

Amniotic Fluid β 2- Microglobulin Measurements

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ABSTRACT

OBJECTIVE: To determine β 2-microglobulin levels in amniotic fluid during the course of second trimester.

STUDY DESIGN: One hundred patient's amniotic fluid β 2-microglobulin levels had been evaluated retrospectively (March-October 2009). The most common amniocentesis indication was advanced maternal age (33.3%). Others were; high risk result for triple test (18.5%), high risk result for double test (6.48%), ventriculomegaly (5.55%), obstetric history for fetus with down syndrome (4.62%), the presence of soft markers on ultrasound (13.8%), others (17.8%). Patients average gravida was 2.66 (range: 1-6), parity was 0.75 (range: 0-3), abortion was 0.65 (range: 0-3).

RESULTS: All patients were at second trimester and the average gestational week was 17.7 (range 15-22). Patients were divided into four groups (15th, 16th, 17-18th and 19-20th gestational weeks). We have demonstrated that amniotic fluid β 2-microglobulin levels are increased progressively throughout the second trimester. We have specified normal β 2-microglobulin values of each gestational week/period in order to be used in clinical practice.

CONCLUSION: We have demonstrated that amniotic fluid β 2-microglobulin levels are increased progressively throughout the second trimester.

Keywords: Amniotic fluid, β 2-microglobulin, Second trimester

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Introduction

β 2 - microglobulin is a surface protein that belongs to the major histocompatibility complex (MHC) Class 1 family.¹ The MHC Class 1 is made of a heavy chain, carrying the allotypic determinants of its specificity and a non-covalent bond light chain, β 2-microglobulin.¹ β 2-microglobulin stabilizes the structure of the heavy chain and allows surface MHC Class 1 antigen expression.¹ β 2-microglobulin joins the circulation as a monomer when it is separated from the heavy chain. Approximately ninety nine percent of it is reabsorbed from the proximal tubules of the kidney after glomerular filtration. Daily loss by urine is less than 400 ng.¹ Therefore,

measurement of urine β 2-microglobulin levels may be an indicator of proximal renal tubular function.²

The concentration of β 2-microglobulin in amniotic fluid increases progressively up to the 20-24th weeks of pregnancy. It reaches a peak level during the second trimester which is an eightfold value compared to the maternal serum level and is similar to the maternal serum concentration at term.³ It is believed that these changes are due to fetal renal tubular maturation.³

In our study, we aimed to determine the amniotic fluid β 2-microglobulin levels week by week at second trimester so that this variable can be used prenatally in order to show fetal renal function or intrauterine fetal kidney parenchyma injury.

Material and Method

We have used 100 patients' amniotic fluid samples obtained by amniocentesis to determine β 2-microglobulin levels. Necessary consent forms are signed by patients prior to entering prenatal diagnosis program and amniocentesis itself.

Amniocentesis was performed with a 21-G needle under ultrasonographic guidance. Ten to fifteen ml of amniocentesis material was used for karyotyping and 2 ml used for β 2-microglobulin measurements. Karyotyping was performed by using conventional cytogenetic methods and β 2-microglobu-

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lin measurements were performed with radioimmunoassay techniques. The statistical software package SPSS version 17.0 (SPSS, Chicago, IL, USA) was used for data analyses.

Results

All patients were at second trimester and the average gestational week was 17.7 (15-22). The most common amniocentesis indication was advanced maternal age (33.3%). Others were; high risk result for triple test (18.5%), high risk result for double test (6.48%), ventriculomegaly (5.55%), obstetric history for fetus with down syndrome (4.62%), the presence of soft markers on ultrasound (13.8%) and others (17.8%).

Patients' average (mean) gravida was 2.7 (range: 1-6), parity was 0.8 (range: 0-3), abortion was 0.7 (range: 0-3). The average (mean) β 2-microglobulin value was 8.17 mg/ml (4.25-22.71). Patients were divided into four groups (15th (n=7), 16th (n=31), 17-18th (n=45) and 19-20th (n=14) gestational weeks). Beta2-microglobulin amniotic fluid concentrations during the course of second trimester gestational weeks/periods are show in table 1 and figure 1.

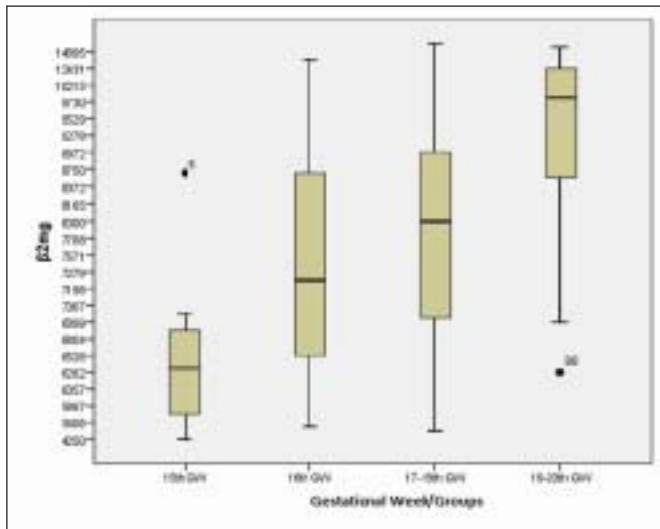


Figure 1: Amniotic fluid beta2-microglobulin level distribution according to the gestational weeks. (B2mg: Beta2 microglobulin, GW: Gestational week)

Four groups compared with Kruskal Wallis test. There was statistically significant difference between four groups ($p < 0.001$). Whereupon pair wise comparison non-parametric

multiple comparison test was performed and detected statistically significant difference between four groups ($p < 0.05$)

According to our results amniotic fluid β 2-microglobulin levels are increased progressively throughout the second trimester. We measured the highest levels in the 19-20th gestational week group.

Discussion

β 2-microglobulin is low molecular weight protein (11.800 Daltons) of MHC Class I which is excreted only by the kidney.² Approximately 99% is reabsorbed by the proximal tubules.⁴ When plasma β 2-microglobulin level rises, the tubular reabsorption increases too. So urine β 2-microglobulin levels are steady.⁵ Thus, β 2-microglobulin becomes a specific and sensitive indicator of proximal renal tubular function. This reabsorption takes place with full capacity in term infants, however for preterm infants this is not the case. Except for dismaturation, renal ischemia, interstitial inflammation, toxins, heavy metals, etc. can lead to dysfunction of the proximal tubules.⁶ For preterm infants, who don't have these risk factors, high levels of β 2-microglobulin can be linked to proximal renal tubular dismaturation. Cole et al.² suggested this theory and added that the other reason of high β 2-microglobulin levels at amniotic fluid can be fractional excretion of water.⁷

Hadnagy et al.³ found that amniotic β 2-microglobulin levels increases progressively and makes a peak at second trimester (20-24th gestational week) and becomes equal to maternal serum level at third trimester. They mentioned that this is due to renal tubular maturation and they said that amniotic fluid β 2-microglobulin levels can be used for determination of fetal age.³ On the contrary, Vesce F et al.⁸ studied the β 2-microglobulin levels and lecithin/sphingomyelin (L/S) ratio at 14th and 42th gestational weeks. They looked for a relationship between lung maturation and β 2-microglobulin levels but they didn't find any correlation. Fetal urine β 2-microglobulin value was reported to be around 6mg/ml at term pregnancy probably due to fetal kidney maturation.⁸

In our study, we have demonstrated that amniotic fluid β 2-microglobulin levels are progressively increased during the course of second trimester. We have obtained the normal amniotic fluid β 2-microglobulin concentrations of second

Table 1: β 2-microglobulin levels of 15th, 16th, 17-18th and 19-20th gestational weeks

Groups/ β 2-microglobulin(µg/l)	Median(µg/l)	IQR(µg/l)	Min./Max.(µg/l)
15 th gestational weeks (n=7)	6325.0	2708.0	4250.0-8685.0
16 th gestational weeks (n=31)	7249.0	2274.0	5327.0-13124.0
17-18 th gestational weeks (n=45)	8000.0	2093.0	5112.0-22712.0
19-20 th gestational weeks (n=14)	9752.0	4245.25	6262.0-21829.0

Four groups compared with Kruskal Wallis test, $p < 0.001$

trimester gestational weeks/periods so that these values can be used in the determination of fetal kidney function or fetal renal parenchyma injury due to obstructive uropathies or other urinary system abnormalities. Our values are critical and clinically useful because amniotic fluid values make a peak in between 20-24th gestational weeks and stay stable afterwards until delivery.³

Conclusion

In our study, we have demonstrated that amniotic fluid β 2-microglobulin levels are increased progressively during second trimester gestational weeks/periods. Our results will enable us to use β 2-microglobulin measurements prenatally in order to demonstrate intrauterine fetal renal function or to show fetal renal injury due to obstructive uropathies or other urinary system problems by having amniocentesis.

İkinci Trimester Amniyon Sıvısı β 2-Mikroglobulin Değerleri

ÖZET

AMAÇ: İkinci trimester sırasında amniyotik sıvıda β 2-mikroglobulin düzeylerini belirlemek.

GEREÇ VE YÖNTEMLER: Bu çalışmada, 100 hastanın amniyotik sıvı β 2-mikroglobulin düzeyleri retrospektif olarak değerlendirildi (Mart 2009 - Ekim 2009). En sık amniyosentez endikasyonu ileri anne yaşı olup (%33,3), diğerleri sırasıyla üçlü test risk artışı (%18,5), ikili test risk artışı (%6,48), ventrikülo-megali (%5,55), down sendromlu çocuk öyküsü (%4,62), diğerleri (%17,8) idi. Ortalama gebelik sayısı 2,66 parite 0,75, abortus 0,65 idi.

BULGULAR: Tüm hastalar ikinci trimesterde olup, ortalama gebelik haftası 17,65 (15-22) idi. Hastalar dört gruba ayrıldı (15 (n=7), 16 (n=31), 17-18 (n=45) ve 19-20. (n=14) gestasyonel

haftalar). Bu çalışmada ikinci trimesterde haftalar ilerledikçe amniyotik sıvı β 2-mikroglobulin düzeylerinin yükseldiğini gösterdik. Aynı zamanda klinik pratikte kullanılmak üzere, her gestasyonel haftanın amniyotik sıvı β 2-mikroglobulin düzeyini belirledik.

SONUÇ: Bu çalışmada ikinci trimesterde haftalar ilerledikçe amniyotik sıvı β 2-mikroglobulin düzeylerinin yükseldiği gösterilmiştir.

Anahtar Kelimeler: Amniyotik sıvısı, β 2-mikroglobulin, İkinci trimester

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