

Analysis of alfa-fetoprotein concentrations in maternal serum of Romany and non-Romany women in the Prešov Region of Eastern Slovakia

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Introduction

Alpha-fetoprotein (AFP) is an embryo-specific serum alpha-globulin protein that is a major component of early embryonal serum in mammals. The biological function of AFP is still not known. AFP produced by the fetal liver appears in the maternal serum in a measurable quantity by the 15th completed week and increases in concentration until term.

Neural tube defects (NTD) are the most common congenital malformation of the

Aim. The aim of the study was to estimate concentrations of alpha-fetoprotein in the maternal serum of Romany and non-Romany women in the Prešov region (Slovakia) in the period from 2003-2006 and their comparison with attention to ethnic origin. AFP testing involved 1983 women. **Methods.** The study includes 265 Romany (14-44 years; mean age 23.64 ± 0.57 year) and 1718 non-Romany women (17-45 years; mean age 28.22 ± 0.24 year). To show the statistical difference between the ethnic groups, we employed multiple regression analysis. **Results.** The median values of MSAFP at 15-18 weeks gestation in Romany women were lower in comparison with non-Romany women of majority population in the Prešov region. **Conclusion.** The obtained results suggest that a correction for AFP concentrations or the use of group-specific medians for various ethnic populations would be appropriate.

Key words: Romanies, Ethnic differences, Ethnicity, Alpha-fetoprotein.

central nervous system. Screening of all pregnancies for neural tube and other birth defects using the triple test which combines the AFP (alpha-fetoprotein), hCG (human chorionic gonadotropin) and uE3 (estriol) is now a routine practice. Screening methods improve screening by addition of new markers and combination of serum and ultrasound markers.

Romanies (Gypsies) in Eastern Slovakia constitute a considerable part of the popula-

tion. According to the classic classification the Romanies belong to the White race also called Caucasian, Euro Asiatic or Indo-European. The exact number of Gypsies is not known, it is estimated to be about 10 million in the world, about 5 million of Gypsies live in Europe (12). In the Slovak republic live approximately 400 000 Romanies. The highest concentration of the Romany population lives in Eastern Slovakia.

Results of population genetic structure have revealed high consanguinity and coefficients of inbreeding in the Romany population in Slovakia (2). In literature ethnical differences in the levels of biochemical screening markers were described (4, 11, 1, 8). Benn et al. (1997) concluded that a correction for maternal weight and race should be applied when values for AFP in maternal serum are being interpreted (1).

Patients and Methods

The aim of the study was to estimate the concentrations of AFP in the maternal serum of Romany and non-Romany women in the Prešov region (Slovakia) between 2003-2006 and their comparison with attention to ethnic origin. AFP testing involved 1983 women. Data were collected from AFP tests performed on singleton, non-diabetic pregnancies at 14. to 18. week of gestation. The study includes 265 Romany (14-44 years; mean age 23.64 ± 0.57 year) and 1718 non-Romany women (17-45 years; mean age

28.22 ± 0.24 year). AFP concentrations in maternal serum were measured by standard radioimmunoassay (RIA-test-AFP, Human Lab, CS) according Wald et al. (1987) in the Laboratory of Nuclear Medicine in the Faculty Hospital of J.A.Reiman Prešov (16). AFP values are expressed as multiples of the median (MoM) value established for each week of gestation.

To show the statistical difference between the ethnic groups, we employed the multiple regression analysis using gestational week and ethnicity as explanatory variables (SPSS test, version 15.0). Here, ethnicity was a dummy variable which expresses the two ethnics as „0“ and „1“. Maternal age was also included in the analysis.

Results

The concentrations of AFP in maternal serum in the 14th to the 18th week of gestation in Romany and non-Romany women were analysed. Table 1 summarizes the statistical significance of MSAFP concentrations in Romany and non-Romany women in separate gestational weeks. The median values of MSAFP at 15-18 weeks gestation in Romany women were lower in comparison with non-Romany women of the majority population in the Prešov region.

Results of maternal body weight and maternal age analysis, which are included in the analysis also are given in Tables 2 and 3.

Table 1. MSAFP levels (MoM) in Romany and non-Romany women in the Prešov region (2003-2006)

Gestational week	MSAFP value							
	Romany women				Non-Romany women			
	N	Median	Mean	Standard deviation	N	Median	Mean	Standard deviation
14.	4	0.9950	1.000	0.35954	69	0.960	0.9941	0.3611
15.	21	0.9000	0.9243	0.37633	463	1.010	1.0892	0.3934
16.	131	0.9000	0.9176	0.38832	870	1.060	1.1159	0.3983
17.	63	0.8000	0.9443	0.38864	219	1.000	1.1057	0.4437
18.	46	0.8000	0.9022	0.38583	97	1.000	1.0936	0.4482

Table 2 Maternal body weight (kg) of Romany and non-Romany women in the Prešov region (2003-2006)

Gestational week	Maternal body weight							
	Romany women				Non-Romany women			
	N	Median	Mean	Standard deviation	N	Median	Mean	Standard deviation
14	4	55.00	56.25	6.344	69	59.00	61.28	10.357
15	21	51.00	50.26	7.806	463	58.00	60.91	11.257
16	131	56.00	58.61	12.992	870	60.00	62.53	11.308
17	63	54.00	56.89	13.067	219	60.00	62.72	11.519
18	46	52.00	55.90	11.604	97	60.00	61.91	11.115

Table 3 Maternal age (years) of Romany and non-Romany women in the Prešov region (2003-2006)

Gestational week	Maternal age							
	Romany women				Non-Romany women			
	N	Median	Mean	Standard deviation	N	Median	Mean	Standard deviation
14	4	26.50	27.25	6.131	69	27.00	27.32	4.470
15	21	21.00	22.48	4.106	463	27.00	27.66	4.902
16	131	22.00	23.72	5.564	870	28.00	28.41	4.857
17	63	23.00	23.63	5.865	219	28.00	28.84	5.288
18	46	24.00	23.41	4.906	97	27.00	28.38	5.239

A multiple regression analysis (included MSAFP levels, maternal age and maternal body weight) revealed evidence of a significant trend (beta coefficient for ethnicity -0.194; $t = -6.872$) (Table 4).

Table 4 Statistical significance of obtained results

Control variables	Unstandardized coefficient		Standardized coefficient		95% confidence interval for B		t	Sig.
	Beta	Beta	Beta	Beta	Lower bound	Hoper bound		
Gestational week	0.017	0.009	0.043	0.043	- 0.001	- 0.035	1.836	0.066
Maternal weight	- 0.003	0.001	- 0.072	- 0.072	- 0.004	- 0.001	- 3.180	0.001
Maternal age	0.000	0.002	- 0.004	- 0.004	- 0.004	0.003	- 0.155	0.877
Ethnicity	- 0.194	0.028	- 0.170	- 0.170	- 0.249	- 0.138	- 6.872	0.000

Dependent Variable: AFP

Results of analyses confirmed the differences in MSAFP concentrations between Romany and non Romany women. Detected differences in MSAFP concentrations were independent of ethnic differences in body weight (partial correlation: coefficient of correlation: -0.15).

Discussion

Anthropological characterization of isolated ethnic groups takes an important place in the anthropological research. The specific development of Romany children starts in prenatal development influenced by factors which negatively impact the foetus. From

the results of their observations, Bernasovský and Bernasovská (1998) state that Romany newborns differ substantially from other populations. Statistically significant differences were found between the average birth weight, the length as well as head and breast circumferences in Romany and non-Romany newborns of the East Slovakia region. The question arose whether the World Health Organization limit for the low birth weight 2500g is correct for Romany full-term newborns (2). According to data from population genetic investigations amongst Romanies the gene pool of the present day Romany population in Europe is significantly different from the majority of the European population (3).

Selecting appropriate levels of screening tests is also affected by the prevalence of disorder in the population to be screened. The prevalence of neural tube defects varies. The highest incidence of NTD has been reported in Ireland and Wales (6.38-10.92 per 1000 births), whereas its incidence in other European countries has been only 0.1-0.6 per 1000 births (10). The prevalence of neural tube defects in Slovakia was estimated to 1-8/1000 births (7). The incidence of NTD in Romany ethnics in Slovakia has not yet been researched.

Knowledge about the distribution of blood groups, serum and isoenzyme variants, HLA systems and DNA polymorphisms suggests the similarity of the Romany ethnic group to Indian people (3). According to literature data the prevalence of NTD from different parts of India has been reported to vary from 0.5 to 1.1 per 1000 births (14, 15). Kulkari et al. (1989) have found a prevalence of NTD in consanguineous couples to be 16.3-20.6/1000 compared to 5.9-8.4/1000 in couples without consanguinity. The high prevalence of NTD has been attributed to consanguinity (9).

For AFP, the absolute value of a pregnant woman's AFP level is modified by other fac-

tors that affect the result. Biological factors and assay conditions are two variables that obviously affect the median serum AFP value; maternal weight is a third, less-obvious one, maternal weight and AFP concentration in serum apparently are inversely related. Race has been suggested as a fourth variable (4).

The median values of MSAFP at 15 to 18 weeks gestation in Romany women in the Prešov region (Slovakia) in 2003-2006 were lower in comparison with non-Romany women of the majority population. These findings are consistent with data from previous studies showing ethnic differences in MSAFP concentrations in screening for open neural tube defects (1, 5, 13). Dar et al. (1996) concluded that there is a predisposition for abnormal levels of serum markers influenced by genetic and/or environmental factors (6).

Many corrections were made regarding gestational age and multiple gestations, thus decreasing the number of abnormal results. Further studies are necessary, especially with regard to detection of neural tube defects and Down syndrome. The results of our study suggest that a correction for AFP concentrations or the use of group-specific medians for various ethnic populations would be appropriate.

Conclusion

Maternal serum screening programs have the potential to decrease fetal morbidity and mortality by providing access to earlier diagnosis, by enabling families to make more informed reproductive decisions, and may be designed by appropriate delivery strategies.

There is a need for more studies on the value of MSAFP in monitoring pregnancies with attention to ethnic origin in MSAFP screening of neural tube defects. The aim for physicians and anthropologists remains henceforward to deal with this problem in numerous surveys.

References

1. Benn PA, Clive JM, Collins R. Medians for second-trimester maternal serum α -fetoprotein, human chorionic gonadotropin, and unconjugated estriol, differences between races or ethnic groups. *Clinical Chemistry*. 1997;43:333-7.
2. Bernasovská J, Bernasovský I, Pačín J. Anthropometric studies of Romany (Gypsy) newborns in East Slovakia delivered within 1991-1992. *J Hum Ecol*. 1998; 9(2):131-5.
3. Bernasovský I, Juričková J, Ferák V. Population genetic study in Gypsies (Roms) from Slovakia: Distribution of blood group genetic markers. *Anthropological Science*. 1994; 102: 409-19.
4. Crandall BF, Leberherz TB, Schroth PC, Matsumoto M. Alpha-fetoprotein concentrations in maternal serum: relation to race and body weight. *Clin Chem*. 1983; 29:531-3.
5. Cuckle HS, Wald NJ. Effect of allowing for ethnic group in prenatal screening for Down's syndrome. *Prenatal diagnosis*. 1996;16(8):691-8.
6. Dar H, Merksamer R, Berdichevsky D, David M. Maternal serum markers levels in consecutive pregnancies: a possible genetic predisposition to abnormal levels. *Am J Med Genet*. 1996;2:154-7.
7. Hájek Z, Kulovaný E, Macek M. *Základy prenatální diagnostiky*. Grada Publishing, 2000; 424.
8. Khoshnood B, Pryde P, Wall S, Singh J, Mitterdorf R, Lee KS. Ethnic differences in the impact of advanced maternal age on birth prevalence of Down syndrome. *Am J Public Health*. 2000;90(11):1778-81.
9. Kulkari ML, Mathew MA, Reddy V. The range of neural tube defects in Southern India. *Arch Dis Child*. 1989; 64:201-24.
10. Lemire RJ. Neural tube defects. *JAMA*. 1988; 259(4): 558-62.
11. Macri JN, Kasturi RV, Hu MG, Krantz DA, Douros TJ, Sajda P, et al. Maternal serum alpha-fetoprotein screening. III. Pitfalls in evaluating black gravid women. *AM J Obstet. Gynecol*. 1987;157:820-2.
12. McDowel B. „The Gypsies, wanderers of the world“. National Geographic Society. Washington, 1970.
13. Shapiro LM, Skinner LG, Philips HV, Whitfield CR. Racial variation in maternal serum alpha-fetoprotein. *Lancet*. 1975;6,2(7945):1142.
14. Sharma AK, Upreti M, Kamboi M, Membra P, Das K, Misra A. et al. Incidence of neural tube defects at Lucknow over a 10 years period from 1982-91. *Indian J Med Res*. 1994; 99:223-6.
15. Verma IC, Mathews AR. Congenital malformations in India. In: *Peoples of India: Some Genetic Aspects*. Ed. Satyavali GV. New Delhi, Indian Council of Medical Research, 1983; 70.
16. Wald NJ, Cuckle HS. Recent advances in screening for neural tube defects and Down's syndrome. *Baillières Clinical Obstetrics and Gynecology*. 1987;1(3):649-76.