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Original Article

Correlation of Actual Fetal Weight with Clinically and Ultrasonographically detected Macrosomia cases among Diabetic Mother

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Abstract

Background: Correlation of actual fetal weight with clinically and ultrasonographically detected macrosomia cases among diabetic mother is very essential for the management of the neonates. **Objectives:** The purpose of the present study was to correlate actual fetal weight with clinically and ultrasonographically detected macrosomia cases among diabetic mother. **Methodology:** This cross-sectional study was carried out in inpatient Department of Obstetrics and Gynecology and in outpatients Department of Radiology and Imaging, BIRDEM during the period of April 2005 to March 2007. Pregnant women with diagnosed diabetes mellitus (DM) or gestational diabetes mellitus (GDM) selected for caesarean section or induction of labour, gestational age 236 weeks having 23700 gm by clinical method were included in this study. First clinical estimation of fetal weight was done by the investigator then Radiologist estimated the fetal weight without knowing the EFW by clinical method. The actual birth weight was estimated after the birth of the babies. **Result:** The mean (±SD) age of the patients was 30.8±5.1 years ranged from 20 to 40 years. A significant correlation ($r=0.5081$; $p<0.05$) was found between clinically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm). Significant correlation ($r=0.6199$; $p<0.05$) was found between sonographically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm). Significant correlation ($r=0.4863$; $p<0.05$) was found between clinically estimated fetal weight (gm) and sonographically estimated fetal weight (gm). **Conclusion:** The study findings indicate that clinical method can be used instead of ultrasonography for prediction of macrosomia in diabetic mother. *[Journal of Science Foundation 2018;16(2):38-44]*

Keywords: Pregnant Women; Diabetes Mellitus; Gestational diabetes mellitus; correlation; actual weight; ultrasonographic estimated weight

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Introduction

Chronic hyperglycemia is the most important problem in pre-gestational DM and GDM in pregnancy (Wild et al., 2004). The incidence of shoulder dystocia in the general population is 0.5% cases which increases to 31% in the macrosomia infant of a diabetic mothers (Dudley 2005). Accurate antenatal fetal weight prediction could, therefore, lead to a considerable reduction in perinatal morbidity in this group (Baum et al., 2002). Evaluating fetal weight is an important part of obstetrics. Accurate estimation can help in deciding the timing and mode of delivery of macrosomic fetuses. Methods of evaluating fetal weight include clinical and ultrasonography methods. Since ultrasonographic facilities are expensive, not easily available and trained personnel are required, it would be immensely useful to know if other simpler clinical methods can estimate fetal weight with the same degree of accuracy (Coomarasamy et al., 2005).

In a study clinical estimates of fundal height and fetal size and ultrasound estimates of abdominal circumference and head circumference were routinely carried out of gestational age of 28, 34 and 38 weeks or before delivery (Diase and Monga 2002). Prediction improves with closeness to delivery. There is no difference in the prediction power for macrosomia between clinical and ultrasound measurement (Hart et al., 2010). Currently, several studies have challenged the accuracy of sonographic birth weight estimation and have concluded that sonography may be no more accurate for the prediction of birth weight than clinical palpation. Ultrasonography is not available in very remote areas of Bangladesh; even when available, not all patients can afford the cost (Nahum and Stanislaw 2002).

Estimation of fetal weight from ultrasonic measurements is not proven to be reliable. Nonetheless, sonographic measurements to evaluate excess fetal weight to assist in clinical management decisions may be warranted in rare circumstances. Routine use of these estimates to identify macrosomia are not recommended; indeed, the findings of several studies are indictive that estimates of fetal weight by physician-conducted physical examination of the pregnant woman are as reliable as, or even superior to those made from ultrasonic fetal measurements (Best and Pressman 2002; Melamed et al., 2011; Janzen et al., 2003). In this above context the present work has been designed to correlate the clinical findings of macrosomia with ultrasonographic findings of macrosomia in pre-gestational and gestational diabetic mothers with actual birth weight.

Methodology

This was a prospective, consecutive, non-interventional and non-randomized cross-sectional study. The study was carried out in the department of Obstetrics and Gynecology, Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh in collaboration with the department of Radiology and Imaging of the same institute. The study was carried out from April 2005 to March 2007 for a period of two years. Prior to the commencement of this study, the research protocol was approved by the Local Ethics Committee (ERC) of BIRDEM Academy. Pregnant Women with pre-gestational and gestational diabetes mellitus having fasting blood sugar level 26.1mmol/L with the age group of 20 to 40 years and gestational age 36 weeks who were admitted in inpatient Department of Obstetrics and Gynecology, BIRDEM and attending in outpatient Department of Radiology and Imaging of the same institute were selected as study population. Non-randomized consecutive sampling was used to collect the data. Pregnancy of 36 weeks with diagnosed pre-gestational DM and GDM having fasting blood sugar level less than 6.1mmol/L selected for caesarean section or induction of labour; accurate gestational age, regular menstrual cycle with exact last menstrual period and having early ultrasonography, longitudinal lie, cephalic presentation, intact membranes and estimated fetal weight 23700 gm by clinical method were selected as study subjects. Pregnancy less than 36 weeks, pregnancy with pre-gestational DM or GDM with complication like hypertension, ketoacidosis, presence of uterine tumour, ruptured membranes, malpresentation, multiple pregnancy, diagnosed fetal anomaly, excessive obesity of the mothers and estimated fetal weight less than 3700 gm by clinical method were excluded from this study. Those who were agreed to take part in this study were selected. Written consent was taken from the patients. Then detailed history was taken and clinical examination was done and those who were clinically macrosomic were sent for ultrasonographic estimation of the fetal weight. Once the babies were born, their actual birth weights were measured by weight machine. All the information were recorded in a pre-designed data collection sheet.

Clinical estimation of fetal weight: Fetal weight was estimated by the investigator. Before estimation of fetal weight by clinical method bladder was evacuated. Patient was placed in supine position and abdomen was exposed as necessary and then uterus was placed in midline position and then symphysio fundal height was taken by non elastic tape with cm with the side of the tape facing downwards provided the uterus was relaxed. Then fetal weight was estimated (McCormick, 2000).

Sonographic estimation of fetal weight: Ultrasonographic estimation of fetal weight was done by a Radiologist without knowing the estimated fetal weight by clinical method.

Estimation of actual birth weight: Birth weight was estimated by calibrated weight machine. The data sheets were scrutinized to check the quality of the raw data. The hundred percent cross check were done after editing. Collected data were entered into the computer and processed by it. Data were analyzed by software SPSS (Statistical Package for Social Science version 20.0). Paired 't' test and Chi-square test and Z test were used where it was applicable. The results were presented in Tables and Figures and were expressed as mean and standard deviation. The relationship between clinical estimation of fetal weight, sonographic estimation of fetal weight and actual birth Weight was examined using Pearson's coefficient correlation (r) analysis. Difference was considered statistically significant if p value was <0.05.

Results

The targeted sample size was 73 and was collected 73 cases. Out of these, 4 cases were dropped due to delivery in other hospital. Finally, 69 pregnant women were studied.

Age Distribution of the subjects (n=69)

The mean age of the study subjects was 30.8 years with standard deviation 15.1 years and ranged from 20 to 40 years. The maximum pregnant woman was found between 26 to 30 years age range and minimum was found between 36 to 40 years age range (Tab1e 1).

Table 1: Age Distribution of the Study Subjects (n=69)

Age Group	Frequency	Percentage
20 to 25 Years	27	39.1
26 to 30 Years	30	43.5
31 to 35 Years	8	11.6
36 to 40 Years	4	5.8
Total	**69**	**100.0**
Mean $\pm$SD	30.8$\pm$15.1 years	

Clinically estimated fetal weight of 69 cases were expressed in gm and actual birth weight (macrosomia) were also expressed in gm. A significant positive correlation was found between clinically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm) (Figure I).

The value of Pearson's correlation coefficient was 0.5081 and it is significant ($p<0.05$). Therefore, there was a significant correlation between clinically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm) in the study population.

Sonographically estimated fetal weight (gm) of 69 cases were expressed in gm and actual birth weight (macrosomia) were also expressed in gm. A significant positive correlation was found between sonographically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm) (Figure II).

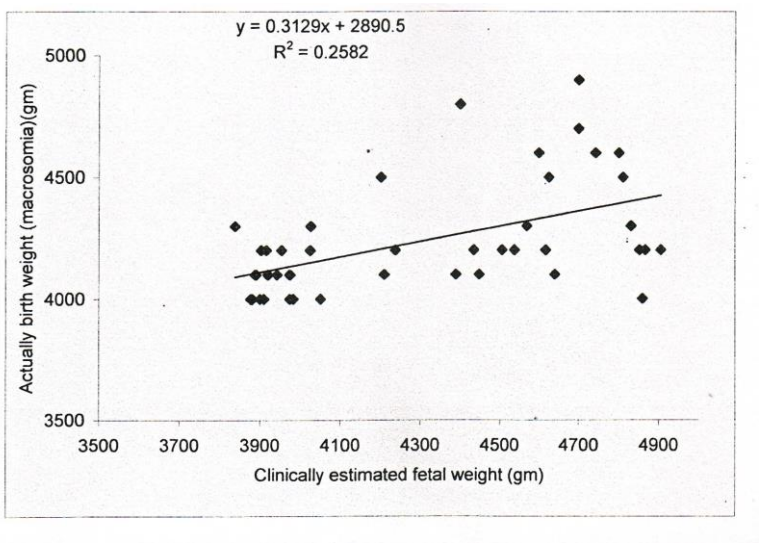

Figure I: The scatter diagram shows significant relationship (r=0.5081) between clinically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm)

The value of Pearson's correlation coefficient was 0.6199 and it is significant ($p<0.05$). Therefore, there was significant correlation sonographically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm) in the study population.

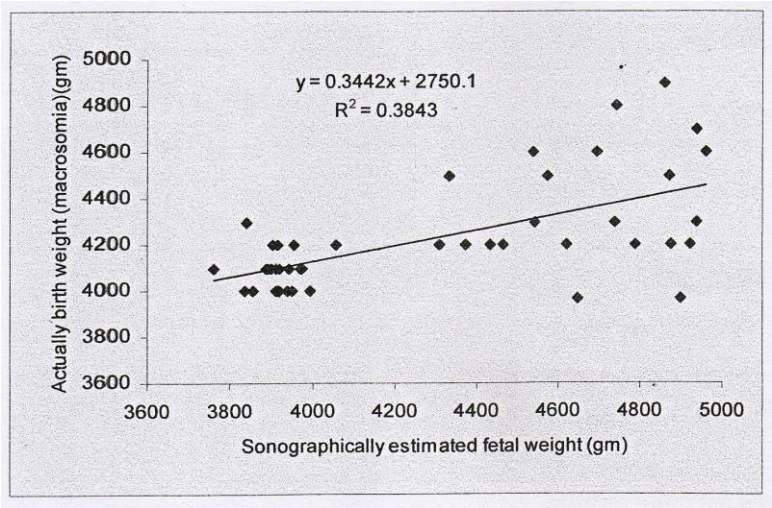

Figure II: The scatter diagram shows significant relationship (r=0.6199) between sonographically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm)

Clinically and sonographically estimated fetal weight (gm) of 69 cases were expressed in gm. A significant positive correlation was found between clinically and sonographically estimated fetal weights (gm) (Figure III). The value of Pearson's correlation coefficient was 0.4863 and it is significant ($p<0.05$). Therefore, there was significant correlation between clinically and sonographically estimated fetal weight (gm) macrosomia in the study population.

Discussion

Evaluating fetal weight is an important part of obstetrics. Accurate estimation can help in deciding the timing and mode of delivery of macrosomic fetuses. An accurate diagnosis of macrosomia can lead to a decrease in perinatal morbidity. Its prediction may enable the physician and staff to prepare for shoulder dystocia or prevent a traumatic injury. Methods of evaluating fetal weight include l clinical and ultrasonographic. Since ultrasonographic facilities are expensive, not easily available and trained personnel are required, it would be immensely useful to know if other simpler clinical methods can estimate fetal weight with the same degree of accuracy (Bamberg et al., 2013).

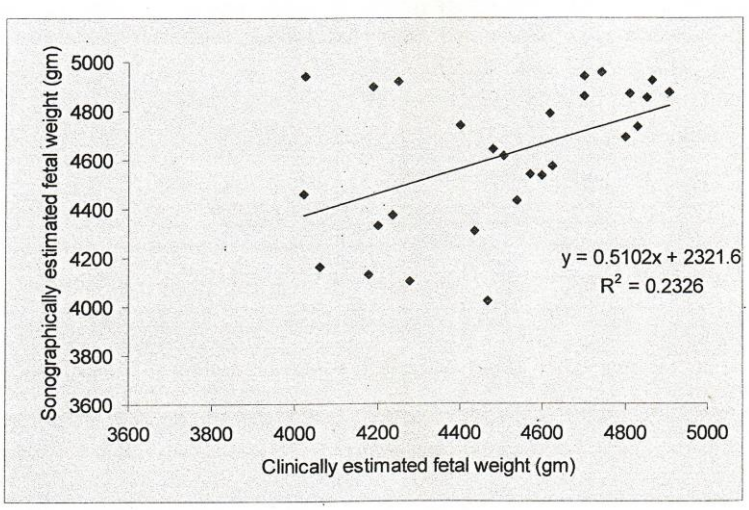

Figure 3: The scatter diagram shows significant relationship (r=0.4863) between clinically estimated fetal weight (gm) and sonographically estimated fetal weight (gm)

Different studies have challenged the accuracy of sonographic birth Weight estimation and have concluded that sonography may be no more accurate for the prediction of birth weight than clinical palpation. Untrasonography is not available in very remote areas of Bangladesh. Even when available, not all patients can afford the cost. Many of the rural obstetric population in this country are not sure of their dates. So, gestational age derived birth weight centiles are also unsuitable for those women with unsure dates who cannot afford or access ultrasonography (Haque 2005).

Macrosomia is generally used to refer to fetuses with an estimated fetal weight greater than or equal to 4000 gram (Rahimian and Varner 2006). Nahum (2000) with his colleagues' developed an equation for predicting fetal macrosomia based on maternal demographic and pregnancy-specific factors alone and by using this equation, they predicted term birth within 7.6% (267g) and they choose a cut off value of 3775gm for prediction of fetal macrosomia.

Several studies have documented mean errors of estimation of fetal weight by clinical method is about 300 gm (Zamorski and Biggs 2001). In the above context, this study included clinically estimated fetal weight more than 3700 gm as inclusion criteria for macrosomia though macrosomia actually means 2.4 kg. This prospective study was carried out with an aim to correlate the clinical evaluation of macrosomia with ultrasonographic evaluation of macrosomia in diabetic mother and actual birth weight.

Banerjee et al (2004) have also made almost identical observations. According to that study clinical method of evaluating fetal weight is as good as ultrasonographic estimation. The difference between clinical evaluation of macrosomia and ultrasonographic evaluation of macrosomia, clinical evaluation of macrosomia and actual macrosomia and between sonographic evaluation of macrosomia and actual macrosomia was not statistically significant.

A significant positive correlation was found between clinically estimated fetal weight and actual birth weight and the correlation co-efficient was 0.5081 (p value <0.05). Sonographically estimated fetal Weight (gm) of 69 cases were expressed in gm and actual birth weight (macrosomia) were also expressed in gm. A significant positive correlation was found between sonographically estimated fetal weight (gm) and actual birth weight (macrosomia). The value of Pearson's correlation coefficient was 0.6199 and it is significant ($p<0.05$). Therefore, there was significant correlation sonographically estimated fetal weight (gm) and actual birth weight (macrosomia) (gm) in the study population. Clinically and sonographically estimated fetal weight (gm) of 69 cases were expressed in gm. A significant positive correlation was found between clinically and sonographically estimated fetal weights. The value of Pearson's correlation coefficient was 0.4863 and it is significant ($p<0.05$). Therefore, there was significant correlation between clinically and sonographically estimated fetal weight macrosomia in the study population.

Noumi et al (2005) have shown that correlation coefficient between the clinical and sonographic EFW and the actual birth weight were 0.62 ($p<0.001$) and 0.66 ($p<0.001$) respectively. The results of the present study agree with these investigations.

Watson et al (1988) noted that both clinical and sonographic methods of predicting birth weight had a similar accuracy even among macrosomic fetuses. Chauhan et al (1995) shows sonographic models were not significantly superior to clinical examination in detecting newborns with birth-weights 24,000 g. All these results support the present study. Iohnstone et al (1996) observed clinical examination is as predictive as ultrasound measurements but at the sometime also observed that no matter how data were presented they show that clinical and ultrasound measurements are poor predictors of macrosomia.

From the results of the present findings as well as the findings obtained by a number of investigators, it is conceivable that clinical method can be used instead of ultrasonography for prediction of macrosomia in diabetic mother. However, further studies are recommended to use clinical method for prediction of macrosomia in diabetic mother.

Conclusions

In conclusion estimation of macrosomia by ultrasonography and clinical weight are in positive correlation with the actual birth weight. Therefore, either clinical or ultrasonographic method of estimation may be considered to estimate fetal macrosomia. As the study was conducted with a small number of subjects, further study may be undertaken in future with large number of subjects.

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