Maternal Variables as Potential Modifiable Risk Indicators of Preterm Labor in Jeddah, Saudi Arabia

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Abstract

**Background:** This study sought to estimate the prevalence of preterm births in Jeddah, (Western) Saudi Arabia with a view to understanding the extent of the public health problem, and to gain insight into the assessment of the most common maternal risk indicators associated with this condition in the Saudi Arabian population.

**Methods:** De-identified data preterm births over the period of six months were obtained from the medical records of Al-Azizyah Maternity and Children Hospital in Jeddah, Kingdom of Saudi Arabia. Maternal demographics (age, Parity, follow up and pregnancy index) were included in the analysis. Gestational age, gender, birth weight, mode of delivery and outcome of each preterm baby were the other variables included.

**Results:** In this study, 899 births were reported during the study period of those 123 births were preterm. Late preterm births were the most common of the three gestational ages constituting 58.6% of the total number of preterm born within the study period. The prevalence of preterm birth among Saudi women in Jeddah city, Saudi Arabia, was 13.7%. Multi Gravidae women were twice more likely to give birth to preterm baby than their primi Gravitate counterparts. The most reported maternal risk indicators were anemia (34.1%), followed by Positive Urine infection (23.6%) and 2nd trimester VB (20.3%).

**Results:** This research identified the prevalence of preterm births of infants in Jeddah, Saudi Arabia over a six month period, and highlighted the risk indicators involved.

**Keywords:** Maternal; Pre-term birth; Risk Saudi Arabia

Introduction

A preterm birth is defined as a birth of an alive infant before 37 weeks (259 days) of gestation [1]. It is estimated that world-wide some 15 million preterm babies are born annually, at a rate of approximately 1 in 10 babies [1,2]. The rate is typically higher in developing countries, with some research estimating the risk at 120 times greater than in developed countries [3]. According to the WHO, it is estimated that in Saudi Arabia in 2010 some 35,700 preterm births occurred [4]. Of those, 2,900 preterm infants died due to complications. Interestingly and of unknown cause there is an increasing rate of preterm birth. A recent Saudi Arabian case-control study in Jazan city [5], concluded that the prevalence of spontaneous preterm birth was considerably high in Jazan (8.24%) in comparison with other developing countries. Worldwide prematurity is the leading cause of neonatal mortality and the second leading cause of death in children under the age of five (after pneumonia). Unfortunately, one million children die every year as a result of preterm birth complications [1]. Inequalities in survival rates around the world are stark. In low- income settings, half of the babies born at 32 weeks (two months early) die due to a lack of feasible, cost-effective care, such as warmth, breastfeeding support, and basic care for infections and breathing difficulties [2]. In developed countries, almost all of these babies survive. It must be recognized that even survivors are facing a lifetime of physical and mental disability, learning disabilities and visual and hearing problems [6,7].

In Saudi Arabia the birth rate continues to rise, and in 2014 it was estimated at 18.78 births/1,000 people with an estimation of 14.58 infant deaths/1,000 live births [8]. A consequence of prevalence in western region of Saudi Arabia is unknown, and prior estimates are likely to be obsolete in light of newer changing patterns of maternal risk indicators among Saudi population. This current study therefore aims to estimate the prevalence of preterm births in Jeddah, (Western) Saudi Arabia with a view to understanding the extent of the public health problem, and to gain insight into the assessment of the most common maternal risk indicators associated with this condition in the Saudi Arabian population.

Materials and Methods

**Ethics**

Ethical approval for the study was obtained from the Ethics Committee (HREC) at The University of Western Australia and Ethics Committee at Al-Azizyah Maternity and Children Hospital. All data were de-identified.

**Data collection/source**

De-identified data was obtained from the medical records of Al-Azizyah Maternity and Children Hospital in Jeddah, Kingdom of Saudi Arabia. This is a tertiary-care hospital with a catchment of over 3.6 million people in Jeddah region. The study sample included preterm births over the period of six months (from 1st of January 2014 to 30th of June 2014). Maternal demographics (age, Parity, follow up and pregnancy index) were included in the analysis. Gestational age, gender, birth weight, length, head circumference, mode of delivery and outcome of each preterm baby were the other variables included.

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Classification of preterm births method

Data was re-coded using the gestation age of each baby into: Extremely preterm (those born before 28 weeks of gestation) 28 Very preterm (those born between 28 and 32 weeks) and Late preterm (those born between 32 and 37 weeks) based on the McGuire and Fowlie classification.

Software

SPSS 21 for Windows (Statistical package for the social sciences; SPSS, Chicago, IL, USA) software was used for analysis. ANOVA test and Pearson Chi-square test with 95% confidence intervals were used to assess significant associations between variables. Statistical significance was set at 95%, and p-values less than 0.05 considered significant. A multinomial regression analysis was used to assess the relationship between preterm births classification (categorical variable) as a dependent variable and reported risk indicators as predictors or independent variables (categorical variables).

Results

In this study, 899 births were reported during the study period of those 123 births were preterm. From our sample the prevalence of preterm birth among Saudi women in Jeddah city, Saudi Arabia, was 13.7%.

The mean age of mothers in the sample at time of birth was 31.3 ± 5.5 years old. In the sample, the mean gestational age (in weeks) of preterm births was 32.9 ± 2.8 years, with a mean weight of 2.56 ± 0.7 kg. Multi Gravidae women were twice more likely to give birth of preterm baby than their primi Gravidae counterparts (Table 1). The most reported maternal risk indicators were anemia (34.1%), followed by Positive Urine infection (23.6%) and 2nd trimester VB (20.3%) (Table 1).

Other lower risk indicators accounting for the remainder 22% were being diabetic (6.5%), hypertension (5.7%), and pre-eclampsia (9.8%). With respect to gender, more than a third (36.6%) of the pre-term births were males whereas the majority 63.4% was females. In terms of follow-up, the proportion for regular was greater at 68.3% compared to others for whom it is less than 5%. It is also more common among multi-gravidae women (18.7%) compared to primi-gravidae women (9.7%) women. With respect to maternal risk indicators, 8.1% of incidents were preterm births among those with 2nd trimester VB (0.8%).

Late preterm

Late preterm births were the most common of the three gestational ages constituting 58.6% of the total number of babies, and were mostly males (39.9%). They were most prevalent among the 30-35 age group accounting for over a quarter (26%) of the total for this gestational age, among multi-gravidae women (41.5%), and those who undertook regular follow-up (40.7%). In terms of risk indicators, late preterm births are most common among those with the risk-factor of anaemia (26%) followed by positive urine infection (18.7%). In contrast, this gestational age appears to be least common amongst mothers aged 18-23 among whom the prevalence is 4.9% and those with 2nd trimester VB (0.8%).

Very preterm

Very preterm births are also most prevalent among the same 30-35 year age group of mothers (as for late preterm births) with a rate of 15.4% compared to others for whom it is less than 5%. It is also more common among multi-gravidae women (18.7%) compared to primi-gravidae women (9.7%) women. With respect to maternal risk indicators, 8.1% of incidents were preterm births among those with 2nd trimester VB (0.8%).

Table 1: Bivariate analysis of risk indicators for preterm births among Saudi woman; Pearson Chi-square p<0.05.
trimester VB, and 7.3% with anaemia (7.3%) whereas it is least common among those with hypertension (0.8%). With respect to gender, 16.3% of births were of very preterm males compared to 12.2% females, and 21.1% of mothers had regular follow-up compared to 7.3% not regular.

**Extremely Preterm**

Extremely preterm births were less frequent than later preterm births, and they occurred for 4% of births for each of the two lowest age groups, namely 18-23 and 24-29. These frequencies compare to 3.2% for the age range 30-35, and 1.6% for the over 35 year category. In terms of parity, both primi and multi gravidae women experienced the same proportion of extremely preterm births (6.5%), and this proportion was also the same in the case of regular and non-regular follow up. The pregnancy index however, showed marked differences. Extremely preterm birth appear to be almost exclusively prevalent among those women with 2nd trimester VB for whom the proportion was 11%. The only other minor indicators were anaemia and pre-eclampsia, and in both these cases the proportion was 0.8%. The gender difference was small, with 5.7% of prevalence among female births, and 7.3% among male babies.

**Multinomial regression analysis**

The multinomial regression analysis revealed a particular independent variable to be significant (at the 5% level of significance) in differentiating both the very preterm and extremely preterm birth categories from the reference gestational age of late preterm. This variable is 2nd trimester VB, and the p-values in their cases are 0.044 and 1.2 respectively. However, the standard error for the 18-23 age groups in the extremely preterm category has a value greater than 2 (2.203), which may be indicative of numerical issues such as multicollinearity among its independent variables. Also notably, the gender of the baby was not a differentiating factor for either category, nor was the age of the mother, parity or any other factor.

**Discussion**

This study sought to estimate the prevalence of preterm births in Jeddah, with a view to determine the extent of the problem, and identify the most common possible associated maternal risk indicators. In particular, it satisfied the need to obtain a current estimate of its prevalence in the western region of Saudi Arabia, which was previously

| Preterm stage | Risk indicators | B   | S.E. | Wald | df  | Significance | Odds ratio |
|---------------|-----------------|-----|------|------|-----|-------------|------------|
| Extremely preterm | Mother age (in years) |     |      |      |     |             |            |
| 18-23 | 2.850 | 2.203 | 1.674 | 1 | .196 | .058 |
| 24-29 | 2.574 | 1.847 | 1.943 | 1 | .163 | .076 |
| 30-35 | 1.690 | 1.549 | 1.190 | 1 | .275 | .184 |
| >35  | .936  | 1.174 | .635 | 1 | .425 | 2.549 |
| Parity | Primi  | .659  | .928 | .505 | 1 | .477 | .517 |
|        | Gravidae Multigavidae | .659  | .928 | .505 | 1 | .477 | .517 |
| Followup Pregnancy index | Regular Notregular |     |      |      |     |             |            |
| 18-23 | 5.888 | 1.920 | 9.399 | 1 | .002 | 360.578 |
| 24-29 | -18.315 | 6669.3 | 0.000 | 1 | .998 | 1.112-008 |
| 30-35 | -19.648 | .000 | .000 | 1 | 2.931-009 |
| >35  | -1.029 | 1.561 | .434 | 1 | .510 | .357 |
| Parity | Diabetic Anaemia Hypertension Pre-eclampsia | -18.700 | 1.000 | .000 | 1 | .756-009 |
| Followup Pregnancy index | Baby Gender | Female Male | 1.369 | .903 | 2.298 | 1 | .130 | 3.932 |
| Very preterm | Gender Mother age (in years) |     |      |      |     |             |            |
| 18-23 | .628  | 1.248 | .253 | 1 | .615 | 1.873 |
| 24-29 | .232  | .960 | .059 | 1 | .809 | 1.262 |
| 30-35 | 1.140 | .763 | 2.232 | 1 | .135 | 3.127 |
| >35  | .112  | .607 | .034 | 1 | .853 | 1.119 |
| Parity | Primi  | .112  | .607 | .034 | 1 | .853 | 1.119 |
|        | Gravidae Multigavidae | .112  | .607 | .034 | 1 | .853 | 1.119 |
| Followup Pregnancy index | Regular Notregular |     |      |      |     |             |            |
| 18-23 | 2.708 | 1.344 | 4.056 | 1 | .044 | 14.992 |
| 24-29 | -1.272 | .845 | 2.264 | 1 | .132 | .280 |
| 30-35 | .283  | .993 | .081 | 1 | .775 | 1.327 |
| >35  | -1.194 | .770 | 2.402 | 1 | .121 | .303 |
| Parity | Diabetic Anaemia Hypertension Pre-eclampsia | -1.881 | 1.327 | .441 | 1 | .507 | .414 |
| Followup Pregnancy index | Baby Gender | Female Male | .754  | .506 | 2.218 | 1 | .136 | 2.124 |

* Significant value (as p<0.05) The reference category is: Preterm. (B= Coefficient for the constant, S.E. = Standard Error. Wald = Waldchi-square test. df= degree of freedom).

Table 2: Multinomial regression analysis of reported risk indicators based of prematurity.
unknown. The prevalence in the sample examined was 13.7%. This compares unfavorably with the global average estimated by WHO of 10%, 1 and is higher than the value of 8.24% obtained by Kamal (2010) for the city of Jazan also in the Saudi kingdom. Given the large number of births (899) examined, this proportion of 13.7% should be a cause for concern in Jeddah. This is because of higher death rates among preterm infants due to complications, 1 and the higher prevalence of health issues, including physical, mental or learning disabilities, and visual/ hearing problems among those who survive.6 In order to manage these health problems appropriately, and resort to preventive measures, it is necessary to identify those at higher risk for pre-term delivery, including possible risk indicators and risk factor assessment. Most of the preterm births were of male babies (63.4%) compared to females, most of whom (39.9%) were late preterm. In this sample, mothers in the older age group of 30-35 years were most likely to have preterm births, with a prevalence of 55%. However, there does not appear to be an association of preterm births incidences with age. The proportion of preterm births is greater in higher age groups compared to lower age groups up to the age group of 30-35 years, but the proportion for women over 35 is less than half. This confirms Al-Kadri et al’s (2014) finding of preterm births being more common in specific age groups, but the prominent age group differs in that they found preterm births most prevalent among women aged 16-19 whereas this study supports the 30-35 age group as having the highest rate of preterm births. In fact, this study shows that a preterm births in Jeddah is over 3.2 times more likely to occur among women aged 30-35 than it is among those aged 18-23. Also, multi gravidae women are twice as likely (66.6%) compared to primi gravidae women (33.3%) to be susceptible to the condition.

As mentioned, the most reported maternal risk indicators were anemia (34.1%), followed by Positive Urine infection (23.6%) and 2nd trimester VB (20.3%) (Table 1). All other indicators (diabetes, hypertension and pre-eclampsia) were less prevalent than 9.8%, which was the frequency for pre-eclampsia. The latter (2nd trimester VB), which is vaginal bleeding during the second trimester, was also shown by the multinomial regression analysis (Table 2) to be a distinguishing factor between the three gestational ages. This condition is a common occurrence during pregnancy [10,11] and has been associated with early fetal loss, low birth weight and preterm labour in other studies, such as by Ramaeker & Simhan (2011) [12]. Sharami et al. (2013) for instance, found that VB increases the risk of preterm delivery 3 times, and that the outcome of preterm labour specifically is dependent on the characteristics of bleeding time, frequency, severity and intensity [11].

They recommended interventions during VB to prevent a preterm birth. Previous studies have also established adverse outcomes specifically for first trimester [13] and third trimester VB, [14] but this study specifically examined the 2nd trimester and lends support to other studies that have also linked this trimester to the occurrence of preterm births.

Conclusion

This research identified the prevalence of preterm births of infants in Jeddah, Saudi Arabia over a six month period, and highlighted the risk indicators involved. These results can contribute towards the early identification of women at risk of preterm delivery, emphasize the importance of providing affordable health services, and promote health for all Saudi infants born prematurely.

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