Effect of Young Maternal Age on Obstetric and Perinatal Outcomes: Results from the Tertiary Center in Turkey

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Background: Young maternal age is variously defined in studies of its effect on obstetrics and perinatal outcomes. Also, pregnancy has been reported as the leading cause of death in adolescent girls in low- and middle-income countries.

Aims: The aim of the study was to evaluate whether young maternal age was associated with an increased risk of obstetrics and perinatal adverse outcomes.

Study Design: Case-control study.

Methods: This case-control study was derived from a database of the medical records between January 2008 and December 2012. In the present study, 1374 teenage pregnancy and 1294 adult pregnancy cases were included. After restriction of analyses to singleton primiparous women, 1282 teenage pregnancy and 735 adult pregnancy cases were analyzed. Maternal age was separated into three groups: 15 and less, 16-19, and 20-34 years. Adjusted odds ratios (ORs) were derived through logistic regression models for the potential confounding factors.

Results: Adolescents aged 15 years and younger had higher risks of preterm delivery, early preterm delivery, intrauterine fetal death and neonatal death compared with women aged 20 to 34 years after adjustment for confounding factors. In addition, both groups of adolescents had higher risks for anemia and episiotomy and lower risk of cesarean delivery. The rates of pre-eclampsia, gestational diabetes, chronic diseases, intrauterine growth restriction (IUGR) were higher in the adult group.

Conclusion: Younger maternal age was correlated with increased risks of preterm delivery, fetal and neonatal death and anemia.

Keywords: Adolescent pregnancy, perinatal mortality, preterm delivery
RESULTS

Throughout the study period, a total of 56,421 infants were born in our hospital. Overall, 1374 (2.4%) infants were born to adolescents aged 19 years and younger. In the adolescent age group, 1282 infants were born to primiparous mothers. Within the primiparous mother group, 6.6% (85) infants were born to those aged 15 years and younger and 93.4% (1197) to those aged 16–19 years. At the beginning, 1294 adult pregnancy cases were recruited for the control group. After the restriction of analyses to singleton primiparous women, 735 adult pregnancies were analyzed. Tables 1 and 2 indicate the maternal demographic and obstetric characteristics of the study group. The youngest adolescents (<16 years) had the highest preterm (<37 weeks) and early preterm labor (<34 weeks) rates, the highest intrauterine fetal death and neonatal death rate, the lowest birthweight and an Apgar score below 7 at 5 minutes, whereas the these parameters for older adolescents were similar to those of adult women. Compared with mothers aged 20 to 34 years, adolescent mothers had a higher incidence of prenatal anemia, lower educational level, lower number of prenatal visits, lower gestational age at birth, lower incidence of cesarean delivery, and higher incidence of episiotomy. The rates of preeclampsia, gestational diabetes, chronic diseases and intrauterine growth restriction were higher in the adult group. Also, CPD as an indication of cesarean delivery was found to be higher in the adult group.

In Table 3, adjusted ORs for the association between maternal age, and adverse maternal and perinatal outcomes are
demonstrated. Younger adolescents showed higher preterm delivery risks and early preterm delivery adjusted for education level, the number of prenatal visits, smoking, chronic diseases, low urinary tract infection, preterm rupture of membrane, preeclampsia and intrauterine growth restriction compared with adults aged 20-34 years. Infants born to mothers aged 15 years or younger exhibited higher risks of intrauterine fetal death and neonatal death than infants of mothers aged 20-34 years after adjusting for level of education, prenatal visit numbers, smoking, chronic diseases, preeclampsia and intrauterine growth restriction. Adolescents aged 16-19 years had lower risks of LBW, IUGR, preeclampsia, gestational diabetes and PROM in comparison to adults. Our study group did not have maternal mortality. The adolescent mothers had a higher

<table>
<thead>
<tr>
<th>TABLE 1. Characteristics of the study population and maternal outcomes</th>
<th>Maternal age (years)</th>
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</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>≤15</td>
</tr>
<tr>
<td>Maternal age (n)</td>
<td>85</td>
</tr>
<tr>
<td>Education level</td>
<td>14.63±0.65</td>
</tr>
<tr>
<td>Primary school or less</td>
<td>19 (22.4%)</td>
</tr>
<tr>
<td>Secondary school</td>
<td>62 (72.9%)</td>
</tr>
<tr>
<td>High school</td>
<td>4 (4.7%)</td>
</tr>
<tr>
<td>Cigarette smoking n (%)</td>
<td>4 (4.7%)</td>
</tr>
<tr>
<td>Number of prenatal visit n (%)</td>
<td>71 (83.5%)</td>
</tr>
<tr>
<td>Chronic disease n (%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Anemia n (%)</td>
<td>14 (16.5%)</td>
</tr>
<tr>
<td>Gestational diabetes n (%)</td>
<td>0</td>
</tr>
<tr>
<td>Preeclampsia n (%)</td>
<td>4 (4.7%)</td>
</tr>
<tr>
<td>Eclampsia n (%)</td>
<td>0</td>
</tr>
<tr>
<td>Urinary infection n (%)</td>
<td>12 (14.1%)</td>
</tr>
<tr>
<td>Placenta previa n (%)</td>
<td>0</td>
</tr>
<tr>
<td>Abruptio placenta n (%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Chorioamnionitis n (%)</td>
<td>0</td>
</tr>
<tr>
<td>Endometritis n (%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Post-partum hemorrhage n (%)</td>
<td>3 (3.5%)</td>
</tr>
<tr>
<td>Episiotomy n (%)</td>
<td>66 (91.7%)</td>
</tr>
<tr>
<td>Laceration n (%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Mode of labor n (%)</td>
<td>72 (84.7%)</td>
</tr>
<tr>
<td>Cesarean section</td>
<td>13 (15.3%)</td>
</tr>
</tbody>
</table>

N: non-significant

<table>
<thead>
<tr>
<th>TABLE 2. Association between perinatal outcomes and maternal age</th>
<th>Maternal age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>≤15</td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>36.64±3.61</td>
</tr>
<tr>
<td>Preterm delivery</td>
<td>36 (42.4%)</td>
</tr>
<tr>
<td>Early preterm delivery (&lt;34 weeks)</td>
<td>18 (21.2%)</td>
</tr>
<tr>
<td>Birth weight (gram)</td>
<td>2799.78±791.09</td>
</tr>
<tr>
<td>LBW (&lt;2500 gram)</td>
<td>29 (34%)</td>
</tr>
<tr>
<td>VLBW (&lt;1500 gram)</td>
<td>6 (7%)</td>
</tr>
<tr>
<td>IUGR</td>
<td>2 (2.4%)</td>
</tr>
<tr>
<td>LGA</td>
<td>0</td>
</tr>
<tr>
<td>PROM</td>
<td>8 (9.4%)</td>
</tr>
<tr>
<td>5th minute Apgar score &lt;7</td>
<td>6 (7%)</td>
</tr>
<tr>
<td>Fetal death</td>
<td>3 (3.5%)</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>2 (2.4%)</td>
</tr>
<tr>
<td>Admission to NICU</td>
<td>16 (18.8%)</td>
</tr>
</tbody>
</table>

LBW: low birth weight; VLBW: very low birth weight; IUGR: intrauterine growth restriction; PROM: premature rupture of membrane; LGA: large for gestational age; NICU: neonatal intensive care unit; N: non-significant

<table>
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<tr>
<th>TABLE 3. Adjusted OR for association between maternal age, and maternal and perinatal outcomes</th>
<th>Maternal age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>≤15 Adjusted OR</td>
</tr>
<tr>
<td>Preterm delivery</td>
<td>2.69 (1.62-4.45)**</td>
</tr>
<tr>
<td>Early preterm delivery (&lt;34 weeks)</td>
<td>2.63 (1.30-5.33)**</td>
</tr>
<tr>
<td>LBW (&lt;2500 g)</td>
<td>1.26 (0.61-2.61)</td>
</tr>
<tr>
<td>IUGR</td>
<td>0.61 (0.14-2.6)</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>0.59 (0.81-1.69)</td>
</tr>
<tr>
<td>Gestational Diabetes</td>
<td>-</td>
</tr>
<tr>
<td>PROM</td>
<td>1.01 (0.46-2.21)</td>
</tr>
<tr>
<td>Anemia</td>
<td>1.91 (1.01-3.62)*</td>
</tr>
<tr>
<td>5th minute Apgar score &lt;7</td>
<td>1.81 (0.39-8.35)</td>
</tr>
<tr>
<td>Fetal death</td>
<td>4.94 (1.15-21.27)</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>21.09 (2.89-153.91)**</td>
</tr>
<tr>
<td>Admission to NICU</td>
<td>1.06 (0.55-2.06)</td>
</tr>
</tbody>
</table>

LBW: low birth weight; IUGR: intrauterine growth restriction; PROM: premature rupture of membrane; NICU: neonatal intensive care unit

Logistic regression between adolescent mothers aged ≤15 years, 16-19 years and the adult reference group aged 20-34.

*p<0.05, **p<0.01, ***p<0.001.

risk of anemia than mothers aged 20-34 years. Considering other maternal morbidities, chorioamnionitis, endometritis, laceration at birth and postpartum hemorrhage were not different between adolescent and adult mothers.

**DISCUSSION**

The present study investigated the correlation between maternal age and the risk of adverse maternal and perinatal outcomes in our center. Our center accounts for approximately 10% of the total births in Istanbul, which is the biggest city in Turkey. This study demonstrated that our population had a high teenage birth rate, similar to most of the studies from developed and developing countries (24,25).

Younger maternal age is associated with being unmarried, primiparous and under-educated, alcohol/substance abuse, heavy smoking and inadequate prenatal care, which may lead to adverse pregnancy outcomes (2,16-22). Young mothers may also be more likely to have a pregnancy due to sexual abuse compared with adult mothers, which could lead to an impaired stress response or to variable behaviors that increase the likelihood of preterm delivery (22). To evaluate the effect of younger maternal age on pregnancy outcomes, these confounding variables have to be considered. Our population was comprised of Muslim women. Teenage pregnancies were almost always desired and these women are married. Also, because of traditional and religious thoughts, alcohol or substance abuse is almost unheard of (26). Sexual abuse pregnancies constituted a very small portion of all adolescents in our center; we therefore excluded this population due to there more likely being an effect on pregnancy outcomes. Also, this study included only singleton primiparous women between teenage and adult groups due to possible effect of parity on pregnancy outcomes.

This study confirmed increased risk of prematurity in younger adolescent group after adjusting for confounding variables, similar to previous studies (3-16). Scholl et al. (17) explained the association between low gynecological age (conception within 2 years after menarche) and preterm delivery as insufficiency in maturity of the uterine and cervical blood supply may cause susceptibility young pregnant women to subclinical infection, prostaglandin production increase and a trend towards the increased incidence of preterm delivery. We did not include the incidence of genital tract infections. However, lower urinary tract infection, which was considered a reflection of genital tract infection, was found to be significantly higher in younger adolescents. The present study supported biological immaturity in the younger adolescent group with a higher incidence of PROM compared with older adolescents.

It was thought to be associated with higher rates of genitourinary infection. On the other hand, the relationship between preterm delivery and the low gynecological age (<16 years) continued after adjustment for urinary tract infection, PROM and the other confounding variables. The other explanation of preterm delivery for younger adolescents, short cervix (≤25mm) and small uterine volume may also be more common among younger mothers (27,28).

This study also confirmed the higher risk of LBW among infants of younger adolescent mothers, as found in the most previous studies (4-10). However, in accordance with Vienne et al. (2), these associations were not significant after adjusting for confounding variables. The results of studies related to the association of teenage pregnancy and IUGR are contradictory (11,12); in fact, some of them were not adjusted for confounding factors. We observed a lower incidence of intrauterine growth restriction in teenage pregnancy, especially in the older adolescent group. The disappearance of the higher risk of LBW among infants of adolescent mothers could be associated with lower rates of IUGR in the adolescent group compared with the adult group. Although it may be due to the small sample numbers, the present study showed an increased risk of intrauterine fetal deaths in pregnant young adolescents, consistent with other studies (2,3,8,11,14) (adjusted OR: 4.94). On the contrary, some large population studies reported that fetal death was usually either unaffected or decreased in cases with younger maternal age (3,4,13,15). Also, conflicting results were reported in previous investigations about neonatal mortality in adolescent pregnancy (4,6,8-11,13,14). In our study, infants from younger adolescent mothers showed a higher risk of early neonatal death related to preterm delivery and LBW (adjusted OR: 21.09), although this may be due to the small sample numbers.

In accordance with the previous reports from either developed or developing countries, we found that adolescent mothers more frequently experienced anemia than adult mothers (3-6,9,10). Iron requirements during adolescence significantly increase due to faster growth spurts and the start of menses (29). Moran emphasized that low iron stores before pregnancy in young women makes them more prone to iron deficiency in pregnancy and most cases had insufficient dietary intake (30). In agreement with other studies (4,12), we found that gestational diabetes was lower in adolescent women. This supports the need for screening for gestational diabetes in young women with risk factors. Either increased (3-5) or decreased risks (10,13) of preeclampsia have been reported in other studies. In addition, we found significantly lower incidence of preeclampsia amongst teenage mothers in accordance with Vienne et al. (2). In this study, adolescent mothers were more likely to have a vaginal delivery and had a lower caesarean...
delivery rate, as reported in many studies carried out to date (4-8,13). The rate of CPD as an indication of cesarean delivery was observed to be lower in adolescent mothers. Higher vaginal delivery rates in adolescent mothers may be explained by favored myometrial function, greater elasticity of the connective tissue, lower compliance of the cervix and low birth weight babies (31,32). The rate of episiotomy in our study was significantly higher among adolescent pregnancy, particularly among young adolescents. However, the rate of perineal tears did not differ between adolescent and adult pregnancies. Our center is a teaching hospital where most deliveries are carried out by residents and students in training. Episiotomy is usually performed against the risk of perineal tears in primiparous pregnancy. We therefore believe that this high episiotomy rate might have prevented perineal tears.

We acknowledge a number of limitations of our study because of the retrospective characteristic of the analysis. We could not assess some factors which are known to have an effect on adverse pregnancy outcomes, such as pre-pregnancy body mass index, weight gain during pregnancy, family income, employment and sexually transmitted disease. Furthermore, although the size of the cohort was appropriate, the younger adolescent and adult groups were not represented by optimal numbers of individuals. Therefore, some of the borderline associations could potentially reach significance in larger samples Also, our study reflects the population in one center and one country; therefore, our results may not apply to all populations.

In conclusion, the results of the present study confirm that adolescent pregnancy should be evaluated in two groups as young and older adolescents based on biological immaturity. Young adolescent mothers were more likely to deliver pre-term and experience a high risk of fetal and neonatal death. Therefore, young adolescent pregnancies, which have adverse perinatal outcomes, need further attention and investigation. Our mission should be aimed at reducing the numbers of adolescent pregnancies and providing adequate antenatal care for young pregnant women.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the local ethics committee. (19.12.2011/19890)

**Informed Consent:** Written informed consent was obtained from the parents of the patients who participated in this study.

**Peer-review:** Externally peer-reviewed.


**Conflict of Interest:** No conflict of interest was declared by the authors.

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**REFERENCES**

11. Malabarey OT, Balayla J, Klam SL, Shrim A, Abenhaim HA. Pregnancies in young adolescent mothers: a population-ba-


