

Survey of health status and congenital abnormality detection among diabetic pregnant women using ultrasound

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ABSTRACT


Background: Diabetes during pregnancy is associated with many congenital anomalies such as macrosomia. Early detection and appropriate follow-up during pregnancy can improve the pregnant women health and reduce the risk factors. **Objectives:** The objectives of this study are to assess the ultrasound detection rate of congenital fetal malformations in women diagnosed with gestational diabetes mellitus (DM). **Materials and Methods:** A cross-sectional study contains 460 diabetic pregnant women. Data collected from participants was age, weight, body mass index (BMI), previous miscarriage, termination of pregnancy, stillbirth, previous cesarean section, type of diabetes (Types 1 or 2). Ultrasound scan performed for all women at least once during the study period, between 16 and 24 weeks of gestation. **Results:** During the study period, 460 pregnant women with pre-existing DM performed pregnancy checkup and antenatal ultrasound. The mean age of patients in the study population was 40 years, BMI was obviously high 31 kg/m² (standard deviation 7 kg/m²), and 61.5 of the women were obese to overweight. A total of one anomaly (0.22%) was present in the fetuses of diabetic women ($P < 0.001$), and the anomalies diagnosed by ultrasound was spinal defects. **Conclusion:** The findings of this study suggested that all pregnant women regardless their location and economic status should follow their pregnancy with the proper follow-up and screening program to improve the pregnancy outcome and reduce the adverse reaction of diabetic during pregnancy.

KEY WORDS: Gestational Diabetes Mellitus; Pregnancy; Ultrasound; Congenital Fetal Malformations

INTRODUCTION

Many pregnant women, especially after the 24th week, may develop gestational diabetes; it may be because they have it before or after they conceived.^[1-3] It is important to be aware of the symptoms altering of blood glucose (blood sugar) levels to ensure mothers and baby health. In the United States (US), 2.8% of pregnant women diagnosed with

gestational diabetes mellitus (GDM).^[4,5] There is evidence that the total number of GDM will increase by 12% by 2025 worldwide.^[2] The adverse outcome of presentation of diabetes in pregnancy affected both the mother and the infant. These adverse outcomes include congenital abnormalities, birth defects, preterm birth, cesarean delivery, macrosomia, hypertension, and preeclampsia. Overweight, age, family history, and the race (e.g., African, Hispanic, Pacific Islanders, and East Asian) have a high prevalence of GDM increases the risk of developing GDM during pregnancy.^[6] Awareness, screening, and early detection of GDM lead to reduce the adverse effect of birth defects, delivery complication, and macrosomia.^[2] Uncontrolled diabetes during pregnancy may increase the possibilities of early delivery, increase baby weight, low blood glucose after birth, and breathing problem. In addition to the adverse

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effect on the baby, the mother can develop eye problem and kidney disease, especially when the glucose level is too high. There is also a chance to develop preeclampsia and high urine protein, especially in the second trimester. Developing preeclampsia can lead to early delivery to avoid life-threatening problems.^[2,5]

Many studies focused on the relationship between GDM and birth outcomes, maternal experience and maternal complications. The increase in the body mass index (BMI) showed significant association with risk of adverse pregnancy outcomes.^[3,7] Late fetal death among the pregnant women with BMI ≥ 29 increased compared to the women with healthy BMI.^[5,8] Some studies stated that weight control has positive outcomes for the women who are planning a first pregnancy as well as a positive outcome for gestational.^[9] The objectives of this study are to assess the ultrasound detection rate of congenital fetal malformations in women diagnosed with GDM.

MATERIALS AND METHODS

The study was conducted at Omdurman Maternity hospital, Omdurman, Sudan. Women with pre-existing diabetes (Types 1 and 2) screened between April 2017 and June 2017. Patient information includes age, weight, BMI, previous miscarriage, termination of pregnancy, stillbirth, previous cesarean section, type of diabetes (Type 1 or 2), use of periconceptional folic acid, and routine maternal serum screening. Ultrasound scan performed for all women at least once during the study period. Only pregnancy between 16 and 24 weeks of gestation was considered, pregnancy with bleeding disorders was excluded from the study as well as referral scan from other hospitals.

The ultrasound machine used was GE ultrasound system; it is a state-of-the-art user easy to use menu and allows the operator to perform scans more efficiently and accurately. The scans performed by two radiologists, three qualified obstetric, and gynecologist sonographers with 5–12 years' experiences. The scan was performed according to the American College of Radiology (ACR) and the American College of Obstetricians and Gynecologists (ACOG) guidelines. All scan were documented and images recorded as required for normal and abnormal conditions. Images labeled with the hospital, patient identification, date, and operators name. Scan checklist including fetal age, size cardiac activity, placental appearance, location, and fetal anatomy evaluation was recorded for each scan. A consultation of radiologist and gynecologist was performed in case of severe cases and images evaluated in terms of quality at the end of the day to ensure adequate image quality. Scan was recorded on a CD and saved with the patient's record.

All cases followed up until delivery and neonatologists were examined all neonates immediately after birth, if any

malformations or congenital anomalies detected a referral procedures to the follow-up clinics performed.

Ethical approval was obtained from the university and hospital ethics committee. Informed consent form was obtained from the patients before data collection to participate in the study.

Statistical analysis was performed using Statistical Package for the Social Science (SPSS Inc., Chicago, IL, USA).

RESULTS

Between April 2017 and June 2017, 460 pregnant women with pre-existing DM performed pregnancy checkup and antenatal ultrasound. The mean age of patients in the study population was 40 years, ranging between 15 years and 58-year-old. 65.2% ($n = 300$) of women have no history of DM before pregnancy (Group A) and 34.8% ($n = 160$) have DM before pregnancy (Group B). 25.7% were Type 1 DM and 74.3% Type 2 DM. The BMI was obviously high for the pregnant women 31 kg/m² (standard deviation [SD] 7 kg/m²), and 61.5 of the women were obese to overweight.

Pregnancy-related diseases among pregnant women investigated are renal, cardiac, and blood pressure. The highest coprevalence health issues related to renal function 32.6% (SD, 0.457), such as increase of renal plasma, glomerular filtration rate and high glycosuria which is expected due to GDP. 17.8% (SD, 0.383) where a complaint of hypertension and only 5.4% (SD, 0.459) complained of cardiac disease. Previous pregnancy history was investigated; among the study, 22.2% had a previous miscarriage, 3.5% had intrauterine death, and 18.5% had intrauterine growth restriction. A total of one anomaly (0.22%) was present in the fetuses of diabetic women ($P < 0.001$), and the anomalies diagnosed by ultrasound was spinal defects.

DISCUSSION

Although the number of pregnant women who flow their pregnancy with obstetric and gynecology clinics increased lately due availability of services and increase of awareness, the number still low in Khartoum state, Sudan compared to the actual pregnant women. More awareness was needed, especially, among diabetic pregnant women to ensure proper follow-up and avoid complications to the mother and baby. Diabetic women should have proper counseling and planning for their future pregnancy with health-care providers and family medicine physicians.^[10]

The modern ultrasound technology is able to detect congenital fetal anomalies at early pregnancy stages which allow selective terminated if approved by authorized bodies. The detection rate varies 40–70% in high-risk patients and were

less on low-risk patients depending on the technology used, operators qualifications and skills, and complications stages.^[6]

The main three reasons of failing to detect are as follows: (a) Fail to detect the anomalies due to poor image quality, equipment, and operators errors; (b) obesity as most of the diabetic pregnant women have high BMI of 31 kg/m² which also recorded in this study 61%; and (c) the inability of ultrasound equipment to detect the congenital anomalies at the gestational age of 30%. Thus, it will be a challenge to improve ultrasound detection rate by improving the technology used, operators education, skills, and training as well as improve the pregnant women awareness of early detections.^[6,11-14] Diabetic pregnancy can increase the risk of congenital anomalies to 20%, especially, the glycemic control is not appropriate during pregnancy period.^[3,15]

CONCLUSION

The congenital anomalies classified into major or minor according to the definition of ACR and ACOG. Only one case was reported in this study with significant congenital anomalies related to spinal and central nervous system (0.22%).

The incident of abnormality detection in this study was low; it may be due to the high performance of ultrasound screening as well as the awareness of the pregnant women of the consequences of diabetic during pregnancy. This study can be the first step to ensure that all the women should follow their pregnancy with the proper consultation as well as ensure that the services are available for every pregnant regardless of their location or economic status.

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