Research Article

Fetal Macrosomia; Risk Factors and Validity of its Diagnostic Tools

Ahmed R. El-Adawy, Hany H. Kamel, Hashim F. Mohammed and Hamada M. Fouly
Department of Obstetrics & Gynecology, El-Minia Faculty f Medicine

Abstract
Introductions: The term macrosomia is used to describe a newborn with an excessive birth weight. A diagnosis of fetal macrosomia can be made only by measuring birth weight after delivery; therefore, the condition is confirmed only retrospectively, ie, after delivery of the neonate. Fetal macrosomia has been defined in several different ways, including birth weight greater than 4000-4500 g or greater than 90% for gestational age. **Aim of Study:** Assessment of prevalence of fetal macrosomia and accuracy of its diagnostic tools in Minia Maternity University Hospital. **Patients and Methods**: **Design of work:** In our Cross sectional observational study 208 recruited women who were admitted to our hospital for CS indicated by prenatal diagnosis of fetal macrosomia .Complete evaluation of all our cases was done and fetal weight was assessed clinically and by ultrasou .**Results**: Prevalance of fetal macrosomia was high in Minia maternity hospital and Ultrasound evaluation of fetal weight showed better performance than the clinical method regarding absolute errors and error percentages. Ultrasound assessment had higher sensitivity and specificity in detecting fetal weight. **Conclusion:** The prevalence of fetal macrosomia at MMH was 5.5% Sonographic evaluation of fetal weight displayed superiority than the clinical approach as regards absolute errors and error percentages.

Key words: macrosomia, Risk Factors, neonate

Introduction
The term macrosomia is used to describe a newborn with an excessive birth weight. A diagnosis of fetal macrosomia can be made only by measuring birth weight after delivery; therefore, the condition is confirmed only retrospectively, ie, after delivery of the neonate. Fetal macrosomia has been defined in several different ways, including birth weight greater than 4000-4500 g (8 lb 13 oz to 9 lb 15 oz) or greater than 90% for gestational age (Practice Bulletin, 2016). According to National Vital Statistics Report for U.S. Births in 2015, approx.-imately 7% of infants had birth weight >4,000g, 1% had birth weight greater than 4,500g, and 0.1% had birth weight greater than 5,000g (Martin et al., 2017).

Attempts at perinatal diagnosis of macro-somia have proven difficult and are often inaccurate.

Factors associated with fetal macrosomia include genetics; duration of gestation; presence of gestational diabetes; high pre-pregnancy body mass index (BMI); excessive gestational weight gain; and class A, B, and C diabetes mellitus (Kim et al., 2014)

Genetic, sex, racial, and ethnic factors influ-ence birth weight and the risk of macrosomia. Male newborns typically weigh more than female newborns and thus comprise a greater proportion of infants with birth weights exceeding 4500 g.

The risk of macrosomia also varies with ethnicity. Even when controlled for dia-betes, studies have demonstrated that Hispanic women have a higher risk of fetal macrosomia compared with white, African American, or Asian women. Genetic factors, such as parental height and weight, may also play a

role in determining newborn birth weight (Okun et al., 1997).

Aim of Study

Assessment of prevalence of fetal macrosomia and accuracy of its diagnostic tools in Minia Maternity University Hospital.

Patients and Methods

Design of work:

In our Cross sectional observational study 208 recruited women who were admitted the Obstetrics and Gynecology department, in Minia Maternity University Hospital from May to October 2019 for CS indicated by prenatal diagnosis of fetal macrosomia Complete evaluation of all our cases was done and fetal weight was assessed clinically and by ultrasound.

Ethical considerations:

Ethical permission was sought from a Local Research Ethics Committee (REC) in the department. The patients were given a full and clear explanation about the study.

Inclusion criteria

All pregnant females who were admitted to our hospital and were delivered by CS indicated by prenatal diagnosis of fetal macrosomia.

Exclusion criteria

1- All macrosomic babies caused by congenital fetal malformation such as hydrocephalus, fetal hydrops.
2- Multiple pregnancy.
3- Other obstetric indication of CS.

Methods

History taking

Included Name, age, residence, occupation and duration of marriage .

Obstetric history of G.. P..+..,gestational age, Estimated date of delivery, antenatal care visits in current pregnancy, previous macrosomia, previous caesarean section and finally symptoms of current pregnancy including those of medical disorders as gestational DM or pregnancy induced hypertension.

- Past history of Previous deliveries of macrosomic babies, medical diseases especially DM, drugs intake and Previous operation.
- Assessment of fetal weight clinically by measuring length from midpoint of upper edge of symphonies pupis to the highest fundal point to give Fundal Height [FH] in centimeter then measuring Abdominal Girth [AG] by measuring women waist in centimeter then calculate fetal Weight in grams by (FH × AG).
- Assessment of fetal weight sonogramphically by two dimensional ultrasound and single Sonographer by measuring Bi Parietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC) and Femur Length (FL) then fetal weight was calculated using Had lock formula
- Pregnancy outcome were obtained from CS indicated by prenatal diagnosis of fetal macrosomia were weighted and compared to prenatal weights.

Results

Demographic data of 208 women included in the study are shown in **(Table 1)**.The studied women had an age of 31.63±4.97 years (19-42), Parity of 3.45±1.75 deliveries (1-8), A gestational age 40.05±1.63 weeks, Most of them were postdate. A BMI (kg/m2) 31.98±5.28, Most of them were overweight (84.6%). Most of them had a previous history of fetal macrosomia (71.6%) by routine screening of DM most of studied women are diadetic (69.2%). Most of studied women were Rural and House worker.

Figure (1): shows risk factors of fetal macrosomia there was a strong association between fetal macrosomia and maternal age greater than 30 years 135 (81.3%) and high parity 134 (80.7%), Pregnancy duration greater than 40 weeks was also significantly associated with fetal macrosomia. 134 (80.7%) of macrosomic cases are postdate, Fetal macrosomia may be due to greater

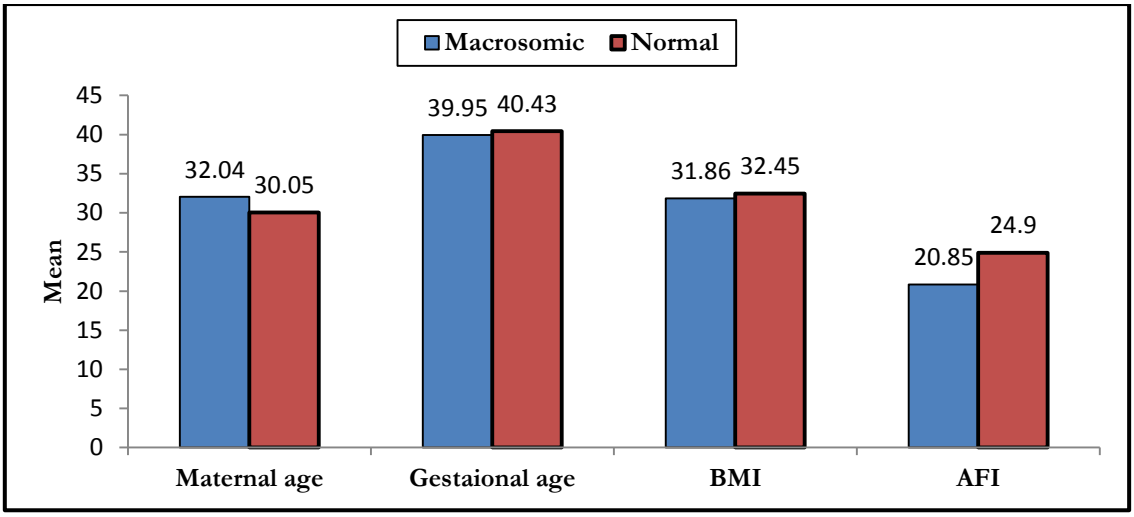
maternal BMI at the time of conception, excessive weight gain between pregnancies as well as weight gain during pregnancy 135 (81.3%), Maternal hyperglycemia should be considered a strong predictor of fetal macrosomia.

A history of diabetes mellitus (pre-existing or gestational) occurred more frequently among the cases, Previous history of macrosomia likely contributes to macrosomia 120(72.3%). The high male to female ratio in the macrosomic group was reported 131(78.9%) but polyhydraminos not frequently associated with fetal macrosomia (46.4%).

Table (2): shows Comparison between clinical and ultrasound methods regarding absolute mean error at different gestational ages and absolute error > 500g showed significantly higher absolute mean error in the clinical method at different gestational ages.

Table (1): Demographic data of studied sample (n=208)

Variable	N (%)	Range	Mean ±SD
Maternal age (years)		19-42	31.63±4.97
Parity		1-8	3.45±1.75
Primi-para	45(21.6%)		
Multipara	163(78.4%)		
Gestational age (weeks)		37-42	40.05±1.63
Postdate			
Yes	161(77.4%)		
No	47(22.6%)		
BMI (kg/m^2)		23-40	31.98±5.28
Normal (18.5-24.9)	32(15.4%)		
Overweight/ obese (>25)	176(84.6%)		
Diabetic:			
Yes	144(69.2%)		
No	64(30.8%)		
Previous history of macro-somia			
Yes	149(71.6%)		
No	59(28.4%)		
Residence			
Rural	115(55.2%)		
Urban	93(44.7%)		
Occupation			
Housework	128(61.5%)		
Others	80(38.4%)		



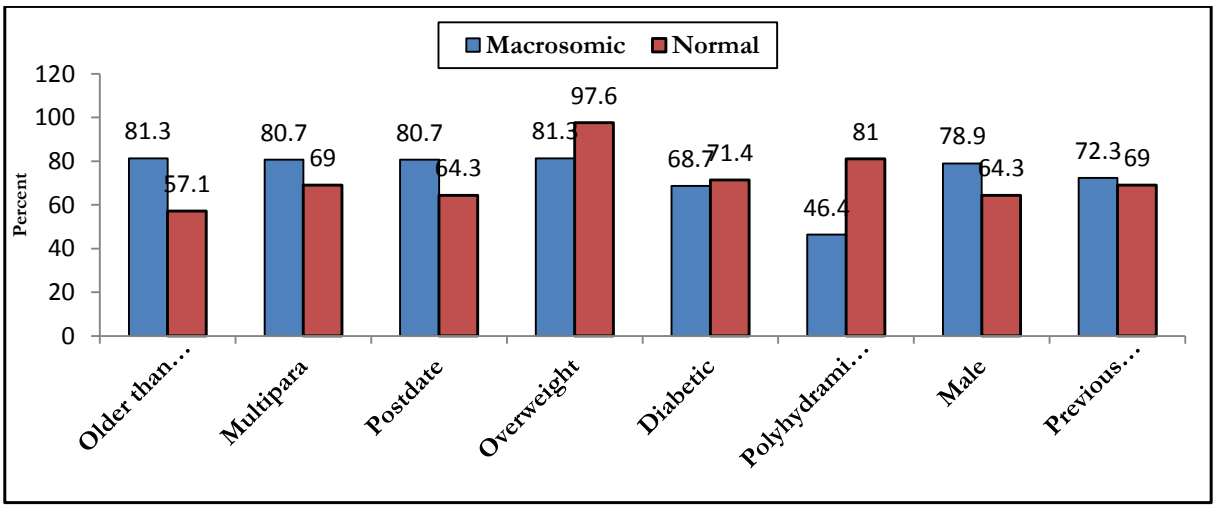


Figure (1): Maternal and fetal characteristics

Table (2): Absolute mean error at different gestational ages and error percentages .

	Clinical	**Ultra Sound**	**p-value**
Mean absolute error (gm)	297.60±185.44	176.44±135.92	<0.001***
Absolute error >500 gm	38(18.3%)	6(2.9%)	<0.001***
Mean error percentages (%)	7.42±4.98	4.45±3.56	<0.001***
Absolute mean error at different gestational ages			
37 Weeks (n=1)8	216.66±104.31	158.33±62.42	0.050
38 Weeks (n=3)0	293.33±197.71	186.66±125.89	0.016*
39 Weeks (n=1)7	191.17±120.20	135.29±89.72	0.134
40 Weeks (n=5)8	268.96±183.73	168.10±138.50	0.001**
41 Weeks (n=)29	406.89±210.74	177.58±201.59	<0.001***
42 Weeks (n=56)	331.25±172.30	197.32±125.92	<0.001***
Error percentages			
≤5%	93(44.7%)	146(70.2%)	<0.001***
5-10%	67(32.2%)	41(19.7%)	0.003**
10-15%	28(13.5%)	18(8.7%)	0.119
15-20%	17(8.2%)	1(0.5%)	<0.001***
>20%	3(1.4%)	2(1%)	0.708

Discussion

Maternal and fetal mortality and morbidity remain a chief health issue strongly correlated with fetal growth pattern, an issue of research interest showing that fetal growth issues is correlated to the risk of common non communicable diseases in adulthood (Ugwu et al., 2014).

The prevalence of fetal macrosomia in our study was 5.5%. Other studies in Tanzania have reported 2.3% (Aisha Salim et al., 2016) Africa have reported prevalence of 3.4 % in South Africa (Essel, Opai-Tetteh, 1995) and 3.5% in Nigeria (Adesina, Olayemi, 2003).

The study recruited 208 women who were admitted to our hospital and were delivered by CS indicated by prenatal diagnosis of fetal macrosomia. Fetal weight was assed clinically and by ultrasound. Both techniques were analyzed. In our study, both clinical and ultrasound fetal weight estimates and the actual birth weight revealed that both estimates are significantly higher the actual birth weight. In addition, it was shown that clinical estimate is significantly higher than ultrasound estimate.

This is in harmony with the study of on 200 term pregnant women. They used three formulae for the estimation of fetal weight at term; The Had lock formula for the USG method, and two different formulas for clinical methods, maternal symphesis-fundal height and abdominal circumference at the level of umbilicus. The authors concluded that all three methods statistically overestimated birth weight for the high and normal birth weight groups. However, in a previous research study performed comparing the accuracy of clinical and Sonographic methods of predicting fetal weights at term, clinical fetal weight estimation was significantly higher actual weight while ultrasound assessment was significantly lower actual weight (Lanowski et al., 2017).

Conclusions and Recommendations

This study demonstrated that:

The prevalence of fetal macrosomia at MMH was 5.5% and an important cause of maternal and neonatal morbidity.

Maternal risk factors of fetal macrosomia in our study included multiparity, previous history of macrosomia, presence of diabetes mellitus, overweight , gestational age of 40 weeks and above, and maternal age ranging between 30 and 39 years.

Sonographic evaluation of fetal weight displayed superiority than the clinical approach as regards absolute errors and error percentages. Sonographic examination additionally revealed better statistical sensitivity and specificity in detection of fetal weight > 4000 gm.

So we recommend:

- We should depend on US more than clinical methods in estiamation of fetal weight
- Avoid over diagnosis of macrosomia by good evulaution of cases by senior obstetrician
- Good assessment of risk factors
- Pre gestational control of obesity and diabetes mellitus.

References

1. Adesina OA, Olayemi O. Fetal macros omia at the University College Hospita l, Ibadan: a 3-year review. J Obstet Gy naecol. 2003;23:30–3.
2. Essel JK, Opai-Tetteh ET. Macrosomia –maternal and fetal risk factors. S Afr Med J. 1995;85:43–6.
3. Kim SY, Sharma AJ, Sappenfield W, Wilson HG, Salihu HM. Association of maternal body mass index, excessive w eight gain, and gestational diabetes mel litus with large-for-gestational-age birt hs. Obstet Gynecol. 2014 Apr. 123 (4): 737-44.
4. Lanowski JS, Lanowski G, Schippert C, Drinkut K, Hillemanns P, Staboulid

ou I. Ultrasound versus Clinical Exami nation to Estimate Fetal Weight at Ter m. Geburtshilfe Frauenheilkd. 2017; 7 7: 276-283.
5. Martin JA, Hamilton BE, Osterman M J, Driscoll AK, Mathews TJ. Births: Fi nal Data for 2015. Natl Vital Stat Rep. 2017 Jan. 66 (1):1. .
6. Okun N, Verma A, Mitchell BF, Flowe rdew G. Relative importance of matern al constitutional factors and glucose int olerance of pregnancy in the developm ent of newborn macrosomia. J Matern Fetal Med. 1997 Sep-Oct. 6(5):285-90.
7. Practice Bulletin No. 173 Summary: F etal Macrosomia. Obstet Gynecol. 201 6 Nov. 128 (5):1191-1192. .
8. Ugwu EO, Udealor PC, Dim CC, Obi SN, Ozumba BC, Okeke DO, et al., Ac curacy of clinical and ultrasound estim ation of fetal weight in predicting actua l birth weight in Enugu, Southeastern Nigeria. Niger J Clin Pract. 2014; 17: 2 70-275.