Hyperinsulinemia and Preeclampsia among Pregnant Women: A Quantitative Study

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Author’s contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i41A32335

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Complete Peer review History: https://www.sciarticle4.com/review-history/72170

ABSTRACT

Hypertensive disorders in pregnancy complicate 1 in 10 pregnancies, often associated with maternal and neonatal mortality and morbidity. The study was done on 100 pregnant women’s attending antenatal clinic of Sree Balaji Medical College & Hospital, Chromepet, Chennai, during the period from December 2013 - May 2015. All women who met the inclusion and exclusion criteria were taken into the study. Fasting insulin was calculated at 18-22 weeks of gestation, and then follow up of cases was done for signs of development of Pregnancy-induced hypertension (PIH). In the hypertensive group, the bulk of the patients were between the ages of 25 and 30. As (P > 0.05), there is no statistical significance in correlation between age and (PIH) in our study. Out of 100 cases studied, 64 cases (64%) had hyperinsulinemia. The remaining 36 cases (36%) had normal insulin values. The prevalence of PIH associated with hyperinsulinemia was 58% in our study. This test showed sensitivity of 87%, specificity of 82%, positive predictive value of 90%, negative predictive value 77% and diagnostic accuracy was 92%.

Keywords: Hyperinsulinemia; preeclampsia; hypertension.

1. INTRODUCTION

Pregnancy is a physiological stress associated with many complex and interrelated biochemical, physiological and anatomical alterations occurring in the body. More emphasis is laid on the biochemical changes seen in the blood during the normal pregnancy and are
exaggerated in various complications of pregnancy. Hypertensive disorders of pregnancy, one of the commonest complications of pregnancy, are a leading cause of maternal mortality. The hypertensive disorders of pregnancy are high in developing countries. Collectively these disorders complicate 5-10% of all pregnancies [1].

Hypertension in pregnancy is also responsible for fetal and infant mortality as well as 46% of infants born small for gestation [2]. Similarly it was estimated that 3-10% of infants are growth restricted. Fetal growth restriction is associated with substantive perinatal morbidity and mortality [3,4,5].

2. MATERIALS AND METHODS

This study is a prospective study which involves a group of 100 women who attend the antenatal clinic of SreeBalaji Medical College and Hospital. The purpose of this study is to estimate fasting insulin as a predictor of pregnancy induced hypertension.

The values are tabulated. Subsequently the subjects were followed up for regular antenatal care at 2 weekly intervals until 36 weeks & weekly thereafter until delivery and 4 weeks after delivery till 12 weeks. The primary outcome is the development of gestational hypertension.

The statistical analysis has been carried out with IBM SPSS Version - 20. Categorical variables will be analyzed with chi square test. Continuous variables are presented as Mean (SD). For normally distributed data (e.g., BW, Age, and BP) between groups’ analyses was done. For statistical significance, a two tailed probability value of less than 0.05 will be considered.

3. RESULTS

Table 1 shows, 66% in pregnancy induced hypertension group, remaining 34% are in normal group.

Table 1. Incidence of pregnancy induced hypertension

| Incidence of PIH | No of cases | Percentage |
|------------------|-------------|------------|
| Normal           | 34          | 34.0%      |
| PIH              | 66          | 66.0%      |
| Total            | 100         |            |

Fig. 1 shows the age distribution, mean age of the women in this study group with PIH is 31-37 years. Majority of women under the age group 18 -24 years in normotensive patients. Where as in hypertensive group majority of the patients were under 25 -30 years age group. As (P > 0.05), there is no statistical Significance in correlation between age and pregnancy induced hypertension.

Fig. 2 shows, hypertensive patients most of the cases were under 29 .9 BMI classification, when compared to normotensive patients. Chi square value =0.1 50, p >0.05. There is no significant difference in BMI groups and development of PIH.

Fig. 3 shows distribution according to parity, Majority of them were multigravida. There is no statistical significant difference in parity between normotensive and hypertensive patients.

Table 2. Family history

| Family history | No of cases | Percentage |
|----------------|-------------|------------|
| No             | 90          | 90.0       |
| YES            | 10          | 10.0       |
| Total          | 100         | 100.0      |

Table 2 shows, In the present study, 10% had family history of pregnancy induced hypertension, whereas remaining 90% were nil significant.

Of the 25 vaginal deliveries, 12 were spontaneous; one case was induced with misoprostol and12 cases with prostaglandin E2 gel. All the cases were monitored alternately by antepartum surveillance and CTG. ARM and Oxytocin acceleration was done in as per necessary with close monitoring of fetal heart rate. 3 cases required forceps extraction and 2 cases vacuum application (Table 3).

Of the total cases, 8 women had previous LSCS, repeat LSCS was done for them.In rest 62 cases and Emergency LSCS was done in view of both abnormal CTG pattern and fetal distress, failed induction.

In the present study, babies of 56.06% (37/66) with hyperinsulinemia had NICU stay which indicates adverse perinatal outcome compared to normal insulin levels and 20.58%(7 /34) of the babies born to cases with normal insulin levels had NICU stay (Table 4).
Fig. 1. Age distribution in years

Fig. 2. BMI with outcome

Fig. 3. Parity with outcome
| Mode of delivery | No of cases (hyperinsulinemia) | No of cases· (normal insulin) | Total |
|------------------|-------------------------------|-------------------------------|-------|
| Elective LSCS    | 4                             | 4                             | 8     |
| Emergency        | 40                            | 22                            | 62    |
| LSCS             | 18                            | 7                             | 25    |
| Spontaneous vaginal delivery | 1       | 2                             | 3     |
| Outlet forceps application | 1   | 1                             | 2     |
| Vacuum assisted  | 64                            | 36                            | 100   |

Table 4. Hyperinsulinemia and Perinatal Outcome

| Insulin             | Healthy baby | NICU | Still birth | Total |
|---------------------|--------------|------|-------------|-------|
|                     | No | %   | No | %   | No | %   | No | %   | No | %   |
| Hyperinsulinemia    | 29 | 43.93 | 37 | 56.06 | 0  | 0  | 66 | 66%          |
| Normal insulin      | 26 | 76.47 | 7  | 20.58 | 1  | 2.94 | 34 | 34%          |
| Total               | 55 | 55   | 44 | 44   | 1  | 1  | 100 | 100.00       |

4. DISCUSSION

In 5 to 10% of pregnant women, hypertension develops, making it the leading cause of maternal death in our country and around the world. Establishing an accurate diagnosis of preeclampsia and proceeding with early treatments after it is established is one strategy to lessen the impact of arterial hypertension on maternal mortality. Preeclampsia is diagnosed when a pregnant woman has high blood pressure (> 140/90 mm Hg) after the 20th week of pregnancy (without a previous history of arterial hypertension) and substantial proteinuria (>300 mg in 24 hours). [6,7].

These symptoms are now thought to be a late symptom of an illness that has been present since the first trimester of pregnancy. Because of this “diagnostic delay,” numerous tests have attempted to diagnose preeclampsia as soon as possible, sometimes even before the patient develops arterial hypertension. Doppler ultrasonography examination of maternal and foetal circulation, as well as uric acid, have been reported as early diagnostic tests for preeclampsia [8,9]. Hyperinsulinemia has been seen in patients with pregnancy-induced hypertension, according to the investigations. In both cross-sectional and cohort studies, pregnancy-induced hypertension has been linked to hyperinsulinemia. The majority of women with hyperinsulinemia had pregnancy-induced hypertension, according to the current study. In our study, the prevalence of PIH associated with hyperinsulinemia was 58%. At 12-20 weeks of pregnancy, fasting insulin was determined, and cases were followed up on for symptoms of PIH development. This test showed sensitivity of 87%, specificity of 82%, positive predictive value of 90%, negative predictive value 77% and diagnostic accuracy was 92%.

All the cases were monitored by ante partum surveillance. In the present study, 25 women had vaginal deliveries. Of these, 12 had spontaneous onset of labour while others were induced. One case was induced with misoprostol and 12 cases with prostaglandin E2 gel, after assessing their Bishop’s score. Indication for induction was severe pre-eclampsia. During labour, ARM and Oxytocin acceleration was done when required with close monitoring of fetal heart rate. 3 cases required forceps and in 2 cases vacuum was applied.

In the present study, babies of 56.06% (37/66) with hyperinsulinemia had NICU stay which indicates adverse perinatal outcome (in terms of neonatal complications which included birth asphyxia, Meconium aspiration syndrome, hyperbilirubinemia, respiratory distress syndrome, etc) compared to normal insulin levels in which 20.58% (7/34) of the babies had NICU admission. Whereas, Gupta [10] 55.1% of cases with hyperinsulinemia had NICU admission. The prevalence of PIH associated with hyperinsulinemia was 58% in our study. This test
showed sensitivity of 87%, specificity of 82%, positive predictive value of 90%, negative predictive value 77% and diagnostic accuracy was 92%. Early screening for preeclampsia may allow vigilant antenatal surveillance and appropriate timing of fetal delivery in order to avoid serious sequelae. Preeclampsia is frequently described as a state of insulin resistance [11]. Many features of insulin resistance like hypertension, hyperinsulinemia, glucose intolerance and lipid abnormalities are associated with this condition [12]. Insulin resistance, inflammation and atherosclerosis appear to be linked via the metabolic syndrome. Insulin resistance is associated with elevated levels of various proinflammatory markers which cause endothelial dysfunction and initiate the atherosclerotic cascade [13]. In several studies conducted postpartum, women with a history of preeclampsia have been shown to be more insulin resistant when compared with women with normotensive pregnancy [14-16].

5. CONCLUSION

The high frequency of preeclampsia in women with diabetes underscores the need for more study into the pathogenesis, prognostic markers, therapy, and long-term health consequences of preeclampsia in this population. From this study, we can conclude that pregnant women with increased insulin values are likely develop pregnancy-induced hypertension. The occurrence of preeclampsia is significantly linked to increased insulin resistance. Insulin resistance can thus be utilized as a biomarker for preeclampsia diagnosis.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

Informed consent was obtained from all study participants and as per international standard or university standard written ethical approval has been collected and preserved by the author(s). ICH/GCP guidelines were followed.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here: https://www.sdiarticle4.com-review-history/72170