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Women's knowledge on activities associated with maternal hyperthermia during pregnancy. A cross-sectional study of the sample of Polish women

Abstract

Introduction. Hyperthermia during the first trimester increases the risk of miscarriage and birth defects. A variety of activities predisposing to hyperthermia during pregnancy such as attending sauna, hot tubs or solarium may lead to irreversible abnormalities of the developing fetus.

Aim. The aim of the study was to assess women's knowledge on the risks of maternal hyperthermia during each trimester of pregnancy.

Material and methods. It was a cross-sectional study conducted by means of an anonymous questionnaire. The study group included 302 women aged 17-65 who were admitted to a tertiary referral hospital. The questionnaire was designed on the basis of the Committee Opinion formulated by the American College of Obstetricians and Gynecologists and was consisted of two sections: demographic data and respondents' opinions on activities associated with hyperthermia in pregnancy. Statistical analysis was conducted to estimate the association of age, level of education and obstetrical status.

Results. The lowest percentage of given proper answers was observed in case of questions about early pregnancy. There was no association between respondents' level of education and choice of correct answers. Current pregnancy was associated with higher awareness of contraindicated using of hot tubs and steam rooms.

Conclusions. Patients' education concerning hyperthermia in pregnancy should focus on information about high risk of birth defects caused by overheating in the early pregnancy and a variety of activities linked with temperature elevation.

Keywords: congenital abnormalities, heat, high temperature, induced hyperthermia, pregnancy.

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INTRODUCTION

It has been proved that both internal (fever) and external (i.e. hot tub, sauna) heat exposure during pregnancy increases the risk of birth defects in offspring. Research performed on animal models, namely rats and guinea pigs, suggests that an increase in maternal body temperature above 2.5°C over the baseline for at least one hour is associated with teratogenicity [1,2]. Epidemiological observations in humans revealed that prolonged elevation in maternal body temperature of at least 2°C for 24 hours is associated with a range of developmental defects [1]. The most powerful study was conducted by Milunsky et al. which proved that hot tub and whirlpool bath in the first 2 months of pregnancy are associated with almost 3-fold increased risk of neural tube defects (adjusted RR for hot tub=2.8) [3]. Li et al. confirmed that hot tub use during pregnancy is associated with a 2-fold elevation of miscarriage risk. Authors also observed that the risk of pregnancy loss is proportional to the frequency of hot tub use, especially in early pregnancy [4]. Duong et al. showed that the offspring of women using a hot tub more than once in the first trimester is more likely to develop esophageal atresia, omphalocele, gastroschisis

and neural tube defects (OR=2.91) [5]. According to the opinion formulated by the American College of Obstetricians and Gynecologists (ACOG), undertaking any activities associated with hyperthermia during pregnancy should be discouraged regardless of the trimester [6].

AIM

Basing on foregoing up-to-date medical knowledge on the teratogenic effects of hyperthermia, this study aimed to assess women's awareness of recommended limitations concerning sauna, hot tub and solarium use during pregnancy.

MATERIAL AND METHODS

It was a cross-sectional study conducted by means of anonymous questionnaire. The study group included women aged 17-65 who were admitted to a tertiary referral hospital. The questionnaire was designed on the basis of the Committee Opinion of ACOG published in December 2015. It comprised of two sections – demographic data and respondents' opinions on hyperthermia in pregnancy. First section included questions

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concerning patients' age, place of residence, level of education as well as parity and current pregnancy if applied. Second section contained questions about respondents' opinions on activities associated with maternal hyperthermia in each trimester. Women were invited to participate in the study during control visit, hospitalization, before or after delivery.

Statistical analysis was conducted to estimate the association of age (≤ 19 , 20-29, 30-39, and ≥ 39 years old), educational level (higher, secondary, elementary, vocational) and pregnancy status related knowledge. Fisher's Exact Test was performed for dichotomous variables and Chi-squared Test for continuous variables.

RESULTS

Population characteristics

Altogether 302 surveys were collected. The mean age of respondents was 32 years old (min. 17, max. 65). The proportion of pregnant respondents to not pregnant was 73% to 27%. Among pregnant respondents (n=151), 11.8% (n=17) were in the first trimester, 25.0% (n=36) in the second trimester and 63.2% (n=91) in the third trimester. The majority of surveyed women obtained higher education (72.3%, n=209), 23.5% (n=68) secondary, 2.8% (n=8) elementary and 1.4% (n=4) vocational education. Over half of respondents lived in a city with population higher than 100.000 inhabitants (61.9% n=177). The sample included 151 pregnant and 116 non-pregnant women.

The exact acceptance rate of each mentioned activity – attending sauna, solarium, steam room and hot tub – during each trimester of pregnancy is shown in Table 1.

Age

In the study we have attempted to assess influence of age on knowledge about chosen activities associated with hyperthermia in the first trimester of pregnancy. We have divided respondents into four groups depending on their age: group 1 (age ≤ 20 years old), group 2 (20 < age ≤ 30 years old), group 3 (30 < age ≤ 40 years old) and group 4 (older than 40 years old). We have observed significant difference between the compared groups in giving correct answers regarding steam room in the first trimester of pregnancy ($p < 0.001$), whereas there is no significant difference between the compared groups in the correct answers regarding hot tubs in the first trimester ($p = 0.13$).

Level of education

We have compared respondents' answers with their level of education – group I (elementary/vocational education), group II (secondary education) and group III (higher education). No significant differences in awareness of hyperthermia and risks associated with sauna, hot tub nor steam room were observed.

Comparison between pregnant and non-pregnant women

Pregnancy was significantly and independently associated with higher awareness of hot tub ($p < 0.001$) and steam room ($p = 0.04$) contraindications. There was no significant difference observed between two groups in questions about sauna ($p = 0.2$) and solarium ($p = 0.7$).

DISCUSSION

Awareness of risk associated with exposure to hyperthermia during pregnancy plays a major role in avoiding long-term overheating complications. Teratogenic effect of heat depends both on temperature elevation and time of exposure [7]. Studies performed on animal models prove that together with the temperature increase, exposure time causing defects reduces logarithmically [8]. Our study shows that most of the surveyed women is familiar with contraindications during pregnancy concerning leisure activities linked with body temperature elevation. However, knowledge on the impact of undergoing specific procedures slightly differs. The highest rate of respondents' acceptance during pregnancy was indicated in case of attending steam rooms and using hot tub facilities. It is worth mentioning that staying in hot tubs may last relatively longer than solarium tanning, what highlights the meaning of both components in delivering threshold dose of heat and avoiding overheating effects [7]. Moreover, activities connected with hyperthermia were more often selected as secure during the first trimester of pregnancy than in consecutive trimesters. This is alarming as numerous defects caused by teratogenic heat effect develop in the first trimester [9].

Majority of available data focuses on development of hyperthermia caused neural tube defects. Nonetheless, exposure to heat in early pregnancy may also result in increased risk of developing other deformities for instance hypospadias [10]. Consequently, postnatal examination of children exposed to heat during early development stages should be thorough and detailed.

Another challenge associated with hyperthermia during leisure activities is linked with emerging new types of entertainment, in some cases commercially aimed at pregnant women. Hot yoga becomes more and more popular activity among future mothers [11,12]. This example shows that standard interview concerning exposure to heat is not enough. Additionally, patients may be convinced about safety of such activities and rely on inaccurate information delivered by non-medical instructors.

TABLE 1. Patients' acceptance rate of leisure activities in pregnancy associated with hyperthermia: sauna, solarium, steam room and hot tub.

	I Trimester (1-13 weeks of pregnancy)		II Trimester (14-26 weeks of pregnancy)		III Trimester (27-40 weeks of pregnancy)	
	Contraindicated	Allowed	Contraindicated	Allowed	Contraindicated	Allowed
Sauna	257 (94.85%)	14 (5.2%)	260 (97.4%)	7 (2.6%)	262 (98.1%)	5 (1.9%)
Solarium	270 (99.3%)	2 (0.7%)	268 (100%)	0	296 (100%)	0
Steam room	246 (90.8%)	25 (9.2%)	256 (95.9%)	11 (4.1%)	258 (97.0%)	8 (3.0%)
Hot tub	214 (79.0%)	57 (21.0%)	220 (82.7%)	46 (17.3%)	227 (85.3%)	39 (14.7%)

CONCLUSION

To conclude, hyperthermia is a complex risk factor of birth defects and some efforts should be made in order to educate patients and provide adequate information about possible exposure to this teratogen. Patients' education should include information about high risk of birth defects caused by overheating in the early pregnancy and a variety of activities linked with temperature elevation.

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