

## Serum $\alpha$ FP Level in Cord Blood of Full Term Neonates Born in Babol City

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### ABSTRACT

**BACKGROUND AND OBJECTIVE:** Serum alpha-fetoprotein ( $\alpha$ FP) level is considered as a diagnostic marker is higher than normal in many congenital tumors such as germ cell, hepatoblastoma, as well as liver and metabolic diseases in neonates. Normal neonates also have a higher level of alpha-fetoprotein than others, so it is important to diagnose this interference. In valid sources, the normal serum alpha-fetoprotein level in infants is related to advanced countries, which may vary in our country. Therefore, this study was conducted to determine the serum levels of alpha-fetoprotein in the umbilical cord blood of term neonates born in Babol and to compare them in two genders.

**METHODS:** This cross-sectional study was performed on 500 neonates (37-42 weeks) born in hospitals in Babol city where physical examination was normal. At birth, 5 ml of umbilical cord blood was taken and samples were sent to the lab for measurement of alpha-fetoprotein. Serum alpha-fetoprotein level was measured by ELISA method and was compared in two genders.

**FINDINGS:** Mean serum  $\alpha$  FP levels was  $76.57 \pm 35.25$  ng/ml (range 2.3-160) and it was significantly higher in males ( $80.54 \pm 36.95$  vs.  $73.69 \pm 33.73$  ng/ml) which was statistically significant ( $p=0.002$ ).

**CONCLUSION:** The results of this study showed that the level of alpha-fetoprotein in neonates born in Babol is relatively high and also in males is more than females.

**KEY WORDS:** *Alfa-fetoprotein, Newborn, Umbilical Cord Blood.*

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## Introduction

**A**lpha-fetoprotein is a protein produced in humans by the  $\alpha$ FP gene, and it seems that alpha-fetoprotein in the fetus is similar to that of the serum albumin and the gene of both proteins is located on chromosome 4. This protein can be seen in monochrome, dimer, and thermic forms, and binds with copper, nickel, fatty acids and bilirubin. The molecular weight is 75,000-61,000 Daltons and is a single-stranded alpha globulin containing 590 amino acids and its sequencing is known. This glycoprotein also has 3.4% carbohydrate (1). Its physical and chemical properties are similar to albumin and can be seen in other mammals (2). Human alpha-fetoprotein appears very early in the embryonic period and can be identified in the fourth week of embryonic life. Serum alpha-fetoprotein concentrations increase rapidly, reaching its maximum at week 14 and then decreasing (3,4).

Alpha-fetoprotein is produced in an embryo that is being developed by an equal amount of fetal yolk sac and liver. At week 13, the yolk sac is degenerated and the fetus is the main source of production of alpha-fetoprotein (2,5). The production of alpha-fetoprotein is stopped after delivery (6). These results quickly decrease with age, reaching less than 10 ng / ml at the end of the first year of life (5,7). The metabolism of alpha-fetoprotein is not known, but after delivery, its half-life is estimated to be about 5 days (1,7,8). The biological role of alpha-fetoprotein is not yet defined, but due to its biochemical similarity to albumin, it is thought that alpha-fetoprotein can be a carrier protein or even play a role in the metabolism of bilirubin (9). It is possible to consider the role of Immunoregulator during pregnancy (6,7,10).

Unlike its biologic action, alpha-fetoprotein has diagnostic applications. Serum levels of alpha-fetoprotein have been observed in a number of tumors, such as hepatocellular carcinoma, hepatoblastoma and germ cell tumors (yolk sac, ovarian carcinomas, and malignant teratomas) (7,8). There is also an increased level of alpha-fetoprotein in hepatic diseases, such as infantile hepatitis, biliary atresia, Indian cirrhosis of children, and tyrosinemia, as well as in the defects of the omphalocele and fetal nervous system (3,5).

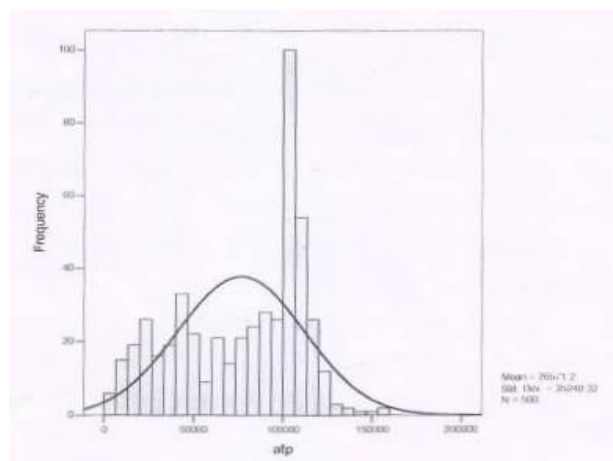
Considering that the level of serum AFP in the neonates is much higher than other ages, and also in some cases, such as germ cell tumors and hepatoblastoma, and some other diseases of the liver and some of the chromosomal diseases in newborn babies, serum levels of serum alpha-fetoprotein are also increased. Serum alpha-fetoprotein levels in our newborns may differ from global reference. Therefore, this study was conducted to determine the serum levels of alpha-fetoprotein in the umbilical cord blood of term-neonates born in Babol and to compare them in two genders.

## Methods

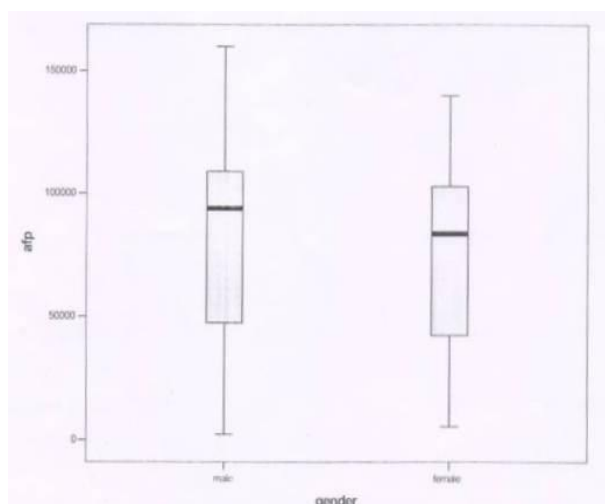
This study was carried out after approval of the Ethical Committee of Babol University of Medical Sciences with code for 500 neonates (37-42 weeks) in Babol's hospitals. After receiving written consent from parents, 5 ml of blood was taken at birth and sent to the laboratory to determine serum alpha-fetoprotein levels. All cases were excluded from the study due to the presence of diseases that increase the alpha-fetoprotein, such as the presence of tumors and metabolic diseases and liver disease, clinically and para-clinically after diagnosis based on history and clinical examination. The alpha-fetoprotein was determined using the Padtan kit in Iran using ELISA method. The alpha-fetoprotein levels were then calculated and compared in two genders. The data were entered into SPSS version 16 and then analyzed by Mann-Whitney test and  $P < 0.05$  was considered significant.

## Results

Of the newborns, 210 (42%) were male and 290 (58%) were female. The lowest amount of alpha-fetoprotein was 2300 ng/ml and its maximum value was 160,000 ng/ml. The mean of alpha-fetoprotein level in males was  $80548.81.86 \pm 36950.33$  ng/ml and in females was  $73690.86 \pm 33735.06$  ng/ml which was more in males than in females ( $p=0.002$ ). The comparison of the mean alpha-fetoprotein levels in the umbilical cord blood of infants and in both genders is presented in Figures 1 and 2.



**Figure 1. Frequency distribution of serum alpha-fetoprotein in the umbilical cord blood of newborns born in Babol**



**Figure 2. Comparison of the mean of alfafetoprotein levels in both genders**

## Discussion

Based on the results of this study, the lowest amount of alpha-fetoprotein was 2300 ng/ml and its maximum value was 160,000 ng/ml with mean of ng/ml  $76571.2 \pm 35248.32$ . The results of this study indicated that the level of alpha-fetoprotein in the study was greater than the serum alpha-phetoprotein level obtained from similar studies in neonates of other countries. In the study of Blohm et al. (11), the mean of alpha-fetoprotein at birth was 41687 ng/ml, which differed significantly from our study.

In another study by Bader et al. (12) investigated umbilical cord blood of 260 term and near to term neonates with birth weight more than 1700 grams, the

mean levels of alpha-fetoprotein were  $61.6 \pm 44.8$  µg/ml (between 1.7-146.5 µg/ml). In this study, the alpha-fetoprotein level was between 15.7-146.5 µg/ml. The mean of alpha-fetoprotein in this study is closer to our study, but it should be noted that in this study, near-term infants were also included in the study, and considering that the level of alpha-fetoprotein in preterm infants was 10 times higher than the term of a neonate (13).

The higher this mean than other studies, and its close proximity to our study is worth for considering. In our study, the mean alpha-fetoprotein level in males was  $80548.81 \pm 36950.33$  ng/ml and in females was  $73690.86 \pm 33735.06$  ng/ml which was higher in males than females, and was statistically significant. Similar to our study in the study of Lee et al. in Taiwan, the level of alpha-fetoprotein was higher in males (14). In the study of Obiekwe, the level of the alpha-fetoprotein of the arteries and the placenta was significantly higher in males than females (15).

But in the study of Bader and colleagues, serum alpha-fetoprotein levels were not significantly correlated with sex (12). In humans, the levels of alpha-fetoprotein are gradually reduced after birth, reaching the adult level after 8-12 months. The normal level of alpha-fetoprotein is low but measurable, although this protein has no known role in humans. In natural embryos, alpha-fetoprotein bonds to estradiol hormone. The alpha-fetoprotein is measured in blood or amniotic fluid in pregnant women to screen for evolutionary defects. This protein increases in the defects of the nervous system and amphalocele and decreases in Down syndrome.

In addition, alpha-fetoprotein is measured in other individuals to detect some tumors, particularly hepatocellular carcinoma and hepatoblastoma, and endoderma sinus tumors, and generally germ cell tumors (16-18). Therefore, knowing the natural level of this protein in humans is important for determining diagnostic criteria.

Based on the fact that in reference books, serum levels of alpha-fetoprotein in advanced countries may vary with its level in our country, this study was conducted to standardize the serum level of alpha-fetoprotein in our country and to compare it with global

standards and based on its results it has been determined that its level in our country is higher than the amount provided in other references. Therefore, further studies are needed to evaluate the level of alpha-fetoprotein in other parts of the country and performing meta-analysis in Iran by collecting the results of these studies is recommended to determine the more reliable means.

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