

Prevalence of Pre-Pregnancy Risk Factors and its Relationship with Preconception Care in Isfahan- Iran

Parisa Shadab¹, *Nafisehsadat Nekuei², Ghasem Yadegarfar³

¹ Instructore of Midwifery, School of Nursing and Midwifery, Kermanshah University of Medical Science, Kermanshah, Iran.

² Faculty Member, Midwifery and Reproductive Health Department, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.

³ Associate Professor, Epidemiology and Biostatistics Department, Heart Failure Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

Abstract

Background

Preconception care means interventions required for maternal and fetal health care and detection of pre-pregnancy risk factors. Some risk factors that have a significant effect on the outcome of pregnancy can be detected and controlled before pregnancy. The present study aimed to determine the prevalence of pre-pregnancy risk factors, and its relationship with preconception care in Isfahan-Iran.

Materials and Methods

This descriptive study was a cross-sectional research which was conducted with multi-stage sampling (stratified and cluster) from April to May 2016 on 702 women giving birth in hospitals in Isfahan (Iran). Data collection tool was a researcher made questionnaire and data were analyzed using SPSS software, descriptive statistics and chi-square test.

Results

The results showed that, the interval between current pregnancy with a previous pregnancy less than 4 years (22.8%), abnormal weight (13%), sexually transmitted infections (11.3%), thyroid disorders (11 %), and history of hospitalization of infants in the intensive care unit (11.1%), were the highest pre-pregnancy risk factors reported. There was a significant positive correlation between thyroid disorder and polycystic ovary ($P<0.05$). Also, a significant negative correlation was observed between interval less than 4 years between two maternal pregnancies, and receiving preconception care ($P<0.05$).

Conclusion

Results of this study showed that some of the risk factors (such as the interval less than 4 years between two pregnancies, abnormal weights and sexual infections) that generally affect pregnancy outcome, exist in women before pregnancy. Since many of these factors are easily identifiable before pregnancy, health planners and implementers need to pay special attention to this issue and identify people with these factor with screening programs before pregnancy.

Key Words: Iran, Preconception care, Pregnancy outcomes, Risk factors.

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*Corresponding Author:

Nafisehsadat Nekuei, Midwifery and Reproductive Health Department, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Hezarjarib, Avenue, Isfahan, Iran.

Email: Nekuei@nm.mui.ac.ir

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1- INTRODUCTION

Preconception care including any intervention to improve fetal, maternal and neonatal conditions (1). This performance controls risk factors for pregnancy by providing information and medical support (2). The base of adverse pregnancy outcomes is often made at the beginning of pregnancy. Therefore preventive measures must be taken as soon as possible and preferably before pregnancy (3).

With preconception care, pregnancy outcomes were improved and it aims to enhance the quality of life of the fetus, infants and children, through primary prevention (4), and has a favorable impact on the life of the mother. This type of care is necessary for all women of childbearing age and includes items such as preventing unwanted pregnancies, preventing teen pregnancy, promotion of optimal birth spacing, correcting nutritional status, optimized pre-pregnancy weight, vaccination and administration of folic acid (5), the existence of pre-pregnancy risk factors such as high and low body mass index (BMI) (6), chronic diseases (7) can affect pregnancy outcome, however, pregnancy outcome can be improved with preconception care necessary measures.

In fact, this care is a screening test that detects the risk factors associated with pregnancy (8). For example, studies have shown that this care in women with diabetes decreases 70% of congenital anomalies and 69% of perinatal mortality (7), and in mothers with human immunodeficiency virus (HIV) can improve the pregnancy outcome and reduce the risk transmission to the fetus (9). In women with epilepsy disease and phenylketonuria (PKU), preconception care changes fetal, maternal and neonatal outcome (7). Also, the early diagnosis of high blood pressure before pregnancy, can lead to intervention and management during pregnancy (10). Risk assessment, screening and treatment of certain

infections are a part of preconception care and prevent infection in infants (11).

The above-mentioned items show the impact of pre-pregnancy risk factors on pregnancy outcome the importance of controlling them. Other studies which have also been done in this regard, including results of a study to investigate the views of women with chronic renal failure showed that, according them there is need to make consultation for informed decisions about pregnancy and this prepares them for possible side effects (12); also, the results of other studies emphasize on the need to carry out the consultation in women with risk factors (especially chronic diseases) (13-15).

Few studies have been conducted on the prevalence of pre-pregnancy risk factors. According to a study in Italy, about 97% of women have one or more pre-pregnancy risk factors (16). In another study, the prevalence of 18-45% has been reported for receiving this care in women with chronic diseases and it has been reported that, most people using these services are people with type 1 diabetes and type 2 diabetes (17).

In total, studies in this area are limited and it shows the need to do more studies. In Iran also no certain study reporting the prevalence of pre-pregnancy risk factors was found. The precise and certain statistics of these risk factors can be an important factor in careful planning and implementation of health care functions so that the modifiable risk factors were adjusted and then women enter the pregnancy and unmodifiable risk factors will be under correct management (prohibition of pregnancy or intensive care). This study was designed and executed with the aim of determining the prevalence of pre-pregnancy risk factors and its relationship with preconception care in Isfahan city, Iran.

2- MATERIALS AND METHODS

This cross-sectional study was performed over 702 women given birth in hospitals after delivery Isfahan (Iran) from April to May 2016, according to the following formula:

$$\frac{(1.96 + 0.85)^2\{0.1056 + 0.1716\}}{0.08^2} = 342$$

According to the above formula 342 random samples (in each group: with or without risk factors) to be studied. First, the hospitals were classified by type of public, private, charitable organization dependent, social security dependent, health and education (by categories of health systems in Isfahan) and on the basis of random sampling, a hospital was chosen from each class and the number of cases assigned to each class was determined in terms of the size of monthly delivery of that class to the monthly delivery of Isfahan-Iran. Then samples were selected from hospitals selected based on criteria and methods. Inclusion criteria include the following items: Iranian citizenship, living in Isfahan city, and intention to participate in the study. The data collection tool was a two-part questionnaire: the first part includes 6 questions about preconception care and demographic characteristics and, the second part includes 45 questions about pre-pregnancy risk factors (there was no standard questionnaire in this regard). The face and content validity was confirmed by reference resources and specialists in the field of midwifery and then it was given to 20 similar women of the study population and it was completed and minor changes were applied based on those. Reliability was calculated by test-retest method in 20 patients from the same study population (Cronbach's alpha = 0.75). Sampling was done based on the periodic weekly programs at the centers. At the beginning of the week, the program of the presence in the hospital was randomly determined and every day a hospital was referred. Considering the fact

that 6 hospitals were selected from 6 class, all hospitals were visited during a week and sampling was done. Per week in each hospital sampling was done to complete 30-number cluster of the women given birth with completion questionnaire and interview. The data were analyzed in the software and then using Chi-square test. This study was approved by the Department of Research and Technology and the Ethics Committee of and Isfahan University of Medical Sciences with the ID-code: 395098.

3- RESULTS

The results revealed that, the subjects were mostly housewives (88.3%), with an average age of 29 years \pm 4.86; residents of the city with diploma and higher degrees. 47.7% received preconception care among which 63% have been referring to the private center for this purpose. In total 77% of women had wanted pregnancy (**Table.1**). In examining risk factors, the interval less than 4 years between two pregnancies, abnormal weights and sexual infections were the most pre-pregnancy risk factors.

Most people with heart disease, digestive, psychiatric disorders, anemia and an inappropriate history of pregnancy had not received preconception care. According to Chi-square test and regression analysis, a significant positive correlation was observed between the thyroid disorder (OR=2.51, 95% CI: 1.52-4.15, P<0.001), and polycystic ovary (OR=3.90, 95% CI: 2.00-7.58, P<0.001). Also, a significant negative correlation was observed between interval less than 4 years between two maternal pregnancies, and receiving preconception care (OR=0.49, 95% CI: 0.34-0.71, P<0.001) (**Tables 2 and 3**).

In reviewing other risk factors, vaccine-preventable infections, consumption of alcohol, tobacco and drugs were found in none of the samples.

Table-1: Individual characteristics in subjects

Individual characteristics		Number (%)	Total, n (%)
Female Job	Housekeeper	605(86.2)	702 (100)
	Eemployed	81(11.5)	
	Other cases	16(2.3)	
Male Job	Self-employed	496(70.6)	702 (100)
	Governmental	164(23.4)	
	Other cases	42(6)	
Education	Illiterate	21(3)	702 (100)
	High school	96(13.7)	
	Diploma	279(39.7)	
	Graduate	306(43.6)	
Location	Village	42(6)	702 (100)
	City	660(94)	
Wanted or unwanted pregnancy	Wanted	541(77)	702 (100)

Table-2: The prevalence of pregnancy risk factors (chronic diseases) before pregnancy in subjects and its relationship with preconception care receive

Risk factors before pregnancy	Receive preconception care, n (%)		Total	P-value
	Yes 335(47.7)	No 367 (52.3)	Number (%)	
Heart disease	2(0.6)	9(2.5)	11(1.6)	0.66
Liver disease	1(0.3)	1(0.3)	2(0.3)	1.000
Cancer	0(0)	1(0.3)	1(0.1)	1.000
Diabetes	2(0.6)	1(0.3)	3(0.4)	0.608
Rheumatoid Arthritis	0(0)	0(0)	0(0)	-
Minor Thalassemia	11(3.3)	7(1.9)	18(2.6)	0.340
Systemic Lupus erythematosus	0(0)	0(0)	0(0)	-
hypertension	0(0)	0(0)	0(0)	-
Hypothyroidism ^a	52(15.5)	25(6.8)	77(11)	0.000
digestive Disease	4(1.2)	6(1.6)	10(1.4)	0.755
seizure	2(0.6)	1(0.3)	3(0.4)	0.608
Psychotic disorders	2(0.6)	4(1.1)	6(0.9)	0.688
Asthma	1(0.3)	1(0.3)	2(0.3)	1.000
TB	0(0)	0(0)	0(0)	-
Anemia	27(8.1)	35(9.5)	62(8.8)	0.509
Thrombophilia	0(0)	0(0)	0(0)	-
Migraine	0(0)	2(0.5)	2(0.3)	0.086
Severe allergies	1(0.3)	0(0)	1(0.1)	0.086
Varicose	1(0.3)	0(0)	1(0.1)	0.086
Urinary tract infection	0(0)	5(1.3)	5(0.7)	0.086
Genetic disorders	2(0.6)	0(0)	2(0.3)	0.227
Family History of Genetic disorders	10(3)	6(1.6)	16(2.3)	0.312
Abnormal Weight	49(14.6)	42(11.4)	91(13)	0.218

^a Listed all hypothyroid patients were not diagnosed with the disease. Often had use of Levothyroxine; P-value < 0.05.

Table-3: The prevalence of pregnancy risk factors (previous pregnancies and gynecologic) and its relationship with preconception care receive

Risk factors before pregnancy	Receive preconception care, n (%)		Total N (%)	P-value
	Yes, 335(47.7)	No, 367 (52.3)		
Pregnancy interval less than 4 year	55(16.4)	105(28.6)	160(22.8)	0.000
Infertility	27(8.1)	14(3.8)	41(5.8)	0.523
Use of ART	5(1.5)	3(0.8)	8(1.1)	0.489
Parity > 5	0(0)	2(0.5)	2(0.3)	0.500
A history of ectopic pregnancy	2(1.5)	6(2.6)	8(2.2)	0.716
History of molar pregnancy	0(0)	0(0)	0(0)	-
Disorders of amniotic fluid	1(0.7)	2(0.9)	3(0.8)	1.000
Multiple pregnancy	1(0.7)	1(0.4)	2(0.5)	1.000
Fetal growth retardation	1(0.7)	1(0.4)	2(0.5)	1.000
Fetal anomaly	2(1.5)	1(0.4)	3(0.8)	0.557
Fetal weight less than 2.500 gr	5(3.7)	12(5.1)	17(4.6)	0.615
Labor dystocia	3(2.2)	3(1.3)	6(1.6)	0.672
Fetal death	2(1.5)	2(0.1)	4(1.1)	0.624
Preterm delivery	7(5.2)	19(8.1)	26(7.1)	0.398
Infants death in few first day	3(2.2)	4(1.7)	7(1.9)	1.000
Admission to neonatal care unit	12(0.9)	29(12.4)	41(11.1)	0.390
Abnormal bleeding during or after pregnancy	4(3)	6(2.6)	10(2.7)	1.000
Postpartum Depression	10(7.5)	17(7.3)	27(7.3)	1.000
Post-partum infection	0(0)	4(1.7)	4(1.1)	0.301
Uterine polyps	1(0.3)	0(0)	1(0.1)	0.086
Ovarian Cysts	1(0.3)	0(0)	1(0.1)	0.086
Polycystic ovarian	39(11.6)	12(3.3)	51(7.3)	0.000
Uterine myomas	1(0.3)	1(0.3)	2(0.3)	0.086
STD and vaginitis	42(12.5)	37 (10.1)	79 (11.3)	0.339

*P-Value < 0.05; ART: Assisted Reproductive Technology; STD: sexually transmitted diseases.

4- DISCUSSION

This study was conducted with the aim of determining the prevalence of pre-pregnancy risk factors and the relationship of receiving preconception care with them in Isfahan city-Iran and demonstrated that, the gap less than 4 years with previous pregnancies, abnormal weights, sexually transmitted infections, thyroid disorders, polycystic ovarian syndrome, anemia infertility history, history of hospitalization in the neonatal intensive care unit are the

greatest pre-pregnancy risk factors. Various studies have been conducted in this field such as the results of a study (2013) in Malaysia showed that 68.8% of women have had at least one pre-pregnancy risk that, these factors include: overweight and obesity 35.2%, unhealthy lifestyle (smoking, alcohol, substance abuse) 3%, increased blood pressure of 3.9%, anemia 14.4%. Also, 80.8% of those with risk factors did not use any method of contraception and 1.5% of them had the

physical examination abnormalities (18). The results of the present study compared with the findings showed that the prevalence of obesity and anemia was lower and the prevalence of smoking, alcohol, drug abuse and hypertension in this study has been lower due to cultural difference. The results of another study (2012) in Italy conducted on 1,892 women given birth and 320 pregnant women in the first quarter of the year, showed that about 97% of the women had one or more pre-pregnancy risk factors that was as follows: 41% were older than 35 years, 19% of body mass index greater than 25, 10% with chronic disease and 26% of smoking in the last menstrual period (16).

In this study 13% of patients had abnormal weight that is close to the results of this study and, the prevalence of cigarette smoking and age above 35 years with existence of chronic disease are less in our study. The results of a study (2013) in Korea showed that out of 890 samples, 39.1% had thyroid disorders, 15.8% had hypertension, and kidney disease 11.3%, asthma 10.5%, smoking 8.4% and 58.3% consumed alcohol before pregnancy (19) that, the prevalence is lower in the present study. It should be noted that the level of awareness and education, lifestyle, age and access to health services can affect these risk factors. According to the present study, the majority of risk factors with different prevalence have existed in the samples. Control and correction of many of these risk factors is possible before pregnancy and health care system plays an important role in this regard with providing preconception care.

The risk factors in women with childbearing age need to pay more attention to pre-pregnancy screening and intervention in this regard. In the present study a percent of women with pre-pregnancy risk factors have not received preconception care that it is different about various factors, since these factors can

affect pregnancy outcome, it is necessary to modify flexible risk factors by carrying out accurate and timely advice before pregnancy and about the inflexible factors, intensive care or contraception ban, it is recommended to prevent adverse outcomes of pregnancy and childbirth.

Another part of this study is the relationship between receiving preconception care and the existence of risk factors. According to the present study, among all pre-pregnancy risk factors, thyroid disorders and polycystic ovary had a positive significant relationship with preconception care and interval less than 4 years with previous pregnancy had negative relationship. In a study (2013) in Korea, the reasons of referring to preconception care in 890 samples studied were as follows: mother medical problems including chronic diseases and need for medicines 22.5%, infertility 3%, family history of genetic disorders 0.8% (19); and the results of the present study compared with this study about hypothyroidism, polycystic ovarian syndrome, thalassemia, diabetes and seizures that have received more preconception care are almost the same and about infertility and family history of genetic disorders is higher than this study.

Unfortunately, in the present study most of cases with heart disease, gastrointestinal disorders, psychopathy, anemia, migraine, and urinary tract infection had not received preconception care, although statistically no significant relationship was observed. The results of a study (2014) in Australia with the aim of reviewing the extent and nature of use of preconception care services in pregnant women with chronic diseases showed that, the receiving prenatal of preconception care in women was 1.18% up to 45% (17), and the results of our study are similar. In general, this indicates that the majority of women with chronic diseases do not receive preconception care, in the study mentioned

the relationship has not been investigated. Most of subjects with the history of depression after delivery, preterm delivery, severe infection after delivery, the death of infant in the first few days after birth, ectopic pregnancy, hospitalization of infants and weight under 2,500 grams had not received preconception care although statistically no significant relationship was observed. The results of a study (2012-2010) in the United States showed that in women with a history of adverse neonatal outcome in a previous pregnancy, only 28.8% have received preconception care (20) and the results are similar to this study. According to the results of another study (2013) in Korea, 4.5% of patients referred for clinical pre-pregnancy due to previous adverse results in pregnancy (19) and the study results of the total population and the study for preterm deliveries, postpartum depression and birth weight less than 2,500 grams are almost the same. In fact, since this study was conducted in the general population and not the population of patients, the percentage of any risk factor in all samples is low.

Studies on specific populations suffering from any disease or risk factors can report more accurate results. The results of a study (2010) in China, investigating the impact of planning for pregnancy and preventive measures on the defects of the neural tube showed that only 13.8% of people who had delivered a baby with neural tube defects were referred for preconception care (21). According to the results, 75% of people with a history of fetal abnormalities, have received preconception care that, the results of this study are not the same. Of course, the study design and sample size in two studies are different and on the other hand the percent of the people in this study is very small and therefore, the results are not comparable.

Significance of 2 factors (thyroid disorders and polycystic ovary) with preconception

care may mean that, people with these risk factors are more sensitive to their pregnancy outcome and therefore have more referred; but the downside is that many risk factors while having negative impact on pregnancy outcome but unfortunately, patients or health care team do not have sufficient attention to provide preconception care. Many important complications of pregnancy and childbirth (diabetes, preeclampsia, placental abruption, fetal death, abortion, etc.) may occur in future pregnancies. In these cases, with appropriate pre-pregnancy measures and actions, adverse pregnancy outcomes associated with these cases can be prevented.

4-1. Limitations of the study

Limitations of this study, lack of access to all the women of various social economy groups at the beginning of pregnancy to check for the presence of pregnancy risk factors, so pregnant women has been considered as the study population.

5- CONCLUSION

Results of this study showed that many of the risk factors that generally affect pregnancy outcome, exist in women before pregnancy. Since many of these factors are easily identifiable before pregnancy, health planners and implementers need to pay special attention to this issue and identify people with these factor with screening programs before pregnancy and if possible eliminate the risk factor and then the women become pregnant. In cases that there is no possibility of removing the risk factor, the prohibition of pregnancy must be taken into consideration by providing a convenient method of preventing or providing special preconception care to the end of the pregnancy. This action can be an important factor in improving pregnancy outcome for mother and fetus.

6- CONFLICT OF INTEREST

The authors had not any financial or personal relationships with other people or organizations during the study. So there was no conflict of interests in this article.

7- ACKNOWLEDGMENTS

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8- REFERENCES

1. Dean SV, Lassi ZS, Imam AM, Bhutta ZA. Preconception care: closing the gap in the continuum of care to accelerate improvements in maternal, newborn and child health. *Reprod Health* 2014; 11(Suppl.3):S1.
2. Oksuz S, Topdagi Yilmaz EP, Guven Pirim AB, Cayir Y. A Case with double outlet right ventricle caught pre-pregnancy care. *Medicine Science* 2014; 3(4):1685-90.
3. Elsinga J, de Jong-Potjer LC, van der Pal-de Bruin KM, le Cessie S, Assendelft WJ, Buitendijk SE. The effect of preconception counselling on lifestyle and other behaviour before and during pregnancy. *Womens Health* 2008; 18(6 Suppl):S117-25.
4. Wildschut HI, van Vliet-Lachotzki EH, Boon BM, Lie Fong S, Landkroon AP, Steegers EA. Preconception care: an essential part of the care for mother and child. *Ned Tijdschr Geneesk* 2006; 150(40):2221-22.
5. Dean SV, Mary Mason EM, Howson CP, Lassi ZS, Imam AM, Bhutta ZA. Born too soon: care before and between pregnancy to prevent preterm births: from evidence to action. *Reprod Health* 2013; 10(Suppl.1): S3.
6. Morino S, Ishihara M, Nishiguchi S, Fukutani N, Adachi D, Tashiro Y, et al. The association between pregnancy-related discomforts and pre-pregnancy body mass index in Japanese women. *J Women's Health Care* 2015; 4:1.
7. Lassi ZS, Imam AM, Dean SV, Bhutta Z. Preconception care: screening and management of chronic disease and promoting psychological health reproductive health. *Reprod Health* 2014; 11(Suppl.3):S5.
8. Li CL, Zhao K, Li H, Farah OI, Wang JJ, Sun RZ, et al. Free preconceptual screening examination service in rural areas of Hubei province, China in 2012. *PLoS One* 2014; 9(11):e111918.
9. Boelig RC, Coleman JS, Keller J, Sewell C, Anderson J. Preconception counseling and care in the setting of HIV: clinical characteristics and comorbidities. *Infec Dis in Obstet Gynecol* 2015; 2015: 240613.
10. Hedderson MM, Darbinian JA, Sridhar SB, Quesenberry CP. Prepregnancy cardiometabolic and inflammatory risk factors and subsequent risk of hypertensive disorders of pregnancy. *Am J Obstet Gynecol* 2012; 207(1): 68.e1-9.
11. Lassi ZS, Imam AM, Dean SV, Bhutta ZA. Preconception care: preventing and treating infections. *Reprod Health* 2014; 11(Suppl.3):S4.
12. Wiles KS, Bramham K, Vais A, Harding KR, Chowdhury P, Taylor CJ, et al. Pre-pregnancy counselling for women with chronic kidney disease: a retrospective analysis of nine years' experience. *BMC Nephrol* 2015; 16: 28.
13. Pandolfi E, Agricola E, Gonfiantini MV, Gesualdo F, Romano M, Carloni E, et al. Women participating in a web-based preconception study have a high prevalence of risk factors for adverse pregnancy outcomes. *BMC Pregnancy Childbirth* 2014; 14:169.
14. Shawe J, Delbaere I, Ekstrand M, Hegaard HK, Larsson M, Mastroiacovo P, et al. Preconception care policy, guidelines, recommendations and services across six European countries: Belgium (Flanders), Denmark, Italy, the Netherlands, Sweden and The United Kingdom. *Eur J Contracept Reprod Health Care* 2015; 20(2):77-87.
15. Kachoria R, Oza Frank R. Receipt of preconception care among women with prepregnancy and gestational diabetes. *Diabet Med* 2014; 31(12):1690-95.

16. Mastroiacovo P, Nilsen RM, Leoncini E, Gastaldi P, Allegri V, Boiani A, et al . Prevalence of maternal preconception risk factors: an italian multicenter survey. *Ital J Pediatr* 2014; 40:91.
17. Steel A, Lucke J, Adams J. The prevalence and nature of the use of preconception services by women with chronic health conditions: an integrative review. *BMC Womens Health* 2015; 15:14.
18. Nik Mazlina M, Ruziaton H, Nuraini DB, Izan Hairani I, Norizzati B, Isa MR and et al. Risk factors for women attending pre-pregnancy screening in selected clinics in selangor .*Malays Fam Physician* 2014; 9(3):20-6.
19. Lee MY, Ryu HM, Kim MY, Ahn HK, Choi JS, Kim MH, et al. Preconception Care: prevalence of chronic disease. *J Womens Health* 2014; 3:1.
20. Batra P, Higgins C, Chao SM .Previous adverse infant outcomes as predictors of preconception care use: an analysis of the 2010 and 2012 Los Angeles mommy and baby (LAMB) surveys. *Matern Child Health J* 2016; 20(6):1170-7.
21. Gong R, Wang ZP, Gao LJ, Lu QB, Sun XH, Zhao ZT. A case-control study of the effects of pregnancy planning on neural tube defects and its primary preventive measures. *Birth Defects Res A Clin Mol Teratol* 2010; 88(9):737-42.