


■ Orijinal Makale

## Evaluation of obstetric outcomes in adolescent pregnancies delivered by cesarean section: Single center experience

### *Sezaryen ile sonuçlanan adolesan gebeliklerde obstetrik sonuçların değerlendirilmesi: Tek merkez deneyimi*

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#### Abstract

**Aim:** Adolescent pregnancies; defined as pregnancies in women aged 10-19 years old are still an important public health problem and must be considered as high risk pregnancies with increased maternal and fetal mortality and morbidity rates. In this study, we aimed to examine the obstetric and perinatal outcomes in adolescent pregnancies delivered with cesarean section (CS) and compare the outcomes in determined adolescent age groups.

**Materials and Methods:** In this retrospective study, the obstetric and perinatal outcomes in 2665 adolescent patients who delivered with cesarean section were examined in three groups divided according to the age of delivery: group 1 included the patients aged 14-15 years old, group 2 the patients aged 16-17 years old and group 3 the patients aged 18-19 years old. The outcomes were compared between the identified age groups.

**Results:** The incidence of preterm delivery was higher in group 1 compared with group 2 and group 3 ( $p=0.001$ ) and 52.3% of group 1 patients had delivered between 29-34 gestational weeks. Fetal birth weight and APGAR scores were lower and need for neonatal intensive care unit (NICU) was higher in group 1. In group 3 116 (8.4%) patients had postpartum hemorrhage which was higher than group 1 and group 2 with statistically significant difference ( $p=0.001$ ).

**Conclusion:** Preterm delivery, low birth weight, low APGAR scores and need for NICU are higher in 15-17 years old adolescents delivered with C/S whereas postpartum hemorrhage and need for blood transfusion is higher in adolescents aged 18-19 years old.

**Keywords:** Adolescent pregnancy; cesarean section; maternal outcome; fetal outcome

## Öz

**Amaç:** 10-19 yaş arası kadınların gebeliği olarak tanımlanan adölesan gebelikler halen önemli bir halk sağlığı sorunudur ve maternal ve fetal mortalite ve morbidite oranlarının arttığı yüksek riskli gebelikler olarak kabul edilmelidir. Bu çalışmada sezaryen (CS) ile sonuçlanan adölesan gebeliklerde obstetrik ve perinatal sonuçların incelenmesi ve belirlenen adölesan yaş gruplarında bu sonuçların karşılaştırılması amaçlandı.

**Gereç ve Yöntem:** Bu retrospektif çalışmada sezaryen ile doğum yapan 2665 adölesan hastanın obstetrik ve perinatal sonuçları doğum yaşlarına göre oluşturulan 3 grupta incelendi: Grup 1; 14-15 yaş grubu, grup 2; 16-17 yaş grubu ve grup 3; 18-19 yaş grubundan oluşmaktaydı. Sonuçlar belirlenen yaş grupları arasında karşılaştırıldı.

**Bulgular:** Erken doğum insidansı grup 1'de grup 2 ve grup 3'e göre daha yüksekti ( $p=0,001$ ) ve grup 1'deki hastaların %52,3'ü 29-34 gebelik haftaları arasında doğum yapmıştı. Grup 1'de fetal doğum ağırlığı ve APGAR skorları daha düşük ve yenidoğan yoğun bakım ünitesi ihtiyacı daha yüksekti. Grup 3'te 116 (%8.4) hastada görülen postpartum kanama, grup 1 ve grup 2'ye göre istatistiksel olarak anlamlı farkla daha yüksekti ( $p=0,001$ ).

**Sonuç:** 15-17 yaş arası sezaryen ile doğum yapan adölesanlarda erken doğum, düşük doğum ağırlığı, düşük APGAR skorları ve yenidoğan yoğun bakım ihtiyacı daha yüksek iken, 18-19 yaş arası adölesanlarda doğum sonu kanama ve kan transfüzyonu ihtiyacı daha yüksektir.

**Anahtar Kelimeler:** Adölesan gebelik; sezaryen; maternal sonuçlar; fetal sonuçlar

## 1. Introduction

Maternal age has been increased as a result of educational, economic and social issues in the last decades but adolescent pregnancies still remain to be an important public health problem with its medical and legal aspects in both developed and developing countries. Pregnancy in women aged 10-19 years old is defined as adolescent pregnancy by World Health Organization (WHO) and it is estimated that around 16 million adolescents get pregnant and give birth every year all around the world (1). In our country, 6% of adolescents aged between 15 and 19 years old get pregnant every year (2).

The accelerated somatic development and psychological differentiation are the main features of adolescence and can be negatively affected by an adolescent pregnancy. The insufficient knowledge about reproductive physiology, contraception methods, pregnancy and its outcomes in this age group and the weak relationships with the parents can lead to unwanted pregnancies.

According to WHO, maternal mortality rates are four times higher and neonatal mortality is twice as high in pregnant adolescents under the age of 16. There are many studies reporting that adolescent pregnancies must be considered as high risk pregnancies because of the increase in adverse obstetric and perinatal outcomes (3-5). Preterm delivery, hypertensive disorders of pregnancy, anemia, gestational diabetes, low birth weight, stillbirth, low APGAR scores are found to be increased in adolescent pregnancies (5-7).

In most of the studies, the obstetric and perinatal outcomes in adolescent pregnancies has been compared with the outcomes

in adult pregnancies (8, 9), and were not classified according to the route of delivery and age of the adolescent. In this study we aimed to examine the demographic characteristics and obstetric and perinatal outcomes of adolescent pregnancies delivered with cesarean section in determined adolescent age groups.

## 2. Materials and Methods

This study was conducted as a retrospective trial at the Sanliurfa Research and Training Hospital between January 2017 and December 2019. Patients who delivered with cesarean section in adolescence period were analyzed. This study protocol was approved by the Harran University ethics committee (15.05.2020/15) and was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from the guardians of all participants at the time of hospitalization.

Adolescent delivery was determined as patients giving delivery at 14-19 years of age. Patients aged over 19 years, patients who delivered with vaginal delivery or who delivered in another center despite having their follow-up in our hospital and patients whose all data could not be accessed from the records were excluded. The patients were divided into three groups according to the age of delivery: group 1 included the patients aged 14-15 years old, group 2 the patients aged 16-17 years old and group 3 the patients aged 18-19 years old.

Data of the patients including age, parity, body mass index (BMI), smoking, gestational week at delivery, indication for cesarean delivery (CS), fetal birth weight, newborn APGAR scores, need for neonatal intensive care unit (NICU), diagnosis of maternal post-partum hemorrhage, and need for maternal



transfusion were recorded by the scanning of the files. The demographic characteristics, maternal and neonatal outcomes in the determined age groups were compared according to the recorded data.

The gestational week was calculated according to the first date of the last menstruation and ultrasonographic measurements of the fetus at 9-12 weeks of gestation. Fetal distress was diagnosed by the International Federation of Gynecology and Obstetrics (10). In the diagnosis of preeclampsia, hypertension was defined as the first occurrence of a systolic blood pressure  $\geq 140$  mmHg and a diastolic blood pressure  $\geq 90$  mmHg after the 20th week of pregnancy, measured at least twice at four hour intervals in the left lateral decubitus position. All patients diagnosed with preeclampsia were followed up for 12 weeks after birth (11). Abnormal labor included an active-phase arrest in the first or second stage of labor. The arrest of labor in the first stage was defined as  $\geq 6$  cm of dilation with ruptured membranes and failure to progress despite (a) 4 hours of adequate uterine activity or (b) at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change. Arrest of labor in the second stage was diagnosed after at least 2 hours of pushing in multiparous women and at least 3 hours of pushing in nulliparous women. All women with abnormal labor underwent cesarean delivery. Birth weight  $>4,000$  g was defined as macrosomia. Postpartum hemorrhage

was diagnosed when more than 500 ml of bleeding occurred in the first postpartum 24 hours (12).

### Statistical Analysis

SPSS 20 (IBM Corp. released 2011. IBM SPSS Statistics for Windows, version 20.0, Armonk, NY: IBM Corp.) was used to evaluate the data. The data were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov–Smirnov/ Shapiro–Wilk’s tests) to determine their normal distribution. A one-way ANOVA and Kruskal–Wallis test were used to compare continuous variables with a normal and non-normal distribution, respectively. Relationships between categorical variables were analyzed using a chi-squared test. A p-value  $<0.05$  was considered to indicate statistical significance.

### 3. Results

A total of 107.659 live births took place in our hospital during the study period. The number of patients who had cesarean section was 39,452 and 3260 of these patients were under the age of 19. Considering the exclusion criteria, 2665 patients were included in the study. There were 363 (13.6%) patients in group 1, 924 (34.6%) patients in group 2 and 1378 (51.8%) patients in group 3.

Demographic characteristics of the adolescent pregnancies delivered by cesarean section are provided in Table 1. There

**Table 1.** Demographic characteristics according to adolescent maternal age groups

	Total cohort (n=2665)	Group 1 (n=363)	Group 2 (n=924)	Group 3 (n=1378)	p
Maternal age (years)	18 (14-19)	15 (14-15) <sup>b,c</sup>	17 (16-17) <sup>a,c</sup>	18 (18-19) <sup>a,b</sup>	<b>0.001</b>
Gravida	1 (1-3)	1 (1-2) <sup>b,c</sup>	1 (1-3) <sup>a,c</sup>	2 (1-3) <sup>a,b</sup>	<b>0.001</b>
Parity	0 (0-2)	0 (0-1) <sup>b,c</sup>	0 (0-2) <sup>a,c</sup>	1 (0-2) <sup>a,b</sup>	<b>0.001</b>
Body mass index (kg/m <sup>2</sup> )	27 (18-42)	27 (a 18-40)	26.5 (18-42)	27 (18-42)	0.915
Smoking					0.313
Yes	62 (2.3)	12 (3.3)	23 (2.5)	27 (.0)	
No	2603 (97.7)	351 (96.7)	901 (97.5)	1351 (98.0)	
Gestational week at delivery	37 (26-41)	31 (28-41) <sup>b,c</sup>	37 (26*41) <sup>a,c</sup>	37 (32-40) <sup>a,b</sup>	<b>0.001</b>
<28 weeks	19 (0.7)	5 (1.4)	14 (1.5)	0	
29-34 weeks	332 (12.5)	190 (52.3)	84 (9.1)	58 (4.7)	
34-37 weeks	694 (26)	68 (18.7)	182 (19.7)	444 (32.2)	
>37 weeks	1620 (60.8)	100 (27.5)	644 (69.7)	876 (63.3)	

Data presented as median (min-max) and n (%). p values with statistical significance (p<0.05) are shown in bold.  
<sup>a</sup>There was a significant difference with compared group 1 in post-hoc comparison.  
<sup>b</sup>There was a significant difference with compared group 2 in post-hoc comparison.  
<sup>c</sup>There was a significant difference with compared group 3 in post-hoc comparison.

was a statistically significant difference between the groups in terms of gravity and parity ( $p=0.001$ ). The incidence of preterm delivery was higher in group 1 compared with group 2 and group 3 and the difference was statistically significant ( $p=0.001$ ). In group 1, 52.3% of patients had delivered between 29-34 weeks whereas the median gestational week at delivery was 37 weeks in 69.7% of the patients in group 2 and in 63.3% of the patients in group 3.

Considering the total cohort, the main cesarean indication for adolescents was previous cesarean section ( $n=1145$ ; 43%) and the second indication was fetal distress ( $n=982$ ; 36.8%). Table 2 summarizes the cesarean section indications by age groups. In group 1, 324 patients (89.3%), in group 2, 455 (49.2%) patients and in group 3, 203 (14.7%) patients had undergone cesarean section with the diagnosis of fetal distress and the difference between the groups was statistically significant ( $p=0.001$ ). The incidence of cesarean section due to previous CS in group 3 was higher (73.9%) than group 1 and group 2 ( $p=0.001$ ).

Fetal outcomes of adolescent pregnancies are presented in Table 3. Fetal birth weight and APGAR scores were lower and neonatal need for intensive care unit was higher in group 1 compared with group 2 and group 3 and the difference was statistically significant ( $p=0.001$ ). The indication for need for NICU was prematurity in all groups.

Maternal outcomes are listed in Table 4. Postpartum transfusion was needed in 12.3% of the patients in group 3 and it was higher than group 1 and group 2 with a statistically significant difference ( $p=0.001$ ). In group 1, only 8 (2.2%) patients were diagnosed to have postpartum hemorrhage whereas 70 (7.6%) patients in group 2 and 116 (8.4%) patients in group 3 had postpartum hemorrhage.

#### 4. Discussion

Adolescent pregnancies are still a public health problem especially due to its adverse maternal and neonatal outcomes. Our hospital is in the province with the highest birth rate in Turkey. Considering the early marriages in the region, the incidence of adolescent pregnancies is also high and over 1000 adolescent pregnancies were reported during 2019. In this study, of the 2665 adolescent pregnancies resulted with cesarean delivery, the main cesarean indication for the patients aged 14-17 was fetal distress whereas it was previous cesarean section in patients aged 18-19 years. Preterm delivery was higher in patients under 18 years of age and need for NICU was also high in this age group related with prematurity. On the other hand postpartum hemorrhage and need for blood transfusion was higher in 18-19 years old adolescent group.

There are studies comparing the maternal and neonatal outcomes of adolescent pregnancies with the outcomes of

**Table 2.** CS indications according to age groups in adolescent pregnant women

	Total cohort (n:2665)	Group 1 (n:363)	Group 2 (n:924)	Group 3 (n:1378)	p
Fetal distress	982 (36.8)	324 (89.3) <sup>b,c</sup>	455 (49.2) <sup>c</sup>	203 (14.7)	<b>0.001</b>
Ablatio placenta	226 (8.5)	10 (2.8) <sup>b,c</sup>	112 (12.1)	104 (7.5)	<b>0.001</b>
Abnormal presentation	119 (4.5)	11 (3)	56 (6.1) <sup>a,c</sup>	52 (3.8)	<b>0.042</b>
CPD	100 (1.3)	16 (4.4)	84 (9.1)	-	-
Previous CS	1145 (43)	-	126 (13.6)	1019 (73.9)	-
Abnormal labor	66 (2.5)	3 (0.8)	63 (6.8)	-	-
Macrosomia	23 (0.9)	2 (0.6)	21 (2.3)	-	-
Preeclampsia	21 (0.8)	-	21 (2.3)	-	-
Fetal anomaly	21 (0.8)	-	21 (2.3)	-	-
Cord prolapsus	7 (0.3)	-	7 (0.8)	-	-
Maternal systemic disease	7 (0.3)	-	7 (0.8)	-	-
Multiple pregnancy	14 (0.5)	-	14 (1.5)	-	-

CPD: cephalopelvic disproportion, CS: cesarean section. Data presented as n (%). *p* values with statistical significance ( $p<0.05$ ) are shown in bold.

<sup>a</sup>There was a significant difference with compared group 1 in post-hoc comparison.

<sup>b</sup>There was a significant difference with compared group 2 in post-hoc comparison.

<sup>c</sup>There was a significant difference with compared group 3 in post-hoc comparison.



**Table 3.** Comparison of fetal outcomes in adolescent maternal age groups

	Total cohort (n:2665)	Group 1 (n:363)	Group 2 (n:924)	Group 3 (n:1378)	p
Fetal weight (gr)	2850 (700-4080)	2580 (1500-3900) <sup>b,c</sup>	2980 (700-4080) <sup>a,c</sup>	2900 (1600-3670) <sup>a,b</sup>	<b>0.001</b>
APGAR 1	9 (5-9)	9 (5-9) <sup>b,c</sup>	9 (6-9) <sup>a</sup>	9 (7-9) <sup>a</sup>	<b>0.001</b>
APGAR 5	10 (7-10)	10 (7-10) <sup>b,c</sup>	10 (7-10) <sup>a</sup>	10 (8-10) <sup>a</sup>	<b>0.001</b>
Need for NICU					<b>0.001</b>
Yes	375 (14.1)	157 (43.3)	94 (10.2)	124 (9)	
No	2290 (85.9)	206 (56.7)	830 (89.8)	1254 (91)	
NICU indication					0.057
Prematurity	335 (97.1)	147 (94.8)	84 (100)	104 (98.1)	
Nutritional defects	10 (2.9)	8 (5.6)	-	2 (1.9)	

NICU: neonatal intensive care unit. Data presented as median(min-max) and n(%). *p* values with statistical significance (*p*<0.05) are shown in bold.

<sup>a</sup>There was a significant difference with compared group 1 in post-hoc comparison.  
<sup>b</sup>There was a significant difference with compared group 2 in post-hoc comparison.  
<sup>c</sup>There was a significant difference with compared group 3 in post-hoc comparison.

**Table 4.** Comparison of maternal outcomes in adolescent pregnant according to age groups

	Total cohort (n:2665)	Group 1 (n:363)	Group 2 (n:924)	Group 3 (n:1378)	p
Preoperative hemoglobin value (gr/dl)	12 (8-15)	11 (8-15)	12 (8-15)	12 (8-15) <sup>a,b</sup>	<b>0.001</b>
Postoperative hemoglobin value (gr/dl)	10 (7-14)	10 (8-13)	10.50 (8-14)	10 (7-13) <sup>a,b</sup>	0.048
Transfusion					<b>0.001</b>
Yes	238 (8.9)	19 (5.7)	49 (5.3)	170 (12.3) <sup>a,b</sup>	
No	2427 (91.1)	344 (94.8)	875 (94.7)	1208 (87.7)	
Anesthesia					<b>0.001</b>
General	57 (2.1)	1 (0.3)	56 (6.1)	-	
Spinal	2608 (97.9)	362 (99.7)	868 (93.9)	100 (100)	
Postpartum hemorrhage					<b>0.001</b>
Yes	194 (7.3)	8 (2.2)	70 (7.6)	116 (8.4) <sup>a,b</sup>	
No	2471 (92.7)	355 (97.8)	854 (92.4)	1262 (91.6)	
Hospitalization duration (days)	2 (0-7)	1 (1-4) <sup>b,c</sup>	2 (0-7)	2 (1-3)	<b>0.001</b>

Data presented as median (min-max) and n (%). *p* values with statistical significance (*p*<0.05) are shown in bold.

<sup>a</sup>There was a significant difference with compared group 1 in post-hoc comparison.  
<sup>b</sup>There was a significant difference with compared group 2 in post-hoc comparison.  
<sup>c</sup>There was a significant difference with compared group 3 in post-hoc comparison.

adult pregnancies. Although it was supposed that immaturity of adolescent pelvis and emotional status might increase cesarean delivery as a result of labor progress failure (13), the incidence of CS was reported to be similar in adolescents compared with adults (6). Jennifer L. et al reported in their study that

adolescents were half as likely to undergo CS than adults and CS for failure to progress was significantly lower in adolescents and there was no difference in CS delivery for fetal distress between adolescents and adults (14). In our study, repeated CS was the main indication in the whole adolescent population whereas CS

for fetal distress was higher in adolescent groups aged 14-15 and 16-17 years and previous CS was higher in 18-19 years of old age group. CS for failure in labor progress was performed in only 100 (3.7%) adolescents.

Preterm delivery and low birth weight are reported to be the main adverse fetal outcomes in adolescent pregnancies (6, 8, 14-16). In our study similar with these studies preterm delivery and low birth weight incidences were found to be high. Preterm delivery incidence was 39.2% and 13.1% of the deliveries were before 34 weeks of gestation in the adolescent patients and it was higher when compared with previous studies (8). This result was attributed to the selection of patients as adolescents delivered by cesarean section only are included in the study. Preterm delivery was higher in adolescents aged 14-15 years old and most of these deliveries were at 29-34 gestational weeks. In 16-17 and 18-19 age groups the preterm delivery rate was lower compared to 14-15 years old group and most of them occurred between 34-37 gestational weeks. The immaturity of the adolescent skeleton system, lower socioeconomic level related factors such as nutritional deficiency, inadequate pregnancy follow-up are supposed to be the reasons of preterm delivery in adolescents.

The incidence of low birth weight and the need for NICU were also higher in group 1 compared with other groups mostly as a result of increased preterm delivery incidence especially at 29-34 gestational weeks and due to the factors related with adolescent age mentioned above.

Repeated CS is related with increased intraoperative and postoperative complications (17). Kaplanoglu et al. examined the complications and outcomes of repeat CS in adolescent women and reported that gestational week at delivery decreased and lower APGAR score values were observed in the third CS group (15). The risk of placenta previa, placenta acreata and related postpartum hemorrhage were also increased with increased number of repeated CS. In our study, postpartum hemorrhage and need for blood transfusion were higher among adolescents aged 18-19 years old compared with 14-5 and 16-17 years of old groups and this was supposed to be the result of increased CS incidence performed for repeated CS.

The number of the adolescent patients in our study is superior to other studies in the literature since our hospital has the highest birth rate in our country. There are studies discussing the maternal and fetal outcomes of adolescent pregnancies but we could not find any studies comparing adolescent pregnant women according to their age groups and only delivered with CS.

Our study has some limitations. The determination of perinatal risk factors and maternal outcomes were limited due to its retrospective design. The high number of births in our hospital limited our access to some patients and patient records. The patients in the study group were adolescents living in similar geographical conditions. Their living standards and socioeconomic conditions were very similar. In this sense, the lack of homogeneous distribution may be a bias.

In conclusion, fetal distress is the most common cause of cesarean section in adolescent pregnant women under 18 years of age. Preterm delivery, low birth weight, low APGAR scores and need for NICU are higher in this adolescent age group whereas postpartum hemorrhage and need for blood transfusion is higher in 18-19 years old adolescents.

#### **Yazar katkısı**

Araştırma fikri ve tasarımı: OA, NNY ve FE; veri toplama: NNY ve FE; sonuçların analizi ve yorumlanması: OA, NNY ve FE; araştırma metnini hazırlama: OA, NNY ve FE. Tüm yazarlar araştırma sonuçlarını gözden geçirdi ve araştırmının son halini onayladı.

#### **Etik kurul onayı**

Bu araştırma için Harran Üniversitesi Klinik Araştırmalar Etik Kurulundan onay alınmıştır (Karar no: 15/11.05.2020).

#### **Finansal destek**

Yazarlar araştırma için finansal bir destek almadıklarını beyan etmiştir.

#### **Çıkar çatışması**

Yazarlar herhangi bir çıkar çatışması olmadığını beyan etmiştir.

#### **Author contribution**

Study conception and design: OA, NNY, and FE; data collection: NNY, and FE; analysis and interpretation of results: OA, NNY, and FE; draft manuscript preparation: OA, NNY and FE. All authors reviewed the results and approved the final version of the manuscript.

#### **Ethical approval**

The study was approved by the Harran University Clinical Research Ethics Committee (Protocol no. 15/11.05.2020).

#### **Funding**

The authors declare that the study received no funding.

#### **Conflict of interest**

The authors declare that there is no conflict of interest.

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