Frequency of Rh phenotypes in relation to the outcome of pregnancy in the two groups of pregnant women

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Abstract

Lethal and sublethal genetical factors, including Rh factor, represent endogenous risk factors of the pregnancy outcome. These factors are most frequently inherited in recessive way and they often lead to the negative outcome of pregnancies. They represent pregnancy (a prirori) risk of various degrees. Inheritance of Rh system blood groups is linked to chromosome 1 and it could be explained by two alternative theories; molecular Rh system genetics has not yet been completely explained. The first formal-genetic theory postulates three closely linked gene sites (loci C, D and E) while the second theory has a monogenic character (one locus with several allele genes).
Data on 755 pregnancies, which were (for various reasons) estimated as increased risk pregnancies, were registered at Gynaecology Clinic, Clinical Centre of University of Sarajevo, during the period from 1989 to 1992. These data were collected from pregnant women who, according to the certain indications from their familiar and personal anamnesis, demanded genetic consultations.
The result of investigation of the basic Rh system phenotype distribution shows no statistically significant difference between monitored pregnant women. This result is assumed as valid for both pregnant women and their partners. The same result is suggesting that the observed increased risk pregnancy samples do not significantly differ from the previously studied population samples. Therefore, it has been concluded that Rh factor is not closely related to the increased risk of individual pregnancy outcomes, that is, it does not have relevant influence on the observed reproduction parameters. This result is very interesting and deserves particular medical attention and further evaluation in the future, particularly considering known immunological phenomena resulting from relations between reproduction partners' belonging to the basic Rh system phenotypes.
Key words: Rh system, chromosome 1, prenatal diagnostics, human reproduction, Sarajevo, pregnancy risks.

Introduction

Lethal and sublethal genetical factors, including Rh factor, represent endogenous risk factors of the pregnancy outcome. These factors are most frequently inherited in recessive way and they often lead to the negative pregnancy outcomes. They represent pregnancy (a prirori) risk of various degrees. Inheritance of Rh system blood groups is linked to chromosome 1 (Thomson et al. 1991) and it could be explained by two alternative theories; molecular Rh system genetics has not yet been completely explained (Mouro et al. 1993). The first formal-genetic theory postulates three closely linked gene sites (loci C, D and E) while the second theory has a monogenic character (one locus with several allele genes (Vogel et Motulsky 1986).
Both theories equally satisfy well known heredo-graphical facts regarding the Rh phenotype inheritance. Rh system phenotypes are usually divided to only two different phenotypes - phenotype Rh^+ and phenotype Rh^- what has been particularly investigated in many population-genetic studies. The four most common alleles, that is, allele combinations have their total frequency percentage above 96% in different populations (Giblett 1983).
Haemolytic disease in newborns and transfusion incompatibility are of particular medical importance and they are both related to the Rh blood factors. Recently, more attention has been paid to the other possible immune relations beside those seen in the biological reproduction processes in humans. For these reasons, the frequency of basic Rh system phenotypes in pregnancy samples has been recently more often investigated, not only considering eventual haemolytic disease appearance, but also regarding the pregnancy outcome and possible influence on the assessment of pregnancy risks.

Investigations of the frequency of Rh system phenotypes in population of Bosnia and Herzegovina are mostly sporadically carried out. This is also pertaining to the pregnancy samples classified considering their recorded outcomes (newborns, spontaneous abortions, artificial abortions). Comparative available data on pregnancy samples in Sarajevo region have also been considered (Babić 1983 and 1988, Redžić 1996).

The objective of this paper-work was to stress the importance and specificity of the frequency of Rh system phenotypes in pregnancies with various risk degrees. Specific group genetic features of risky and unsuccessful pregnancies (grouped in accordance with applied medical treatments) were investigated. Individual belongings

of pregnant women and their partners to the basic Rh system phenotypes were monitored.

Material and methods

Data on 755 pregnancies, which were (for various reasons) estimated as increased risk pregnancies, were registered at Gynaecology Clinic, Clinical Centre of University of Sarajevo, during the period from 1989 to 1992 (Redžić 1996). These data were collected from pregnant women who, according to the certain indications from their familiar and personal anamnesis, demanded genetic consultation.

Amniocentesis (sub-sample A1) was performed in 409 women while in other 346 women there were no indications for amniocentesis performance (sub-sample A2). The other observed sample included 480 cases of spontaneous abortions (sample E) registered at Gynaecology Clinic and in Sarajevo Health Centres during the period from 1992 to 1994 (Table 1).

Frequency of the basic Rh system phenotypes was determined in all mentioned samples. At the same tame, data on appropriate partners of the monitored pregnant women - potential fathers (if they were available) were also analysed. Previously published data on Rh blood type frequency among mothers of newborns (Babić 1983) and among abortions (Babić 1988), in the same population, were simultaneously presented and processed (Table 2).

Statistically significant difference among studied (sub) samples of the examined material was estimated by the «t test» method (Garret, 1959), and the results were presented in Table 3. The same techniques were used for the eventual testing difference in relation to the other compared samples (Babić 1983 and 1988).

Results and discussion

The result of investigation of the basic Rh system phenotype distribution shows no statistically significant difference between monitored pregnant women. This result is assumed as valid for both pregnant women and their partners. The same result is suggesting that the observed increased risk pregnancy samples do not significantly differ from the previously studied population samples. Therefore, it has been concluded that Rh factor is not closely related to the increased risk of individual pregnancy outcomes, that is, it does not have relevant influence on the observed reproduction indicates. This result is very interesting and deserves particular medical attention and further evaluation in the future, particularly considering known immunological phenomena resulting from relations between reproduction partners' belonging to the basic Rh system phenotypes.

Table 1. General features and size of the observed samples

	Samples		**Samples**	**Size**
Pregnancies with indications for		Amniocentesis- performed	A1	409
Antenatal diagnostic (risky pregnancies)	A	Amniocentesis-not performed	A2	346
Non-successful pregnancies	E	SPONTANEOUS ABORTIONS (1992-1994)		480
Antenatal diagnostics	K	MEDICAL ABORTIONS DURING THE PERIOD JUNE-SEPTEMBER 1996		532
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Table 2 Frequency of Rh+ phenotypes in observed samples (pregnant women and their partners)*

Samples		**No.**	**Pregnant women % Rh+**	**Partners % Rh+**
Risky	A1	409	89.5	75.1
Pregnancies	A2	346	82.9	73.7
Spontaneous abortions	E	480	76.7	80.0
	Babić, 1988	120	80.0	80.0
Newborns	Babić, 1983	7223	78.7	-
* Appropriate data on the abortion sample (Babić 1983) and pregnant women sample during 1980-1981 (Babić 1988) are also presented				
A1—Amniocentesis-performed (AC) A2—Amniocentesis- not performed				

Table 3 Significance of the differences of Rh+ phenotype percentage frequency (t% test results)* in observed (sub) samples

	EP	ET	A2P	A2T	A1P
A1T	0.550	0.705	0.816	0.374	0.788
A1P	0.251	0.099	0.047	0.392	
A2T	0.153	0.302	0.430		
A2P	0.293	0.145			
ET	0.155				
T - Pregnant women P - Partners					
** - For all determined results t% - p > 0.95*					

Table 4 Frequency of Rh+ phenotypes in relation to the various pregnancy outcomes in observed samples (pregnant women and their partners)

PREGNANCY OUTCOME	SAMPLE	SAMPLE SIZE	PERCENTAGE OF FREQUENCIES OF Rh+ PHENOTYPES	
			PREGNANT WOMEN	PARTNERS
SPONTANEOUS ABORTION	(A) + E BABIć 1988	553 120	77.2 80.0	78.1 80.0
NEWBORNS	(A) BABIć 1983	667 7223	87.0 78.8	75.7 -
(A) - A part of pregnant women' (sub)samples A1 and A2 with negative pregnancy outcomes				

Frequencies of Rh^+ phenotypes considering differences among the compared samples in relation to the various pregnancy outcomes were studied in the same way (Table 4). It was observed that our investigation samples did not significantly differ (according to statistics) from the analogue samples of the same or even broader population (Babić 1983 and 1988).

Haemolytic disease in newborns is not the only aspect of the Rh immunological relations between parents that influences on the parameter of significance for the reproduction investigations. It was found that various forms of Rh incompatibilities between partners were related to the frequency of (early) abortions what could be the subject of our future investigations.

Conclusion

On the account of the Rh blood factor distribution process in pregnancy samples of various risk degrees and various outcomes it is concluded that there are no statistically significant differences between pregnant women and their partners in all observed samples, as well as in comparison with the similar samples from a broader population. The conclusion is that Rh factor does not express relevant influence on the observed bio-reproduction parameters.

Sažetak

U endogene uzroke rizičnosti ishoda trudnoće ubrajaju se letalni kao i subletalni genetički faktori među koje spada i Rh faktor. Ovi se faktori najčešće nasljeđuju recesivno i dovode do nepovoljnih ishoda trudnoće, odnosno uzrokuju njihovu (apriornu) rizičnost različitog stupnja. Nasljeđivanje krvnih grupa Rh sistema vezano je za hromosom 1 i objašnjava se dvijema alternativnim teorijama; molekularna genetika Rh sistema još uvijek nije sasvim razjašnjenja. Prva formalno-genetička terorija postulira tri tijesno vezana genska mjesta (lokusi C, D i E), a druga je monogenskog karaktera (jedan lokus sa više alelogena).
U periodu 1989-1992 na Ginekološko-akušerskoj klinici KC Univerziteta u Sarajevu detaljno su registrovani podaci o 755 trudnoća koje su iz različitih razloga unaprijed procijenjene kao povišeno rizične. Radi se o trudnicama koje su na osnovu odgovarajućih indikacija iz porodične i lične anamneze zatražile genetičku konsultaciju.
Ispitivanjem raspodjele osnovnih fenotipova Rh sistema konstatovano je da ne postoje statistički značajne razlike među posmatranim uzorcima trudnica. Ovaj nalaz se odnosi kako na trudnice, tako i na njihove partnere. Isti račun je pokazao da posmatrani uzorci trudnoća povišenog rizika nisu značajno različiti ni od ranije proučenih uzoraka populacije. Istraživanje, prema tome, ukazuje da Rh faktor nema vezu sa povećanim rizikom neuspjeha individualnih graviditeta, odnosno nema relevantan uticaj na posmatrane reprodukcijske pokazatelje.
Posmatrajući raspodjelu Rh krvnog faktora u uzorcima trudnoća različitog stupnja rizičnosti i sa različitim ishodima, konstatovano je da ne postoje statistički značajne razlike među trudnicama i njihovim partnerima u posmatranim uzorcima kao i u poređenju sa sličnim uzorcima šire populacije. To bi značilo da Rh faktor nema relevantan uticaj na praćene bioreprodukcijske pokazatelje.
Ključne riječi: Rh sistem, hromosom 1, prenatalna dijagnostika, humana reprodukcija, Sarajevo, rizici trudnoće.

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