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ORIGINAL ARTICLE

Evaluation of effect of selected occupational factors on termination of pregnancy and state of the newborn

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Abstract

The occupational activity of women has become a common phenomenon in the majority of developed countries, where approximately 50% of women at reproductive age are occupationally active. This phenomenon has also been observed in Poland. In the occupational environment many factors may exert an unfavourable effect on the health of the mother and developing foetus. These factors are: passive smoking at the workplace, heavy physical work, working for over 42 hours a week, as well as exposure to various types of chemical substances, electromagnetic waves or radioactive radiation. These factors may considerably increase the risk of occurrence of premature birth or delivery of a baby with reduced birth weight in relation to the gestational age, and may also cause abnormal foetal development.

The objective of the study was determination of the effect of occupational activity in pregnancy on the wellbeing of the newborn.

The study was carried out from 15 January 2011 – 20 March 2011, at the John Paul II Regional Hospital in Zamość, Poland, using a diagnostic survey. The survey covered 100 mothers who had been occupationally active in pregnancy. The technique applied was a questionnaire form based on the 5-point Liket scale, which consisted of 39 items. Apart from socio-demographic data, the questions covered obstetric-gynaecological history, state of health, life style, course of the last pregnancy, and working conditions.

The results confirmed that prolonging the weekly working time by more than 42 hours is conducive for the occurrence of low birth weight of babies, also, passive nicotinism at the workplace may negatively affect newborns' birth weight.

The presence of more than one harmful factor at the workplace results in a slight shortening of pregnancy duration.

The scope of problems concerning hazards at the workplace during pregnancy requires further studies on large groups of mothers.

Key words

pregnancy, newborn, hazards, occupational activity

INTRODUCTION

Pregnancy is a natural and entirely physiological condition. The life style of a woman during pregnancy exerts a considerable effect on the course of pregnancy and the development of a baby before and after birth. A healthy woman who takes care of herself and observes the principles of rational nutrition has no need to change her life style, but should remember that her behaviours and environment should not create risk for the baby's health and wellbeing [1, 2].

In the developing countries, an increase has been noted in the percentage of occupationally active women at reproductive age. When the course of pregnancy is normal there are no contraindications to performing household jobs and occupational activity. The occupational activity of the mother may affect the time of termination of pregnancy and the state of the newborn [2]. The main factors which affect the course of pregnancy and the foetus are conditions at the workplace, i.e. the occurrence of physical and chemical hazards, as well as the character of the work performed (intellectual, physical, standing, sitting, etc.) [1].

The objective of pre-delivery care is the provision of the mother's good general wellbeing in pregnancy, normal course of pregnancy, and assistance to the family in the adaptation to changes associated with pregnancy and the coming delivery. Health promotion should be an integral part of the first and each subsequent visit, and should cover the discussion on health promoting behaviours during pregnancy [3].

There is a group of potential hazards occurring at the workplace which may affect the course of pregnancy and the wellbeing of the newborn. Biological factors harmful for pregnant women are: infections with hepatitis virus type B, smallpox and zoster virus, rubella virus, HIV virus, listeriosis and toxoplasmosis virus [4].

Into the chemical factors creating risk for pregnant women may be classified: 2-ethyloxyethanol, chloroprene,

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cytostatics, manganese, lead and its organic and inorganic compounds, mercury, and plant protection products. Studies show a relationship between an elevated concentration of these substances and reduced birth weight of a newborn [5]. In Poland, plant protection products have been included in the list of compounds to which pregnant and breastfeeding women should not be exposed [6, 7]. The first month of pregnancy is the period of the greatest susceptibility to damage caused by pesticides. Plant protection products and their metabolites penetrate through the placental barrier, may inhibit intrauterine foetal growth, and may be the cause of reduction of the duration of pregnancy and low birth weight of the newborn [7, 8, 9].

The hazardous factors to which pregnant women are exposed at their place of work cover: physical effort, electromagnetic fields, ionizing fields, noise and vibration [9]. The presence of these factors at the workplace leads to disorders such as: spontaneous abortions, premature birth, still birth, and abnormal foetal development [9, 10]. Occupational activity is often related with great physical effort, which mainly concerns women working in agriculture and in industry while performing work activities associated with carrying loads. Physical effort at the workplace is most frequently an effort engaging small groups of muscles, with the prevalence of static effort resulting from the maintenance of forced body position and/or lifting loads. Carrying loads during the entire period of pregnancy causes an increase of pressure in the abdominal cavity, which may result in uterine contractions. Negative effects of physical effort during pregnancy are also related with the mechanism of changes in blood flow distribution. A considerable part of cardiac output is directed to the working groups of muscles, contributing to the decrease in blood flow in the internal organs, including the uterus. This is manifested by a decreased foetal heart rate [10, 11].

The subsequent negative factor is passive exposure of a pregnant woman to tobacco smoke at the workplace. This affects foetal development by reducing the birth weight of a newborn, foetal intrauterine growth inhibition (foetal nicotine syndrome), premature birth, developmental defects and an increase in perinatal mortality [12, 13]. Toxic substances in tobacco smoke show a negative effect on the viability of gametes, predisposition to conceiving, embryo cleavage and embryo transport and implantation. The result of this effect are spontaneous abortion and ectopic pregnancy [14, 15].

Psychosocial stress is an important factor exerting an effect on the mother's health. Noxiousness of the work environment may negatively affect pregnancy and the wellbeing of the newborn. Studies of this problem indicate that stress in pregnancy may be the cause of such complications as: spontaneous abortion, premature birth, delivering an asphyxiated newborn, or a baby with hypotrophy [16, 17].

OBJECTIVE

The objective of the study was determination of the effect of selected factors related with occupational activity on the termination of pregnancy and state of the newborn.

MATERIAL AND METHODS

The study was conducted from 15 January 2011 – 20 March 2011 at the John Paul II Regional Hospital in Zamość, Poland, after obtaining written consent from the director of the hospital and head of the Obstetric-Maternity Ward. The proper study was preceded by pilot studies.

The survey covered 100 patients in the Obstetric-Maternity Ward, aged 20-42, who had been occupationally active during pregnancy. The respondents were informed concerning voluntary participation in the survey, its anonymity, and the use of information obtained exclusively for scientific purposes, according to the Helsinki Declaration.

The study was carried out by means of a diagnostic survey. The technique applied was a self-designed questionnaire based on the 5-point Likert scale containing 39 items, which apart from socio-demographic data, also concerned obstetric-gynaecological history, state of health, life style, course of the last pregnancy and working conditions

The data collected in 100 questionnaires was subjected to statistical analysis. A statistical unit was a respondent who provided a reply to the items in the research instrument. The relationships between the characteristics were analyzed by means of the chi-square test for independence (level of significance $p<0.05$).

RESULTS

The study showed that the respondents most frequently performed physical-intellectual occupations – 41%, while 27% – intellectual work, and 32% – physical work.

Analysis showed that the respondents were most frequently exposed at their workplaces to noise (46%) and electromagnetic fields (46%), followed by other factors (17%), whereas they were rarely exposed to vibration (7%), anti-cancer drugs (3%), organic solvents (2%), ionizing radiation (2%), radioactive radiation (1%), and heavy metals (1%).

The results confirmed that for 58% of respondents the duration of working time was less than 42 hours per week, while for 42% – more than 42 hours.

The study showed that 22% of respondents were exposed to passive nicotinism at their workplace, whereas 78% of the women examined reported that they were not exposed.

The majority of mothers in the study delivered a baby during weeks 37–40 of pregnancy – 71%, while 4% – weeks 33–36, and 25% – more than week 41 of pregnancy (post term).

The studies showed that the mothers who performed intellectual-physical work more frequently delivered pre- or post-term (36.59%) than the respondents who performed intellectual work (11.11%) or only physical work (34.38%). The differences observed were close to statistical significance ($p=0.06$) (Tab. 1).

Results of the studies showed that the respondents exposed to passive smoking at work slightly more often delivered babies with low birth weight (12.50%) than the respondents who were not exposed (3.95%). The differences observed were not statistically significant ($p=0.25$), (Tab. 2).

Statistical analysis showed a significant relationship between weekly working time and birth weight of the baby ($p=0.007$). It was noted that the respondents who worked for more than 42 hours per week more often delivered babies with

Table 1. Term of delivery with consideration of the type of occupation performed

Type of occupational activity performed	Term of delivery		
	at term	pre-term/post-term	Total
	N %	n %	n %
manual work	21	11	32
	65.63%	34.38%	100.00%
office work	24	3	27
	88.89%	11.11%	100.00%
manual-office work	26	15	41
	63.41%	36.59%	100.00%
Total	71	29	100
	71.00%	29.00%	100.00%
Statistical analysis: Chi²=5.79; p=0.06			

Tabela 2. Birth weight of the newborn according to exposure to passive smoking at the workplace

Passive smoking at the workplace	Body weight of a newborn			
	2,100-2,500 g	2,600-4,000 g	over 4,000 g	Total
	n %	n %	n %	n %
Tak	3	19	2	24
	12.50%	79.17%	8.33%	100.00%
Nie	3	62	11	76
	3.95%	81.58%	14.47%	100.00%
Razem	6	81	13	100
	6.00%	81.00%	13.00%	100.00%
Statistical analysis: Chi²=2,77; p=0,25				

Table 3. Body weight of a newborn with consideration of weekly working time of the mother

Working time of the mother	Body weight of a newborn			
	2,100-2,500 g	2,600-4,000 g	over 4,000 g	Total
	n %	n %	n %	n %
<42 hours	1	53	4	58
	1.72%	91.38%	6.90%	100.00%
>42 hours	5	28	9	42
	11.90%	66.67%	21.43%	100.00%
Total	6	81	13	100
	6.00%	81.00%	13.00%	100.00%
Statistical analysis: Chi²=10.00; p=0.007				

low birth weight (11.90%), compared to those who worked for less than 42 hours (1.72%) (Tab. 3).

The studies confirmed that the respondents occupationally exposed to the effect of only one hazardous factor significantly more often delivered at term (80.95%) than those exposed to two or more factors (54.05%). The differences observed were statistically significant (p=0.004) (Tab. 4).

The studies showed that the respondents who conversed on a cellular telephone for more than one hour daily insignificantly more often delivered at term than those (86.36%) who conversed for 20-60 minutes (62.50%) or less than 20 minutes (67.74%). The differences were not statistically significant (p=0.18).

Table 4. Term of delivery with consideration of hazardous factors at the workplace of the mother

Hazardous factors at workplace	Term of delivery		
	at term	pre-term/post-term	Total
	N %	n %	n %
one factor	51	12	63
	80.95%	19.05%	100.00%
two or more factors	20	17	37
	54.05%	45.95%	100.00%
Total	43	16	59
	72.88%	27.12%	100.00%
Statistical analysis: Chi²=8.19; p=0.004			

Based on the statistical analysis performed, no statistically significant relationship was observed between the week of delivery and exposure to stress at work (p=0.16). The analysis showed that the respondents who performed physical work slightly more often delivered babies with low birth weight (12.50%) than those who were engaged in intellectual work (0.00%) and intellectual-physical work (4.88%). The differences observed were not statistically significant (p=0.27).

DISCUSSION

Contemporary women worldwide increasingly more frequently continue occupational activity during pregnancy. Pregnancy is a physiological condition which is not a contraindication to occupational activity if the work performed by a pregnant woman is not associated with an excessive load, and there are no factors in the environment which would interfere with the course of pregnancy and development of the foetus [16, 18, 19].

The problem of the effect of occupational activity of pregnant women on the wellbeing of the newborn and the outcome and course of pregnancy still remains unresolved. At present, there are many, sometimes controversial reports concerning the role of factors related to occupational activity and the occurrence of hypotrophy and premature birth [20, 21]. The discrepancies in the results of studies may be the consequence of difficulties with the isolation of one harmful factor on the background of many other hazards exerting a simultaneous effect, they may also result from various environmental or racial conditioning.

Studies conducted by T. Makowiec-Dąbrowska et al. confirm that the prolongation of working time of >42 hours weekly contributes to an increased risk of premature birth and delivery of a baby with low birth weight, especially in the mothers who are occupationally active during the entire pregnancy [22]. Siedlecka, Peoples-Sheps et al., and Vrijheid M. et al. also paid attention to the relationship between an increased number of working hours and the reduction in birth weight of newborns [23, 21]. These reports are in accordance with the results of the presented study.

Mozurkiewich EL, et al. indicate the relationship between physical work and an increased incidence of abortions,

premature births and low birth weight of newborns [24], which is partially confirmed by the results of the presented study.

Analysis of the literature shows a negative effect of physical, biological, and chemical factors occurring at workplaces on the course of pregnancy, and on the birth weight of the newborn [18, 21, 25]. The presented study did not unequivocally confirm such relationships; however, the group of mothers examined was small.

The studies by Adamek, Hanke et al., Martin et al., and Vrijheid et al. [12, 20, 21, 26] confirmed the fact that tobacco smoking by pregnant women, both active and passive, negatively affects the birth weight of newborns. The results obtained in this study indicate the risk of delivering a baby with low birth weight caused by passive nicotinism; however, no statistically significant differences were observed.

While analyzing various reports concerning risks associated with occupational activity it may be presumed that this scope of problems requires further studies, which should be conducted in the largest groups of women possible.

CONCLUSIONS

1. Prolongation of the weekly working time to more than 42 hours is conducive for the occurrence of reduced birth weight of newborns.
2. The occurrence of more than one hazard at the workplace results in a slight shortening of the duration of pregnancy.

FINAL STATEMENT

The scope of problems concerning hazards at the workplace during pregnancy requires further studies on large groups of women.

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