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Adverse obstetric outcomes in early and late adolescent pregnancy

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Abstract

Adolescent pregnant women should be considered as a high risk patient group. The aim of our study is to compare pregnancies in adolescent with adult age group pregnancies and to evaluate maternal and fetal obstetric outcomes. Patients were admitted to Gynecology Department of Okmeydani Training and Research Hospital between January 1, 2015 and December 31, 2019. Pregnant women were divided into 3 groups as Group 1 (aged ≤16 years: n: 280), Group 2 (aged 17-19 years; n: 956) and Group 3 (aged 25-35 years; n: 656). Demographic characteristics of the patients and maternal and obstetric outcomes were recorded.In adolescent age groups,numbers of gravida, parity and abortus, and gestational age, fetal weight, and rates of cesarean delivery were found to be significantly lower relative to age group of 25-35 years Adolescents aged ≤16 years had a significantly lower risk than adults as for preeclampsia (AOR: 9,23 (6,36-11,82) p=0,001),had a significantly higher risk than adults as for low birth weight (AOR: 4,75 (2,26-9,21) p=0,001). and prematurity (AOR: 7,54 (5,12-9,43) p=0,001). Adolescents aged 17-19 years had a significantly higher risk than adults regarding small for gestational age (AOR: 4,48 (1,89-10,67) p=0,001), oligohidramnios (AOR: 2,29 (1,16-4,54) p=0,017), prematurity (AOR: 4,97 (3,1-7,97) p=0,0001) and LBW (AOR: 2,14 (2,71-9,74) p=0,0001).Our study was conducted with a large pregnant group, Since pregnant women in adolescent group are closely associated with preterm birth, delivery of small for gestational age and low birth weight infants, it is important to improve health services to reduce adverse pregnancy outcomes.

Keywords: adolescent pregnancy, adverse pregnancy outcomes, low birth weight, preterm delivery, teenage pregnancy

1. Introduction

Adolescence is the transition period of the individual from childhood to adulthood with psychological, social and biological changes. Adolescents constitute 20-25% of the population and 85% of those in this age group live in developing countries. The World Health Organization considers the age group 10-19 as adolescents (1). Worldwide, the rates of adolescent pregnancy increases in societies where poverty prevails and educational opportunities do not exist. While adolescent pregnancies occur due to marriages under pressure in developing countries, in developed countries it occurs because of insufficient contraception methods.

As babies born to adolescent mothers carry risks in terms of neonatal death and diseases, obstetric complications are more frequently encountered in adolescent mothers due to inadequate prenatal care. In adolescent pregnancies, adverse obstetric outcomes as low birth weight, preterm labor, perinatal death, maternal death, anemia, increased risk of fetal anomaly and preeclampsia may be encountered (2,3). Adolescent pregnant women have very low reserves since their own growth is not completed. Therefore, fetal growth and breastfeeding increase the nutritional needs of adolescents.

Early and unwanted pregnancies are associated with many unfavorable health, social, educational and economic consequences. In developing countries every year 12 million children between the ages of 15-19 and 777,000 children under the age of 15 give birth. Besides, 3.9 million unsafe abortions are seen every year in this age group (4,5). Teenage pregnancy has been found to be associated with low socioeconomic status, substance use during pregnancy, and mental health problems (6). The age at onset of substance use and smoking was found to be earlier in pregnant adolescents compared to non-pregnant adolescents (7).

Since Turkey is a receiving country, adolescent birth rate is increasing. The aim of our study is to compare pregnancies in this age group with adult age group pregnancies and to evaluate maternal and fetal obstetric outcomes.

2. Materials and Methods

Our study was carried out by retrospectively examining the records of patients who were admitted to Gynecology Department of Okmeydani Training and Research Hospital between January 1, 2015 and December 31, 2019 and gave birth between the ages of 10 and 19. As the control group, adult

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pregnant women in the age group of 25-35 who gave birth on the same dates as the adolescent group were selected. The study was initiated after the approval of the hospital Ethics Committee was obtained. Vaginal examination was performed in all patients in the study group at the time of admission to the hospital, and the presence of cervical effacement and dilatation was recorded. External monitoring was performed to determine uterine contractions, and obstetric ultrasonography to see fetal development. Gestational age was estimated based on the last menstrual period or findings of ultrasound performed before the 20th gestational week. Pregnant women below the 24th gestational week and those who delivered babies with chromosomal anomalies were not included in the study. A total of 1892 pregnant women were included in the study. Pregnant women were divided into 3 groups as Group 1 (aged ≤16 years: n: 280), Group 2 (aged 17-19 years; n: 956) and Group 3 (aged 25-35 years; n: 656).

Demographic characteristics of the patients were recorded. Groups were compared regarding the gestational week of delivery, delivery type, indications of cesarean section, gender, birth weight, gravida, parity, abortion, nationality, consanguineous marriage, use of Assisted Reproductive Technology (ART), multiple pregnancy, maternal anemia, need for blood transfusion. Besides, diseases as cholestasis, heart disease, thrombosis, asthma, and epilepsy were noted and evaluated.

Maternal and obstetric outcomes such as preeclampsia, abruptio placentae, gestational diabetes, intrauterine fetal demise, fetal anomalies other than chromosome anomalies, small for gestational age (SGA), preterm labor, preterm premature rupture of membrane (PPROM), premature rupture of membrane (PROM), oligohydramnios, polyhydramnios, low birth weight (LBW), macrosomia, chorioamnionitis, perineal laceration, need for intensive care and/ or maternal intensive care were compared among three age groups. Subsequently, logistic regression models were developed to investigate the correlations between age groups, maternal and neonatal outcomes, adjusted for parity.

The diagnosis of gestational diabetes mellitus (GDM) was made in 2 steps as recommended by the American College of Obstetricians and Gynecologists (AGOC) (8). Glucose tolerance test was performed between 24. and 28. gestational weeks using 100 g glucose for pregnants whose blood glucose level was 140 mg/dl one hour after a glucose tolerance test performed with 50 g glucose and the diagnosis of GDM was made when higher glycemic levels were found on 2 or more than 2 occasions. The diagnosis of preeclampsia and gestational hypertension was made according to the criteria determined by the International Society for the Study of Hypertension in Pregnancy (9). Diagnosis of gestational hypertension was made when systolic and diastolic blood pressures measured twice at 4 hour intervals were ≥ 140 mm Hg, and ≥ 90 mmHg, respectively in a normotensive pregnant woman who had not significant proteinuria after the 20th gestational week. Diagnosis of preeclampsia is made in consideration of above-mentioned findings and also high levels of protein (≥ 300 mg) in 24-hour urine samples or 2 (+) proteinuria at 2 different occasions were detected. Premature rupture of membrane (PROM) is defined as rupture of fetal membranes before the onset of labor. Preterm premature rupture of membranes (PPROM) was defined as spontaneous rupture of the amniotic membrane before the 37th gestational week and the release of amniotic fluid before the onset of labor. Small for gestational age (SGA) was defined as birth weight below the 10th percentile for gestational age. Preterm labor was defined as delivery with cervical dilatation and effacement accompanying uterine contractions before 37 gestational weeks. Deliveries after 42. gestational week were evaluated as postmature births. Macrosomia is defined as fetal weight over 4000 gr and low birth weight as a birth weight of less than 2500 g. Fetal loss (fetal demise) was defined as intrauterine fetal loss after 24 weeks of gestation. In polyhydroamnios, amount of amniotic fluid is 8 cm above the single quadrant or 20 cm above the sum of four quadrants in ultrasonographic measurements. In oligohydramnios amount of amniotic fluid is 2 cm below the single quadrant measurement or 5 cm below the total of four quadrants based on ultrasonographic measurements

In this study, statistical analyzes were performed using the Number Cruncher Statistical System (NCSS) 2007 Statistical Software (Utah, USA). One-way analysis of variance was used for intergroup comparisons, and Tukey multiple comparison test for subgroup comparisons of normally distributed variables. For intergroup comparisons of variables not normally distributed Kruskal- Wallis test, and for their subgroup comparisons Dunn's multiple comparison test were used. Chi-square test was used for comparisons of qualitative data. Logistic regression models were developed to investigate the associations between age groups, maternal and neonatal outcomes, adjusted for parity. Odds ratio (OR) and adjusted odds ratios (aORs) with corresponding 95% confidence intervals (CIs) were generated. The results were evaluated at the significance level of $p < 0.05$. This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University of Health Sciences, Okmeydanı Training and Research Hospital (Date.04/05/2020./No. 48670771-514.10./117).

3. Results

The demographic characteristics and obstetric results of the patients were compared between age groups of ≤ 16, 17-19, and 25-35 years. (Table 1) In adolescent age groups, numbers of gravida, parity and abortus, and gestational age, fetal weight, and rates of cesarean delivery were found to be significantly lower relative to age group of 25-35 years. In the age group 25-35 years previous cesarean deliveries were performed more frequently, while rates of fetal distress and progress failure were found to be higher in adolescent Groups 1 and 2.

Table 1. Maternal characteristics and obstetric outcomes by maternal age groups

		All age group		Group 1 Age ≤16 years		Group 2 Age 17-19 years		Group 3 Age 25-35 years		p
Gravida	Mean (SD)	1.89±0.70		1.24±0.57		1.44±0.75		2.84±1.5		
	Median (IQR)	1 (1-2)		1 (1-1)		1 (1-2)		3 (2-4)		**0.0001ǂ**
Parity	Mean (SD)	0.70±0.99		0.2±0.54		0.33±0.55		1.46±1.17		
	Median (IQR)	0 (0-1)		0 (0-0)		0 (0-1)		1 (1-2)		**0.0001ǂ**
Parity Group	Nulliparity	1.047	55.34%	233	83.21%	680	71.13%	134	20.43%	
	Multiparity	845	44.66%	47	16.79%	276	28.87%	522	79.57%	**0.0001+**
Abortus	Mean (SD)	0.19±0.58		0.04±0.22		0.1±0.43		0.37±0.8		
	Median (IQR)	0 (0-0)		0 (0-0)		0 (0-0)		0 (0-0)		**0.0001ǂ**
Gender	Female	906	47.89%	146	52.14%	428	44.91%	332	50.61%	
	Male	986	52.11%	134	47.86%	525	55.09%	324	49.39%	**0.025+**
Gestational age	Mean (SD)	38.11±2.19		37.74±2.36		38.03±2.19		38.38±2.08		**0.0001***
Fetal Weight	Mean (SD)	3125.42±538.12		3061.14±547.15		3089.14±534.66		3205.74±530.61		**0.0001***
Assisted Reproductive Technology		1	0.05%	0	0.00%	0	0.00%	1	0.15%	0.390+
Delivery	Vaginal	1.297	68.55%	245	87.50%	696	72.80%	356	54.27%	
	Cesarean	595	31.45%	35	12.50%	260	27.20%	300	45.73%	**0.0001+**
Indications for Cesarean Sections	Previous Cesarean	254	42.69%	3	8.57%	77	29.50%	174	58.19%	
	Fetal Distress	135	22.69%	12	34.29%	75	28.74%	48	16.05%	
	Progress failure	66	11.09%	6	17.14%	37	14.18%	23	7.69%	
	Cephalopelvic disproportion	32	5.38%	3	8.57%	17	6.51%	12	4.01%	**0.0001+**
	Macrosomia	28	4.71%	2	5.71%	16	6.13%	10	3.34%	
	Malpresantation	63	10.59%	8	22.86%	34	13.03%	21	7.02%	
	Placenta previa	5	0.84%	0	0.00%	2	0.77%	3	1.00%	
	Multiple gestation	12	2.02%	1	2.86%	3	1.15%	8	2.68%	
Consanguineous marriage		416	21.99%	54	19.29%	238	24.90%	124	18.90%	**0.008+**
Nationality	Turkish	1.024	54.12%	73	26.07%	428	44.77%	523	79.73%	
	Foreign	868	45.88%	207	73.93%	528	55.23%	133	20.27%	**0.0001+**
Multiple gestation		14	0.74%	1	0.36%	5	0.52%	8	1.22%	0.199+
Hemoglobin	Mean (SD)	11.15±2.66		11.09±1.53		11.13±3.43		11.19±1.49		0.837*
Hematocrit	Mean (SD)	33.61±4.07		33.58±4.05		33.55±4.20		33.72±3.90		0.717*
Blood transfusion		111	5.87%	22	7.86%	63	6.59%	26	3.96%	**0.027+**
Fetal Anomaly		8	0.42%	3	1.07%	4	0.42%	1	0.15%	0.140+
Maternal Disorders	Astma	37	1.96%	3	1.07%	13	1.36%	21	3.20%	**0.016+**
	Tyroide	43	2.27%	1	0.36%	7	0.73%	35	5.34%	**0.0001+**
	Epilepsy	6	0.32%	0	0.00%	5	0.52%	1	0.15%	0.255+
	Cardiac disorders	8	0.42%	1	0.36%	1	0.10%	6	0.91%	**0.047+**
	Cholestasis	2	0.11%	0	0.00%	1	0.10%	1	0.15%	0.806+
	Trombosis	3	0.16%	0	0.00%	0	0.00%	3	0.46%	0.059+

*One-way Analysis of Variance, ǂKruskal Wallis Test, + Chi-Square test

A statistically significant difference was observed between the distribution of consanguineous marriages and nationalities among three groups (p = 0.008, p = 0.0001 respectively). Number of consanguineous marriages and foreign nationals were significantly higher in the adolescent group. Any significant intergroup difference was not detected as for hemoglobin, and hematocrit values, while rates of blood transfusions were statistically significantly higher in the adolescent group (p = 0.027). Incidence of maternal asthma, thyroid disease and heart disease were significantly higher in the age groups of 25-35 years (p: 0.016, 0.0001, 0.047 respectively) In Table 2, maternal and fetal obstetric adverse outcomes are evaluated. There was no significant difference as for rates of abruptio placentae, PROM, PPROM, SGA, fetal death, oligohydramnios, polyhydramnios LBW, postmaturity, maternal intensive care, and neonatal intensive care admissions, perineal laceration, chorioamnionitis among 3 groups.

Rates of preeclampsia, GDM, and macrosomia were found to be higher in the age group of 25-35 years than in the adolescent pregnant group (p = 0.002, p = 0.001, p = 0.032, respectively) A statistically significant difference was observed among all three age groups regarding premature births (p = 0.0001). Premature birth was significantly higher in age groups of ≤ 16 and 17-19 years. Logistic regression models were developed to investigate the associations between age groups maternal and neonatal outcomes, adjusted for parity. These findings were shown in Tables 3, and 4

Table 2. Comparision of adverse obstetric outcomes between age groups

	All age groups		Group 1 Age ≤16 years		Group 2 Age 17-19 years		Group 3 Age 25-35 years		p+
Preeclampsia	55	2.91%	1	0.36%	25	2.62%	29	4.42%	**0.002**
Abruptio Placantae	15	0.79%	1	0.36%	8	0.84%	6	0.91%	0.663
Gestational Diabetes Mellitus	28	1.48%	0	0.00%	9	0.94%	19	2.90%	**0.001**
PROM	50	2.64%	5	1.79%	27	2.82%	18	2.74%	0.623
PPROM	21	1.11%	2	0.71%	9	0.94%	10	1.52%	0.443
SGA	78	4.12%	7	2.50%	45	4.71%	26	3.96%	0.255
Fetal death	17	0.90%	2	0.71%	11	1.15%	4	0.61%	0.496
Oligohydramnios	76	4.02%	11	3.93%	39	4.08%	26	3.96%	0.990
Polyhydramnios	13	0.69%	1	0.36%	6	0.63%	6	0.91%	0.608
Low birth weight	179	9.46%	26	9.29%	104	10.88%	49	7.47%	0.071
Macrosomia	59	3.12%	3	1.07%	28	2.93%	28	4.27%	**0.032**
Preterm birth	372	19.66%	76	27.14%	201	21.03%	95	14.48%	**0.0001**
Postterm birth	15	0.79%	1	0.36%	8	0.84%	6	0.91%	0.663
Maternal intensive care	6	0.32%	1	0.36%	3	0.31%	2	0.30%	0.991
Neonatal intensive care	22	1.16%	5	1.79%	12	1.26%	5	0.76%	0.381
Perineal Laceration	3	0.16%	0	0.00%	3	0.31%	0	0.00%	0.230
Chorioamnionitis	3	0.16%	0	0.00%	2	0.21%	1	0.15%	0.740

+ Chi-Square test PROM: Premature rupture of membrane, PPROM: Preterm premature rupture of membrane, SGA: Small for gestational age

Table 3. Risk of adverse obstetric outcomes maternal aged ≤16 years versus aged 25-35 years

Age groups (years)	Age 25-35 years		Age ≤16 years		OR (%95 CI)	AOR (%95CI) [a]
Preeclampsia	29	4.42%	1	0.36%	7.91 (2.74-10.20) **p=0.012**	9.23 (6.36-11.82) **p=0.001**
Abruptio Placantae	6	0.91%	1	0.36%	0.38 (0.47-3.24) p=0.382	2.34 (0.15-7.66) p=0.547
Gestational Diabetes Mellitus	19	2.90%	0	0.00%	0.05 (0.0-0.96) p=0.989	0.01 (0.0-0.18) p=0.987
PROM	18	2.74%	5	1.79%	1.55 (0.57-4.22) p=0.390	1.69 (0.53-5.35) p=0.376
PPROM	10	1.52%	2	0.71%	2.15 (0.47-4.13) p=0.325	1.56 (0.26-9.42) p=0.624
SGA	26	3.96%	7	2.50%	1.61 (0.69-3.75) p=0.271	2.78 (0.92-8.34) p=0.069
Fetal death	4	0.61%	2	0.71%	0.85 (0.15-4.68) p=0.855	2.35 (0.15-7.68) p=0.547
Oligohydramnios	26	3.96%	11	3.93%	1.00 (0.49-2.07) p=0.980	1.17 (0.91-5.17) p=0.108
Polyhydramnios	6	0.91%	1	0.36%	1.00 (0.49-2.07) p=0.980	1.34 (0.15-7.64) p=0.547
LBW	49	7.47%	26	9.29%	0.79 (0.48-1.29) p=0.350	4.75 (2.26-9.21) **p=0.001**
Macrosomia	28	4.27%	3	1.07%	4.12 (1.24-9.65) **p=0.021**	1.17 (0.29-4.73) p=0.822
Preterm birth	95	14.48%	76	27.1%	0.46 (0.32-0.64) **p=0.001**	7.54 (5.12-9.43) **p=0.001**
Postterm birth	6	0.91%	1	0.36%	1.57 (0.31-6.49) p=0.382	1.34 (0.15-5.57) p=0.547
Maternal intensive care	2	0.30%	1	0.36%	0.85 (0.08-6.44) p=0.897	0.52 (0.04-0.75) p=0.764
Neonatal intensive care	5	0.76%	5	1.79%	0.42 (0.12-1.47) p=0.176	0.12 (0.02-0.57) p=0.243

PROM: Premature rupture of membrane, PPROM: Preterm premature rupture of membrane, SGA: Small for gestational age [a] Adjusted by parity

When adjusted for parity, adolescents aged ≤16 years had a significantly lower risk than adults as for preeclampsia (AOR: 9.23 (6.36-11.82) p=0.001).

When adjusted for parity, adolescents aged ≤16 years had a significantly higher risk than adults as for LBW (AOR: 4.75 (2.26-9.21) p=0.001), and prematurity (AOR: 7.54 (5.12-9.43) p=0.001).

The risk of having SGA newborns in the age group of ≤ 16 years was statistically insignificant in the age group of 25-35 years (OR: 1.61 (0.69-3.75) p = 0.271), but when adjusted for parity, although statistical insignificance persisted, the risk increased (AOR: 2.78 (0.92-8.34) p = 0.069).

The risk of macrosomia in the age group of ≤ 16 years was found to be statistically significantly lower when compared to the age group of 25-35 years (OR: 4.12 (1.24-9.65) p = 0.021), but when adjusted for parity the risk of developing macrosomia was found to be statistically insignificant. (AOR: 1.17 (0.29-4.73) p = 0.822).

When adjusted for parity, adolescents aged 17-19 years had a significantly higher risk than adults regarding SGA (AOR: 4.48 (1.89-10.67) p=0.001), oligohidramnios (AOR:2.29 (1.16-4.54) p=0.017), prematurity (AOR:4.97 (3.1-7.97) p= 0.0001) and LBW (AOR: 2.14 (2.71-9.74) p=0.0001).

Risks of preeclampsia and GDM were found to be statistically significantly lower in the age group of 17-19 than the age group of 25-35 years (OR: 1.72 (0.99-2.96) p = 0.049, OR: 3.14 (1.41-6) 98) p = 0.005, respectively), When adjusted for parity intergroup differences as for preeclampsia and GDM were found to be statistically insignificant (AOR: 1.17 (0.53-2.57) p = 0.697, AOR: 1.20 (0.35- 4.12) p = 0.770 respectively).

Table 4. Risk of adverse obstetric outcomes maternal aged 17-19 years versus aged 25-35 years

Age groups (years	Age 25-35 years		Age 17-19 years		OR (%95 CI)	AOR (%95CI) [a]
Preeclampsia	29	4.42%	25	2.62%	1.72 (0.99-2.96) **p=0.049**	1.17 (0.53-2.57) p=0.697
Abruptio Placantae	6	0.91%	8	0.84%	1.09 (0.38-3.17) p=0.869	2.14 (0.50-9.44) p=0.189
Gestational Diabetes Mellitus	19	2.90%	9	0.94%	3.14 (1.41-6.98) **p=0.005**	1.20 (0.35-4.12) p=0.770
PROM	18	2.74%	27	2.82%	0.97 (0.53-1.78) p=0.923	1.28 (0.97-3.35) p=0.057
PPROM	10	1.52%	9	0.94%	1.62 (0.65-4.03) p=0.291	1.84 (0.49-6.95) p=0.370
SGA	26	3.96%	45	4.71%	0.84 (0.51-1.37) p=0.475	4.48 (1.89-10.67) **p=0.001**
Fetal death	4	0.61%	11	1.15%	0.53 (0.17-1.66) p=0.274	5.53 (0.69-14.29) p=0.107
Oligohydramnios	26	3.96%	39	4.08%	0.97 (0.58-1.61) p=0.907	2.29 (1.16-4.54) **p=0.017**
Polyhydramnios	6	0.91%	6	0.63%	0.68 (0.22-2.13) p=0.513	1.75 (0.31-4.68) p=0.366
LBW	49	7.47%	104	10.88%	0.66 (0.46-0.94) **p=0.023**	2.14 (2.71-9.74) **p=0.0001**
Macrosomia	28	4.27%	28	2.93%	1.48 (0.87-2.52) p=0.151	2.31 (0.93-5.79) p=0.073
Preterm birth	95	14.48%	201	21.03%	0.64 (0.49-0.83) **p=0.001**	4.97 (3.1-7.97) **p=0.0001**
Postterm birth	6	0.91%	8	0.84%	1.09 (0.38-3.17) p=0.869	1.44 (0.40-3.54) p=0.259
Maternal intensive care	2	0.30%	3	0.31%	0.97 (0.16-5.83) p=0.975	0.03 (0.00-0.21) p=0.998
Neonatal intensive care	5	0.76%	12	1.26%	0.60 (0.21-1.72) p=0.346	0.01 (0.00-0.16) p=0.998

PROM: Premature rupture of membrane, PPROM: Preterm premature rupture of membrane, SGA: Small for gestational age[a] Adjusted by parity

4. Discussion

This large-scale retrospective study where we compared adolescent pregnancies with adult pregnancies has shown us that maternal, fetal, and obstetric complications are more common in adolescents. In our study, although gestational diabetes, preeclampsia, macrosomia and cesarean delivery were observed at a lower rate in teenage pregnancies; adverse obstetric outcomes such as preterm birth, low birth weight, small for gestational age, oligohydramnios have been observed more frequently. Adolescent pregnancy is an important problem in developed and developing countries. Complications during pregnancy and delivery are the leading causes of death in girls aged 15-19 years worldwide (10). They need nutritional support due to low socioeconomic level and nutritional deficiency (11). In our country, adolescent births have recently increased due to migration. In our study significantly higher rates of adolescent births were detected among foreign nationals (73,93% of the ≤ 16 age group, and 55.23% of the 17-19 age group) In a study comparing pregnant Turkish adolescents and pregnant immigrant adolescents, the researchers reported that adolescent pregnancies were very common among immigrants with an increase in low birth weight rates (12).

Since both the development of the fetus and adolescent pregnants occur simultaneously, iron stores of adolescents are depleted rapidly with higher risk of anemia (13,14,15). World Health Organization (WHO) has defined anemia in pregnancy as the hemoglobin (Hb) concentration of less than 11 g / dl (16). Higher incidence rates of anemia in adolescent pregnants were reported (17,18).(2,83, and 1,8 times higher when compared with adult pregnants, respectively). In a study performed in 12 clinical centers and 19 hospitals in the United States the researchers reported increased risk of maternal anemia in both younger and older adolescents, and higher rates of blood transfusion in the older adolescent group (19). In our study, any significant difference was not found in hemoglobin and hematocrit values between the younger and older adolescent pregnants when compared to adult pregnant women, and the mean values remained within the WHO recommended values. However, the need for blood transfusion was observed to be increased in all adolescents. The rates of transfusion at ≤16, and 17-19 years of age were 7.86%, and 6.59%, respectively with a statistically significantly higher rates in adolescent groups when compared with the adult group. (P: 0.027)

Many studies have examined the delivery methods in adolescent pregnancies. Some publications have reported similar cesarean and vaginal birth rates in adolescent and adult age groups (20). However, in most of the studies, cesarean delivery rates in adolescents were found to be lower than adults. In a study by Ganchimeg et al. 27.9% of the pregnant women under 15 years of age and 21,5% of those between the ages of 18-19 gave birth by cesarean section (21). Prophylactic uterotonics, and prophylactic antibiotics for caesarean section and antenatal corticosteroids for preterm delivery at 26-34 weeks of age were less frequently used in adolescent women. In our study, we found that statistically significantly lower rates of cesarean section were performed in pregnant women in all adolescent age groups. Normal birth rates for pregnants aged ≤ 16, and 17-19 were 87.50%, and 72.80%, respectively. It has been suggested that better myometrial function and elasticity in adolescents may contribute to a higher rate of vaginal deliveries. However, the rates of operative vaginal delivery, postpartum hemorrhage and episiotomy increased in adolescents (22). In the study of Torvie AJ et al. although cesarean and operative vaginal delivery rates were lower in young adolescents aged 11-14 years compared to young adults, higher risks of preterm delivery, delivery of low and very low birth weight newborns, and death were observed in this age

group (2).

Some studies have demonstrated that the rate of intervention in adolescents has increased due to the underdevelopment of the pelvic floor and the cooperation problem, and genital lacerations due to difficult labor increase the risk of bleeding (23). In our study, perineal laceration was observed in only 3 patients in the 17-19 age group. One study found that the second stage of labor in adolescents was shorter. However, the risk of postpartum hemorrhage and perineal laceration is higher in younger adolescents. Cesarean section due to progress failure and cephalopelvic disproportion was observed more frequently in younger adults than in older adolescents (19). In some studies, in adolescents higher rates of cesarean deliveries due to cephalopelvic disproportion and emergency conditions have been reported (24,25). In our study, cesarean deliveries due to fetal distress, progress failure, cephalopelvic disproportion and malpresentation were observed more frequently in the age group of ≤ 16 years compared to other age groups. There are publications showing that placenta previa is less frequently observed in adolescents (25,26). In our study, any incident of placenta previa was not observed in the age group of ≤ 16, while it was encountered in 2 patients in the 17-19 age group and 3 patients in the adult group, and all of these patients gave birth by cesarean section. Some studies have demonstrated that the rates of pregnancy-induced hypertension and eclampsia increase in adolescent pregnant women (18,21,26). In some studies, an increase in preeclampsia was observed in the younger adolescent group under the age of 16 years (19). In the study by Fleming N et al. gestational hypertension and placental abruption were observed less frequently in the adolescent group (25). In a study conducted with Indian adolescents, the risk of eclampsia was observed in adolescents. Although the risk of eclampsia increased in the adolescent group, the risk of mild pregnancy-induced hypertension, and preeclampsia was found to be higher over the age of 20 (14). In our study, when placental abruption was examined, no significant difference was found between the adolescent and adult groups. However, the risk of preeclampsia was observed to be significantly higher in adult pregnant women compared to the adolescent group. (p: 0.002) When compared with the adult pregnant group, the risk of preeclampsia was found to be statistically significantly lower in the ≤ 16 and 17-19 age groups. (p = 0.012, 0.049 respectively) Also, when adjusted for parity, with increased parity, the risk of preeclampsia was found to be statistically significantly lower in the ≤16 age group when compared with the 25-35 age group. (AOR: 9.23 (6.36-11.82) p = 0.001). There are publications stating that there is no difference in birth rates of small for gestational age (SGA) newborns, between adult and adolescent groups (25). In some studies, an increase in the rates of SGA was observed in adolescents (14,22,24). In our study, while no significant difference was found in the rates of SGA among all age groups, when adjusted for parity the risk of presence of SGA in the 17-19 age group was found to be statistically significantly higher than the 25-35 age group (AOR: 4.48 (1.89-10.67) p = 0.001). In most of the studies we examined, premature birth is more common in adolescent pregnancies compared to adult pregnancies (20,21,27). In primipara adolescents, preterm birth was found to be higher than in primipara adults (15). In our study, gestational age was significantly lower in the age group of ≤16 years. The prevalence of prematurity was significantly higher in the adolescent age group compared to the adult group. (0,0001). The risk of premature deliveries was found to be statistically significantly higher in the age group of ≤16 and 17-19 years than in the 25-35 age group. (AOR: 7,54 (5,12-9,43) p = 0.001, AOR: 4.97 (3,1-7.97) p = 0,0001 respectively). Post-mature births and macrosomic fetuses are less frequently observed in young gravidas (14,24). In our study, no significant difference was found between the groups as for postmature births. However, in accordance with the literature, greater number of macrosomic fetuses were observed in the adult group. (P = 0.032)

Low socioeconomic status and insufficient antenatal care may cause an increase in delivery of low birth weight (LBW) babies. In the study of Torvie AJ et al, LBW rate ratio increased significantly especially in the young adolescent group compared to the adult group (2). In our study, fetal weight was significantly lower in adolescent age groups compared to adult pregnancies. (P = 0,0001) Chen XK et al. found a relative risk of 1,4% in terms of low birth weight in their study with adolescent pregnancies aged 10-19 years (27). In addition to the studies showing that rates of LBW were higher among primipara adolescents (15), some other studies could not find any relationship between LBW and adolescents (25,28). In our study, the risk of LBW presence was found to be statistically significantly higher in the ≤ 16,and 17-19 age groups than in the adult age group. (AOR: 4,75 (2,26-9,21) p = 0,001; AOR: 2,14 (2,71-9,74) p =0,0001 respectively) Although there are publications (25) showing that the risk for PPROM is increased in adolescents, no risk increase was found in our study.

Considering the relationship between gestational diabetes mellitus (GDM) and adolescent pregnancy, GDM is less common in all age groups of adolescents compared to adults (20,22,25,26). The results in our study were also compatible with the literature. When all groups were compared, GDM was significantly higher in the adult group (p = 0.001) and the risk of GDM in the adult group was 3.14 times higher than in the 17-19 age group. However, as the parity increased, this significance decreased between both groups. (AOR: 1,20 (0,35-4,12) p = 0,770).Intrapartum fetal death may be seen in adolescents as a result of fetal asphyxia and shoulder dystocia depending on the immaturity of the bony pelvic structure. In some studies any difference cannot be found between adolescents and adults regarding intrapartum fetal mortality (24,25). In our study, no significant difference was found between adolescent and adult pregnant women in terms of fetal mortality. However, in some studies, the risk of stillbirth was

found to be 4 times higher in pregnants younger than 15 years of age. Also, early neonatal death may increase (22,29). In another study, the risk of infant death was increased in adolescents aged 11-14 years compared to adults (2). In our study, the need for maternal and neonatal intensive care did not increase in adolescents. In most of the studies, the need for treatment in the neonatal intensive care units increased in adolescents (18,21,25,30) and was found to be less common in older adolescents than younger ones (19). There are publications showing that puerperal endometritis increases in adolescents (21,22) The risk of chorioamnionitis was found to be higher in young adolescents compared to older adolescents (19). In a study comparing adolescent primigravidas and adult primigravida, puerperal infection and chorioamnionitis were observed to be increased in adolescents (26). In our study group, no difference was found among the groups in chorioamnionitis. Maternal mortality risk increases in pregnancies under 15 years of age (22). Hypertensive diseases and maternal heart diseases are the most important causes of death (26). Maternal death was not observed in any of our adolescent and adult cases.

Obstetric and perinatal outcomes were found to be similar in adolescents who gave birth to twins when compared with the adult age group. However, it has been reported in some publications that the risk of extreme preterm birth increases in adolescents (31). In our study twin birth rates were similar in both groups. There was no difference between adolescent and adult groups in the incidence of multiple pregnancies. When the risk of adolescent pregnancy and congenital anomaly is examined, there are publications stating that there is an increase in central nervous, gastrointestinal and musculoskeletal system anomalies in adolescent pregnants. Increases in the risk of circulatory / respiratory anomalies, urogenital anomalies, or Down's syndrome were not detected (32). In our study, higher rates of fetal anomaly were not detected in adolescents. In the study of dos Reis LV et al, congenital anomalies in adolescent births were also examined and they stated that they most frequently encountered neural tube defects. They concluded that this condition might be related to the inadequacy of folic acid supplementation in unplanned adolescent pregnancies (33).

We acknowledge that this study has some limitations. Data related to socioeconomic status, education status of the mother, maternal weight, nutritional status were not analyzed in this study.

Adolescent pregnant women should be considered as a high risk patient group and it is necessary to provide emotional and educational clinical support to pregnant women. Since pregnant women in this age group are closely associated with preterm birth, delivery of small for gestational age and low birth weight infants, it is important to improve pregnancy prevention strategies and health services to reduce adverse pregnancy outcomes. In addition, multidisciplinary prenatal management is required. Our study was conducted with a large pregnant group, but multicenter prospective studies are needed to better evaluate perinatal outcomes.

Conflict of interest

All authors declare that they have no conflict of interest.

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