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Assessment of five-year data of high-risk pregnancies

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ABSTRACT. – OBJECTIVE: Pregnancy is a natural physiological process, but certain conditions can increase the risk, leading to high-risk pregnancy. Several risk factors may cause high-risk pregnancy. The leading ones are chronic diseases, anemia, multiple pregnancies, premature rupture of membrane, preeclampsia, obesity, frequent pregnancy, and advanced maternal age.

PATIENTS AND METHODS: A total of 7,230 women with high-risk pregnancies followed up by the Unit of Women's and Reproductive Health of the Directorate of Public Health Services, Kayseri Provincial Directorate of Health between 2016 and 2020 were included in the study. Demographic data, pregnancy outcomes, and risk factors were recorded. The mean age was 27.62±6.55 years. The mean number of pregnancy follow-ups was 3.69±1.36. The mean number of follow-ups for Turkish pregnant women was 3.73±1.34 while it was 1.93±1.1 for foreign pregnant women. Binary logistic regression analysis was used to investigate the effect of risk factors on pregnancy outcomes.

RESULTS: Pregnancies that did not result in live birth were associated with preeclampsia (OR=12.677), hypertension (HT) (OR=2.079), and cardiovascular disorders (OR=2.277). It was revealed that the number of follow-ups for high-risk pregnancies was low.

CONCLUSIONS: In conclusion, we believe that increasing monitoring of high-risk pregnancies and developing follow-up models by health authorities will improve the quality of monitoring for high-risk pregnancies.

Key Words:
Chronic disease, Hypertension, Preeclampsia, Eclampsia, Pregnancy, Stillbirth.

Introduction

Pregnancy is a physiological process of a fetus growing in the body of the mother. This is a process in which several physiological changes come out compared to the pre-pregnancy period. Although these changes occur in a physiological process, pregnancy has also been described as a stressful process in which several biophysical, psychosocial, sociodemographic, or environmental changes occur[1]. A healthy pregnancy is defined as the absence of any current or past pregnancy complications, no significant maternal medical conditions, no history of maternal morbidity or mortality, and the presence of adequate fetal growth without any predictable risks[2]. Although many pregnancies and deliveries occur healthily without any undesired or negative outcomes at the end of these physiological processes, it can still be a process resulting in morbidity and mortality for both the fetus or newborn and mother, particularly in developing countries.

High-risk pregnancy comes out in case of conditions increasing perinatal morbidity and mortality. The most widely accepted classification for categorizing at-risk pregnancies, as used by our Ministry of Health, follows a two-tier system: low-risk and high-risk pregnancies. Since pregnancy is a dynamic process, it is not accurate to assume that a pregnancy that begins without complications will remain complication-free. Therefore, all pregnancies are initially classified as low-risk. The conditions that place pregnant women in the high-risk category include neonatal death in previous pregnancies, macrosomia, intrauterine growth retardation, fetal malformation, hypertensive disorders, rhesus (Rh) incompatibility, chronic diseases in mother's medical history or emerging during pregnancy, anemia, multiple pregnancies, premature rupture of membrane, and preeclampsia-eclampsia as well as general risk factors such as difficulties in accessing healthcare services, pregnancy under the age of 18, advanced maternal age, substance and smoking addiction,

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consanguineous marriage, infertility treatment, risk factors in obstetric history, multiparity, and inter-pregnancy interval of less than 2 years[3,4].

Regardless of the reason, maternal, fetal, or neonatal death due to preventable causes is unacceptable. As a multidimensional indicator of development, maternal and infant mortality rates are closely related to the quality of reproductive health services provided. According to the 2020 data from the World Health Organization (WHO), it is estimated that approximately 287,000 maternal deaths occur worldwide every year[5]. Approximately 95% of these deaths occur in developing countries and most of them are due to preventable causes[5]. In our country, 35% are involved in any risk category, according to Turkey Demographic and Health Survey[6]. In Turkey, maternal mortality rate was 13.1% in 2021[7]. Although these developments and figures show a decrease, the rates are still very high.

There are many studies in the literature examining the risk factors individually. We aimed to assess high-risk pregnancies affecting maternal and infant health by analyzing multiple risk factors simultaneously using our five years of data accumulation.

Patients and Methods

Study Design and Patient Population

High-risk pregnant women followed up by the Unit of Women's and Reproductive Health of the Directorate of Public Health Services, Kayseri Provincial Directorate of Health, between 2016 and 2020 were included in the study. The study included pregnant women of reproductive age who had at least one risk factor. Demographic data, pregnancy outcomes, and risk factors of the pregnant women were recorded. These risk factors are considered to include preeclampsia-eclampsia, obesity, hypertension (HT), diabetes mellitus (DM), infection, hematologic disorders, advanced maternal age and age below 18, smoking, cesarean history, history of frequent pregnancies (less than two years apart), Rh incompatibility, coagulopathy, rheumatic disorders, stillbirth history, *in-vitro* fertilization history, multiparity, consanguineous marriage, cardiovascular disorders, asthma, multiple pregnancy history, abortus history, and history of giving birth to a baby with anomalies. Coronary artery diseases, congestive heart failure, and arrhythmias were classified as cardiovascular diseases, while chronic obstructive pulmonary disease and asthma were classified as chronic lung diseases. The study took place in a region with conservative characteristics, leading to a very low number of pregnant women using alcohol or substances. However, five pregnant women were still excluded from the study for this reason. The birth outcomes of the pregnant women were followed and recorded in the system. Birth outcomes of the pregnant women were also assessed in two groups: those resulting in live birth and those not resulting in live birth. Pregnancies that did not result in live births included ectopic pregnancy/pseudo-gestational sac, abortus, and stillbirths. The age of 35 and above was accepted as advanced maternal age. Ethics committee approval dated October 10, 2020, numbered 214, was obtained from the local ethics committee for research authorization.

Statistical Analysis

Statistical analysis was performed using SPSS 23 for Windows (IBM Corp., Armonk, NY, USA). The conformity of continuous variables to normal distribution was evaluated by examining histogram graphs and interpreting the Kolmogorov-Smirnov test. In data analysis, frequency mean, standard deviation, median, minimum and maximum values were determined as descriptive data. An Independent *t*-test was used to determine whether there was a statistically significant relation between the two independent groups. In numerical data, the Mann-Whitney U test was used for non-normally distributed groups. The Chi-square test was used to compare qualitative data between groups. Correlation analysis was performed to determine whether there is a relationship between two or more variables and, if so, its strength and direction. Binary logistic regression analysis was performed. Differences between groups were accepted as significant at $p<0.05$ with a reliability interval of 95%.

Results

A total of 7,230 individuals followed between 2016 and 2020 were included in the study. Of these women, 97.8% were Turkish. The mean age was 27.62±6.55. Of the pregnancies, 80.4% resulted in live births. The highest rates by year were as follows: the rate of ectopic pregnancy or pseudo gestational sac was 33.0% in 2019, the rate of live births was 21.3% in 2020, the rate of abortus was 30.4% in 2018, and the rate of stillbirth was 26.5% in 2019. While the mean hemoglobin level

of the pregnant women at the initial examination was 12.34±1.34, the mean hemoglobin level at the final was 11.06±0.79. The mean number of prenatal follow-up visits was 3.69±1.36. The mean number of follow-up visits for Turkish pregnant women was 3.73±1.34, while it was 1.93±1.1 for foreign pregnant women. Foreign pregnant women were monitored less frequently (p=0.000). The median duration of pregnancy was 268 (15-294) days. The median of total risk factors was 1 (1-7). The frequency analyses for other data are detailed in Table I. The duration of pregnancy was 257 (15-86) days in those with preeclampsia-eclampsia, 264 (47-290) days in those with hypertension (HT), 267 (15-294) days in advanced aged pregnant women, 263 (35-294) days in those with multiparity, and 262 (43-284) in those who had become pregnant with an assisted reproductive technique. The duration was lower in those with preeclampsia-eclampsia (p=0.000), HT (p=0.013), advanced age (p=0.000), and multiparity (p=0.000), and in those who had become pregnant with assisted reproduc-

Table I. Descriptive data.

Descriptive variables (n=7,230)		n (%)
Year	2016	1,476 (20.4)
	2017	1,322 (18.3)
	2018	1,404 (19.4)
	2019	1,542 (21.3)
	2020	1,486 (20.6)
Pregnancy outcome	Ectopic pregnancy/pseudosac	115 (1.6)
	Live birth	5,813 (80.4)
	Abortus	754 (10.4)
	Stillbirth	548 (7.6)
Area of residence	Urban	5,664 (78.3)
	Rural	1,566 (21.7)
Education	Illiterate	521 (7.2)
	Primary school	4,460 (61.7)
	High school	1,694 (23.4)
	University	555 (7.7)
Obesity	Yes	337 (4.7)
HT	Yes	167 (2.3)
DM	Yes	203 (2.8)
Preeclampsia-eclampsia	Yes	91 (1.3)
Infection	Yes	127 (1.8)
Advanced age	Yes	1,556 (21.5)
Being younger than 18	Yes	283 (3.9)
Presence of hematologic disorders	Yes	472 (6.5)
Smoking	Yes	357 (4.9)
Cesarean history	Yes	1,221 (16.9)
Pregnancy more frequent than 2 years	Yes	1,017 (14.1)
Rh incompatibility	Yes	1,537 (21.3)
Coagulopathy	Yes	56 (0.8)
Thyroid diseases	Yes	266 (3.7)
Rheumatic disorders	Yes	70 (1.0)
Stillbirth history	Yes	159 (2.2)
***In-vitro* fertilization of pregnancy**	Yes	124 (1.7)
Multiparity	Yes	405 (5.6)
Consanguineous marriage	Yes	389 (5.4)
Cardiovascular disorders	Yes	145 (2.0)
Asthma	Yes	113 (1.6)
Multiple pregnancy	Yes	274 (3.8)
Abortus history	Yes	432 (6.0)
History of giving birth to a baby with anomaly	Yes	75 (1.0)

Frequency analysis was performed. DM: diabetes mellitus, HT: hypertension, Rh: rhesus.

tive techniques (p=0.000). There was a difference between urban and rural areas in terms of pregnancy outcome, obesity, HT, advanced age and being under 18, smoking, cesarean history, Rh incompatibility, thyroid disorders, stillbirth history, *in-vitro* fertilization pregnancy, consanguineous marriage, cardiovascular disorders, asthma, history of multiple pregnancy, and abortus history. Details of the data are given in Table II.

The risk factors were compared according to the pregnancy outcomes. Preeclampsia-eclampsia (p=0.000), obesity (p=0.000), HT (p=0.000), and DM (p=0.000) were high, especially in those who had a stillbirth. Data of other variables are given in Table III. Correlation analyses of age, number of risk factors, initial and final hemoglobin levels, number of pregnancy follow-up visits, and duration of pregnancy were given in Table IV.

Regarding educational status, the number of pregnancy follow-up visits was lower among illiterate women compared to primary school (p=0.000), high school (p=0.000) and university (p=0.016) graduates. The rate of pregnancies not resulting in live birth was higher among illiterate women (p=0.000).

It was observed that pregnancies not resulting in live births (ectopic pregnancy/pseudogestational sac, abortus and stillbirths) increased due to preeclampsia-eclampsia by 12.677 times (OR=12.677, p=0.000, 95% CI=7.015-22.911), HT by 2.079 times (OR=2.079, p=0.002, 95% CI=1.316-3.284), cardiovascular disorders by 2.277 times (OR=2.277. p=0.001. 95% CI=1.38-3.757). Detailed data on the variables are given in Table V.

Discussion

Pregnancy is a physiological and dynamic process characterized by metabolic needs and hemodynamic changes that evolve as the pregnancy progresses and get back to normal after childbirth. The entire process progresses without any problems most of the time. However, in case of medical conditions that could affect the health of the mother and the fetus or the life of both, pregnancy is considered high-risk[9]. Thousands of women are affected by high-risk pregnancies with serious complications each year. All these risk factors can cause adverse pregnancy outcomes[1]. In our study, the data of 7,230 high-risk pregnant women followed up in our region between 2016 and 2020 were assessed. The minimum number of visits specified in the basic antenatal care model recommended by WHO was changed in 2016 from at least 4 visits to at least 8 contacts[10]. In the antenatal care implemented in our country, the number of follow-up visits recommended during pregnancy is at least 4, including one in the first trimester, one in the second trimester, and two in the third trimester[11], which is similar to the standard antenatal care model of the WHO. In our study, the mean number of pregnancy follow-up visits was 3.69, which was close to the required number of follow-up visits in our study but low according to the antenatal care model of the WHO. In studies[12], the number of follow-ups less than 4 has been associated with the increase in the risk of stillbirth. In our study, the number of follow-up visits for foreign pregnant women was particularly low. Among the reasons for this are difficulties in accessing healthcare services. Communication problems arising from language and cultural differences may be a contributing factor. Furthermore, insufficient services from migrant health centers may also be a contributing factor, as these centers are attempting to operate beyond their capacity. Therefore, they become inadequate in presenting healthcare services.

High-risk pregnancies increase the risk of preterm birth. Some of the leading risk factors include preterm birth history, conception through assisted reproduction techniques, obesity, advanced maternal age, frequent pregnancies, multiparity, maternal infections during pregnancy, preeclampsia or eclampsia, and chronic diseases such as diabetes mellitus (DM)[13-17]. Among the common causes of indicated preterm births, preeclampsia or eclampsia is a significant factor[18]. The aim of treating preeclampsia is to manage maternal hypertension to achieve the best outcomes for both the mother and the baby. This involves monitoring fetal health and adjusting the timing of delivery to prolong the pregnancy as much as possible. In our study, the duration of pregnancy was lower among women with preeclampsia, conception through assisted reproduction techniques, advanced maternal age, and multiparity. Monitoring and early detection of these pregnancies, along with early intervention, will reduce adverse pregnancy outcomes.

The risk of preterm birth is 0.24 times higher in pregnant women who have infections during pregnancy, and the risk of preterm birth is 3.13 times higher in pregnant women who have a urinary tract infection during pregnancy[20]. According to the study by Martius et al[21], having a urinary tract infection during pregnancy increas-

Table II. Comparison of variables according to urban and rural areas.

Variables		Urban (n/%)	Rural (n/%)	*p*-value
Pregnancy outcome	Ectopic pregnancy/pseudosac	94 (1.7)	21 (1.3)	**0.002**
	Live birth	4,508 (79.6)	1,305 (83.3)	
	Abortus	629 (11.1)	125 (8.0)	
	Stillbirth	433 (7.6)	115 (7.3)	
Obesity	No	5,370 (94.8)	1,523 (97.3)	**0.000**
	Yes	294 (5.2)	43 (2.7)	
HT	No	5,545 (97.9)	1,518 (96.9)	**0.025**
	Yes	119 (2.1)	48 (3.1)	
DM	No	5,507 (97.2)	1,520 (97.1)	0.726
	Yes	157 (2.8)	46 (2.9)	
Preeclampsia-eclampsia	No	5,596 (98.8)	1,543 (98.5)	0.400
	Yes	68 (1.2)	23 (1.5)	
Infection	No	5,561 (98.2)	1,542 (98.5)	0.446
	Yes	103 (1.8)	24 (1.5)	
Advanced age	No	4,396 (77.6)	1,278 (81.6)	**0.001**
	Yes	1,268 (22.4)	288 (18.4)	
Age below 18	No	5,479 (96.7)	1,468 (93.7)	**0.000**
	Yes	185 (3.3)	98 (6.3)	
Hematologic disorders	No	5,244 (92.6)	1,514 (96.7)	**0.000**
	Yes	420 (7.4)	52 (3.3)	
Smoking	No	5,345 (94.4)	1,528 (97.6)	**0.000**
	Yes	319 (5.6)	38 (2.4)	
Previous cesarean history	No	4,654 (82.2)	1,355 (86.5)	**0.000**
	Yes	1,010 (17.8)	211 (13.5)	
Pregnancy more frequent than 2 years	No	4,877 (86.1)	1,336 (85.3)	0.425
	Yes	787 (13.9)	230 (14.7)	
Rh incompatibility	No	4,413 (77.9)	1,280 (81.7)	**0.001**
	Yes	1,251 (22.1)	286 (18.3)	
Coagulopathy	No	5,618 (99.2)	1,556 (99.4)	0.488
	Yes	46 (0.8)	10 (0.6)	
Thyroid diseases	No	5,430 (95.9)	1,534 (98)	**0.000**
	Yes	234 (4.1)	32 (2)	
Rheumatic disorders	No	5,605 (99)	1,555 (99.3)	0.225
	Yes	59 (1)	11 (0.7)	
Stillbirth history	No	5,554 (98.1)	1,517 (96.9)	**0.005**
	Yes	110 (1.9)	49 (3.1)	
***In-vitro* fertilization of pregnancy**	No	5,555 (98.1)	1,551 (99)	**0.009**
	Yes	109 (1.9)	15 (1)	
Multiparity	No	5,336 (94.2)	1,489 (95.1)	0.183
	Yes	328 (5.8)	77 (4.9)	
Consanguineous marriage	No	5,390 (95.2)	1,451 (92.7)	**0.000**
	Yes	274 (4.8)	115 (7.3)	
Cardiovascular disorders	No	5,570 (98.3)	1,515	**0.000**
	Yes	94 (1.7)	51 (3.3)	
Asthma	No	5,589 (98.7)	1,528 (97.6)	**0.002**
	Yes	75 (1.3)	38 (2.4)	
Multiple pregnancy	No	5,476 (96.7)	1,480 (94.5)	**0.000**
	Yes	188 (3.3)	86 (5.5)	
Abortus history	No	5,345 (94.4)	1,453 (92.8)	**0.019**
	Yes	319 (5.6)	113 (7.2)	
History of giving birth to a baby with anomaly	No	5,607 (99.0)	1,548 (98.9)	0.621
	Yes	57 (1.0)	18 (1.1)	

The Chi-square test was used. DM: diabetes mellitus, HT: hypertension, Rh: rhesus.

Table III. Comparison of variables according to pregnancy outcomes.

		Ectopic pregnancy/pseudosac	Live birth	Abortus	Stillbirth	*p*-value
Preeclampsia/eclampsia	No	115 (100)	5,791 (99.6)	730 (96.8)	503 (91.8)	0.000
	Yes	0 (0)	22 (0.40)	24 (3.20)	45 (8.20)	
Obesity	No	115 (100)	5,577 (95.9)	715 (94.8)	486 (88.7)	0.000
	Yes	0 (0)	236 (4.10)	39 (5.20)	62 (11.30)	
HT	No	113 (98.3)	5,712 (98.3)	728 (96.6)	510 (93.1)	0.000
	Yes	2 (1.70)	101 (1.70)	26 (3.40)	38 (6.90)	
DM	No	115 (100)	5,667 (97.5)	733 (97.2)	512 (93.4)	0.000
	Yes	0 (0)	146 (2.5)	21 (2.8)	36 (6.6)	
Advanced age	No	75 (65.20)	4,600 (79.10)	548 (72.70)	451 (82.30)	0.000
	Yes	40 (34.80)	1,213 (20.90)	206 (27.30)	97 (17.70)	
Age below 18	No	114 (99.10)	5,581 (96.0)	736 (97.60)	516 (94.20)	0.005
	Yes	1 (0.90)	232 (4.0)	18 (2.40)	32 (5.80)	
Hematologic disorders	No	106 (92.20)	5,472 (94.10)	705 (93.50)	475 (86.70)	0.000
	Yes	9 (7.80)	341 (5.90)	49 (6.50)	73 (13.30)	
Smoking	No	111 (96.50)	5,551 (95.50)	715(94.80)	496 (90.50)	0.000
	Yes	4 (3.50)	262 (4.50)	39 (5.20)	52 (9.50)	
Previous cesarean history	No	58 (50.40)	4,845 (83.30)	658 (87.30)	448 (81.80)	0.000
	Yes	57 (49.60)	968 (16.70)	96 (12.70)	100 (18.20)	
Pregnancy more frequent than 2 years	No	74 (64.30)	5,022 (86.40)	652 (86.50)	465 (84.90)	0.000
	Yes	41 (35.70)	791 (13.60)	102 (13.50)	83 (15.10)	
Rh incompatibility	No	87 (75.70)	4,529 (77.90)	593 (78.60)	484 (88.30)	0.000
	Yes	28 (24.30)	1,284 (22.10)	161 (21.40)	64 (11.70)	
Coagulopathy	No	111 (96.5)	5,795 (99.7)	727 (96.4)	541 (98.7)	0.000
	Yes	4 (3.5)	18 (0.3)	27 (3.6)	7 (1.3)	
Thyroid diseases	No	114 (99.1)	5,619 (96.7)	716 (95.0)	515 (94.0)	0.001
	Yes	1 (0.9)	194 (3.3)	38 (5.0)	33 (6.0)	
Rheumatic disorders	No	115 (100)	5,786 (99.5)	717 (95.1)	542 (98.6)	0.000
	Yes	0 (0)	27 (0.5)	37 (4.9)	6 (1.1)	
Stillbirth history	No	114 (99.1)	5,721 (98.4)	731 (96.9)	505 (92.2)	0.000
	Yes	1 (0.9)	92 (1.6)	23 (3.1)	43 (7.8)	
In-vitro fertilization of pregnancy	No	113 (98.3)	5,738 (98.7)	735 (97.5)	520 (94.9)	0.000
	Yes	2 (1.7)	75 (1.3)	19 (2.5)	28 (5.1)	
Multiparity	No	112 (97.4)	5,581 (96.0)	658 (87.3)	474 (86.5)	0.000
	Yes	3 (2.6)	232 (4.0)	96 (12.7)	74 (13.5)	
Consanguineous marriage	No	104 (90.4)	5,515 (94.9)	697 (92.4)	525 (95.8)	0.004
	Yes	11 (9.6)	298 (5.1)	57 (7.6)	23 (4.2)	
Cardiovascular disorders	No	115 (100)	5,726 (98.5)	728 (96.6)	516 (94.2)	0.000
	Yes	0 (0)	87 (1.5)	26 (3.4)	32 (5.8)	

Table continued

Table III. *(Continued).* Comparison of variables according to pregnancy outcomes.

		Ectopic pregnancy/pseudosac	Live birth	Abortus	Stillbirth	*p*-value
Multiple pregnancy	No	97 (84.3)	5,614 (96.6)	732 (97.1)	513 (93.6)	0.000
	Yes	18 (15.7)	199 (3.4)	22 (2.9)	35 (6.4)	
Abortus history	No	112 (97.4)	5,483 (94.3)	695 (92.2)	508 (92.7)	0.023
	Yes	3 (2.6)	330 (5.7)	59 (7.8)	40 (7.3)	
History of giving birth to a baby with anomaly	No	115 (100)	5,770 (99.3)	737 (97.7)	533 (97.3)	0.000
	Yes	0 (0)	43 (0.7)	17 (2.3)	15 (2.7)	
Infection	No	114 (99.1)	5,713 (98.3)	742 (98.4)	534 (97.4)	0.478
	Yes	1 (0.9)	100 (1.7)	12 (1.6)	14 (2.6)	

The Chi-square test was used. DM: diabetes mellitus, HT: hypertension, Rh: rhesus.

es the risk of preterm birth by 1.4 times. Similarly, study published during the pandemic have demonstrated that preterm births can be triggered by infections[22]. However, in our study, it was observed that infections during pregnancy did not affect birth outcomes. The lack of categorization of infections (such as urinary tract infections, pneumonia, etc.) and the evaluation of all infections as a single group may have contributed to this result.

Obesity is a well-known risk factor for its adverse effect on maternal and infant health during pregnancy[23]. Our study has revealed that obesity increases the risk of stillbirth. Additionally, obesity was more prevalent in urban areas. Sedentary lifestyle resulting from urban living may have contributed to increased prevalence of obesity.

Factors such as women's increased participation in workforce in urban areas and longer educational processes contribute to the rise in advanced-age pregnancies. In our study, pregnant women with advanced maternal age were mostly observed in urban areas. As noted in the study by Hochler et al[24], the risk of adverse pregnancy outcomes increases with advanced maternal age. We similarly observed an increase in the rate of stillbirths among pregnant women with advanced maternal age.

Table IV. Correlation between age, number of risk factors, initial and final hemoglobin values, number of pregnancy follow,-ups and duration of pregnancy.

		Number of risk factors	Age	Initial hemoglobin value	Final hemoglobin value	Number of pregnancy follow-ups	Duration of pregnancy
Number of risk factors	r	1	.134**	-.065**	-.078**	.368**	-.157**
	p		0.000	0.000	0.000	0.000	0.000
Age	r	.134**	1	.141**	0.018	0.011	-.081**
	p	0.000		0.000	0.122	0.366	0.000
Initial hemoglobin value	r	-.065**	.141**	1	.495**	.051**	.056**
	p	0.000	0.000		0.000	0.000	0.000
Last hemoglobin value	r	-.078**	0.018	.495**	1	.041**	0.022
	p	0.000	0.122	0.000		0.000	0.064
Number of pregnancy follow-ups	r	.368**	0.011	.051**	.041**	1	-.057**
	p	0.000	0.366	0.000	0.000		0.000
Duration of pregnancy	r	-.157**	-.081**	.056**	0.022	-.057**	1
	p	0.000	0.000	0.000	0.064	0.000	

**Correlation is significant at the 0.01 level (2-tailed).

Table V. Effects of variables on pregnancies not resulting in live births.

Variable	OR	SE	Sig.	95% CI for EXP (B)
HT	2.079	0.233	0.002	1.316-3.284
Preeclampsia-eclampsia	12.677	0.302	0.000	7.015-22.911
Advanced age	0.338	0.147	0.000	0.253-0.451
Previous cesarean history	0.549	0.145	0.000	0.412-0.73
Pregnancy more frequent than 2 years	0.478	0.16	0.000	0.349-0.654
Rh incompatibility	0.327	0.158	0.000	0.24-0.446
In-vitro fertilization of pregnancy	0.359	0.338	0.002	0.185-0.697
Multiparity	0.385	0.244	0.000	0.239-0.621
Cardiovascular disorders	2.277	0.255	0.001	1.38-3.757
Multiple pregnancy	0.449	0.231	0.001	0.285-0.706
Abortus history	0.348	0.222	0.000	0.225-0.537
Duration of pregnancy	1.045	0.002	0.000	1.042-1.048
Number of risk factors	0.209	0.091	0.000	0.174-0.249

Pregnancies not resulting in live births were accepted as reference data. Binary logistic regression analysis was performed. HT: hypertension, Rh: rhesus, SE: standard error, OR: odds ratio.

In recent years, pregnancies achieved through assisted reproductive technologies have become more common. The rise in substance use and the trend of women having children at later ages contribute to a decline in fertility[25]. Pregnancies achieved through *in vitro* fertilization are associated with increased risks for both the mother and the baby[26]. In our study, the rate of stillbirths was higher among those who conceived through *in vitro* fertilization.

In recent years, pregnancies with assisted reproductive techniques have become more common. The increase in harmful substance use and women having children at a later age are contributing to a decline in fertility[24,27] The risks for the mother and the baby increase in pregnancies with *in-vitro* fertilization[28].

The use of harmful substances such as cigarettes and alcohol is known to increase the risk of low birth weight and spontaneous abortion during pregnancy[27,29]. According to a study[30], although pregnant women in rural areas smoke more, this was not true for our region. In our study, the number of pregnant women using cigarettes was higher in urban areas. Women in urban areas are more likely to participate in the workforce and earn an income, which may increase their access to cigarettes. Additionally, the stress of work and city life could contribute to higher smoking rates[31]. In contrast, the pregnant women in the rural area where our study was conducted are part of a more traditional community where smoking is often discouraged. This cultural context may help explain the lower prevalence of smoking among these women.

Low educational level and stillbirth history increase the risk of stillbirth[11]. The fact that educated pregnant women are more equipped and willing to understand their diagnoses and treatment regimens decreases the possibility of adverse outcomes[32]. The number of pregnancy follow-up visits was lower, and the rate of pregnancies not resulting in live birth was higher among the illiterate pregnant women in our study.

Hypertensive disorders during pregnancy are important causes of maternal and fetal morbidity and mortality and account for about 18% of maternal deaths around the world[33]. The provided evidence suggests that women with chronic HT may be at risk in terms of preeclampsia-eclampsia, gestational DM, and indicated preterm birth compared to the women with normal blood pressure during the first-trimester follow-up[34]. Many studies[35-42] have revealed that hypertensive disorders associated with pregnancy, such as chronic HT, gestational HT, and preeclampsia-eclampsia, increase the risks such as preterm birth, cognitive disorder, infantilism, congenital malformations, and fetal death as well as maternal risks such as acute renal failure, pulmonary edema, stroke, and death. According to an observational study[43] performed on 2,121,371 pregnant women from 1967 to 2006 in Norway, the mortality rate in hypertensive pregnant women was 12 times higher compared to normotensive pregnant women. In a retrospective study[44] performed on 6,942 pregnant women in a single center in India, the causes of intrauterine fetal deaths were investigated, and 19.6% of deaths, at the highest rate, were found

to be caused by pregnancy-induced hypertensive disorders. According to a multi-centered study including 10,614,679 pregnant women between 1995 and 1997 with data obtained from the Centers for Disease Control and Prevention and National Center for Health Statistics in the United States of America, the most common causes of fetal death were chronic HT and gestational HT among chronic disorders of the mother[45]. In our study, pregnancies not resulting in live births mostly increased due to preeclampsia-eclampsia, HT, cardiovascular disorders, and a history of giving birth to a baby with anomalies. Hypertension increased the risk by 2.079 times, while preeclampsia increased it by 12.677 times.

Limitations

Our study was performed on a large population of 7,230 pregnant women. All risk factors and birth outcomes of the pregnant women were thoroughly assessed, and the participants were included in the study. These aspects constitute the strengths of our study. However, the long-term survival of infants and mothers could not be monitored. We were unable to differentiate gestational and chronic HT. In addition, we lacked data on the level of healthcare in which the prenatal follow-ups were performed and whether the pregnant women were followed up by a general practitioner or a specialist, which are the limitations of our study.

Conclusions

High-risk pregnancy continue to be a significant health problem that threatens both maternal and infant health, increasing mortality and morbidity rates with physiological, psychological, social, and economic dimensions. Stillbirths have been associated with preeclampsia-eclampsia, hypertension, advanced maternal age, and particularly chronic conditions such as diabetes mellitus and cardiovascular disorders as well as a history of adverse pregnancy outcomes. The number of follow-up visits has been observed to be low for high-risk pregnant women. Considering all these results, we believe that pregnancy follow-up visits for high-risk pregnant women need to be increased. We also believe that increasing monitoring the high-risk pregnancies and developing follow-up models by health authorities will make the monitoring of high-risk pregnancies more qualified.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Ethics Approval

Ethics Committee approval, numbered 214 and dated October 10, 2020, was obtained from the Kayseri City Training and Research Hospital's Ethics Committee.

Authors' Contributions

Conceptualization: M.B.G and H.A.; methodology: M.B.G and H.A.; writing-original draft preparation, M.B.G.; writing-review and editing, M.B.G and H.A.; supervision, M.B.G. All authors have read and agreed to the published version of the manuscript.

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Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Informed Consent

All participants provided fully informed written consent at the time of recruitment for their data to be used in research.

AI Disclosure

No AI was used to conduct and draft this article.

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