Relationship between Fetus Weight and Biochemical Marker Results that Tested for Aneuploidy Screening in the Second Trimester

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ABSTRACT

Objective: We aimed at determining whether there was a relationship between the fetus weight and biochemical markers (hCG, MSAFP, and unconjugateed estriol) results that were studied in the maternal serum during the aneuploidy screening in the second trimester.

Methods: In our study, 425 pregnant women who had completed their triple scan tests and who gave mature birth in our Ege Obstetrics and Birth Training and Research Hospital were retrospectively examined. The babies were divided into groups that were suitable for 5%, 10%, 50%, 90%, and 95% according to their birth weight. The number of patients in the groups was 26, 63, 359, 27, and 8, respectively. The babies who were suitable for 50% were the control group. The results of hCG, AFP, and E3, which were used for the triple scan test in the second trimester, were found in the archive of our hospital. Babies who had fetal anomalies, pregnant women with gestational diabetes and hypertension, pregnant women who had chronical diseases, and those who smoked were excluded from the study.

Results: In this study, the average birth weight of babies who were over 2 MoM for hCG 2963.75 g difference was found statistically meaningful. However, the birth weight of 2963.75 g was suitable to 10%–50%. When the average birth weight of the babies who had less than 0.5 MoM for AFP 3032.50 g was compared with the control group, there was a statistically meaningful difference (p=0.009), but the average birth weight of this group was also found suitable nearly to 50%. While comparing the group who had more than 2 MoM for AFP with the group who had less than 2 MoM for hCG, no meaningful statistical difference was found. While comparing the groups who had less than 0,5 MoM for uE3 and more than 1.5 MoM with the control group, no statistically meaningful difference was found.

Conclusion: It is observed that the power of the biochemical scan tests to predict the fetal weight in the first and second trimester was low. There is a requirement to combine more than one abnormal test to study wider populations and to identify new tests. *(JAREM 2016; 6: 19-23)*

Keywords: Aneuploidy, unconjugated estriol, serum screening test, alpha-fetoprotein, human chorionic gonadotropin, unfavorable obstetric outcomes

INTRODUCTION

In terms of maternal and infant mortality and morbidity, when unfavorable obstetric outcomes are a concern, small for gestational age (SGA), intrauterine growth restriction (IUGR), macrosomia, premature birth, and preeclampsia are some of the major etiological factors. In terms of a newborn's health and development, considering the maternal risk factors that can be changed and the interventions that can be performed in order to prevent these factors, the development of tests that can predetermine a probable developmental delay is of great importance.

We aimed to demonstrate whether there is a relationship between fetal birth weight and biological marker results (hCG: human chorionic gonadotropin; MSAFP: maternal serum alpha-fetoprotein; uE3: unconjugated estriol) in the maternal serum studied during aneuploidy screening in the second trimester.

METHODS

In the present study, 425 pregnant women who had been admitted to the Ege Obstetrics and Gynecology Training and Research Hospital and who had completed their triple tests in our hospital and gave mature birth in 2009 were retrospectively examined. The infants were divided into five groups, namely 5, 10, 50, 90, and 95 percentiles, according to their birth weights. The number of patients in the groups was 26, 63, 359, 27, and 8, respectively. The babies who were suitable for inclusion in the 50th percentile group were considered as the control group. The results of hCG, AFP, and E3, which were used for the triple scan test in the second trimester, were found in the archive of our hospital laboratory, while the birth results were obtained from our hospital birth records.

Babies with a fetal anomaly, pregnant women with gestational diabetes and hypertension, pregnant women who had chronic

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Received Date: 12.06.2015 **Accepted Date:** 29.07.2015

Available on-line at www.jarem.org
DOI: 10.5152/jarem.2015.807

diseases, and pregnant women who smoked were excluded from the study.

The gestational age of the patients who had been included in the study was calculated by their last menstrual period and was confirmed by ultrasonography results that had been obtained in the early stages. Following the hospital training and planning board and ethics committee approval, the study was conducted in the Ege Obstetrics and Gynecology Training and Research Hospital, perinatal and maternity unit. Between the dates specified, upon receiving approval and the patients' signed informed consent form, the patients who had been evaluated were included in the study.

Statistical Analysis

For statistical analysis, the Statistical Package for the Social Sciences (SPSS Inc.; Chicago, IL, USA) program was used. While analyzing the data, in addition to descriptive statistical methods (mean, standard deviation, percent) for the intergroup comparison of quantitative data, one-way ANOVA and independent sample t-tests were used (all the parameters were in accordance with the normal distribution). Results with a 95% confidence interval were considered, and $p<0.05$ was considered statistically significant, while $p>0.05$ was considered statistically insignificant.

Table 1. Demographic distribution of the cases

	Mean	SD	Median	Min.	Max.
Maternal age (years)	28.17	4.94	28.00	18	41
Maternal weight (kg)	65.21	11.72	63.60	44	136
Birth weight (grams)	3264.54	459.41	3240.00	1840	4750

SD: standard deviation; Min: minimum; Max: maximum

RESULTS

In our study, 425 pregnant women who had completed their triple scan tests and given mature birth in our hospital were included. The demographic distribution of the cases is presented in Table 1.

According to their birth weight, the babies were divided into three groups as: 2500 grams and below, between 2500 and 4000 grams, and 4000 grams and above (Table 2).

The average hCG, AFP, and UE3 multiple of median (MoM) values correlating with each group were determined. There was no statistically significant difference between the groups (p=0.796, 0.747, 0.547).

According to the percentile values correlated with the babies' birth weight, babies were divided into five groups and examined as 5, 10, 50, 90, and 95 percentiles. The numbers of infants in the groups were 26, 63, 359, 27, and 8, respectively (Table 3). The average MoM of the MSAFP, hCG, and uE3 values of the groups were compared according to the percentile values. No statistically significant difference was detected between the groups (p=0.712, 0.318, 0.834).

The birth weights of the babies at the 50th percentile were compared when 2 MoM took the readings at limit values and above the limit values for alpha-fetoprotein and (Table 4).

As a percentile range, no statistically significant difference was found between the babies whose average birth weight was 3316.56 g at the 10–90th percentile range and babies who had values above 2 MoM for AFP with a 3126.15 g average birth weight (p=0.185). For HCG, babies with a 2963.75 g average birth weight having values above 2 MoM, the difference was statistically significant; however, the average birth weight of 2963.75 grams complied with the 10–50th percentile and was not significant for SGA or IUGR.

Table 2. Comparison according to the birth weight

	Birth weight			
	≤2500 gr n (%) 19 (4.47)	2500-4000 gr n (%) 379 (89.17)	≥4000 gr n (%) 27 (6.35)	p
hCG (MoM)				0.796
Mean	1.282	1.174	1.141	
SD	0.636	0.655	0.583	
MSAFP (MoM)				0.747
Average-mean	1.122	1.050	1.050	
SD	0.570	0.420	0.300	
uE3 (MoM)				0.547
Average-mean	0.986	1.047	1.088	
SD	0.313	0.307	0.344	

hCG: human chorionic gonadotropin; MSAFP: maternal serum alpha-fetoprotein; uE3: unconjugated estriol; SD: standard deviation; MoM: Multiple of Median

Table 3. The comparison of groups according to the percentile values

	≤5 (n=26)	≤10 (n=63)	50 (n=359)	≥90 (n=27)	≥95 (n=8)	p
MSAFP (MoM)						0.712
Mean	1.182	1.041	1.061	1.054	1.089	
SD	0.65	0.47	0.42	0.30	0.31	
hCG (MoM)						0.318
Mean	1.351	1.211	1.174	1.141	0.803	
SD	0.74	0.76	0.63	0.58	0.35	
uE3 (MoM)						0.834
Mean	1.050	1.069	1.039	1.088	0.970	
SD	0.37	0.35	0.89	0.34	0.16	

hCG: human chorionic gonadotropin; MSAFP: maternal serum alpha-fetoprotein; uE3: unconjugated estriol; SD: standard deviation; MoM: Multiple of Median

Table 4. Comparison of birth weight of the babies in the control group with babies who had above 2 MoM for AFP and hCG

	AFP>2 MoM (n=13)	hCG>2 MoM (n=40)	50 per (n=335)	p
Birth Weight				0.185[1]
				0.000[2]*
Mean	3126.15	2963.75	3316.56	
SD	483.38	567.48	300.63	

hCG: human chorionic gonadotropin; MSAFP: maternal serum alpha-fetoprotein; MoM: Multiple of Median
*p<0.05 statistically significant
[1]Level of significance for patients between AFP> 2 MoM and 50 percentile
[2]Level of significance for patients between B-hCG>2 MoM and 50 percentile

Table 5. Comparison of the average birth weight of babies under 0.5 MoM WITH THE control group for AFP and hCG

	AFP<0.5 MoM (n=8)	hCG <0.5 MoM (n=47)	50 per (n=335)	p
Birth weight				0.009[1]*
				0.797[2]
Mean	3032.50	3336.55	3316.56	
SD	332.12	518.01	300.63	

hCG: human chorionic gonadotropin; MSAFP: maternal serum alpha-fetoprotein; MoM: Multiple of Median
*p<0.05 statistically significant
[1]Level of significance for patients between AFP<0.5 MoM and 50 percentile
[2]Level of significance for patients between B-hCG<0.5 MoM and 50 percentile

Table 6. Comparison of the average birth weight of babies under 0.5 MoM and above 1..5 MoM with the control group for uE3

	uE3>1.5 MoM (n=35)	uE3<0.6 MoM (n=20)	50 per (n=335)	p
Birth Weight				0.353[1]
				0.655[2]
Mean	3237.14	3271.50	3316.56	
SD	489.93	438.63	300.63	

uE3: unconjugated estriol; SD: standard deviation, MoM: Multiple of Median
[1]Level of significance for patients between uE3>1.5 MoM and 50 percentile
[2]Level of significance for patients between uE3<0.6 MoM and 50 percentile

For alpha-fetoprotein and hCG, when 0.5 MoM was taken as the limit, the birth weight of the babies whose MoM limit was below 0.5 and the birth weight of the babies who were in the 50th percentile was compared, and the results are presented in Table 5.

For alpha-fetoprotein, when the babies with a MoM value below 0.5 and with an average 3032.50 g birth weight and the control group were compared, there was a statistically significant difference (p=0.009). For HCG, when the babies had a MoM value below 0.5 and an average birth weight of 3336.55 g and the control group were compared, no statistically significant difference was detected (p=0.797).

For unconjugated estriol, the average birth weight of the babies who were above 1.5 MoM and below 0.5 MoM and the birth weight of the babies in the control group were compared (Table 6). No statistically significant difference was found (p=0.353, p=0.655).

DISCUSSION

Although a full consensus on prenatal screening tests has not been reached yet, the studies that have been conducted have focused either on creating a new protocol or on the specificity and sensitivity in congenital anomalies. The second trimester MSAFP, hCG, and E3 threshold values have been reported differently in several studies.

Brock et al. (1) studied the relationship between maternal serum AFP levels and the presence of a low birth weight for the first time, and when an AFP MoM value of 2.3 was taken as the threshold value, it was reported that for cases above this value, a low birth weight was more than 2.5 times likely. Hamilton et al. (2), who used an AFP threshold value of 2.5 MoM, reported that in patients with higher AFP levels, there was a 10-fold risk for a low birth weight, a 10-fold risk for preterm labor, a 3-fold risk for ablatio placentae-placental abruption, and an 8-fold risk for perinatal mortality. Similar results were obtained by Milunsky et al. (3) and by many other researchers (4, 5) by using an AFP threshold of 2 MoM.

In second trimester maternal serum screening, Ganapathy et al. (6) reported that as the hCG level increased, the risk of fetal growth restriction also increased, and in cases with hCG values ≥5, ≥6, ≥7, and ≥8 MoM, fetal growth restriction was reported respectively as 40%, 44%, 64%, and 86%.

In the study conducted by Hung et al. (7) with 42259 pregnant women who had been performed second trimester maternal serum screening, it was reported that there was a relationship between fetal growth restriction risk and AFP, and between high inhibin (>2.5 MoM) and low uE3 (<0.5 MoM), and when these three parameters were assessed together, they demonstrated that 19.5% of births were under 2500 g with a 5% false positive rate.

In this study, the average birth weight of babies who were over 2 MoM for hCG was 2963.75 g and the difference was found to be statistically significant. However, a birth weight of 2963.75 g was suitable for 10%–50%. When the average birth weight of the babies who had less than 0.5 MoM for AFP was 3032.50 g and this was compared with the control group, there was a statistically significant difference (p=0.009), but the average birth weight of this group was also found to be suitable nearly to 50%. While comparing the group who had more than 2 MoM for AFP with the group who had less than 2 MoM for hCG, no meaningful statistical difference was found. While comparing the groups who had less than 0.5 MoM for uE3 and more than 1.5 MoM with the control group, no statistically significant difference was found. When the birth weight was grouped according to their percentile values, no statistically significant difference was found between the groups.

CONCLUSION

Our study included only full-term births. The AFP, hCG, and uE3 distribution ranges were seen to be narrow. The distribution ranges of these parameters are larger in other studies since they focus on studying preterm pregnancies. When examining the literature data, it was seen that the first and second trimester biochemical screening tests had little predictive power for fetal weight. There is a requirement to combine more than one abnormal test to study wider populations and to identify new tests.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ege Obstetrics and Birth Training and Research Hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - Y.O.; Design - B.A.Ş ; Supervision - B.T.; Resources - B.E.; Materials - Y.O.; Data Collection and/or Processing - B.A.Ş.; Analysis and/or Interpretation - S.S.; Literature Search - B.A.Ş., S.S.; Writing Manuscript - B.A.Ş., Y.O.; Critical Review - B.A.Ş.; Other - B.T., B.E., S.S.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

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