Risk Factors for Spontaneous Abortion in Georgian Population

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Abstract

Background: Spontaneous abortion is a difficult problem for reproduction. This leads to the importance of studying risk factors. Since risk factors depend on demographic, ethnic, and environmental conditions of the population. The aim of our explore is to study the risk factors for spontaneous abortions and risk assessment among the population of Georgia. **Methods**: We retrospectively studied the clinical and laboratory features of 111 patients with identified spontaneous abortions who were treated at the Gudushauri clinic in 2015-2017. The control was carried out in the same period during the out-patient department of the Gudushauri clinic, 103 pregnant women who gave birth to live neonates. Research methods: history, clinical, clinical laboratory, immunological, morphological, bacteriological, ultrasound. The study of the following factors: age, education, family conditions, living conditions, bad habits, activities, working conditions, hereditary factors, accommodation, extragenital diseases, diet, physical activity, sleep hygiene, gynecological history, uterine deformities, medication during pregnancy, the results of a previous pregnancy, pregnancy complications, infections. **Results:** The risk of spontaneous abortion increases: Daily travel to long distance OR=4.34(95% CI:1.45-3.03); Stress - OR=6.36(95% CI:2.43-16.66); intermittent sleep - OR=5.72(95%CI:2.15-15.19); Menstrual disorders OR=9.91(95%CI:2.01-48.94); hypertension OR=15.26(95% CI:1.03-27.24); anemia- OR=4.14(95% I:1.78-9.62); Flu during pregnancy - OR=6.24(95% CI:1.63-23.90); leukocytosis - OR=1.32(95%CI:1.12-1.55) and decrease the placenta location

in the base- OR=0.09(95%CI:0.02-0.47). **Conclusion:** Daily travel to long distance, flu, anemia, leukocytosis, stress, intermittent sleep during pregnancy, menstrual disorders, hypertension are the independent risk factors of spontaneous abortion in Georgian Population, relative chance of spontaneous abortion reduce: placenta at the base. The risk of spontaneous abortion in Georgian population is not determined by relationship status, bad habits and educational factors.

Keywords: Spontaneous Abortion, Pregnancy complications, Bad habits

Introduction

Spontaneous abortion is a difficult problem for reproduction. Its frequency is 8-20% of clinically confirmed pregnancy [Fergusson, D. M., et al. 2006 Wang X 2003 et al.]. The etiological factors include genetic abnormalities, infections, immunological and implant abnormalities, uterine and endocrine diseases, and lifestyle factors [Alexander J.2018 , Pinar MH. 2018]. Patient's age, magnetic field and ion radiation(Delabaere A,2014), pesticide[Arbuckle, T. E., 2001], exposure, overweight[Yogev, Y. et al. 2009], Obesity increases after infertility treatment[Wang, J., et al. 2002, Metwally, M., et al. 2008]. risk factors for spontaneous abortions: factors for tobacco and cocaine consumption [Ness R.B., et al. 1999], coffee [Cnattingius, S., et al. 2000, Weng, X., et al. 2008], and folate deficiency, as well as Folic acid intake during pregnancy [George, L., et al. 2002]. Spontaneous abortion is associated with viral infections during pregnancy [Racicot K., et al. 2017]. Students with severe social conditions often experience pregnancy complications and abortion [Tesfaye, S., et al. 2014.]. Since risk factors depend on demographic, ethnic, and environmental conditions of the population, it is necessary to study these factors for all groups of the population. The aim of our study is to explore the risk factors for spontaneous abortions and risk assessment among the population of Georgia.

Methods

We retrospectively studied the clinical and laboratory features of 111 patients with identified spontaneous abortions who were treated at the Gudushauri National Medical Center in 2015-2017. The control was carried out in the same period during the out-patient department of the Gudushauri clinic, 103 pregnant women who gave birth to live neonates. Study design is observational, type is case-control study.

Inclusion criteria: Patients with spontaneous abortions, consent to participate in the study.

Exclusion criteria: genetic abnormalities of a pregnant woman or her partner.

Research methods: history, clinical, clinical laboratory, immunological, morphological, bacteriological, ultrasound.

The study of the following factors: age, education, family conditions, living conditions, bad habits, activities, working conditions, hereditary factors, accommodation, extragenital diseases, diet, physical activity, sleep hygiene, gynecological history, uterine deformities, medication during pregnancy, the results of a previous pregnancy, pregnancy complications, infections.

Statistical analysis: for quantitative indicators, we measured the mean and standard deviation, the number and quantity of quality indicators. Significant difference in quantitative indicators was determined by the Student's test and by qualitative indicators - criteria F (Fisher). The difference was considered significant when $p < 0.05$. We used multivariate binary logistic regression analysis to calculate odds ratio, statistical analysis was performed using SPSS 22.

Results: The distribution of patients by age is shown in 1 Figure

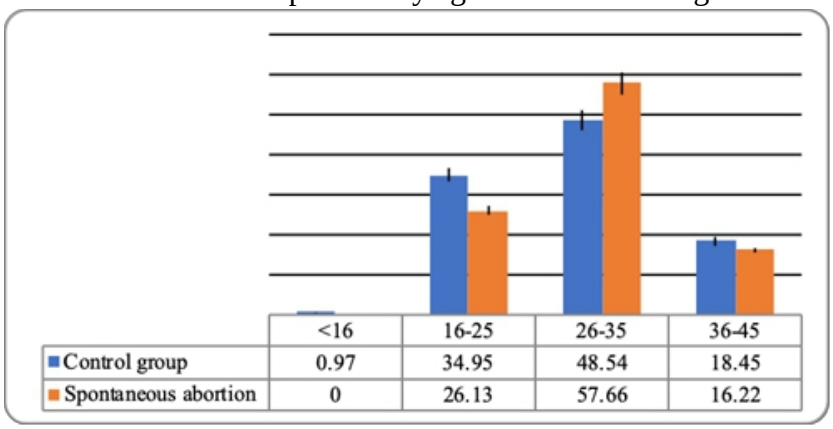

Figure 1. Distribution of patients by age(%)

Among our pregnant women, 26–35 years prevail, and there are no significant differences between groups in the frequency of spontaneous abortions($p>0.05$).Statistical evaluation factors of spontaneous abortions is given in table 1.

Table 1. Statistical assessment of the characteristics of pregnant women in the groups of spontaneous abortion and term labor.

		Control group		Spontaneous abortion		F	p
		N	%	N	%		
Educational level	University degree	64	62.14	74	66.67	0.48	0.4912
	High school	29	28.16	33	29.73	0.06	0.8009
Living conditions	unsatisfactory	4	3.88	22	19.82	13.39	0.0003
	Conflict	1	0.97	2	1.80	0.26	0.6074

Relationship status	Single mother	2	1.94	0	0.00	2.18	0.1415
Bad habits	Coffee > 200 ml per day.	20	19.42	23	20.72	0.06	0.8132
	Smoking	6	5.83	10	9.01	0.78	0.3786
Activity	Student	5	4.85	4	3.60	0.21	0.6506
	Schoolgirl	2	1.94	0	0.00	2.18	0.1415
	Office work	30	29.13	42	37.84	1.81	0.1794
	Physical labor	7	6.80	2	1.80	3.33	0.0695
	Unemployed	63	61.17	68	61.26	0.00	0.9886
Harmful working conditions	Sitting for 6 hours/day	21	20.39	32	28.83	2.04	0.1544
	Standing for 6 hours/day	7	6.80	10	9.01	0.35	0.5519
	Lifting heavy objects more than 9 kg	2	1.94	11	9.91	6.06	0.0146
	Vibration	0	0.00	2	1.80	1.87	0.1727
	Production dust	1	0.97	6	5.41	3.34	0.0690
	Chemicals	0	0.00	2	1.80	1.87	0.1727
	Microclimate	10	9.71	23	20.72	5.04	0.0258
	Daily travel long distance	7	6.80	34	30.63	21.37	<0.0001
	Hard work	36	34.95	67	60.36	14.63	0.0002
Nutrition	Appetite disturbance	39	37.86	50	45.05	1.13	0.2891
	Excess food intake	17	16.50	41	36.94	11.81	0.0007
	Poor nutrition	20	19.42	15	13.51	1.36	0.2453
	Get synthetic fluids	9	8.74	15	13.51	1.22	0.2708
	Nutritional disorder	23	22.33	64	57.66	31.44	<0.0001
Physical activity	Low	37	35.92	43	38.74	0.18	0.6722
	Average	53	51.46	47	42.34	1.78	0.1835
	High	10	9.71	23	20.72	5.04	0.0258
Sleep hygiene	Wake up early	19	18.45	18	16.22	0.18	0.6682
	Late to sleep	11	10.68	19	17.12	1.84	0.1769
	Intermittent sleep	42	40.78	66	59.46	7.66	0.0062
Extragenital diseases	Obesity	7	6.80	20	18.02	6.22	0.0134
	Diabetes melitus	1	0.97	5	4.50	2.45	0.1188
	Hypothyroidism	4	3.88	19	17.12	10.12	0.0017
	Atherosclerosis	0	0.00	0	0.00	-	-
	Hypertension	0	0.00	5	4.50	4.81	0.0293
	Coronary heart disease	0	0.00	0	0.00	-	-

	Gallbladder disease	3	2.91	7	6.31	1.38	0.2419
	Allergy	18	17.48	38	34.23	7.98	0.0052
	Chronic kidney disease	0	0.00	2	1.80	1.87	0.1727
	Varicose veins	1	0.97	14	12.61	11.61	0.0008
	Systemic diseases	0	0.00	7	6.31	6.87	0.0094
	Epilepsy	1	0.97	4	3.60	1.62	0.2045
	Tuberculosis	0	0.00	2	1.80	1.87	0.1727
Gynecological history	Menarche	1	0.97	8	7.21	5.24	0.0231
	Menstrual disorders	3	2.91	30	27.03	26.55	<0.0001
	Infertility over 3 years	4	3.88	3	2.70	0.23	0.6295
	Inflammatory diseases of the pelvic cavity	10	9.71	24	21.62	5.77	0.0171
	Uterine myoma	4	3.88	14	12.61	5.37	0.0215
	Uterine cavity polyps	2	1.94	2	1.80	0.01	0.9401
	Ovarian polycystic	3	2.91	3	2.70	0.01	0.9264
Uterine anomalies	Two uterous or two uterine wombs, uterine tail	0	0.00	0	0.00	-	-
Genetic factor	Congenital thrombophilia	1	0.97	8	7.21	5.24	0.0231
Previous miscarriage	Spontaneous abortion 1	18	17.48	19	17.12	0.00	0.9451
	Spontaneous abortion 2-4	4	3.88	7	6.31	0.64	0.4250
	Spontaneous abortion> 4	1	0.97	0	0.00	1.08	0.3003
	medical abortion 1	11	10.68	18	16.22	1.39	0.2391
	medical abortion 2-4	7	6.80	4	3.60	1.11	0.2928
	medical abortion 4>	1	0.97	7	6.31	4.27	0.0400
	Antenatal fetal death	1	0.97	9	8.11	6.23	0.0133
	Early neonatal death	3	2.91	0	0.00	3.30	0.0707
	Complicated Pregnancy	0	0.00	2	1.80	1.87	0.1727
	Difficult childbirth	0	0.00	7	6.31	6.87	0.0094

	Cesarean section	33	32.04	36	32.43	0.00	0.9585
	Postpartum hemorrhage	0	0.00	3	2.70	2.83	0.0937
	Ectopic pregnancy	1	0.97	2	1.80	0.26	0.6074
Pregnancy complications	Anemia	17	16.50	63	56.76	44.29	<0.0001
	Gestosis	34	33.01	25	22.52	2.96	0.0870
	Hypertension	1	0.97	8	7.21	5.24	0.0231
	Flu	5	4.85	30	27.03	20.89	<0.0001
	Heart failure	0	0.00	0	0.00	-	-
	Urinary Tract Infection	9	8.74	15	13.51	1.22	0.2708
	Injury	2	1.94	14	12.61	9.09	0.0029
	Bloody discharge	27	26.21	28	25.23	0.03	0.8695
	Uterine hypotoneus	51	49.51	52	46.85	0.15	0.6980
	Intoxication	0	0.00	3	2.70	2.83	0.0937
	Anomalies of fetal development	2	1.94	3	2.70	0.13	0.7143
	Retarded fetal growth	0	0.00	5	4.50	4.81	0.0293
Medication	Antibiotics	6	5.83	15	13.51	3.59	0.0593
	Progesterone	58	56.31	45	40.54	5.41	0.0210
	Corticosteroids	6	5.83	4	3.60	0.19	0.6638
	Insulin	0	0.00	3	2.70	2.83	0.0937
	Drugs Acting U pon the Central Nervous System.	1	0.97	3	2.70	0.87	0.3523
	Iodine-containing drugs	9	8.74	33	29.73	15.89	0.0001
	Folic acid	82	79.61	101	90.99	4.92	0.0276
	vitamins of group B	39	37.86	37	33.33	0.48	0.4912
Obstetric Ultrasound	placenta base	18	17.48	8	7.21	5.36	0.0216
	Placenta side	5	4.85	2	1.80	1.57	0.2116
	placenta-back	39	37.86	45	40.54	0.16	0.6904

As shown in the table, there are no significant differences between groups of spontaneous abortions and positive results in education, family environment and bad habits, the frequency of unsatisfactory living conditions compared with spontaneous abortions and control groups.

Despite the fact that physical activity is not a risk factor, the abortion group is relatively high in frequency for those with more than 9 kg of cargo being transported and lead a physically active life. The influence of the production microclimate and daily long-distance travel has become significant.

In the control group, there was no effect on the effects of chemicals, including the presence of hypertension, chronic kidney disease, systemic diseases and complicated births. There was no sign of fetal growth.

Compared to the control of spontaneous abortion, there is a high frequency of over-feeding, eating habits and obesity. Sleep disturbances are relatively high - late sleep and intermittent sleep.

Among patients who have had a spontaneous abortion, the frequency of allergies and varicose diseases is relatively high, and more often in history: hypothyroidism, delayed menaeche, menstrual disorder, pelvic inflammatory diseases, uterine fibroids, more than 4 induced abortions, Prenatal death.

It is worth noting the high incidence of thrombophilia in the group of spontaneous abortions.

Among the current pregnancy complications, the abortion group is reliably high: anemia, hypertension, influenza, trauma.

At the next stage of the study, examine the blood test in both groups (Table 2).

Table 2. Assess the values of the complete blood count for spontaneous abortion and control

	Spontaneous abortion N=111	Control group N=103	t	P
	Mean+Std. Dev.	Mean+Std. Dev.		
Hemoglobin	110.85+13.29	115.74+11.63	-2.87	0.0045
Erythrocytes * 10^{12} cells / l	4.33+1.7	4.71+1.9	1.54	0.9379
Platelet count x10 ^{9}/l	250.77+69.37	259.11+57.19	-0.95	0.3409
Hematocrites	32.23+3.87	34.04+3.79	3.44	0.0007
White blood cells count x10 ^{9}/l	12.79+4.71	10.4+2.35	4.53	<0.0001
Bands neutrophils count x10 ^{9}/l	5.50+3.81	3.56+1.59	4.80	<0.0001
Segmented Neutrophils x10 ^{9}/l	72.83+6.55	67.90+7.32	5.17	<0.0001
Lymphocytes x10 ^{9}/l	14.30+5.94	20.81+6.11	-7.89	<0.0001
Monocites count x10 ^{9}/l	6.00+2.04	5.31+1.84	2.60	0.0100
Erythrocyte Sedimentation Rate	36.35+17.76	28.20+18.70	3.26	0.0013
Eosinophil count x10^{9}/l	1.45+1.06	2.39+2.33	-3.83	0.0002

Hematocrit, leukocytes and ESR are significantly high with spontaneous abortions, and in the case of a good solution, hemoglobin is significantly higher.

No difference was observed for mean red blood cells. Compared with the control, both the hammer and the neutrophil segments, monitors and EMF, respectively, are hematocrit, as well as reduced monocytes and eosinophils.

At the next stage of the study, using the characteristics for which a significant difference was made in spontaneous abortion and control groups, a regression analysis was performed (Table 3).

Table 3. Assessment of relative chances of spontaneous abortion

	p	OR	95% C.I.for OR	
Daily travel long distance	0.0088	4.34	1.45	13.03
Stress	0.0002	6.36	2.43	16.66
Intermittent sleep	0.0005	5.72	2.15	15.19
Menstrual disorders	0.0049	9.91	2.01	48.94
Hypertension	0.0479	15.26	1.03	227.24
Anemia	0.0009	4.14	1.78	9.62
Flu during pregnancy	0.0076	6.24	1.63	23.90
Placenta placement in based	0.0043	0.09	0.02	0.47
Leukocytes	0.0008	1.32	1.12	1.55
Constant	0.1900	0.10		

As shown in the table, the relative chance of spontaneous abortion increases: Daily travel for a long distance, stress, intermittent sleep, menstrual disorders, hypertension, anemia, influenza during pregnancy, an increase in leukocytes; relative chance of spontaneous abortion reduce: placenta at the base.

Discussion

Spontaneous abortion is characterized by multi-factoriality. Socio-economic risk factors indicate low economic conditions and incomplete secondary education[Zheng D., et al. 217]. According to this study, no significant differences were found between groups in terms of education. The incidence of spontaneous abortions was high in women with low income.

Among the risk factors is the age of the parents[de La Rochebrochard E., et al. 2002], which as argued here study did not confirm. It is noteworthy that the risk of housewives is low[de La Rochebrochard E., et al. 2002], which explains the stress and physical stress associated with stressful work. Compared to the control of a group of spontaneous abortions according to this materials, the frequency of unsatisfactory living conditions is relatively high. Predictors of spontaneous abortion is are considered to have severe physical work, foot and heavy weight [Banerjee B., et al. 2005]. This research suggests that the spontaneous abortion group is relatively high in the frequency of those who have more than 9 kgs and carrying a physically active life. The significantly was the impact of the production microclimate and the daily traveling on a long distance, the high-risk factor for everyday travel.

Among the spontaneous abortion predictors, there are harmful habits: consumption of tobacco [Pineles, B. L., et al. 2014], coffee[Cnattingius, S.,

et al. 2000], alcohol[Inga Castillo, G. 2017]. According to other authors, five times a week of alcohol consumption and 375 ml or more coffee per day increases the risk of spontaneous abortion and cigarettes are not increased risk [Rasch V., et al. 2003]. There is no reliable difference in the habit of spontaneous abortion and control in our population.

Increases interest in stress and emotional stress on pregnancy outcomes. Stress were associated with an increase in abortion risk[Arck P.C.,2001., Schenker M.B**.,** et al. 1997], which confirmed this research, and in addition to the spontaneous abortion group, there is also a relatively high levels of sleep disorders - late sleep and intermittent sleep, which also affects the psychological condition. Obesity increases the risk of spontaneous abortion[Bell R. 2014, Boots C, et al. 2011], As demonstrated here, with a high risk of excessive nutrition, eating habits and obesity, but they do not have an independent prognostic significance compared to the controlled abortion grouping.

The concept of taking folic acid during pregnancy varies, according to some studies, it reduces the risk of spontaneous abortion, and in some it increases it [Bailey LB, et al. 2005]. In our study group, the frequency of folic acid intake is higher compared to the control, but it does not have a prognostic value.

Genetic factors are important for thrombophilia, which is the risk of repeated spontaneous abortion [Pritchard A.M., et al. 2016]. This paper showed a high level of thrombophilia in the group of spontaneous abortion.
The risk factors are - mental disorders, urinary tract infections, at least one episode of abortion and sexual activity before the age 18[Inga Castillo, G.2017]; There are associations spontaneous abortions and hypercholesterolemia, hypertension and 2 types of diabetes[Horn J,2019]. Pregnant women with subclinical hypothyroidism have a high risk of spontaneous abortions. However, according to some authors, spontaneous abortions are not associated with mass indexes, congenital anomalies in history, ectopic pregnancy, thyroid dysfunction and hypertension[Poorolajal, J., et al. 2014]. As demonstrated here, in spontaneous abortion group, the frequency of allergies and varicose diseases is significantly high, and in the anamnesis more frequently: hypothyroidism, Delayed Menarche, Menstrual disorders, pelvic inflammatory diseases, fibroids, more than 4 medical abortions, and antenatal death of the fetus. From pregnancy complications women are significantly high: anemia, arterial hypertension, flu, trauma.

Among the risk facts are the introduction of antibiotics such as macrolides (except erythromycin), chinolines[Padberg S, et al. 2014], tetracycline, sulphanlamymides and metronidazole associated with increased risk of spontaneous abortion in the early period of pregnancy [Muanda, F.T.,

et al., 2017, Bar-Oz B. et al. 2012]. This paper shows that, the frequency of antibiotics is undoubtedly higher in the abortion group.

Conclusion

Daily travel to long distance, flu, anemia, leukocytosis, stress, intermittent sleep during pregnancy, menstrual disorders, hypertension are the independent risk factors of spontaneous abortion in Georgian Population, relative chance of spontaneous abortion reduce: placenta at the base. The risk of spontaneous abortion in Georgian population is not determined by relationship status, bad habits and educational factors.

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