Prolactin and its correlation with gestational age and birth weight in a new born

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Abstract

Background: This study was conducted to assess the corelation of prolactin with gestational age and birth weigh in a new born.

Material and methods:Overall, 100 subjects had been recruited in this research. The participants were healthy, nulliparous women with singleton pregnancies. 50 case and 50 control samples were selected from the participants. Plasma samples obtained at 20 weeks of gestation were used. Following birth, pregnancy outcome data and infant measurements were recorded.

Results: There were no differences between groups for any maternal characteristics. SGA cases were delivered earlier than controls. No significant differences were detected in maternal plasma prolactin concentrations between the uncomplicated pregnancy and SGA groups. No differences were seen between the uncomplicated pregnancy and SGA groups in prolactin concentrations when the foetus was female. When the foetus was male, maternal prolactin concentrations were significantly lower in SGA pregnancies compared to uncomplicated pregnancies. Significant correlation of prolactin levels with gestation age was seen.

Conclusion: Prolactin at is likely to be useful biomarker for SGA, however this does not rule out its potential to be useful at a different time point of pregnancy.

Keywords: Prolactin, gestational age, birth weight

INTRODUCTION

Small for gestational age (SGA) infants account for about 30–50% of non-anomalous still-born infants and those that survive have an increase in the risk for neurodevelopmental delays, and cerebral palsy. Furthermore, the effects of being born SGA impacts on health as an adult, with increased risk of cardiovascular complications and diabetes in later life.[1] Identification during pregnancy, leading to intervention and timely delivery has been reported to lead to a four-fold reduction in perinatal death and severe asphyxia. Identifying SGA

before birth is difficult, however, and using population-based growth charts less than a quarter of all SGA babies are identified before birth[2].

Using customized antenatal growth charts that take into account a range of factors including maternal weight, height, and ethnicity can improve antenatal identification of SGA infants, but even with this improvement detection rates are reported to be only around 50%.[3] Recent analysis of a multi-centre cohort study (SCOPE) has identified key clinical variables at 15 weeks that are associated with later development of SGA. In that study, only one quarter (24.5%) of all SGA infants were identified before birth, highlighting the need to have improved methods for detecting SGA during pregnancy.[4]

As indicated in McCowan et al. (2013), the key next step for the development of a personalized algorithm for prediction of SGA is the identification of reliable biomarkers that can be combined with clinical risk factors.[5] One of the key hormones associated with pregnancy is prolactin. While prolactin is thought of primarily as a lactation hormone, it has also been implicated in a wide range of other functions, particularly during pregnancy.[6]

Prolactin concentrations increase progressively throughout pregnancy in women and the placenta also contributes the closely related human placental lactogen as an additional source of circulating hormone that can activate the prolactin receptor.Prolactin may also have a more direct role in foetal growth by influencing trophoblast invasion in early pregnancy, which when impaired, has been associated with SGA pregnancies.[7,8] In animal models, experimental suppression of placental lactogenic hormones is associated with fetal growth restriction. Collectively, these data are consistent with the hypothesis that changing levels of circulating hormones that act through the prolactin receptor, including prolactin and growth hormone from the maternal pituitary.[9.10]The aim of the current study was to investigate if pituitaryderived prolactin levels were reduced at 20 weeks of gestation in pregnancies that resulted in birth of SGA baby.

MATERIAL AND METHODS

The study involved recruiting 100 healthy women with singleton pregnancies who had not previously given birth. From this group, 50 cases and 50 controls were chosen. Blood samples were collected from all participants at 20 weeks of pregnancy, and pregnancy outcome data and infant measurements were recorded after delivery. The cases were defined as women who gave birth to babies with a weight below the tenth percentile adjusted for various factors, while the controls were women who delivered babies with a weight above the tenth percentile. Prolactin levels in maternal plasma samples were measured using commercially available ELISA assays, and both control and case samples were included in each assay plate. Results were analysed using Student's t-test for continuous variables and chi-square tests for categorical variables.

RESULTS

There were no differences between groups for any maternal characteristics. SGA cases were delivered earlier than controls. No significant differences were detected in maternal plasma prolactin concentrations between the uncomplicated pregnancy and SGA groups. No differences were seen between the uncomplicated pregnancy and SGA groups in prolactin concentrations when the foetus was female. When the foetus was male, maternal prolactin

concentrations were significantly lower in SGA pregnancies compared to uncomplicated pregnancies.Significant correlation of prolactin levels with gestation age was seen.

Table 1: Maternal characteristics

Variable	Cases	Controls	p-value
Mean age (years)	30.36	31.74	0.745
BMI (Kg/m^2)	28.12	29.07	0.344
Rural residence (n)	29	26	0.383
Urban residence (n)	21	24	

Table 2: Comparison of prolactin levels

Variable	Cases	Controls	p-value
Mean	361.2	368.4	0.903
SD	13.7	12.9	

Table 3: Correlation of prolactin levels with gender and gestation age of newborn among cases and controls

Gender	r-value	p-value
Girl	0.658	0.646
Boy	-1.328	0.001 (Significant)
Gestational age	-1.745	0.001 (Significant)

DISCUSSION

The role of prolactin in lactation and the factors that serve to regulate pituitary prolactin production in adult humans are reasonably well characterized. On the other hand, the determinants of fetal pituitary prolactin production and the role circulating prolactin serves in thedeveloping human are less well established. Two tissues in the fetus that may be regulated by prolactin are the lung and adrenal cortex. Serum levels of prolactin and the weight of the adrenals increase in concert during fetal development, before the rise in the lecithin/ sphingomyelin ratio in amniotic fluid! Moreover, an augmentation of surfactant lipid synthesis in lung tissue by prolactin has been reported by some, but not all, investigators. It also has been proposed that prolactin may, along with adrenocorticotropin, participate in regulation of adrenal steroid production in human adults· and fetuses.[10- 12]The aim of the current study was to investigate if pituitary derived prolactin levels were reduced at 20 weeks of gestation in pregnancies that resulted in birth of SGA baby.

In the present study, there were no differences between groups for any maternal characteristics. SGA cases were delivered earlier than controls. No significant differences were detected in maternal plasma prolactin concentrations between the uncomplicated pregnancy and SGA groups. CR Parker et al investigated the relationship between hypertension in pregnant women and levels of prolactin and dehydroepiandrosterone sulfate in serum of newborn infants. It was found that with the mild-to-moderate form of pregnancyinduced hypertension (PIH), there was little effect on prolactin levels in newborn serum. In newborns of women with severe PIH, however, serum prolactin levels were

significantly greater ($p < 0.01$) than those in newborns of women with uncomplicated pregnancies. Conversely, umbilical serum concentrations of dehydroepiandrosterone sulfate in newborns of women with severe PIH were significantly less ($p < 0.05$) than those in newborns of women with uncomplicated pregnancies. These findings are supportive of the view that pituitary function and adrenocortical function of fetuses of women with PIH are different from those of fetuses of normotensive women. These findings were suggestive that PIH alters the function of the fetal pituitary and adrenal cortex.[11]

In the present study, no differences were seen between the uncomplicated pregnancy and SGA groups in prolactin concentrations when the foetus was female. When the foetus was male, maternal prolactin concentrations were significantly lower in SGA pregnancies compared to uncomplicated pregnancies. PadviNV et al measured the serum level of cord blood prolactin in normal pregnancy and in pregnancy with maternal complications and its association with development of RDS in newborn. 28 with normal pregnancy (Group A) and 72 with abnormal pregnancies (Group B) were included in the study. In Group A 2 babies with birth weight of 2001-3000 gm had a cord serum prolactin level of 216±137.8 ng/mLdeveloped RDS. In Group B the level of prolactin was 285±276 and 326±132 ng/mL in 4 RDS babies with birth weight of <1000 gm and 1000-2000 gm respectively. It was observed that cord serum prolactin levels had no correlation with the mode of delivery, sex of newborn, steroid therapy. In Group A, 2 neonates developed RDS which were of gestational age between 32-35 weeks with mean prolactin level of 216 ng/ml, while in Group B, 1 neonate with gestational age less than 32 weeks and mean prolactin level of 480 and 4 neonates of 32-35 weeks with mean prolactin level of 266 ng/mL developed RDS. Out of 27 mothers with complications of PIH, 3 developed RDS. 1 case each from IUGR and twins developed RDS respectively.The risk of RDS is less in newborn with high prolactin level than in newborns with low prolactin levels. So prolactin might have a role in fetal lung maturation.[12]

CONCLUSION

Thisstudy concluded that prolactin is likely to be useful biomarker for SGA, however this does not rule out its potential to be useful at a different time point of pregnancy.

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