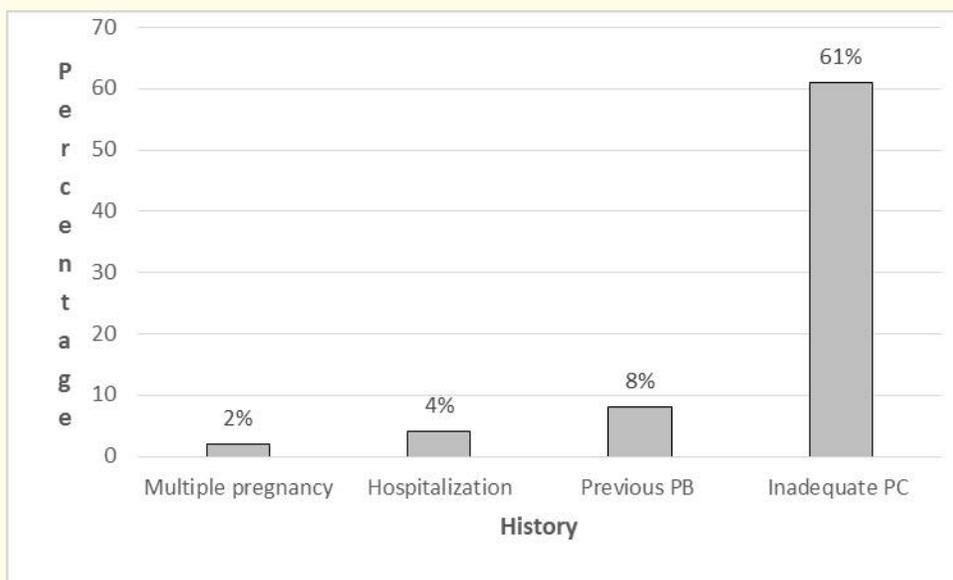


Figure 2: Histories of interest in women from the study (PB, premature birth; PC, prenatal care).

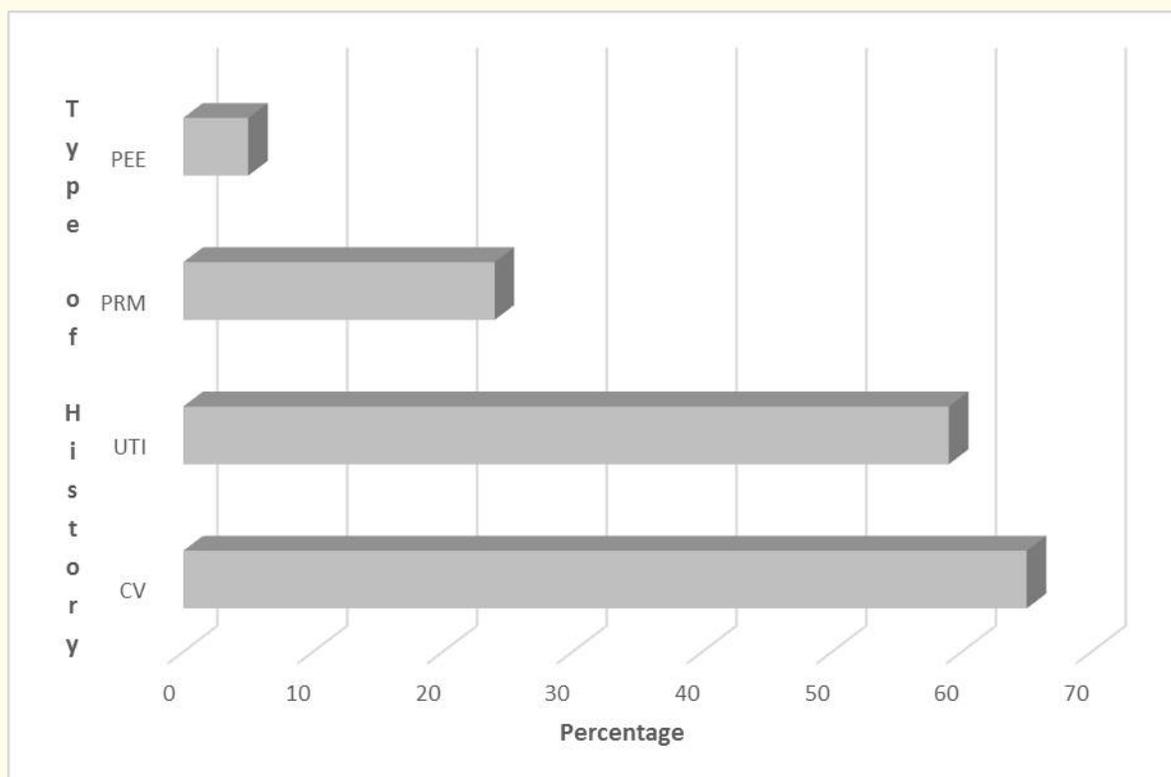


Figure 3: Important previous histories of the participants. CV: Cervicovaginitis; UTI: Urinary Tract Infection; PRM: Premature Rupture of Membranes; PEE: Preeclampsia/Eclampsia.

The differences observed in education and occupation were not significant. In contrast, the factors associated with PB were living in a rural population, 77.5% (OR 3.8, 95% CI 1.08 - 2.89, $p = 0.0169$), age < 18 years, 15.9% (OR 3.28, 95% CI 3.25 - 15.2, $p < 0.05$), previous hospitalization, 8.7% (OR 4.5, 95% CI 1.55 - 13.97, $p = 0.0013$), fewer than five prenatal consultations, 78% (OR 8.0, 95% CI 4.90 - 13.26, $p < 0.05$), history of PB in a previous pregnancy, 13%, (OR 3.2, 95% CI 1.45 - 7.25, $p = 0.0012$) and a history of UTI in the current pregnancy, 78% (OR 3.3, 95% CI 2.06 - 5.43, $p < 0.05$) (Table 2).

| Factor | With PB n = 138 (%) | Without PB n = 293 (%) | OR | 95% CI | p |
|---------------------------------|------------------------|---------------------------|------|--------------|---------|
| Population | | | | | |
| Rural | 107 (77.5) | 194 (66.2) | 1.7 | 1.08 - 2.89 | 0.0169 |
| Urban | 31 (22.4) | 99 (33.8) | | | |
| Age | | | | | |
| < 18 years | 22 (15.9) | 48 (19.6) | 7.02 | 3.25 - 15.2 | 0.00000 |
| ≥ 18 years | 16 (8.4) | 245 (80.4) | | | |
| Previous hospitalization | | | | | |
| Yes | 12 (8.7) | 6 (2.0) | 4.5 | 1.55 - 13.97 | 0.0013 |
| No | 126 (91.3) | 287 (98.0) | | | |
| APC | | | | | |
| No | 107 (77.5) | 88 (30.7) | 8.0 | 4.90 - 13.26 | 0.00000 |
| Yes | 31 (22.5) | 205 (69.3) | | | |
| Previous PB | | | | | |
| Yes | 18 (13) | 13 (4.4) | 3.2 | 1.45 - 7.25 | 0.0012 |
| No | 120 (87) | 280 (95.6) | | | |
| UTI | | | | | |
| Yes | 107 (77.5) | 149 (50.8) | 3.3 | 2.06 - 5.43 | 0.00000 |
| No | 31 (22.5) | 144 (49.2) | | | |

Table 2: Factors associated with PB in pregnant women from Tula, Hidalgo.

PB: Premature Birth; APC: Adequate Prenatal Care (< 5 medical consultations during pregnancy); Previous PB: History of Premature Birth in Previous Pregnancy; UTI: History of Urinary Tract Infection during this Pregnancy.

Discussion

In the United States, it is estimated that medical, educational, and loss of productivity costs associated with PB amount to 26 billion dollars [14]. This is due to the disease burden caused by PB and its complications during the entire pregnancy, labor, and postpartum process. In our study, a frequency of PB of 7.5% was found, a figure similar to that reported in developed countries [2]. However, far from being an adequate situation, our secondary care hospital has limited infrastructure for the care of premature newborns since our neonatal intensive care unit only has four beds. In the last year of the study period (2012), a total of 2,896 births were registered, of which 232 were premature. In absolute numbers, this represents four premature births per week, an amount that exceeds the installed medical care capacity for these cases.

Thus, it is important to identify risk factors associated with PB in our setting because strategies need to be developed to reduce them. In our series, we identified at least six out of 12 factors that could explain the PB in medical units similar to ours. UTI was documented in 59% of the pregnancies, 13% more than other studies [13]. Likewise, the population of adolescent pregnant women in our study (15%) was 30 times higher than that found in other studies [8]. With regard to mortality, in this series, 23% of premature newborns died, a number that is lower than other similar studies [13].

We did not find an association between PB and factors such as psychosocial stress, alcohol consumption during pregnancy, and periodontal disease [7,10,11]. In the first case, this factor was not explored since the source of information was the clinical record and this aspect was not recorded. In the second case, although this is an aspect that should be recorded in the record medical, in our study only one medical record reported the consumption of alcohol. With regard to the third factor, this should also be recorded in the medical record but in our series odontological care was not registered in any of the medical records analyzed.

More research is necessary in our setting to corroborate our findings and to design intervention strategies aimed at the timely detection of risk factors so they can be modified and eventually eliminated, contributing in this way to decrease the frequency of PB and its complications which have a high cost in lives, quality of life and specialized medical care to the population and the health system.

Conclusions

The present exploratory work in the General Hospital of Tula managed to identify the frequency of PB and its associated factors, which will allow the design and implementation of strategies to modify these factors and help provide better quality of obstetric care that will contribute to reduce maternal and neonatal morbidity and mortality.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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