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Original Article

Maternal and neonatal outcomes of adolescent pregnancy

Volkan Karataşlı*, Ahkam Göksel Kanmaz, Abdurrahman Hamdi İnan, Adnan Budak, Emrah Beyan

University of Health Sciences Tepecik Education and Research Hospital, İzmir, Turkey

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ABSTRACT

Objective: To examine the maternal and neonatal outcomes of adolescent pregnancies.
Methods: Deliveries that occurred in a high-volume tertiary center between January 2013 and December 2016 were retrospectively analyzed. We studied pregnant women who were under 19 years of age at the time at which they gave birth, and who underwent regular follow-up. Pregnancies associated with chromosomal abnormalities, early pregnancy losses (before 20 weeks), and ectopic pregnancies were excluded.
Results: In all, 101 pregnant women aged <15 years and 3611 aged 15–19 years were enrolled. The control group contained 13,501 randomly selected pregnant women aged 25–30 years. The median gestational week at delivery was lower in adolescents. Adolescent pregnancies were associated with higher rates of threatened abortion and pre-eclampsia. Gestational diabetes mellitus was less common, whereas the risk for cesarean section was higher, in adolescents. In addition, women aged <15 years were at higher risk for preterm delivery. The rates of <3rd percentile birth weight percentiles by gestational age were 6.9%, 5.1%, 4.2% and <10th percentile were 16.8%, 14.5%, 11% in the three groups, respectively. The 5 min Apgar scores were lower for the babies of adolescents, and the requirement of newborn intensive care was higher for the infants of mothers aged <15 years.
Conclusion: Adolescent pregnancy is a significant issue worldwide. Adverse outcomes differ among study populations, but both preterm delivery and low birth weight are of concern, as are a higher cesarean rate.

Introduction

Adolescent pregnancy is defined by the World Health Organization (WHO) as pregnancy in women aged 10–19 years old, with those aged 10–14 years termed younger adolescents [1]. Sixty percent of all adolescent pregnancies culminate in birth [2]. Although the figure differs among countries, adolescent births constitute about 11% of all births [3]. The rates of adverse maternal and neonatal outcomes are higher for adolescent mothers [4,5]; these include preterm delivery, low birth weight, and a need for newborn intensive care [4]. However, there are conflicting results whether pre-eclempsia is increased or decreased in adolescents [6–8]. Furthermore, the findings regarding Apgar scores for the newborns of adolescents are contradictory [9,10]. Also some studies have found that the risks of maternal and neonatal mortality do not differ [9–11]. Lack of prenatal care is a risk factor of poor perinatal outcome among adolescents [4,9–11]. In a study conducted in Turkey, it was reported that adolescents with adequate prenatal care are not at increased risk of adverse obstetric outcomes [12].

Here, we explore the maternal outcomes of adolescent pregnancies with adequate prenatal care in a high volume tertiary center, including threatened abortion, hyperemesis gravidarum, pre-eclempsia, gestastional diabetes mellitus, placental abruption, placenta previa, cesarean rate, preterm delivery rate and neonatal outcomes, including birth weight in gestation, low birth weight rate, 5 min Apgar score, need for intensive care unit, stillbirth rate.

Materials and methods

We retrospectively studied deliveries between January 2013 and December 2016 at an urban tertiary high-volume center located in the Aegean region of Turkey which is in relatively higher level of development. We enrolled pregnant women aged <15 years and 15–19 years as adolescent pregnancy group according to WHO groups (two groups) [1]. According to the definition of the International Federation of Gynecology and Obstetrics (FIGO) in 1958 on “Elderly primigravidae” and for to avoid unbalanced study and control groups were randomized as pregnant women aged 25–

* Corresponding author at: Bahriye Üçok Mah. 1823 Sok. No:3/9, Karşıyaka, İzmir, Turkey.
E-mail address: volkankaratasli@yahoo.com (V. Karataşlı).

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30 years with SPSS software. Demographic information, pregnancy and delivery outcomes, and neonatal data were retrieved from the hospital information system, delivery room records, and newborn examination cards. Maternal age was defined as that at the time of delivery. Gestational weeks were calculated based on the time of the last menstrual period or the crown rump length in the first trimester. Gestations completed after 20 weeks were defined as deliveries. Pregnancies associated with chromosomal abnormalities, early losses before 20 weeks, and ectopic pregnancies were excluded. Pregnancies culminating in birth and associated with adequate follow-up (at least four prenatal visits, as is compulsory in Turkey) were enrolled. All pregnant adolescents were supported by social workers. Delivery before gestational week 37 was considered as preterm birth, and these pregnancies were subgrouped among themselves as moderate-late preterm pregnancy (32–37 weeks), very preterm (28–32 weeks) and extreme preterm (<28 weeks). Birth weight percentiles by gestational age was calculated from Fenton growth charts [13]; 3rd and 10th percentiles were reviewed. Newborn examinations, 5 min Apgar scores, and any need for intensive care unit admission were analyzed. SPSS (ver. 22) software was used for all statistical analyses and a p-value < 0.05 was considered to reflect statistical significance. Student's *t*-test and the Mann–Whitney *U* test were used to compare normally distributed continuous variables; the chi-square and Fisher's exact test (depending on patient numbers) were employed to compare categorical variables. Odds ratios and adjusted odds ratios were calculated via logistic regression. The following potential confounders were included in the adjusted models; body mass index (BMI) (classified into underweight (18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), obese (≥30 kg/m^2)) and birth weight (classified into birth weight percentiles from Fenton growth charts). These factors are known risk factors for various adverse pregnancy outcomes and may be linked with maternal age therefore they are potential confounders. The study was approved by our institutional ethics committee.

Results

A total of 42,280 deliveries occurred during the study period, 8.8% in adolescents. We enrolled 101 pregnant girls aged <15 years and 3611 aged 15–19 years. The control group contained 13,501 randomly selected pregnant women aged 25–30 years. Demographic data are listed in Table 1. The median group ages were 15, 18, and 27 years, respectively (p < 0.001). The median gestational week at delivery was lower in adolescents (p = 0.001). Nulliparity was more common in adolescents, but the multiple pregnancy rate and body mass index were significantly lower in adolescent than in controls (p < 0.001, p < 0.001, and p = 0.03, respectively).

Pregnancy complications and delivery outcomes are summarized in Table 2. The threatened abortion and pre-eclampsia rates were significantly higher in adolescents (p = 0.046 and p = 0.004, respectively). Gestational diabetes mellitus was significantly less common in adolescents (p < 0.001). The cesarean birth rate was significantly lower in women aged 15–19 years (0.9%), and similar for those aged <15 years (2%), compared to controls (1.9%) (p = 0.02). The risk for preterm delivery was higher in the <15 years age group (32.7%) (p < 0.001).

The neonatal outcomes are listed in Table 3. The mean birth weight was significantly lower in adolescents (p < 0.001), with the rates of <3rd percentile birth weight percentiles by gestational age were 6.9%, 5.1%, 4.2% and <10th percentile were 16.8%, 14.5%, 11%, in the three groups, respectively. The 5 min Apgar score was significantly lower for the neonates of adolescents (p = 0.003), and the need for newborn intensive care was significantly higher for neonates of those aged <15 years (p = 0.014). The logistic regression data are presented in Table 4. No significant differences in the rates of threatened abortion, gestational diabetes mellitus, or pre-eclampsia were evident between the two adolescent groups. Compared to controls, the risk for cesarean section was higher in the <15 years (adjusted OR 2.66, 95% CI 1.72–3.97, p < 0.05) and 15–19 years (adjusted OR 1.91, 95% CI 1.77–2.06, p < 0.05) age groups. Girls < 15 years of age were at higher risk for preterm delivery (OR 2.44, 95% CI 1.61–3.72, p < 0.05).

Discussion

The incidence of adolescent pregnancy differs among countries, and adolescents account for 11% of all pregnancies [1]. In African countries, the average adolescent birth rate is 141/1000 females; the European figure is 25/1000 [1]. Our rate was lower than the global average, this may be associated with the social/ethnic fabric of the study population that is in a higher development province in our country. In a previous study, 3.4% of women reported that they first became pregnant before the age of 15 years, and 39.5% first gave birth aged 15–19 years [14]. Similarly, most of our pregnant adolescents were nulliparous. In addition, the singleton pregnancy rate is higher in adolescents [15]. Levels of follicle-stimulating hormone, and use of fertility-enhancing treatments, increase with age, which helps explain why multiple pregnancies are more common in older women [15]. Adolescents in our study were less overweight than older women, in line with a previous study [10]. The nutritional needs of adolescents in general, and pregnant adolescents in particular, are higher than those of older women [16].

Table 1
Demographic data by maternal age group.

Demographic	Aged <15 years n = 101 (0.6%)	Aged 15–19 years n = 3611 (21%)	Controls aged 25–30 years n = 13,501 (78.4%)	p-value
Age (years), median (range)	15 (12–15)	18 (16–19)	27 (25–30)	**<0.001**
Gestational week, median (range)	38 (28–41)	38 (21–41)	39 (20–41)	**0.001**
Parity				**<0.001**
Nulliparity	91 (90.1%)	2916 (80.8%)	3707 (27.5%)	
Multiparity	10 (9.9%)	695 (19.2%)	9794 (72.5%)	
Number of fetuses	97 (96%)	3544 (98.1%)	12,976 (96.1%)	**<0.001**
One (n, %)	4 (4%)	67 (1.9%)	525 (3.9%)	
Two (n, %)				
Pre-pregnancy BMI (mean ± SD)	20.5 ± 2.8	21.2 ± 3.8	24.1 ± 4.1	**0.03**
underweight (n, %)	12(11.9%)	402 (11.1%)	874 (6.5%)	
normal (n, %)	73 (72.9%)	2392 (66.2%)	8394 (62.1%)	
overweight (n, %)	12 (11.1%)	555 (15.3%)	2332 (17.2%)	
obese (n, %)	4 (4.1%)	262 (7,2%)	1901 (14%)	

BMI: Body mass index (kg/m^2); SD: standard deviation.
Bold: p<0.05.

Table 2
Pregnancy and delivery outcomes by maternal age group.

Event	Aged < 15 years n = 101 (0.6%)	Aged 15–19 years n = 3611 (21%)	Controls aged 25–30 years n = 13,501 (78.4%)	p-value
Threatened abortion (n, %)	1 (1%)	123 (3.4%)	556 (4.1%)	**0.046**
Hyperemesis gravidarum (n, %)	/	77 (2.1%)	377 (2.7%)	0.128
Gestational diabetes mellitus (n, %)	1 (1%)	41 (1.1%)	607 (4.8%)	**<0.001**
Pre-eclampsia (n, %)	1 (1%)	90 (2.5%)	474 (3.5%)	**0.004**
Placental abruption (n, %)	/	10 (0.3%)	41 (0.3%)	0.325
Placenta previa (n, %)	/	5 (0.1%)	57 (0.4%)	0.121
Vaginal delivery (n, %)	99 (98%)	3577 (99.1%)	13,237 (98%)	
Cesarean delivery (n, %)	2 (2%)	34 (0.9%)	263 (1.9%)	0.002
Fetal presentation during vaginal birth				0.275
Vertex (n, %)	96 (95%)	3474 (96.2%)	12,959 (96%)	
Breech (n, %)	5 (5%)	131 (3.6%)	489 (3.6%)	
Other (n, %)	/	6 (0.2%)	53 (0.4%)	
Preterm delivery				**<0.001**
Moderate-Late Preterm (n, %)	28 (27.7%)	523 (14.4%)	2632 (19.4%)	
Very Preterm (n, %)	5 (4,9%)	77 (2.1%)	404 (2.95%)	
Extreme Preterm (n, %)	0(%)	45 (1.2%)	315 (2.3%)	

Bold: p<0.05.

Table 3
Neonatal outcomes by maternal age group.

Outcome	Aged <15 years n=101 (0.6%)	Aged 15–19 years n=3611 (21%)	Controlsaged 25–30 years 13,501 (78.4%)	p-value
Birth weight (g) (mean ± SD)	2934 ± 537.2	3,021 ± 629.3	3,112 ± 681.6	**<0.001**
Birth weight percentiles by gestational age (n, %)				**0.012**
<3rd percentile	7 (6.9%)	184 (5.1%)	556 (4.2%)	
<10th percentile	17 (16.8%)	525 (14.5%)	1458 (11%)	
5 min Apgar score <7, (n, %)	5 (5%)	136 (3.8%)	472 (3.5%)	**0.003**
Newborn intensive care requirement (n, %)	17 (16.8%)	309 (8.6%)	1224 (9.1%)	**0.014**
Stillbirth (n, %)	1 (1%)	51 (1.4%)	201 (1.5%)	0.871

SD: standard deviation.
Bold: p<0.05.

Table 4
Effects of adolescent maternal age and parity on pregnancy and neonatal complications.

	Aged <15 years n=101 (0.6%)		Aged 15–19 years n=3611 (21%)	
	Crude OR (95% CI)	Adjusted OR[a] (95% CI)	Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Threatened abortion	0.23 (0.03–1.67)	/	0.82 (0.76–1.01)	/
Gestational diabetes mellitus	**0.19 (0.20–1.42)**	0.23 (0.32–1.65)	**0.22 (0.16–0.31)**	0.26 (0.03–1.65)
Pre-eclampsia	0.27 (0.03–1.19)	/	**0.70 (0.55–0.88)**	0.79 (0.63–1.10)
Cesarean section	**2.61 (1.76–4.02)**	**2.66 (1.72–3.97)**	**1.96 (1.82–2.11)**	**1.91 (1.77–2.06)**
Preterm delivery	**2.44 (1.61–3.72)**	**0.34 (0.19–0.65)**	1.09 (0.99–1.20)	/
Low birth weight	1.59 (0.97–2.60)	/	1.10 (0.99–1.21)	/

The reference category was the pregnant group aged 25–30 years; n = 13,501.
[a] Statistically significant crude odds ratios were adjusted for maternal BMI and birth weight.

Vaginal bleeding in early pregnancy is associated with later adverse outcomes [17], and such bleeding is more common in adolescents, threatening abortion [18]. Pregnant adolescents exhibit less gestational diabetes mellitus than older women [19,20], as we also found. This result supported the previous reports that recommended that screening for gestational diabetes be applied only on the basis of risk factors in adolescents [21]. The adolescent pre-eclampsia rate was higher in our study than in other works, but previous data are conflicting [7,8], attributable to geographic and socio-demographic variation of the study populations [4]. Because preeclampsia is more common in nulliparous women, it is thought to be more common in our study group [22]. However it was also mentioned that since the adolescents have less comorbidities like chronic hypertension and gestational diabetes mellitus, they would be protected against pre-eclampsia [19].

Cesarean section rates differ among countries [3]. Özdemirci et al. [23] found that pregnant adolescents have higher cesarean rates. However, another study found no difference between adolescents and older women [7]. In the present study, adolescents aged 15–19 years had a higher vaginal delivery rate than other groups. In multivariate regression, the cesarean rate in adolescents <15 years of age was higher than in the control group. This high rate may be caused by their biologic immaturity [5].

The incidence of preterm delivery has been investigated in several studies [4,20,24], and some studies have found that adolescents aged 15–19 years are at higher risk for preterm birth [23], whereas others have not found significant differences between adolescents and adults [25]. In multivariate regression, we found that girls aged <15 years were at high risk for preterm labor. Although, preterm delivery is a multifactorial pregnancy complication, it is thought that the immature uterus and progesterone resistance shown in adolescents may also be associated with these results [5]. Also the socio-demographic factors like marital status and education level, associated with adolescents may effect the risk for preterm labor [4]. We found that

pregnant adolescents were at higher risk for low birth weight, as previously reported [10,26]. Adolescents have shown to be a higher prevalence of smoking, so this may also increase the risk of low birth weight [27]. Infants born to adolescents are at higher risk for mortality and morbidity than those born to adults, and infants born to women aged <15 years are at highest risk [26], as we also found. Small-for-gestational-age infants tend to be more common among adolescent mothers [4], and our results are in line with those findings.

Adolescent use of prenatal care varies. Many studies have found that adolescents tend to not seek prenatal care [28]. However Minjares-Granillo et al. [8] reported no difference between adolescents and adults. Bükülmez et al. [12] pointed out that if adolescents receive adequate antenatal care, they are not at increased risk of adverse obstetric outcomes. All of our pregnant women received adequate prenatal care.

Previous studies have indicated that 5 min Apgar scores vary by maternal age. Vieira et al. [9] reported lower Apgar scores in the infants of adolescents; our results support those findings. Nontheless, Torvie et al. [10] reported that low Apgar scores are not associated with neonatal risks. Although, the inadequate prenatal care was shown to increase the risk for low Apgar scores, all of the mothers in our study had adequate prenatal care [9].

Several reports have indicated that admission rates to the newborn intensive care unit (NICU) do not differ between the infants of adolescents and adults [6,29]. However, Kirbas et al. [11] reported a higher rate of NICU admission of infants born to adolescents, as do we. This may reflect the higher level of preterm birth and the lower birth weight of such infants. The stillbirth rate has been reported to be elevated in infants born to adolescents [29], but we did not find this in our study. Lewis et al. [29] found that late adolescents (aged 17–18 years) had higher risks for stillbirth and stillbirth was also associated with low socioeconomic status in young mothers. However, the number of pregnants in their study were lower and stillbirth rates were higher compared with our study. It is thought that the sociodemographic factors of the study populations are different and also adequate prenatal care in our study may be related to low stillbirth rates [6].

A limitation of our study is that the work was retrospective in nature. However, the number of pregnant adolescents studied is one of the highest single-center figure in the literature reported from our country. In addition, all mothers were cared for in a tertiary center; thus, the quality of prenatal care was high, minimizing negative outcomes. Future, prospective multicenter studies are required to define how best to manage adolescent pregnancies.

Conclusion

Adolescent pregnancy is a significant issue worldwide. Although outcomes differ among populations, both preterm delivery and low birth weight are of concern, as are elevated cesarean section rates.

Conflict of interest

The authors declare that they have no conflicts of interest.

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