

# Selected non-somatic risk factors for pregnancy loss in patients with abnormal early pregnancy

Maciej Paszkowski<sup>1</sup>, Piotr Czuczwar<sup>1</sup>, Sławomir Woźniak<sup>1</sup>, Monika Paszkowska<sup>1</sup>, Piotr Szkodziak<sup>1</sup>, Krzysztof Patyra<sup>2</sup>, Tomasz Paszkowski<sup>1</sup>

<sup>1</sup> 3rd Department of Gynecology, Medical University of Lublin, Poland

<sup>2</sup> Department of Oncology, Medical University of Lublin, Poland

Paszkowski M, Czuczwar P, Woźniak S, Paszkowska M, Szkodziak P, Patyra K, Paszkowski T. Selected non-somatic risk factors for pregnancy loss in patients with abnormal early pregnancy. *Ann Agric Environ Med.* 2016; 23(1): 153–156. doi: 10.5604/12321966.1196872

## Abstract

**Introduction and objective.** Spontaneous abortion constitutes one of the most frequent complication of human pregnancy. Despite intensive research efforts undertaken to date, the etiopathogenesis of early pregnancy loss has not been fully elucidated. The objective of this study was to analyze the role of selected non-somatic risk factors for early pregnancy loss in patients with various clinical manifestations of spontaneous abortion.

**Materials and methods.** The study included 242 women hospitalized between 2001 and 2004 in the 3rd Chair and Department of Gynecology, Medical University of Lublin, Poland (Teaching Hospital No.4) with various clinical categories of spontaneous abortion. Each patient completed a questionnaire assessing her exposure to the examined factors. In patients with threatened abortion dismissed from the hospital with viable gestation, the course of pregnancy was followed-up using questionnaire data and medical records.

**Results.** In the studied population of women with abnormal early pregnancy course, a significant impact on the risk of miscarriage was observed in case of such factors as: exposure to stress at home and limited number of hours of nightly sleep. Factors such as occupational hazards, diet, stress, heavy housework and use of cigarettes or alcohol did not exert a significant effect on the risk of miscarriage in the studied population.

**Conclusions.** The results of this study confirm the complexity of the early pregnancy loss etiopathogenesis. Further research need to be conducted in order to identify the non-somatic causative agents of various clinical forms of miscarriage. It may help do select women in reproductive age at high risk of early pregnancy loss and show the ways in which effective preventive measures can be introduced in such population.

## Key words

spontaneous abortion, threatened abortion, pregnancy loss, risk factors

## INTRODUCTION

Miscarriage (spontaneous abortion) is one of the most frequent complications of human pregnancy. The fact that various definitions of miscarriage can be found in the literature reflects the complexity of the etiopathogenesis and lack of international consensus in this matter. The basis of all definitions is the inability of the expelled foetus to survive. The most popular and the most common definition is the one proposed by World Health Organization (WHO), which uses the criterion of foetus' weight below 500 grams or unfinished 22 gestational weeks [1].

The prevalence of clinically detected spontaneous abortion in the developed countries seems to have been at constant level in recent decades, although the exact occurrence of subclinical early pregnancy loss is unknown [2]. The etiopathogenesis of miscarriage is complex – many etiological factors may have a direct or indirect influence on the early pregnancy loss. Risk factors of miscarriage include foetal, maternal, paternal and environmental factors [3–17]. It has also been proved that exposure to xenobiotics increases the risk of miscarriage [19]. Many authors additionally claim that exposure to environmental tobacco smoke affects the

risk of miscarriage similarly to active smoking [20, 21, 22]. The negative impact of alcohol consumption has also been discussed in many reports [18, 23]. The influence of extensive physical activity, psychophysical factors, stress, occupational hazards and diet on the risk of miscarriage has also been studied [24, 25]. In the great majority of studies investigating the risk factors of miscarriage, the presence of such factors was compared between women who experienced early pregnancy loss and those with uncomplicated pregnancy course. There are only a few reports available in the literature describing the risk factors for pregnancy loss in women with abnormal course of early pregnancy [25], and conclusions delivered by these studies are ambiguous.

## OBJECTIVE

For the above reasons, the aim of the presented study was to analyze the risk factors of pregnancy loss, not in the general population, but in women with various clinical categories of spontaneous abortion and the role of selected non-somatic risk factors (environmental, lifestyle and occupational) for early pregnancy loss.

Address for correspondence: Piotr Czuczwar, 3rd Department of Gynecology, Medical University, Lublin, Poland  
e-mail: czuczwar@wp.pl

Received: 23 October 2013; accepted: 19 December 2013



## MATERIALS AND METHOD

The study comprised 242 women hospitalized between 2001 – 2004 in the 3rd Chair and Department of Gynecology, Medical University of Lublin, Poland (Teaching Hospital No.4) with various clinical categories of spontaneous abortion (threatened abortion – 60.3%, missed abortion – 23.6%, inevitable abortion – 16.1% of patients). The inclusion criterion was the diagnosis in hospital medical records, as defined by the 10th revision of the International Statistical Classification of Diseases and Related Health Problems. Patients in whom the pathological examination did not confirm the clinical diagnosis were not included in the study. If the patient was hospitalized more than once during the examined pregnancy, the last registered hospitalization was evaluated. Overall, 932 women met the inclusion criteria and were qualified for the study.

Each patient received a questionnaire assessing exposure to the examined factors (according to the adopted methodology of research tool preparation), which had been verified by a pilot study conducted in 30 women. After introducing necessary corrections the final questionnaire was distributed. 242 women (26.0%), who returned a completed questionnaire were ultimately enrolled for statistical analysis. To analyze and verify the data obtained from the questionnaires, information from medical records was also used. For the purpose of statistical analysis the patients were divided into 2 groups, depending on the outcome of the examined pregnancy:

1. 'pregnancy loss' group – included patients with different clinical categories of spontaneous miscarriage that resulted in pregnancy loss (N=105);
2. 'live birth' group – included patients who delivered viable neonates at term despite threatened abortion symptoms in early pregnancy (N=137).

Multi-directional tables and tests of homogeneity or independence of the  $\chi^2$  were used to assess the differences or dependencies between the analyzed parameters. For small numbers of patients (below 5) in examined subgroups, Yates correction was used. 5% *non sequitur* was adopted and the associated level of significance,  $p < 0.05$ , indicating the existence of statistically significant differences or correlations. P values  $< 0,05$  were considered statistically significant. Statistical analysis was performed using STATISTICA software (StatSoft, Poland).

## RESULTS

Neither the type of work performed during the examined pregnancy nor the number of working hours during the day significantly influenced the pregnancy outcome. Moreover, no such relationships were found when specific occupational hazards were analyzed, such as night work, vibration or noise (Tab. 1, 2).

A statistically significant ( $p=0.01$ ) positive correlation was found between the average number of hours of nightly sleep during the examined pregnancy and its outcome (Tab. 3).

There was no statistically significant influence of diet modifications on the outcome of pregnancy.

The effect of either active or passive exposure to the tobacco smoke during pregnancy on its outcome was insignificant

**Table 1.** Influence of type of work performed during the pregnancy on pregnancy outcome

Type of work performed during examined pregnancy	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
Mental work	48 (45.7%)	55 (40.1%)	$\chi^2=1.22$ $p=0.54$
Manual labour	22 (21.0%)	27 (19.8%)	
Did not work during pregnancy	35 (33.3%)	55 (40.1%)	

**Table 2.** Influence of the number of daily working hours during pregnancy on pregnancy outcome

No. of daily working hours during examined pregnancy	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
3–5	11 (15.7%)	14 (17.1%)	$\chi^2=0.44$ $p=0.8$
6–8	46 (65.7%)	56 (68.3%)	
>8	13 (18.6%)	12 (14.6%)	

**Table 3.** Influence of the average number of hours of nightly sleep and pregnancy outcome

Question and categories of answers	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
How many hours on average did you devote to nightly sleep?	less than 7 hours	34 (32.4%)	$\chi^2=8.52$ $p=0.01$
	8–9 hours	58 (55.2%)	
	More than 9 hours	13 (12.4%)	

**Table 4.** Influence of exposure to tobacco smoke on pregnancy outcome

Exposure to tobacco smoke	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
Cigarette smoking	Never smoked	81 (77.1%)	$\chi^2=0.4$ $p=0.82$
	Smoked before pregnancy	13 (12.4%)	
	Smoked during pregnancy	11 (10.5%)	
Passive exposure to tobacco smoke	No	64 (61.0%)	$\chi^2=0.003$ $p=0.95$
	Yes	41 (39.0%)	

**Table 5.** Influence of alcohol consumption declared by a patient on pregnancy outcome

Alcohol consumption during pregnancy	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
No	84 (80.0%)	111 (81.0%)	$\chi^2=0.04$ $p=0.84$
Yes	21 (20.0%)	26 (19.0%)	

(Tab. 4). Similar results were obtained when alcohol consumption was considered a potential risk factor (Tab. 5).

Patients who experienced pleasant/friendly atmosphere at home were more likely to deliver a live neonate than patients who rarely experienced such atmosphere (Tab. 6). Similar analysis concerning the influence of atmosphere at work on the pregnancy outcome did not reveal any significant relationship.

Among the analyzed non-occupational factors, such as stress, lifting and heavy housework, none exerted a significant influence on the outcome of pregnancy (Tab. 7).



**Table 6.** Influence of atmosphere at home on pregnancy outcome

Questions and categories of answers	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
How often did you experience a pleasant (friendly) atmosphere at home?	Always	36 (34.3%)	34 (24.8%)
	Often	49 (46.7%)	89 (65.0%)
	Rarely	20 (19.0%)	14 (10.2%)
			$\chi^2=8.63$ $p=0.01$

**Table 7.** Influence of stress, lifting and heavy housework on pregnancy outcome

		Pregnancy outcome		Statistical analysis
		Pregnancy loss	Live birth	
High level of stress	no	59 (56.2%)	83 (60.6%)	$\chi^2=0.47$ $p=0.49$
	yes	46 (43.8%)	54 (39.4%)	
Lifting	no	79 (75.2%)	114 (83.2%)	$\chi^2=2.34$ $p=0.13$
	yes	26 (24.8%)	23 (16.8%)	
Heavy housework	no	85 (81.0%)	114 (83.2%)	$\chi^2=0.21$ $p=0.65$
	yes	20 (19.0%)	23 (19.8%)	

No statistically significant effect of hormonal contraception before pregnancy on its outcome was revealed (Tab. 8).

**Table 8.** Influence of pre-pregnancy hormonal contraception on pregnancy outcome

Hormonal contraception use before pregnancy	Pregnancy outcome		Statistical analysis
	Pregnancy loss	Live birth	
No	80 (76.2%)	103 (75.2%)	$\chi^2=0.03$ $p=0.86$
Yes	25 (23.8%)	34 (24.8%)	

## DISCUSSION

According to various authors, spontaneous abortion occurs in 12% – 78% of all pregnancies [20, 21, 22, 23, 24]. Despite such a large epidemiological scale of this problem, surprisingly little is known about the risk factors for miscarriage. The knowledge about the non-somatic causative factors and predispositions of early pregnancy loss is particularly unsatisfactory.

In the studied population, the relationship between a limited average number of hours devoted to nightly sleep and the risk of miscarriage appeared to be statistically significant. This finding seems to be another argument supporting the restorative function of sleep in pregnant women.

The results obtained considering the role of stress-related factors increasing the miscarriage risk are ambiguous. The risk of pregnancy loss was significantly lowered in patients who reported to be exposed to pleasant/friendly atmosphere at home. Interestingly, such relationship was not revealed when atmosphere at work was analyzed. Similarly equivocal results regarding this issue were obtained by other authors [24, 25]. Boyles et al. states that stressful life events increase the risk of miscarriage, which may, however, be due to higher exposure of these women to tobacco smoke and alcohol than in the general population [23].

## RESULTS

In the population examined, the relation between the type of work performed during pregnancy and the risk of miscarriage was insignificant. Similar conclusions have been presented by other authors [21, 22].

There are many reports in the literature indicating that hard physical work and the accumulation of different occupational hazards (physical and chemical) increase the risk of miscarriage [22, 23, 24]. The results of the presented study and the data from literature indicate that the impact of potentially harmful occupational hazards on the risk of miscarriage is far from being definitely elucidated. Further investigations using research models that allow more precise and multifactorial analysis of the degree of exposure to these factors are indicated.

No effect of cigarette smoking or alcohol use on the risk of early pregnancy loss was found in the studied population. Conflicting opinions concerning the risk of miscarriage in women who drink alcohol can be found in the literature [18, 23]. Much less controversy can be found in scientific literature on the negative effect of tobacco exposure on the risk of spontaneous abortion [17, 18, 19, 20, 21]. Despite the generally accepted opinion about the dangers of gestational exposure to alcohol and tobacco smoke, the unambiguous assessment of the impact of these potentially hazardous agents on the risk of early pregnancy loss would require randomized study, the implementation of which, however, would not be possible for ethical reasons.

In the studied population of women with early pregnancy abnormalities, previous use of hormonal contraception did not influence the risk of miscarriage. Although there are studies that confirm the presented finding, there is also some evidence on the negative impact of hormonal contraceptive use on the risk of miscarriage [10, 15, 16].

There was no significant relationship between diet modifications and pregnancy outcome in the studied population of women. It has been shown that extreme diet modifications may increase the risk of miscarriage due to the essential compounds deficiencies this may induce [25].

While discussing the current results in the light of available scientific literature, the potential differences between the population of women with symptoms of early pregnancy pathology and the general population should be borne in mind.

The presented results confirm the complexity of the pathogenesis of early pregnancy loss. Given the fact that spontaneous abortion is the most common pregnancy complication, it is necessary to conduct further research to identify the non-somatic causative factors of miscarriage. As most of these factors are preventable, such research may not only enable the selection of women at reproductive age at high risk of early pregnancy loss, but also show the ways in which effective preventive measures can be introduced in such a population.

## CONCLUSIONS

1. In the studied population of women with abnormal early pregnancy course, a significant impact on the risk of miscarriage was observed in the case of such factors as: exposure to stress at home and limited number of hours of nightly sleep.



2. Factors such as nature of work, diet, stress, heavy housework and use of cigarettes or alcohol did not exert a significant effect on the risk of miscarriage in the studied population.

## REFERENCES

- WHO recommended definitions, terminology and format for statistical tables related to the perinatal period and use of a new certificate for cause of perinatal deaths. Modifications recommended by FIGO as amended October 14, 1976. *Acta Obstet Gynecol Scand.* 1977; 56(3): 247–253.
- Wendt K, Crilly J, May C, Bates K, Saxena R. An outcomes evaluation of an emergency department early pregnancy assessment service and early pregnancy assessment protocol. *Emerg Med J.* 2013; 17(7): 567–578.
- Coste J, Job-Spira N, Fernandez H. Risk factors for spontaneous abortion: a case control study in France. *Hum Reprod.* 1991; 6(9): 1332–1337.
- Stephenson M. Frequency of factors associated with habitual abortion in 197 couples. *Fertil Steril.* 1996; 66(1): 24–29.
- Stern JJ, Dorfmann AD, Gutierrez-Najar AJ, Cerrillo M, Coulam CB. Frequency of abnormal karyotype among abortus from women with and without a history of spontaneous abortion. *Fertil Steril.* 1996; 65(2): 250–253.
- Alimohamadi S, Javadian P. Progesterone and threatened abortion: a randomized clinical trial on endocervical cytokine concentrations. *J Reprod Immunol.* 2013; 98(2): 52–60.
- Gu CH, Liang WJ, Fu LL, Zheng LW. Risk factors of recurrent spontaneous abortion. *Nat J Androl.* 2013; 19(8): 758–762.
- Armstrong BG, McDonald AD, Sloan M. Cigarette, Alcohol and Coffee Consumption and Spontaneous Abortion. *Am J Public Health.* 1992; 82(1): 85–87.
- Di Cintio E, Parazzini F, Chatenoud L, Surace H, Benzi G, Zanconato G, et al. Dietary factors and risk of spontaneous abortion. *Eur J Obstet Gynecol.* 2001; 95(1): 132–136.
- Jauniaux E, Van Oppenraaij RH, Burton GJ. Obstetric outcome after early placental complications. *Curr Opin Obstet Gynecol.* 2010; 22(6): 452–457.
- Frank P, McNamee R, Hannaford PC, Kay CR. Effect of changes in maternal smoking habits in early pregnancy on infant birthweight. *Br J Gen Pract.* 1994; 44(379): 57–59.
- Kubicki J. Wpływ palenia tytoniu na stan płodu. *Ginekol Pol.* 1991; 62(3): 488–493.
- Windham GH, Swan SH, Fenster L. Parental cigarette smoking and the risk of spontaneous abortion. *Am J Epidemiol.* 1992; 135(12): 1394–1403.
- Maximovich P, Beyler SA. Cigarette smoking at time of in vivo fertilization cycle initiation has negative effect on in vitro fertilization-embryo transfer success rate. *J Assist Reprod Genet.* 1995; 12(2): 75–79.
- Buss L, Tolstrup J, Munk C, Bergholt T, Ottensen B, Gronbaek M, et al. Spontaneous abortion: a prospective cohort study of younger women from the general population in Denmark. Validation, occurrence and risk determinants. *Acta Obstet Gynecol Scand.* 2006; 85(4): 467–475.
- Sackoff J, Kline J, Susser M. Previous use of oral contraceptive and spontaneous abortion. *Epidemiology.* 1994; 5(4): 422–428.
- George L, Granarh F, Johannson AL. Environmental tobacco smoke and risk of spontaneous abortion. *Epidemiology.* 2006; 17(4): 492–494.
- Meeker J, Benedict M. Infertility, Pregnancy Loss and Adverse Birth Outcomes in Relation to Maternal Secondhand Tobacco Smoke Exposure. *Curr Womens Health Rev.* 2013; 9(1): 41–49.
- Regan L, Rai R. Epidemiology and the medical causes of miscarriage. *Clin Obstet Gynaecol.* 2000; 14(5): 839–845.
- Fenster L, Hubbard AE, Windham GC, Waller KO, Swan SH. A prospective study of work-related physical exertion and spontaneous abortion. *Epidemiology.* 1997; 8(1): 66–74.
- Savitz DA, Brett K, Dole N, Tse CK. Male and female occupation in relation to miscarriage and preterm delivery in central North Carolina. *Ann Epidemiol.* 1997; 7(7): 509–516.
- Schlunssen V, Viskum S, Omland O, Bonde JP. Does shift work cause spontaneous abortion, preterm birth or low birth weight? *Dan Med J.* 2007; 169(10): 893–900.
- Nielsen C, Brandt L. Fetal growth, preterm birth and infant mortality in relation to work with video display terminals during pregnancy. *Scand J Work Environ Health.* 1992; 18(6): 346–350.
- Garcia C, Sammel M, Chittams J, Hummel AC, Shaunika A, et al. Risk factors for spontaneous abortion in Early symptomatic first trimester pregnancies. *Obstet Gynecol.* 2005; 106(5): 993–999.
- Johns J, Janiaux E. Threatened miscarriage as a predictor of obstetric outcome. *Obstet Gynecol.* 2006; 107(4): 845–850.

