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Comparison of maternal, fetal and perinatal outcomes between adolescent and adult pregnancies: a retrospective case-control study

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Abstract

Objective: Adolescent pregnancies give rise to high maternal and fetal risk. In our study, we aimed to compare the obstetric and neonatal outcomes of adolescent and non-adolescent pregnancies.

Methods: This study included pregnant women who gave birth between 2018 and 2021 at Necmettin Erbakan University Faculty of Medicine, Obstetrics and Gynaecology Department. The study included 15 to 19-year-old pregnant women, and the control group was 20 to 34, in which age-related complications are known to be the lowest. Multiple pregnancies decreased birth weight and increased preterm delivery risk, so they were excluded from the study, along with patients with incomplete data. Participants' socio-demographic and obstetric characteristics were retrospectively reviewed and determined by analyzing delivery records and patient files. The data was analyzed using the SPSS 26, whereas age, gestational diabetes, pre-eclampsia and APGAR scores were correlated using Pearson or Spearman correlation analyses. The study used 0.05 p-value.

Results: The age, gravidity, parity, abortion and educational level of adolescent pregnancies were significantly lower than in the normal age group (p=0.001 for all parameters). The rates of pre-eclampsia, gestational diabetes and preterm prelabor rapture of membranes were lower in adolescent pregnancies (p=0.044, p=0.010, p=0.044, respectively), while the rates of fetal growth restriction and fetal distress were higher (p=0.016 and p=0.010). The rate of vaginal delivery was lower and the rate of vaginal delivery with episiotomy was higher in adolescent pregnancies (p<0.05). There were significant correlations between age, gestational diabetes and pre-eclampsia. ROC analysis showed that the risk of complications in adolescent pregnancies varies with age and is higher in pregnancies under 18.5 years.

Conclusion: Adolescent pregnancies differ from those of normal age in some parameters of maternal and neonatal outcomes. However, it can be seen that adolescent pregnancies, especially late adolescent pregnancies, can have outcomes that are comparable to those of normal age groups.

Keywords: Adolescent pregnancy, maternal complication, perinatal outcome

Introduction

Adolescent pregnancy is defined as pregnancy occurring in women aged 10 to 19 years.[1] Adolescent pregnancies are classified into three groups: early (10 to 14 years), middle (15 to 17 years) and late (17 years and older).[2] Adolescent pregnancy is a concering issue for the health and welfare of both the individual and the society. Since adolescent pregnant women are biologically, psychologically and socially immature, they may face various risks during pregnancy and birth. These risks may adversely affect both maternal and infant health.

Although the frequency of adolescent pregnancies in Turkey has been decreasing in recent years, it still has a high rate. According to data from the Turkish Statistical Institute (TUİK), the adolescent fertility rate decreased from 49 per thousand in 2001 to 12 per thousand in 2022.[3,4] When the adolescent fertility rates of 27 European Union member countries are analyzed, the adolescent fertility rate in Turkey is 13 per thousand in 2021, which is above the European Union average (7 per thousand).[4]

Studies on the outcomes of adolescent pregnancies have shown that adolescent pregnancies carry a higher obstetric and neonatal risk than those in the reproductive age group.[5,6] The incidence of complications such as gestational diabetes, pre-eclampsia, anemia, low birth weight, preterm delivery, fetal distress, congenital ano-

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malies and perinatal death was found to be higher in adolescent pregnant women, compared to pregnant women in the reproductive age group.[7,8]

The aim of this study was to retrospectively investigate whether there were any differences between the groups in terms of demographic characteristics, maternal and neonatal outcomes, by comparing adolescent pregnancies that occurred between 2018 and 2021 in a university hospital, with a control group of pregnant women aged 20-35 years.

Methods

Design

This study covers the data including the births that took place in Necmettin Erbakan University Faculty of Medicine, Department of Obstetrics and Gynaecology, between 2018 and 2021. This study was conducted in accordance with the Declaration of Helsinki. Prior permission for the study was requested and granted by the relevant ethics committee of Necmettin Erbakan University, bearing number 2022/3838 (No: 10346). The incidence of high-risk mothers is higher in this particular hospital's pregnancies because it is a tertiary center with the largest patient population in the region. At the time of delivery, maternal age was defined as the mother's age in completed years. Pregnant women between the ages of 15 and 19 were included in the study. A 20 to 34 age group was chosen as the control group for the reason that it has the lowest risk of developing age-related complications and a comparison was made between the results observed without the two age groups. Women who were carriers of multiple pregnancies were excluded from the study for the increased risk they carried of preterm birth and decreased birth weights of their infants. Patients for whom all data could not be obtained were also excluded.The data was obtained through a retrospective review method.

Data collection

Delivery records and patient files were analysed to determine the socio-demographic and obstetric characteristics of the participants, such as age, gravida, parity, abortion and educational status. Maternal and obstetric complications included pre-eclampsia, gestational hypertension, HELLP syndrome, fetal growth restriction (FGR), oligohydramnios, polyhydramnios, gestational diabetes mellitus (GDM), anaemia, preoperative and postoperative haemoglobin levels, congenital anomaly, fetal distress, preterm prelabor rapture of membranes (PPROM), the need for blood transfusion, stillbirths, as well as the type of delivery.

Statistical analysis

Statistical analysis of the data obtained was performed using the SPSS 26 (SPSS Inc., Chicago, IL, USA). Appropriate parametric and non-parametric tests such as the t-test and Mann-Whitney U test were used to evaluate the differences between the socio-demographic and obstetric characteristics of the participants. In addition, the chi-square test or Fisher's exact test, was used to evaluate the differences between groups in maternal and perinatal complications such as pre-eclampsia, gestational hypertension, fetal growth restriction, gestational diabetes, anaemia, fetal distress, PPROM, the need for blood transfusion and stillbirth. The Pearson or Spearman correlation analysis was used to evaluate the relationships between age, gestational diabetes, pre-eclampsia and APGAR scores. A p statistical level of 0.05 was accepted in the study.

Results

The study was carried out with 129 adolescent pregnant women aged 15 to 19 years of age and 129 control pregnant women aged over 20 years and under 35 years, who gave birth in the same period in our hospital.The mean age of adolescent pregnant women was significantly lower than that of control pregnant women (17.9 ± 0.9 and 29.3 ± 3.0, respectively, $p<0.0001$). The number of gravida, parity and abortions of adolescent pregnant women were also significantly lower than control pregnant women ($p<0.001$). The educational level of adolescent pregnant women was significantly lower than that of control pregnant women ($p<0.001$) (Table 1).

The rates of pre-eclampsia, gestational diabetes and PPROM were significantly lower in adolescent pregnancies compared to control pregnancies ($p=.044$, $p=.010$, $p=.044$, respectively). The rates of FGR and fetal distress were also significantly higher in adolescent pregnancies compared to control pregnancies ($p=.016$, $p=.010$, respectively). While vaginal delivery was lower in adolescent pregnancies compared to the control group, the rate of vaginal delivery with episiotomy was significantly higher compared to control pregnancies ($p=0.001$). There was no significant difference between adolescent and control pregnancies in terms of caesarean section rate ($p>0.05$) (Table 2). First and 5th minute APGAR scores of adolescent pregnancies were significantly higher than control pregnancies ($p<0.01$). The rate of NICU admission was also higher in adolescent pregnancies compared to control pregnancies, but this difference was not statistically significant ($p>0.05$)(Table 3).

Table 1. Comparison of Adolescent and Healthy Control Pregnancies in Terms of Socio-Demographic Characteristics

Parameters		Adolescent pregnancies (n=129)	Healthy Control pregnancies (n=129)	p-value
Age		17.9 ± 0.9	29.3 ± 3.0	**.0001**
Gravidity		1 (1 – 3)	3 (1 – 8)	**.001**
Parity		1 (1 – 3)	2 (1 – 6)	**.001**
Abortion		0 (0 – 1)	0 (0 – 3)	**.001**
Educational status	**Illiterate**	9 (7.0 %)[a]	10 (7.8 %)[a]	**.001**
	Primary education	70 (54.3 %)[a]	31 (24.0 %)[b]	
	High School	35 (27.1 %)[a]	44 (34.1 %)[a]	
	University	15 (11.6 %)[a]	44 (34.1 %)[b]	

* Independent t test Mean ± SD, ** Mann-Whitney U test Medyan [Min-Max], *** Chi Square test (% n)

Table 2. Comparison of Adolescent and Healthy Control Pregnancies in Terms of Maternal and Obstetric Complications

Parameters		Adolescent pregnancies (n=129)	Healthy Control pregnancies (n=129)	p-value
Preeclampsia		0 (0.0%)	4 (3.1%)	**.044**
GHT		0 (0.0%)	1 (0.8%)	.316
HELLP Syndrome		0 (0.0%)	1 (0.8%)	.316
FGR		20 (15.5%)	8 (6.2%)	**.016**
Oligohydramnios		8 (6.2%)	9 (7.0%)	.802
Polyhydramnios		1 (0.8%)	1 (0.8%)	1.00
GDM		2 (1.6%)	11 (8.5%)	**.010**
Anemia		22 (17.1%)	23 (17.8%)	.870
Preoperative Hgb (g/dl)		11.9 ± 14	12.0 ± 1.3	.432
Postoperative Hgb (g/dl)		10.4 ± 1.6	10.6 ± 1.2	.444
Congenital anomaly		7 (5.4%)	5 (3.9%)	.554
Fetal distress		9 (7.0%)	1 (0.8%)	**.010**
PPROM		0 (0.0%)	4 (3.1%)	**.044**
Need for blood transfusion		7 (5.4%)	2 (1.65)	.090
Stillbirth		1 (0.8%)	1 (0.8%)	1.00
Type of birth	**Vaginal birth**	10 (7.8%)[a]	46 (35.7%)[b]	**.001**
	Vaginal delivery with episiotomy	51 (39.5%)[a]	10 (7.8%)[b]	
	Caesarean section	68 (52.7%)[a]	73 (56.6%)[a]	

* Independent t test Mean ± SD, ** Mann-Whitney U test Medyan [Min-Max], *** Chi Square test (% n

Table 3. Comparison of Adolescent and Control Pregnancies in Terms of Perinatal Outcomes

Parameters		Adolescent pregnancies (n=129)	Healthy Control pregnancies(n=129)	p-value
Birth Week		38.4 ± 1.6	38.2 ± 2.1	.186
Birth weight		2999.5 ± 434.8	3063.1 ± 557.6	.308
Birth Weight Distribution	**≤ 2499 g**	13 (10.1%)	17 (13.2%)	.153
	2500-3999 g	116 (89.9%)	109 (84.5%)	
	≥ 4000 g	0 (0.0%)	3 (2.3%)	
1st minute APGAR		7.0 ± 1.3	6.6 ± 1.0	.005
5th minute APGAR		8.6 ± 1.3	7.8 ± 1.0	.001
NICU hospitalisation		13 (10.1%)	6 (4.7%)	.095

* Independent t test Mean ± SD, ** Mann-Whitney U test Medyan [Min-Max], *** Chi Square test (% n)

There were significant positive correlations between age and GDM (r=0.168, p=0.007), age and pre-eclampsia (r=0.165, p=0.008) and pre-eclampsia, and 1st minute APGAR score (r=-0.193, p=0.002). There were significant negative correlations between age and 1st minute APGAR score (r=-0.172, p=0.006), age and 5th minute APGAR score (r=-0.299, p<0.0001) and preeclampsia and 5th minute APGAR score (r=-0.240, p<0.0001). The strongest correlation was between the 1st and 5th minute APGAR scores (r=0.903, p<0.0001) (Table 4).

Table 4. Correlation Analysis of Age, GDM, Preeclampsia and APGAR Scores in Pregnant Women

Parameters		Age	GDM	Preeclampsia	1.st APGAR	5.th APGAR
Age	r	1				
	p					
GDM	r	.168**	1			
	p	.007				
Preeclampsia	r	.165**	-.029	1		
	p	.008	,644			
1.st APGAR	r	-.172**	-.035	-.193**	1	
	p	.006	.572	.002		
5.th APGAR	r	-.299**	-.040	-.240**	.903**	1
	p	.000	.522	.000	.000	

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

According to the result of the ROC analysis performed to predict the age limit at which complications were least common in terms of maternal and perinatal outcomes, the AUC value was 610 (510 - 711) (p=0.042). When the cut-off point of the test was chosen as 18.5, the sensitivity and specificity of the test were calculated as 73% and 40%, respectively. These results suggest that the risk of complications in adolescent pregnancies varies with age and is higher in pregnancies below the age of 18.5 years (Figure 1).

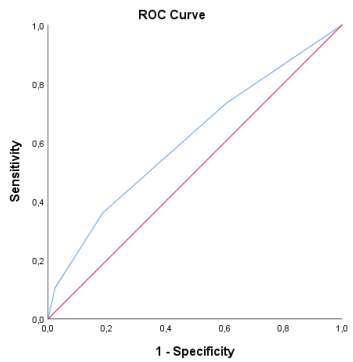

Fig 1. ROC analysis used to predict the age at which maternal and perinatal complications are least likely to occur in adolescent pregnancies

Discussion

It has been shown that adolescent pregnancies have more unfavourable outcomes than control pregnancies in some respects. In terms of maternal outcomes of adolescent pregnancies, the rates of pre-eclampsia, gestational diabetes and PPROM were found to be significantly lower in this study compared to control pregnancies. These findings suggest that adolescent pregnancies are less susceptible to these complications. However, although it is largely consistent with the existing literature, there are also findings that are not. Ultimately, it reveals that more effort is needed for the prevention and follow-up of adolescent pregnancies.

In the literature, it has been reported that adolescent pregnant women have a higher risk of encountering serious problems such as hypertensive diseases, infections and preterm delivery, such as preeclampsia, gestational diabetes and PPROM.[9-11] However, there are also studies showing a reduced risk of gestational diabetes.[12,13] There are also articles stating that the incidence of preeclampsia is lower in adolescent pregnancies than in normal-age pregnancies.[14] The reason for the difference in these findings may be that the mean age of adolescent pregnant women in our study was 17.9 years. Most of the studies in the literature have been conducted in a wide range of ages such as 10 to 19 years and many studies have shown that these complications increase much more dramatically, especially below the age of 15 years.[10,15,16] The reasons why adolescent pregnant women are exposed to these complications include physiological immaturity, malnutrition, socioeconomic deprivation, lack of education, psychosocial stress, difficulty in accessing health services, inadequate or absent antenatal care, unwanted or unaccepted pregnancy, smoking, alcohol or substance use before and during pregnancy.[17,18] It would therefore be an oversimplification to attribute simply to age the higher incidence of complications in adolescent pregnant women.

In our study, a lower rate of caesarean section was found in the adolescent group, but no statistically significant difference was found. In the existing literature, the rate of caesarean section in adolescent pregnancies varies according to different studies: while some report that caesarean section rates are higher than women in the normal age group [19], there are also studies indicating a lower caesarean section rate in the adolescent group [20]; the rate thus varies between 30.5% and 44.8%. Our caesarean section rate was 52.7%, significantly higher than what was reported in the literature, which may be deemed as a specific and particular issue in our country.

In our study, we observed higher normal vaginal delivery rates in adolescent pregnancies compared to nor-

mal age group pregnancies, but there was no statistical significance. We also observed a higher rate of normal deliveries with episiotomy in adolescent pregnant women. A population-based retrospective cohort study conducted between 2015 and 2021, compared the birth outcomes of adolescent and adult pregnant women: the proportion of cases requiring episiotomy was higher in adolescent pregnant women (48.1%) compared to adults (34.6%).[21] A study in Nepal evaluated the prevalence, associated risk factors and outcomes of adolescent pregnancy, where it was determined that 75.4% of adolescent pregnancies were vaginal deliveries, with or without episiotomy.[22] In Turkey, 206 adolescent pregnancies were analysed in the study conducted by Yurtçu et al. in 2020, where it was found that the rate of vaginal delivery with episiotomy was higher in the adolescent pregnancy group (59.9%) compared to the control group (34.07%).[23] One of the reasons why episiotomy is more common in adolescent pregnancies may be that the pelvic structures of adolescent pregnancies are not fully developed, and this situation may require more intervention during labour.

We also observed a higher incidence of FGR in adolescent pregnancies and these findings suggest that adolescent pregnancies adversely affect fetal development and adaptation. One study found that adolescent mothers were 1.2 times more likely to give birth to a newborn with FGR, compared to adult mothers.[24] A report in a large population in the United States found that adolescents had an increased risk of Small for gestational age (SGA), compared to adult pregnancies.[25] Finally, in research conducted in Turkey between 2009 and 2014, 282 adolescent pregnancies were analysed and it was found that the rate of FGR (10.3%) was significantly higher in adolescent pregnancies.[26] It has been reported in the literature that newborns born with FGR are at higher risk for various health problems in adulthood.[27] This situation shows the critical importance of prevention of adolescent pregnancies in the context of protection and improvement of public health. Adolescent pregnancies are reportedly more prone to neonatal complications, such as FGR, low APGAR score, asphyxia, congenital anomaly, respiratory distress syndrome, intracranial haemorrhage, necrotising enterocolitis, sepsis, jaundice, hypoglycaemia, hypocalcaemia, hypothermia, NICU admission and neonatal death.[26, 28] Our study found that the rate of admission to the neonatal intensive care unit (NICU) was higher for babies born to adolescent pregnancies, however the results were not statistically significant, which may result from our small sample size. Many reports in the literature have shown that NICU admission rates do not differ between adolescent and adult babies [29,30], although Kirbas et al. reported a higher NICU admission rate for adolescent infants.[31] This may reflect the high rate of preterm birth and low birth weight of these babies.

In our study, we found a lower rate of GDM in adolescent pregnant women and these findings are consistent with three previous studies in the literature. One report found that women under 20 years of age had a significantly lower incidence of GDM, compared to the 20 to 30 age group.[32] In addition, the groups aged 30 to 35 years, 35 to 40 years and 40 years and older were all found to have a significantly higher risk of GDM, compared to the 20 to 30 age group. Another study found women aged 10 to 19 years had a lower risk of GDM compared to women aged 20 to 34 years.[33] In a broad research of over a thousand adolescent pregnant women, it was reported that the risk of GDM was lower in adolescent pregnant women (1.9% & 9.6%)

Our study has several limitations, which include its retrospective design, small sample size, single-centre experience, inadequate analysis of socioeconomic factors, omission of potential confounding variables and limited study period. These limitations may affect the causality, reliability and generalisability of the results and the results should therefore be interpreted with caution and supported by more comprehensive and long-term studies.

Conclusion

Our study has shown that maternal and neonatal outcomes of adolescent pregnancies differ from those of normal age pregnancies in terms of certain parameters, however it showed that adolescent pregnancies, notably late adolescent pregnancies, may have outcomes comparable to those of normal age groups. This may be related to accessibility to health services and adolescents growing up in better economic and sociocultural environments, compared to previous periods, however more efforts are still needed for the prevention and follow-up of adolescent pregnancies. Larger scale, prospective and multicentre studies are needed to better understand the maternal and neonatal outcomes of these pregnancies.

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