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Ultrasound in Obese and Overweight Pregnant Women Clinical and Technical Factors

Hwida Mohammad Hassan*, Ahmed Abdelrahim Mohammed, Awadia Gareeballah Suliman

Faculty of Radiological Sciences and Medical Imaging, AlzaiemAlazhari University, Khartoum, Sudan

***Corresponding author:** Hwida Mohammed Hassan
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Abstract **Original Research Article**

Over the past decades, the prevalence of obesity has worldwide dramatically increased. In pregnancy, obesity is associated with increased risk of maternal death and of significant complications. Several papers have also reported an increased risk of major anomalies in the offspring of obese pregnant women. At the same time, carrying out an ultrasound examination on an obese pregnant woman is a difficult task, due to the impaired acoustic window. This study was discussing the clinical and technical problems associated with ultrasound examination in obese and overweight women. The study was done among 601 pregnant women with BMI 25-30 and >30 with 424, mean age 29.5 years and mean gestation age was 30.7 weeks, positive clinical history in 353 (58.7%). Visibility of fetal anatomy in ultrasound good in 344 (57.2%), moderate in (38.3%) and poor in (4.5%), the study found that there was strong significant correlation between BMI and visibility of fetal ultrasound anatomy ($p < 0.01$).
Keywords: Maternal obesity, overweight, Maternal health, US, DM, hypertension.

INTRODUCTION

Obesity is generally defined as a condition characterized by excess of body fat frequently resulting in a significant impairment of health. to assess BMI ,body weight based on height and calculated using the formula weight/height^2) Individuals are deemed overweight when they have a BMI between 25 and 30 kg/m^2; obesity is defined as a BMI greater than or equal to 30 kg/m^2, and extreme obesity is defined as a BMI greater or equal to 40 kg/m^2[1].

Maternal obesity can result in negative outcomes for both women and fetuses, maternal obesity increases the risk of a number of pregnancy complications, including hypertensive disorder of pregnancy, gestational diabetes mellitus (GDM), preterm birth and cesarean delivery[2] Scanning obese pregnant women is difficult, and on some occasions it may become a real challenge[4].

Adding to the complexities of providing prenatal care to such patients is the difficulty and increased cost of using ultrasound as a diagnostic and screening tool. Ultrasound examinations in overweight women are a challenge even for experienced sonographers and often do not provide reliable and complete data despite advanced technology, long examination time, and repeat exams [1].

Several factors may limit visualization of fetal anatomy include equipment quality, expertise of the sonologist and ultrasound center, fetal positioning, gestational age, fluid abnormalities, maternal body habitus or tissue density, and other scanning characteristics[3].

There are some techniques available that can improve the visualization of peritoneal organs in obese patients, including the use of the lowest frequency of a multi frequency transducer (the "penetration" mode) and harmonic imaging, which reduces the deleterious effects of subcutaneous tissues [4].

Two major factors affect the visualization in obese women: the depth of insonation required and the absorption of ultrasound energy by the abdominal fat layers [1].

To deal with these problems, ultrasound equipment producers have followed two lines of action. The first involves reducing the mean array emission frequency to warrant better penetration. The second involves using all possible pre- and post-processing filters and techniques to increase the signal-to-background noise ratio [2].

Objectives

The main aim of this study was to illustrate the technical factors responsible for the inadequate visualization rate of fetal anatomy in cases of maternal obesity and to evaluate the clinical complications that affected obese pregnant women

MATERIALS AND METHODS

Descriptive study deals with ultrasound findings in obese and overweight pregnant patients in second and third trimester during the period of April 2016 up to April 2018. Six hundred one obese pregnant women were scan by different modalities of ultrasound machines (GE Voluson S6 and E8 and sonoscape C352 with 3.5 MHZ curve probe) After the patients were informed consent they were scanned by transabdominal approach, to overcome the acoustic window impairment problem in obese or overweight mothers, all the technical features discussed (lower emission frequencies, harmonic and compound imaging and speckle reduction filters) were used: sometimes selectively and on other occasions in combination and the findings were recorded. Scanning was done in room with dim light to minimize the reflected artifact of the screen, the cases were examined in supine position then applying coupling agent to abdomen and begin evaluation with simple sweep of transducer to get a rough sense of the uterine contents before focusing on specific areas of interest, after getting a rough sense that the observation were made and the pregnancy was evaluated [4].

RESULTS AND DISCUSSION

The study was done among 601 pregnant women with BMI 25-30 and >30 with mean maternal age 29.5 years, the mean gestation age was 30.7 weeks (table 1), positive clinical history found in 58.7 %, history of C/S was 19.8 % Table (2).

Concerning ultrasound fetal visibility and by using the protocol of scanning of obese patients we found that good visualization of fetal anatomy with percentage of 57.2%, moderate in (38.3%) and poor in (4.5%) table (3) the study found that there was statistical significant correlation between visibility of fetal anatomy and maternal body mass index (P< 0.01) this result agree with D. PALADINI 2009 (Italy) who state that there is Suboptimal visualization rates according to anatomical structure at the mid-trimester anomaly scan in the obese vs. normal-weight pregnant woman(table 4)[4].

Table-1: descriptive statistic for age, fetal weight, GA

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	601	18.00	47.00	29.4958	4.92921
Fetal weight	601	112	4600	1848.67	947.734
GA	601	18.00	41.00	30.7720	5.31849
Valid N (listwise)	601				

Table-2: Frequency distribution of clinical history

Variable	Frequency	Percent	Valid Percent	Cumulative Percent
Hypertension	17	2.8	4.8	4.8
DM	25	4.2	7.1	11.9
C\S	119	19.8	33.7	45.6
Premature labor	2	.3	.6	46.2
HT&DM	4	.7	1.1	47.3
all of them	28	4.7	7.9	55.2
HT&C.S	15	2.5	4.2	59.5
D/M&C.S	57	9.5	16.1	75.6
HT, premature labor	6	1.0	1.7	77.3
C.S, premature labor	10	1.7	2.8	80.2
HT,DM&CS	39	6.5	11.0	91.2
HT,CS& premature labor	22	3.7	6.2	97.5
DM, CS& premature labor	9	1.5	2.5	100.0
Total	353	58.7	100.0	
Normal clinical history	248	41.3		
Total	601	100.0		

Table-3: Frequency distribution of visibility

Visibility	Frequency	Percent	Valid Percent	Cumulative Percent
Good	344	57.2	57.2	57.2
Moderate	230	38.3	38.3	95.5
Poor	27	4.5	4.5	100.0
Total	601	100.0	100.0	

Table-4: Cross tabulation visibility and BMI

BMI	Visibility			Total
	Good	Moderate	Poor	
25-30	272	124	5	401
More than 30	69	104	22	195
Total	341	228	27	596
P<0.01				

CONCLUSION

Overweight and obesity during pregnancy can result in significant complications to mother's health and adverse obstetric outcomes such as premature labor.

The study concluded that obesity reduce ultrasound fetal anatomy visibility as the study found that there was statistical significant correlation between visibility of fetal anatomy and maternal body mass index (P< 0.01), increasing BMI (more than 30 kg\cm^2) will cause moderate and poor fetal anatomy visibility there for consider approaching fetus through the four major abdominal areas with least subcutaneous fat Perumbilical area, Suprapubic area and right and left iliac fossae. wait for the fetus to be in optimal position, with a posterior spine consider including body mass index value in the demographic part of the report, to document presence or absence of maternal obesity report other cofactors of limited acoustic window, such as previous Cesarean section (for the scar).

Recommendations

More research is needed in the area of maternal and prenatal outcomes of obesity during pregnancy.

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