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EFFECT OF ANTENATAL BETAMETHASONE ON BLOOD SUGAR LEVELS OF PATIENTS WITHOUT GESTATIONAL DIABETES MELLITUS (GDM)

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Abstract

Objective:
To determine the frequency of hyperglycemia in hospitalized pregnant non-diabetic females due to risk of threatened pre-term delivery receiving betamethasone.

Methods:
This descriptive study was conducted in Lady Aitchison Hospital Lahore from April 2024 to October 2024. We included 128 non-diabetic women in whom betamethasone was given due to the risk of threatened abortion between the gestational age of 24 to 33 weeks. In all patients, Betamethasone 12 mg was given intramuscularly, followed by a second 12 mg dose 24 hours after the first dose. After administration of 2nd dose, fasting blood sugar levels were performed after 24 hours to determine the frequency of hyperglycemia (fasting blood sugar levels ≥90 mg/dL).

Results:
The mean age of included patients was 31.6±6.1 years. Mean gestational age at the time of ACS administration was 28.3±2.3 weeks. Mean body mass index (BMI) of patients was 29.8±2.5 Kg/m^2. Out of 128 patients, hyperglycemia was diagnosed in 83 (64.84%) patients.

Conclusion:
Hyperglycemia is a common complication in non-diabetic patients receiving ACS. So regular monitoring of blood sugar levels should be performed in patients receiving ACS

INTRODUCTION

The most common reason for prenatal hospitalization and the leading cause of newborn mortality is preterm delivery. About 9.9% of all live births occur before term, and about 50% of these preterm deliveries are preceded by premature labor. In addition to contributing to 25–50% of cases of long-term neurologic damage in children, preterm birth accounts for about 70% of neonatal fatalities and 36% of infant deaths.[1, 2]

Administering antenatal corticosteroids (ACS) to expectant mothers before they experience preterm labor is recognized as a major breakthrough in perinatal medicine.[3] Numerous randomized controlled trials (RCTs) have provided compelling evidence that supports the use of ACS in reducing risks associated with early preterm birth, including perinatal mortality, respiratory distress syndrome (RDS), and other adverse outcomes for newborns, while showing minimal or no risk of harm.[4,5] As a

result, clinical practice guidelines strongly advocate for the use of ACS as a standard procedure for all women who are deemed to be at imminent and very high risk of early preterm birth. This recommendation applies regardless of the reasons for the preterm labor or the planned delivery method.[6, 7]

Research has shown that the administration of antenatal betamethasone significantly alters the biochemical landscape of cord blood at birth. Specifically, this intervention leads to elevated levels of betamethasone while simultaneously decreasing cortisol concentrations. This pattern suggests a suppression of the fetal hypothalamic-pituitary-adrenal (HPA) axis, which is crucial for regulating stress responses and metabolic functions in the body. Notably, the effects of this suppression can persist for up to seven days following treatment.[8,9] Moreover, the analysis of cord blood has revealed increased concentrations of glucose and C-peptide. These findings raise concern about the potential for hyperinsulinemia in newborns exposed to antenatal betamethasone, as elevated C-peptide levels signify increased insulin production. Hyperinsulinemia can predispose these infants to hypoglycemia shortly after birth, whereby their blood glucose levels drop dangerously low. The implications of this situation extend beyond immediate neonatal care. Newborns experiencing significant fluctuations in glucose levels may require close monitoring and possibly admission to the neonatal intensive care unit (NICU) for specialized treatment. This critical intervention aims to stabilize their glucose levels and mitigate any immediate health risks. Furthermore, the exposure to altered endocrine states during crucial periods of fetal development may carry longer-term risks, potentially impacting neurodevelopmental outcomes.[10] Recent guidelines recommend titrating the dose of insulin to prevent hyperglycemia in women with gestational diabetes; however, no guidelines currently exist for managing hyperglycemia in non-diabetic mothers.[11] Recent studies have emphasized the necessity of initiating transient insulin therapy in women with normal blood sugar levels prior to the administration of betamethasone, should hyperglycemia occur. Consequently, certain researchers advocate for the thorough monitoring of pregnant women during the BM administration period.[12]

In this study, we determined the frequency of hyperglycemia in hospitalized pregnant non-diabetic females due to risk of threatened pre-term delivery receiving betamethasone.

METHODS:

This descriptive study was conducted in Lady Aitchison Hospital Lahore from April 2024 to October 2024. We included 128 women in whom betamethasone was given due to the risk of threatened abortion between the gestational age of 24 to 33 weeks. We only included non-diabetic women. Women having gestational diabetes, impaired fasting glucose or impaired glucose tolerance at 24 weeks (OGTT test), metabolic syndrome, or contraindications to steroids were excluded.

Data regarding patients age, gestational age, and body mass index (BMI) was obtained for each patient.

In all patients, Betamethasone 12 mg was given intramuscularly, followed by a second 12 mg dose 24 hours after the first dose. After administration of 2nd dose, fasting blood sugar levels were performed after 24 hours to determine the frequency of hyperglycemia (fasting blood sugar levels ≥90 mg/dL).

The collected data was entered and analyzed accordingly using SPSS version 23. Quantitative variables such as age, gestational age, and BMI were presented as mean and standard deviation. Qualitative variables such as hyperglycemia was presented as frequency and percentage.

RESULTS:

The mean age of included patients was 31.6±6.1 years. Mean gestational age at the time of ACS administration was 28.3±2.3 weeks. Mean body mass index (BMI) of patients was 29.8±2.5 Kg/m^2 (Table 1). Out of 128 patients, hyperglycemia was diagnosed in 83 (64.84%) patients (Figure 1).

Table 1. Baseline Characteristics.

Age (Years)	31.6±6.1
Gestational Age (Weeks)	28.3±2.3
Body Mass Index (Kg/m^2)	29.8±2.5

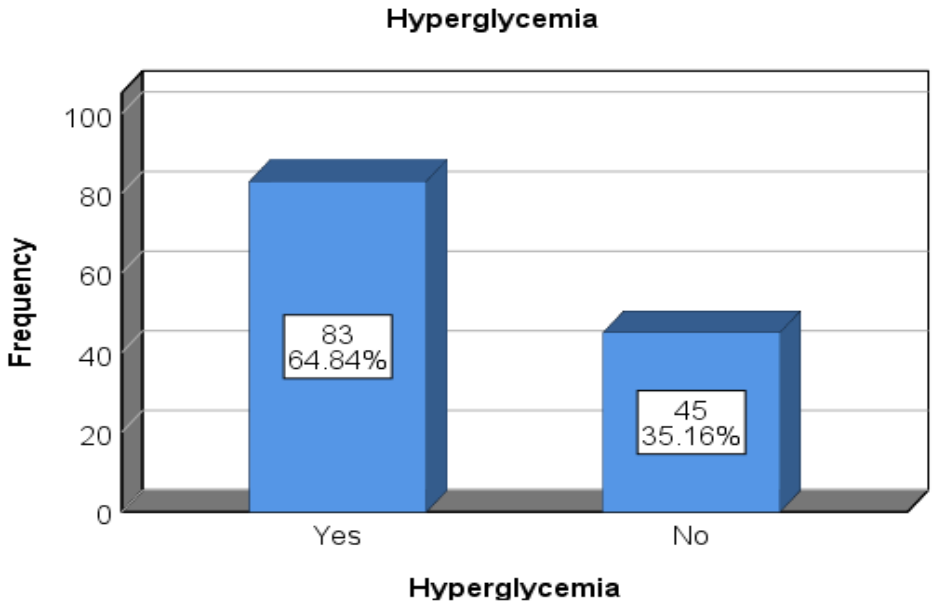

Figure 1. Frequency of Hyperglycemia.

DISCUSSION:

Antenatal corticosteroids are advised for expectant mothers who are at risk of premature delivery, ideally given between 24 and 34 weeks of gestation.[13] A common side effect associated with the use of antenatal corticosteroids is steroid-induced hyperglycemia which can increase the likelihood of experiencing preterm births, whether spontaneously or through medical induction. Our research indicates that a notable percentage of patients develop hyperglycemia following corticosteroid treatment, even among those who do not have a prior diagnosis of diabetes. In our study, we observed that the incidence of hyperglycemia was 64.84%. In this study, we found a significant number of patients develop hyperglycemia after ACS, even if the patients was non-diabetic. The frequency of hyperglycemia in this study was 64.84%.

In a research conducted by Beena and colleagues, it was found that 62 out of 105 patients (66%) showed increased fasting blood sugar (FBS) and postprandial blood sugar (PPBS) levels on Day 2. Among those without gestational diabetes mellitus (GDM), approximately 62.9% required insulin following acute coronary syndrome (ACS). Furthermore, 71.4% of GDM patients managed with oral hypoglycemic agents (OHA) and 82.5% of those managing with medical nutritional therapy (MNT) also needed insulin. Among 35 patients in the GDM group who were on insulin, 23 were prescribed a higher dosage, while out of 12 patients with overt diabetes mellitus, 9 were also administered increased levels of insulin.[14]

In a retrospective study conducted by Kreiner et al., the researchers aimed to assess the effects of antenatal corticosteroids (ACS) on blood glucose levels, specifically fasting blood sugar (FBS) and postprandial blood sugar (PPBS). The study revealed significant findings: more than 90% of women experienced elevated fasting blood sugar levels, exceeding 95 mg/dL, on the second and third days following the administration of ACS. Furthermore, during the first three days post-treatment, at least one postprandial blood sugar reading was elevated over 120 mg/dL in a substantial proportion of women, ranging from 81% to 98%. This indicates that the administration of ACS had a considerable impact on blood glucose regulation during that period. Among the 55 patients diagnosed with gestational diabetes mellitus (GDM)

who received ACS, the necessity for insulin therapy became apparent. Specifically, 11 out of 19 women who had previously maintained blood sugar control through medical nutrition therapy (MNT) required insulin treatment, while 3 out of 6 patients who were utilizing oral hypoglycemic agents (OHA) also needed to start insulin therapy. These findings underscore the potential of ACS to disrupt glucose metabolism in pregnant women, highlighting the importance of close monitoring and appropriate management of blood sugar levels following their administration.[15]

In their research, Ramirez-Torres found that 10 healthy pregnant volunteers, who served as a control group and received 12 mg of betamethasone twice daily for one day, did not exhibit hyperglycemia. The study also revealed that among patients with gestational diabetes mellitus (GDM) who were managed solely through medical nutrition therapy (MNT), 40% required insulin. Additionally, those already on insulin experienced an increase in their daily dosage by 39–112%, while women with pre-gestational diabetes (Pre-GDM) needed to raise their insulin doses by 26–64%.[16]

The major limitation of present study is that we did not followed the patients so were not able to determine the time of normalization of hyperglycemia.

CONCLUSION:

Hyperglycemia is a common complication in non-diabetic patients receiving ACS. So regular monitoring of blood sugar levels should be performed in patients receiving ACS.

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