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Research Article

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Data analysis on prenatal screening of Down's syndrome among 5823 cases in pregnant metaphase

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ABSTRACT

To use the results of second trimester Down's syndrome screening, analysis the relevance of serum AFP, uE3 and a median multiple of β-HCG with gestational age and weight , in order to improve the rate of detection and accuracy for Down syndrome screening. According to the median of 5823 cases of alpha-fetoprotein (AFP) of 15-21 weeks pregnant, human chorionic gonadotropin (β-HCG) and unconjugated estriol (uE3) to calculate AFP, uE3, value of MoM for β-HCG and assess the risk, analysis relevance of gestational age, weight and markers of three serum. Age, weight and markers of three serum are correlated. The markers of normal fetal maternal serum is AFP, levels of uE3 were positively correlated with gestational age; levels of β-HCG were negatively correlated with gestational age; maternal serum AFP, uE3, levels of β-HCG were negatively correlated with maternal weight. AFP, β-HCG, uE3 triple screening of high-risk fetuses in favor of early diagnosis and early intervention to reduce the rate of birth defects in newborns.

Key words: poregnant metaphase; Down's syndrome; prenatal screening; median multiples.

INTRODUCTION

Down's syndrome (Down's syndrome, DS), also known as Down's syndrome or 21 - trisomy syndrome is most common in children caused by defects of the disease, its incidence is about 1/800-1 / 600 [1], the main clinical features of children with mental retardation, developmental delays and special face, and often accompanied by multi-organ malformations or other abnormalities. It closely related to the maternal age, weight and so on. The etiology of disease is not clear, there is no effective treatment, the best means of it is stop pregnant, so prenatal screening and diagnosis are particularly important. In this study, triple detection alpha-fetoprotein (AFP), human chorionic gonadotropin (β-HCG) and unconjugated estriol (uE3), through research and analysis of the median (MoM) of 5823 cases of maternal serum markers multiples, to further explore the relationship between the risk-free rate and gestational age, weight. Improve its early diagnosis of Down's children, reduce the birth rate of Down children to further optimize the quality of the population.

EXPERIMENTAL SECTION

Subjects of study

Select from 5823 cases of pregnant women that accept voluntary prenatal screening for Down's syndrome and receive follow-up on October of 2009 to October of 2012 in this region of as research subjects.

Method

Collect maternal serum At 15-21 weeks of pregnancy, take 2ml whole blood of pregnant women, centrifuge and take the supernatant, put in -20 ℃ refrigerator for test. using advanced chemiluminescence technology of chemiluminescence analysis system from Beckman Coulter Access measured levels of AFP, uE3, β-HCG in

maternal serum, combined with maternal weight, gestational age, with a special analysis software consolidate risk-free rate of fetal abnormalities, pregnant women who receive Down Syndrome screening their merger risk> 1/270, deemed positive. When the AFP (MoM) ≥ 2.5,it judged to be at high risk of neural tube defects[2]. In the case of informed high-risk pregnant women amniocentesis by downstream B, analysis and confirm karyotype of chromosome from the amniotic fluid cell that if diagnosed as abnormal, is need for further processing.

Diagnostic criteria

Triple screening normal range of AFP, β-HCG, uE3 in second trimester serum: 0.65 ≤ AFP (MoM) ≤ 2.5; β-HCG (MoM) ≤ 2.5; 0.5 ≤ uE3 (MoM) ≤ 2.0. High risk cutting of . a value of 21 – trisomy is 1/250; high risk cutting of 18 - trisomy is 1/350; high risk cutting of NTD is 1/250 [3].

Statistical analysis

AFP, uE3, β-HCG in maternal serum using multiples of the median (MoM),the experimental data use SPSS18.0 software for data processing and statistical analysis, explore the relationship between MoM, gestational age and weight, the incidence DS risk of each gestational age group use χ^2 to test, P <0.05 indicates significant difference.

RESULTS AND DISCUSSION

Screening of 5823 cases of pregnant women, it has a total of 312 cases of high-risk, in which 254 cases are DS, risk-free rate is 4.36%; 21 cases of 18 - high risk of trisomy, risk-free rate is 0.36%; 37 cases of congenital neural tube defects (NTD), risk-free rate is 0.64%. 312 cases of which 203 pregnant women at high risk of routine amniocentesis karyotype analysis, ultrasound screening and confirmed regular follow up in deformity, 11 cases of chromosomal abnormalities (6 cases of 21 - trisomy, two cases of 18 - trisomy, 3 cases of other abnormalities), 8 cases of neural tube defects (3 cases of anencephaly children, 5 cases of open spina bifida), 11 cases of other malformations. Terminate pregnancy in the mid-induction. Followed up to women who participate in the screening to birth, one case of high-risk without making prenatal diagnosis delivery Down's children. 21 cases of other defects (including stillbirth, hydrocephalus, congenital heart disease, cleft lip and palate, intestinal atresia and etc.).

Table 1. the results of different disease screening and diagnosis

Names of diseases	screening positive cases	percentage of positive	the number of cases diagnosed	diagnosed percentage
DS	254	4.36%	6	0.103%
18- trisomy	21	0.36%	2	0.034%
NTD	37	0.64%	8	0.137%
total	312	5.36%	16	0.274%

Correlation Analysis

Median multiples (MoM) rule is a standardized method widely used in currently prenatal screening areas. Values of MoM can be based on the following formula: value of MoM = observed value index / the median of the respective groups in index-specific health [4]

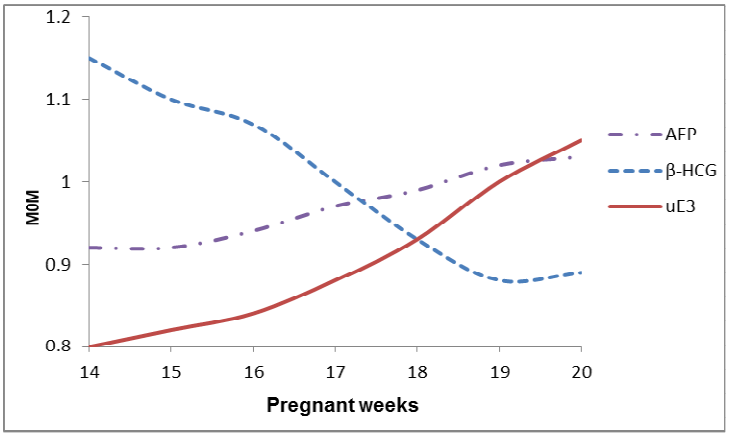
In order to observe its normal pregnant relevance of gestational age, weight and serum indicators, according to triple screening results of AFP, uE3, β-HCG from 5511 cases of pregnant women in the second trimester of pregnancy, outcome measures, using SPSS software get value indicators of MoM, and explore value of MoM with gestational age and weight.

Correlation between gestational age and maternal serum indicators

By correlation analysis of gestational age and each value of MOM of serum markers, the results showed after 14 weeks serum markers AFP increases with increasing gestational age, a positive correlation between them, the correlation coefficient r = 0.98, P <0.05; levelsβ -HCG will decrease with increasing gestational age, showed a negative correlation between them, the correlation coefficient r = -0.98, P <0.05; level of uE3 increases with increasing gestational age, a positive correlation between them, the correlation coefficient r = 0.98, P <0.05. In contrast, pregnancy affected by Down syndrome, the values of AFP and uE3 in parent are decrease with increasing gestational age, levels of β-HCG will increase with increasing gestational age. Many studies have shown that children with Down's syndrome levels of β-HCG are significantly increase in parent, β-HCG levels is also relevant with sex of the fetus, where female fetuses with Down syndrome in screening was significantly higher than male fetuses[5].

Table 2 Distribution of serum markers of gestational age

Pregnant weeks	AFP (MoM)	β-HCG (MoM)	uE3 (MoM)
14	0.92	1.15	0.80
15	0.92	1.10	0.82
16	0.94	1.07	0.84
17	0.97	1.00	0.88
18	0.99	0.93	0.93
19	1.02	0.88	1.00
20	1.03	0.89	1.05



Correlation between maternal serum markers and body weight

Correlation Analysis of maternal body weight and values of M0M of AFP, β-HCG, uE3, the results showed it is correlated between body weight and values of M0M of AFP, β-HCG, uE3. Maternal serum markers AFP will decrease with increasing weight, a negative correlation between them, the correlation coefficient r = -0.96, P <0.05; levels of β-HCG are negatively correlated with weight of body, the correlation coefficient r = -0.75, P <0.05; levels of uE3 were also negatively correlated with weight of body, and the correlation coefficient r = -0.94, P <0.05. According to the literature, the maternal weight is greater and the blood volume is higher, due to the dilution effect of blood volume, the concentration of serum markers were negatively correlated with the weight of pregnant.

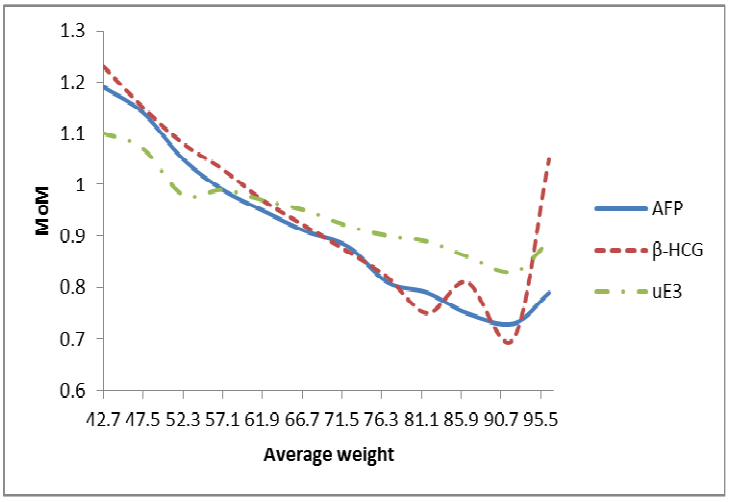
Table 3 Distribution of serum markers of body Restructuring

Weight Group （kg）	Average weight	AFP (MoM)	β-HCG (MoM)	uE3 (MoM)
40-45	42.7	1.19	1.23	1.10
45-50	47.5	1.14	1.15	1.07
50-55	52.3	1.05	1.08	0.98
55-60	57.1	0.99	1.03	0.99
60-65	61.9	0.95	0.97	0.97
65-70	67.0	0.91	0.92	0.95
70-75	72.2	0.88	0.87	0.92
75-80	77.0	0.81	0.82	0.90
80-85	81.8	0.79	0.75	0.89
85-90	86.6	0.75	0.81	0.86
90-95	92.2	0.73	0.70	0.83
95-100	96.5	0.79	1.05	0.89

In this study, triple detect AFP, β-HCG, uE3, is a classic combination of screening for Down syndrome apply to the second trimester (15-21 weeks) screening. According to the literature, the rate is up to 65% -80% detect fetal Down syndrome by this way[6]. Triple screening is non-invasive, simple, widely range of screening, can reduce blindness of prenatal diagnosis, reduce the rate of birth defects.

The median multiples method is a standardized method of more mature and recognized for Down syndrome, Edwards syndrome and neural tube defects such as prenatal screening[7]. In prenatal screening risk calculations, the value of each screening index values are converted to MoM ,then participate in the calculation of risk. However, China's prenatal screening calculation software is based on statistical data in Europe and America, leading to false-positive screening results, the high false negative rate. Therefore, the region should be based on the median maternal serum markers, establish median system for the second trimester screening Down's syndrome of the region to keep track of the median drift, adjust and screen MoM value of serum markers, in order to raise screening detection rate

and accuracy of Tang 's syndrome[8].



After 14 weeks, the AFP, uE3 levels of normal fetal maternal serum markers will increase with increasing gestational age; levels of β-HCG will decrease with increasing gestational age[9,10]. The parent whose children with Down syndrome, maternal serum is just the opposite.

This study maternal weight has the case of extreme value that weighs less than 45kg or above 95kg, due to the small sample size, there be a certain chance detected with three maternal serum markers, the study of the normal range for these two critical values can be determined based on the index value and the reorganization of the body near the index value. Fitting curves obtained in this study indicate that maternal serum AFP, uE3 β-HCG levels are inversely to maternal weight, so indicate that maternal weight is an important factor in the impact of maternal serum markers[11].

MoM values of serum markers of abnormal maternal fetal malformations were significantly higher than other MoM values of serum markers of normal pregnant women, therefore, triple screening of AFP, β-HCG, uE3 is not only predicting 21 - trisomy 18 - trisomy and important means of neural tube defects, are also have important predictive value to fetal malformation or some other obstetric complications.

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