ESTIMATION OF FETAL WEIGHT: REFERENCE RANGE AT 17-25 GESTATIONAL AGE ACCORDING TO ANTHROPOMETRICAL PARAMETERS

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Abstract

The screening and management of abnormal fetal growth, whether it be macrosomia or growth restriction, remain important objectives of prenatal care. The measurement of fetal biometry in the second and third trimesters is an important part of these examinations and biometric measurements are combined routinely in order to calculate the estimated fetal weight (EFW).

EFW is a useful parameter with which to predict birth weight and outcome when it is calculated a few days before delivery.

Total number of fetuses (n=210) according to gestational age were divided in three groups (first group 17-19g.a; second group 20-22g.a and third group 23-25g.a). Each group was divided in subgroups according to the sex criterion. Anthropometrical parameters were measured using methodology of the International Biological Programme (IBP) with standard technique of measurement and equipment.

Fetal parameters were analyzed: fetal weight (FW), fetal length (FL), biparietal diameter (BPI), head circumferences, thigh circumferences, Mid Upper arm circumferences, abdominal circumferences, longitudinal and transversal parameters.

The fetal weight as a basic characteristic and indicator of the physical growth is of great practical importance because it supplies information whether the fetuses weight is normal for the gestational week or there are some deviations which lead to an abnormal development of the fetus. The results showed that anthropometrical parameters of the fetus were in positive correlations with fetal weight and their values were increased in different groups according to gestational age.

Fetal anthropometric models are strongly predictive of actual fetal weight. The need for using measurements of some anthropometrical parameters of the fetus are imposed as sensitive, safe and sample, above all compelling in routine clinical practice.

Key words: fetus, fetal length, fetal weight, anthropometrical parameters.

Introduction

The anthropometric measurements of certain fetal parameters have proved to be a useful method in determining the gestational age of the fetus. The examinations of the fetal growth include anthropometric measurements which are classically based on the descriptions of the fetal growth. Gestational age (length of fetal life) is determined with different parameters in modern obstetrics; parameters which as routine and technical methods are used in determining the same as prenatal assessment [1].

Values obtained from appropriate anthropometric measurements compared to standard values obtained for an individual gestational age represent an indirect method for determining gestation Information in literature shows that by measuring bi -parietal diameter (BPD) as one of the most important parameters in the second trimester of the intrauterine growth of the fetus, we can diagnose intrauterine delay of the development of the fetus in 40-60% of the cases [2].

The BPD measurement is dependent on head shape (which can be quantified using the cephalic index), whilst the head circumference measurement is independent of head shape. Therefore for fetuses with a dolichocephalisc head shape, the head circumference will be within expected limits, but the BPD recorded will be smaller than the normal value for a given GA.

Bi-parietal diameter and femur length equally correlate with gestational age, but measurements of the bi-parietal diameter have proven twice as sensitive in the assessment of the fetal age, whereas in the measurements of the femur length we can notice some [3].

Estimation of fetal weight (EFW) can also be used earlier in gestation to monitor fetal growth. It is a simple and straight forward indicator of global growth that is easy to use for doctors and easy to understand for patients.

However, in such cases, EFW should not be compared directly with the distribution of birth-weight measurements, as a large number of premature births are related to factors that affect fetal growth. Indeed, such a process may lead to an inaccurate assessment of fetal weight and inappropriate counseling and planned location for preterm delivery [4].

This highlights the need for specific reference ranges, which ideally should also be specific for gender and ethnicity. The correlation between anthropometric parameters and gestational age provides us with standard values of the corresponding parameters for each gestational week, by statistical data processing.

The anthropometric measurements of the fetal parameters are fast, easy and noninvasive applicative method which is used in obstetrics.

The aim of this paper is to show the significance of some anthropometrical parameters of the fetus in the assessment of fetal age and estimation of fetal weight.

Material and methods

The material consists of 210 fetuses obtained ex-utero divided into 3 age groups (n=70): first goup (17-19g.a); second group (20-22g.a) and the third group (23-25g.a). Fetuses without any visible anatomic macroscopic malformations served as criterion.

The following anthropometric parameters were measured: fetal weight (FW), fetal length (FL), biparietal diameter (BPI), head circumferences (HC), fetal length (FL), thigh circumferences, mid upper arm circumferences, abdominal circumferences, longitudinal and transversal parameters. Anthropometrical parameters were measured using methodology of the International Biological Programme (IBP) with standard technique of measurement and equipment.

Descriptive statistics and correlation between certain anthropometrics parameters was determined with regressive analysis and correlation coefficient.

Results

Results show that measurement of the anthropometric parameters which correlated with gestational age as one of the basic indicators in determining fetal growth and development are of great practical importance because they provide information about whether the fetus is developing normally for its gestational week or there are deviations which lead to abnormal development. The values of some measured anthropometric parameters are given in table,1,2 and 3 according to gestational age.

Table 1. Body weight, body height, lengths and circumferences of the extremities of fetus (mean and standard deviation).

(17-19 g.a)	N	Body weight (gr)	Body height (cm)	HC (cm)	CRL (cm)
male	35	228.5±96.23	21.6±2.97	14.67±2.01	14.9±2.07
female	35	214.83±97.24	21.24±2.90	14.60±2.24	14.46±1.93*

Sex	N	BPD(cm)	Upper arm (cm)	Femur length (cm)	Circumferences (cm) abdomen
male	35	3.89±0.48*	3.53±0.55	3.27±0.65	11.15±1.88
female	35	4.07±0.88	3.30±0.54	3.38±0.66*	10.66±2.23

Table 2. Body weight, body height, lengths and circumferences of the extremities of fetus (mean and standard deviation).

(20-22 g.a)	N	Body weight (gr)	Body height (cm)	HC (cm)	CRL (cm)
male	35	411.83±114.62	26.52±2.77	18.50±2.01	17.92±1.85
female	35	421.5±95.86	26.73±2.63	18.31±2.39	18±1.72*

Sex	N	BPD(cm)	Upper arm (cm)	Femur length (cm)	Circumferences (cm) abdomen
male	35	5.05±0.75*	4.25±0.68*	3.98±0.69	14.02±2.15
female	35	5.05±0.78	4.15±0.60	4.01±0.61*	14.32±2.03

Table 3. Body weight, body height, lengths and circumferences of the extremities of fetus (mean and standard deviation).

(23-25 g.a)	N	Body weight (gr)	Body height (cm)	HC (cm)	CRL (cm)
male	35	665±147.6	30.90±2.40	21.72±1.49	21.0±1.70
female	35	641±111.29	30.92±1.72	21.68±1.34	21.04±1.21*

Sex	N	BPD(cm)	Upper arm (cm)	Femur length (cm)	Circumferences (cm) abdomen
			4.75±0.53	4.31±0.72	16.82±3.20
male	35	5.91±0.75			
female	35	6.13±0.66*	5.03±0.50	4.63±0.68*	16.99±2.05

They show that all of the above mentioned values are dependent on gestational age and crown-rump length.

The mean values of the head circumference (HC) were (14.67±2.01) in males and (14.60±2.24) in females; in the second group (18.50±2.01) in males and (18.31±2.39) in females and in the third group were for males (21.72±1.49) and (21.68±1.34) for females.

The bi-parietal diameter (BPD) in the first group was in males (3.89±0.48) and (4.07±0.88) in females; in the second group was (5.05±0.75) and in females (5.05±0.78) and in the third group was in males (5.91±0.75) and (6.13±0.66) in females. Rate of growth/week increased as the gestational age is increased in all measured anthropometrics parameters, which are shown in table 1, 2 and 3.

Based on the obtained results, we can seen that following anthropometers showed the highest level of positive correlation with gestational age and fetal weight (table 4).

Table 4. Correlation of some anthropometric parameters

	Gestational age	Crown-rump lengh
Fetal weight	0.89	0.95
Fetal length	0.90	0.99
Head circumference	0.52	0.53
Biparietal diameter	0.85	0.89
Abdominal circumference	0.82	0.89
Femur lenght	0.90	0.96

Discussion

Fetal growth parameters, such as AC and FL, are typically used to calculate EFW and this result is subsequently compared with neonatal population standards to establish the risk of adverse pregnancy outcome.

Fetal nutritional status is generally considered to be adequate when estimated weight is within the normal range. Nonetheless, EFW does not carry the same prognostic significance as actual birth weight because the former cannot be measured directly before birth [5,6].

Longitudinal dimensions are some of the most reliable indicators of intrauterine growth of the fetus which show whether the growth is adequate to the given gestational week. All deviations in the linear dimensions lead to further observation in order to establish the type, degree and etiology of the altered growth [7-9].

Results from numerous anthropometric studies confirm that fetal weigh and fetal length are some of the most important markers for determining the normal development of the fetus and they highly correlate with gestational age, which was also shown in our study [14]. By recommendation of WHO [10-11], other more reliable parameters are included in the classification, such as head circumference (HC), biparietal diameter (BPD), femur length (FL), limbs circumference and abdominal circumference (AC). Measurements of femur length and upper leg circumference are potential parameters for assessment of fetal weight with even distribution of muscle mass and fat tissue during fetal growth and development [12,13].

Measurements of the biparietal diameter proved dependent on the shape of the head, whereas measurements of the head circumferences is independent from its shape [15]. Monitoring the dynamics of the growth of certain dimensions of the fetal head in the intrauterine period shows that the parameters of the head increase proportionally according to gestational age/week.

The recommendations of WHO opened up new phases in the ideas for using other fetal parameters which highly correlate with gestation and crown- rump length and which increase the precision of determining the normal development of the fetus.[16].

Conclusion

Measuring fetuses can be an additional method which will supply information about the fetal growth and estimated fetal weight and the changes that can occur during the growth and development of the fetus.

Crown-rump length and gestational age/week, as reliable fetal parameters which are routinely measured during the entire intrauterine growth of the fetus, are thought to play part in the assessment of fetal growth and development as well as in setting a diagnosis for early fetal abnormalities in the intrauterine growth.

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