

RISK FACTORS FOR SPONTANEOUS ABORTION

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Abstract

Objective:

To determine the risk factors for spontaneous abortion.

Study design:

A prospective cohort study was carried out in Sri Lanka from May 2001 to April 2002 to determine the risk factors for spontaneous abortion. Eight hundred and twenty pregnant mothers were recruited on or before 16 weeks of gestation and followed up until delivery. Socio-demographic, occupational exposures, psychosocial stress and physical activity in terms of posture during pregnancy were assessed. Logistic regression analysis was applied and results were expressed as odds ratios (OR) and 95% confidence intervals (95%CI).

Results:

Maternal age of > 35 years was a risk factor [OR 2.98; 95%CI: 1.07, 8.26] and walking > 2.5 hours/day was a protective factor [OR 0.31; 95%CI: 0.11, 0.92] for second trimester spontaneous abortions after controlling for confounding factors. Occupational exposures, psychosocial stress, alcohol consumption or exposure to passive cigarette smoke during pregnancy were not observed to have an association.

Conclusions Maternal age of >35 years was and less walking hours/day were risk factors for spontaneous abortion

Key Words: Cohort study, Risk factors, Spontaneous abortion

Introduction

Spontaneous abortion is the most frequent cause of foetal loss. It is estimated that 10–15 percent of all clinically detected pregnancies end with a spontaneous abortion.¹ Spontaneous abortion causes greater consequences of psychological impact on maternal life and also affects the whole family.^{1,2}

Hence it is important to understand the factors that lead to spontaneous abortion in order that preventive measures could be adopted before and during pregnancy. Over the recent years a number of studies on risk factors for spontaneous abortion have been published^{3,4} The evaluated were mainly related to smoking, alcohol and caffeine consumption, and maternal variables. However the conclusions of these studies were controversial, because there were methodological variations and also lack of adjustment for potential confounding factors. Physical activity and psychosocial stress during pregnancy have been recognized as risk factors for adverse maternal and foetal outcomes such as pregnancy induced hypertension, pre-eclampsia, preterm birth and low birth weight⁵⁻¹⁰. Even though a few studies had assessed the effect of physical activity and psychosocial stress on spontaneous abortion, the conclusions were controversial.^{11,12}

The objective of the present study was to determine the risk factors for spontaneous abortion as it would be helpful in planning preventive measures to minimize

the incidence of spontaneous abortion.

Methods

A prospective cohort study was carried out in two Medical Officer of Health areas in the Gampaha District. The duration of the study was from May 2001 to April 2002. All women eligible to participate in the study were recruited on or before 16 weeks of gestation and followed until delivery. Exclusion criteria were age <15 years, rhesus negative blood group, a history of diabetes mellitus, hypertension, and major psychiatric conditions.

The study instruments consisted of a questionnaire, which included four main components, namely general information which included socio demographic and pregnancy related data, details related to occupation and environmental exposures, Modified Life Events Inventory (MLEI) and General Health Questionnaire (GHQ 30). The latter two instruments were used to assess the psychosocial status of the women.

Socio demographic data included age, educational level and whether in paid employment or not. Pregnancy related data included details on present and past obstetric history. Details pertaining to occupation in terms of duration of work, exposure to physical hazards such as heat, noise and radiation and chemicals and the use of personal protective

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equipment were inquired from those who were in paid jobs. Duration of different postures adopted in terms of walking, sitting, standing and sleeping were inquired from all women irrespective of whether they were in paid employment or not. For working women the number of hours spent per day in each posture at the work place was considered in addition and standardized for number of working days to determine the number of hours spent per day in each posture.

All the above components of the questionnaire were administered at the time of recruitment to the study. Maternal weight and height, haemoglobin percentage, and blood pressure measurements were carried out according to a standard protocol. Spontaneous abortion was defined as the expulsion of foetus or parts of the foetus between the recruitment of participants (on average 12 weeks of gestation) and 28 weeks of gestation. Therefore the study dealt with the second trimester abortions.

Statistical analysis included univariate and multivariate logistic regression, which was carried out to determine the odds ratio for spontaneous abortions and each of the socio-demographic and maternal variables. Cut off values with regard to haemoglobin level, height, weight and pre pregnancy weight were determined by using receiver operator characteristic curves to get a more accurate estimate of the association.

For the multivariate analysis all the eligible socio-demographic and maternal variables were included. All variables were coded as zero and one. All eligible variables which had a probability of <0.25 were entered into the model simultaneously and then removed one by one if it was ineligible.¹² A two tailed probability of <0.05 was considered as significant.

Results

The total number of women who attended the clinics during the period between May to August 2001 was 942. Forty five were not eligible (4.7%). Twelve were not willing to participate which gave a non participant rate of 1.3%. Nine twin and one triplet pregnancies were identified during the follow up and excluded. Finally a total of 875 women were available for the study. Outcome data were not available for additional 55 women. The latter computes a loss to follow up rate of 6.2%. Thus the final sample size left was 820 for the analysis. The total number of abortions among them was 42 (5.1%).

The mean age of the women was 27.6 years (SD±5.5years) whereas 89% were in the age group of 18 to 34 years. Ninety seven percent (97%) were Sinhalese since the study was carried out in a predominantly Sinhalese area. Seventy one percent (71%) had studied up to General Certificate Examination (ordinary level) while less than 1% only were found to have no schooling at all. Three hundred and forty one (46.2%) women were primiparous whereas 11 women (1.5%)

were grand multiparous. Sixty seven (9.2%) had body mass index (BMI) of <19.8 kg / m² and 25 (3.5%) a BMI of > 29 kg / m². The mean haemoglobin (Hb%) level was 12.2 g/dl (SD 0.92g/dl). Fifty eight women (7%) had Hb% of less than 11g/dl at the booking visit.

In the univariate analysis maternal age >35 years was observed to be significantly associated with spontaneous abortion with an OR of 3.44 [95 % CI: 1.51, 7.83] (Table 1). None of the other variables given in Table 1 were significantly associated with spontaneous abortion.

For the multivariate analysis 760 women were included in the final model. Hosmer and Lemeshow test for goodness of fit was found to be satisfactory (p value 0.95). Number of events per variable was 8.2. Interactions were tested and it was not statistically significant. There was no collinearity between variables.

Multivariate analysis revealed that maternal age >35 years had a three fold risk for spontaneous abortion [OR 2.98: 95% CI: 1.07, 8.26] and walking >2.5 hours per day had 70% reduction of risk for spontaneous abortion [OR 0.31; 95% CI: 0.11, 0.92] after controlling for haemoglobin level, maternal age and sitting hours per day (Table 3).

Discussion

In the present study walking for >2.5 hours/day was a protective factor for spontaneous abortion. Sitting for <3.5 hours/day was also a protective factor for spontaneous abortion, although it was not statistically significant. In other words our study showed that sedentary life was a risk factor for spontaneous abortion. Fenster had reported that standing hours, bending at work, hours spent doing housework and shift work were not associated with spontaneous abortion.¹¹ Fenster also showed that physical activity at work and at home combined together too had no effect on risk of spontaneous abortion.¹¹ Two other studies also revealed that occupation was not a risk factor for spontaneous abortion.^{3,14} In contrast to the above studies, one study showed that unskilled occupation had 4.7 fold risk of spontaneous abortion (p <0.001) after controlling for confounders.¹⁵

In the present study no association was observed between work schedule and or work exposure and spontaneous abortion even in the univariate analysis. Talamanca reviewed the articles on spontaneous abortions and reported that irregular working hours may be a potential risk factor.¹⁶

A higher level of job stress was reported to be associated with spontaneous abortion with an OR of 1.28 [95% CI: 1.05, 1.57]¹⁷, nested case control study reported increased the risk of an adverse pregnancy outcome where it was observed to be

Table 1 – Unadjusted Odds ratios for spontaneous abortion by selected socio-demographic and maternal variables

Exposure variables		Spontaneous abortion		Odds Ratio	95% C.I.	P value
		Yes (n= 42)	No (n=778)			
Maternal Age * Years	> 35	8(19.5)	51(6.6)	3.44	1.51, 7.83	0.002
	≤ 35	33(82.1)	723(93.4)			
Maternal Height * c.m	≤153	21(53.8)	431(56.1)	0.91	0.48, 1.74	0.78
	>153	18(46.2)	337(43.9)			
Pre Pregnancy Weight * Kg	≤ 52	7(17.9)	270(35.0)	1.53	0.82, 2.86	0.18
	> 52	23(82.1)	501(65.0)			
BMI kg/m ² *	≥ 26	7(17.9)	79(10.3)	1.90	0.8, 4.44	0.13
	< 26	32(82.1)	685(89.7)			
Parity	1	19(45.2)	359(46.1)	0.96	0.51, 1.79	0.90
	Others	23(54.8)	19(53.9)			
Past History of abortion	Yes	7(16.7)	128(16.5)	1.01	0.44, 2.33	0.97
	No	35(83.3)	650(83.5)			
Past history of LBW	Yes	2(4.8)	61(7.8)	0.58	0.13, 2.49	0.47
	No	40(95.2)	717(92.2)			
Hb% g/dl *	<12	7(20.0)	255(34.9)	0.46	0.20, 1.08	0.07
	≥12	28(80.0)	476(65.1)			
Education Up to Grade 5 Above	5	1(2.4)	38(4.9)	0.47	0.06, 3.54	0.46
	Above	41(97.6)	740(95.1)			
Per Capita Monthly * Income Rs.	≤1500	8(19.5)	197(25.4)	0.71	0.32, 1.56	0.40
	>1500	33(80.5)	579(74.6)			

* Grand total does not add up to 820 due to non response, 95% CI: 95% Confidence Interval

Table 2 - Unadjusted odds ratios for spontaneous abortion by other exposure variables

Exposure variables	Spontaneous abortion		Odds Ratio	95% C.I.	P value	
	Yes (n= 42)	No (n=778)				
Standing hours/day *	>2.5	10(24.4)	223(28.7)	0.80	0.38, 1.66	0.55
	≤2.5	31(75.6)	554(71.3)			
Walking hours/day *	>2.5	8 (19.8)	247(31.8)	0.52	0.23, 1.14	0.10
	≤2.5	33 (80.5)	530 (68.2)			
Standing + Walking hours/day *	≥4	23(56.1)	483(62.2)	0.77	0.41, 1.64	0.43
	<4	18(43.9)	294(37.8)			
Sitting hours/day *	<3.5	10(24.4)	288(37.1)	0.54	0.26, 1.13	0.10
	≥3.5	31(75.6)	489(62.9)			
Sleeping hours/day	≤8	16(38.1)	268(34.4)	1.17	0.61, 2.22	0.62
	>8	26(61.9)	510(65.6)			
Work schedule and Exposure	Yes	4(9.5)	76(9.8)	0.97	0.33, 2.79	0.80
	No	38(90.2)	702(90.2)			
Employment Status *	Yes	7(16.7)	184(23.7)	0.64	0.28, 1.47	0.29
	No	35(83.3)	593(76.3)			
GHQ Score *	>5	15(35.7)	278(35.8)	0.99	0.52, 1.90	0.98
	≤5	27(64.3)	498(64.2)			
MLEI Score *	≥2	11(36.2)	149(19.2)	1.49	0.73, 3.04	0.27
	<2	31(73.8)	626(80.8)			
Passive Smoking	Yes	12(28.6)	160(20.6)	1.54	0.77, 3.08	0.21
	No	30(71.4)	618(79.4)			
Alcohol Consumption *	Yes	2(4.9)	24(3.1)	1.48	36, 6.06	0.57
	No	39(95.1)	753(96.9)			

* Grand total does not add up to 820 due to non response, 95% CI: 95% Confidence Interval

Table 3 Adjusted odds ratios for spontaneous abortion

Exposure variable	b	SE	OR	95%CI	Prob
Walking > 2.5 hours/ day	- 1.16	0.55	0.31	0.11, 0.92	0.03
Sitting < 3.5hours /day	- 0.63	0.44	0.53	0.22, 1.26	0.15
Maternal age > 35 years	1.09	0.52	2.98	1.07, 8.26	0.04
Haemoglobin < 12g/dl	- 0.71	0.44	0.49	0.21, 1.15	0.10

b: Regression coefficient, SE: Standard Error, OR: Odds Ratio, 95% CI: 95% Confidence Interval, Prob: Probability

associated with spontaneous abortion with an OR. Since it was a case control study the reliability of information obtained was a limitation due to problems in recall.

In the present study occupational stress was not assessed separately. However it was revealed that psychosocial stress in terms of GHQ score of >5 or experience of ³2 life events had no association with spontaneous abortion. In the study carried out by Schenker too, self-reported stress during pregnancy had no statistically significant association [OR 1.4; 95% CI: 0.8, 2.3] with spontaneous abortion.¹² This was consistent with the results of the present study.

We also reported a three fold risk of spontaneous abortion among women aged ≤ 35 years after controlling for walking, sitting hours and haemoglobin level. Our findings were consistent with the findings of another study which showed that age >24 years was a risk factor for spontaneous abortion.¹⁸ In contrast to our study, four other studies had shown that maternal age was had no association with spontaneous abortion.^{3,14,15,19}

Several studies had shown that cigarette smoking has no association with spontaneous abortion.^{3,4,14,18} In two of those studies, cigarette smoking had not been associated with spontaneous abortion even in the univariate analysis.^{4,18} One study had shown that smoking >19 cigarettes per day had an association with spontaneous abortion where the unadjusted odds ratio was 2.23 [95% CI: 1.05, 4.76]. However, after controlling for age, occupation, alcohol and caffeine consumption it had not remained significant [OR 0.95; 95% CI: 0.40, 2.20].¹⁴ All respondents in our study sample were non smokers and passive cigarette smoking was assessed considering exposure to cigarette smoke both at home and at work place. However, passive smoking was not found to be associated with spontaneous abortion [OR 1.54; 95% CI: 0.77, 3.08].

Two studies had shown that alcohol consumption during pregnancy had no association with spontaneous abortion.^{3,19} In the present study also it was shown that alcohol consumption during pregnancy had no association with spontaneous abortion [OR 1.48; 95% CI: 0.36, 6.06]. In contrast to our finding, a case control study had shown that consumption of alcohol of more than five units per week during pregnancy had a five fold risk of spontaneous abortion [95% CI: 2.87, 8.16] after controlling for age, parity, occupation, cigarette and caffeine consumption.¹⁴ In our study population only 3.1% had taken alcohol and quantification of alcohol consumption did not allow for separate analysis because no one consumed alcohol regularly during pregnancy.

According to the present study there was no statistically significant association between primi parity and spontaneous abortion. Our findings are consistent with three other studies.^{3,14,19} Yassin found that more than five pregnancies had a four fold risk of spontaneous abortion ($p < 0.001$) controlling for potential confounding factors.¹⁵ However in the present study, number of grand

multiparous women was inadequate for separate statistical analysis.

The present study also revealed that spontaneous abortion was not associated with a pre pregnancy BMI >26 kg/m² [OR 1.90; 95% CI: 0.81, 4.44]. Our findings are consistent with two other prospective studies, which had shown that BMI ≤ 18.5 kg/m² or ³25 kg/m² was not associated with spontaneous abortion.^{3,19}

The present study recruited women at their booking visit and thus the period of gestation on average was 12 weeks. All the 42 (5.1%) reported, were second trimester spontaneous abortions. Further, exclusion criteria applied at the recruitment were pre-existing diabetes mellitus and hypertension and multiple pregnancies which are known risk factors for spontaneous abortion. This explains the low spontaneous abortion rate in the present study.

Conclusion

In conclusion, maternal age >35 years and sedentary lifestyle during pregnancy were risk factors for spontaneous abortion. There were no associations between BMI, primiparity, occupational exposures, psychosocial stress, alcohol consumption or exposure to passive cigarette smoke during pregnancy and spontaneous abortion.

Acknowledgements

We wish to thank, the National Science Foundation for providing the funds for collection of data for this study.

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