Gynecology and Obstetrics Clinical Medicine 3 (2023) 100–105

Contents lists available at ScienceDirect

Gynecology and Obstetrics Clinical Medicine

journal homepage: www.keaipublishing.com/en/journals/gynecology-and-obstetrics-clinical-medicine

Research Paper

Pregnancy, childbirth and neonatal outcomes associated with adolescent pregnancy

Amene Ranjbar [a], Maliheh Shirzadfard Jahromi [b], Banafsheh Boujarzadeh [b], Nasibeh Roozbeh [b], Vahid Mehrnoush [b,c], Fatemeh Darsareh [b,*]

[a] Fertility and Infertility Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[b] Mother and Child Welfare Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[c] Urology Department, Northern Ontario School of Medicine, Thunder Bay, Ontario, Canada

ARTICLE INFO

Keywords:
Adolescents
Pregnancy
Childbirth
Perinatal outcome
Neonatal outcomes

ABSTRACT

Objective: To assess the obstetric and neonatal outcomes associated with adolescent pregnancy in Iran.
Methods: We retrospectively assessed women who gave birth between January 1st, 2020, and January 1st, 2022. These pregnant women were separated into two groups: (1) women aged 19 and younger; (2) women aged 20–34 years. Main outcome measures include preterm birth, maternal comorbidities, preeclampsia, eclampsia, low birth weight (LBW), intrauterine growth restriction (IUGR), placenta abnormalities, placenta abruption, chorioamnionitis, meconium fluid, fetal distress, methods of delivery, rate of cesarean section (CS), perineal lacerations, postpartum hemorrhage, childbirth trauma, shoulder dystocia, congenital malformation, and unfavorable maternal and neonatal outcome. Logistic regression models were used to determine the influence of teenage pregnancy on adverse pregnancy and childbirth outcomes.
Results: Of 7033 deliveries, 92.4% of women were adults, and 7.6% were adolescents. Adolescents residing in rural districts were more common than adults (42.3% vs. 33.7%). However, access to prenatal facility care was the same as the majority of women had 6-10 prenatal care visits during their pregnancy. There was no difference in the risk of preeclampsia, placenta abruption, placenta previa, fetal distress, preterm labor, shoulder dystocia, perineal lacerations, childbirth trauma, congenital malformation, postpartum hemorrhage, intensive care unit admission, maternal death, and unfavorable neonatal outcome including stillbirth, neonatal intensive care unit admission, neonatal death in adolescent pregnancies compared to adults. Adolescents had a significantly higher risk of LBW (OR: 1.47, 95%CI: 1.01–2.73), IUGR (OR: 1.96, 95%CI: 1.31–2.45), and meconium fluid (OR: 1.74, 95%CI: 1.41–2.32), however, there was no statistically significant difference after adjusting the confounding factors. Compared with adults, adolescents had a significantly lower risk of CS (aRR: 0.67, 95%CI: 0.51–0.77) and a lower risk of gestational diabetes (aRR: 0.78, 95%CI: 0.51–0.95).
Conclusions: Although we found no serious consequences of adolescent pregnancy, more research is needed to reach a more accurate conclusion about teenage pregnancy.

1. Introduction

Adolescent pregnancy is defined as pregnancy in girls aged 10–19 years. It is estimated that about 11% of births worldwide are to adolescents aged 15–19 years, and more than 90% of these births occur in low- and middle-income countries.[1] Despite global attempts to eliminate child marriage, 28% of young women in developing countries marry before reaching the age of eighteen.[2] An estimated 21 million females aged 15–19 in developing countries become pregnant, with around 12 million giving birth annually.[3] A large body of research has found a link between

* Corresponding author. Mother and Child Welfare Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
E-mail address: famadarsareh@yahoo.com (F. Darsareh).

Publishing services by Elsevier on behalf of KeAi

https://doi.org/10.1016/j.gocm.2023.02.002
Received 29 July 2022; Received in revised form 29 December 2022; Accepted 28 February 2023
Available online 25 May 2023
2667-1646/© 2023 The Authors. Publishing services by Elsevier B.V. on behalf of KeAi Communications Co. Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.

adolescent pregnancy and poor prenatal outcomes.[4–7] Teenage pregnancies have serious health consequences for both mothers and their children. Pregnancy and childbirth complications are the leading cause of death among girls aged 15–19 years worldwide, accounting for 99% of global maternal deaths among women aged 15–19 years.[3] Infants born to adolescents are more likely to be premature, have a low birth weight (LBW), be small for gestational age, and have a low Apgar score at 5 min.[6] Furthermore, infants born to young mothers have a higher risk of perinatal mortality, neonatal mortality, post-neonatal mortality, and stillbirth.[6,7] Maternal complications, including anemia, gestational diabetes, and preeclampsia, have also been reported to increase in teenagers.[8,9] According to the literature, adolescent pregnant women are at a higher risk for adverse pregnancy and birth outcomes; however, most research has been conducted in developed countries. When comparing any kind of health problem between industrial and developing countries, geographical context, differences in social inequality, and type of health care system are essential considerations; thus, we aimed to assess the obstetric and neonatal outcomes associated with adolescent pregnancy in Iran.

2. Methods

We retrospectively assessed women who gave birth at Khaleej-e-Fars Hospital in Bandar Abbas, Iran, between January 1st, 2020, and January 1st, 2022. Data were extracted by trained collectors from the "Iranian Maternal and Neonatal Network (IMaN Net)," a valid national system, using electronic patient records. These pregnant women were separated into two groups based on their age: (1) women aged 19 and younger; (2) women aged 20–34 years. Demographic and obstetrical factors include educational level, medical insurance, living place, access to prenatal care facilities, number of prenatal care visits, smoking status, gestational age, parity, preterm birth, maternal comorbidities, preeclampsia, eclampsia, low birth weight (LBW), intrauterine growth restriction (IUGR), placenta abnormalities (previa/acreta), placenta abruption, chorioamnionitis, meconium fluid, fetal distress, methods of delivery, rate of cesarean section (CS), perineal lacerations, postpartum hemorrhage, childbirth trauma, shoulder dystocia, congenital malformation, and unfavorable maternal and neonatal outcome were compared between two groups.

The IBM Statistical Package for the Social Sciences Statistics, version 25, was used to examine the data (IBM Corp, Armonk, NY). Categorical variables were expressed as percentages. The Chi-square test was used to assess the relationship between categorical factors and maternal age groups. The influence of the adolescent group on the risk of unfavorable pregnancy outcomes was evaluated using univariate and multivariate logistic regression, with the adult group serving as the reference group. After adjusting for demographic and obstetrical variables (living place, education, parity, fetal presentation, and history of previous CS), logistic regression models were used to assess the influence of teenage pregnancy on adverse pregnancy and childbirth outcomes (preeclampsia, chorioamnionitis, gestational diabetes, placenta abruption, placenta previa, meconium fluid, fetal distress, preterm labor, LBW, IUGR, rate of CS, shoulder dystocia, perineal lacerations, childbirth trauma, congenital malformation, postpartum hemorrhage, intensive care unit admission, maternal death, and unfavorable neonatal outcome including stillbirth, neonatal intensive care unit admission, neonatal death). The result was presented as odds ratio (OR) or adjusted odds ratio (aOR) and 95% confidence interval (CI). $P < 0.05$ was considered statistically significant, and all statistical tests were two-tailed.

3. Results

There were 7033 deliveries from January 1st, 2020, to January 1st, 2022. Of these, 6499 (92.4%) pregnant women belonged to the adult group (20–34 years old), and 534 (7.6%) pregnant women were 13–19 years old. All women in both groups were married. 6800 (96.7%) women were Iranian, while 233 (3.3%) were non-Iranian. Demographic and clinical characteristics are described by age groups in Table 1. Pregnant adolescents have lower levels of schooling than pregnant adults. Adolescents residing in rural districts were more common than adults (42.3% vs. 33.7%). However, access to prenatal facility care was the same as the majority of women had 6-10 prenatal care visits during their pregnancy. When it came to maternal comorbidities, adult women had a greater rate of thyroid disorders and COVID-19 than adolescents (Table 1).

The disparities in obstetrical (pregnancy and childbirth) outcomes between adolescents and adults are shown in Table 2. Women aged 13–19 years had a lower CS and gestational diabetes rate than those aged 20–34 but a greater meconium fluid, LBW, and IUGR ($P < 0.01$).

Table 3 represents the impact of teenage pregnancy on adverse events of pregnancy and childbirth based on logistic regression analysis. Compared with women aged 20–34 years, women aged 13–19 years had a significantly lower risk of cesarean delivery (aOR: 0.67, 95%CI: 0.51–0.77) and a lower risk of gestational diabetes (aOR: 0.78, 95%CI: 0.51–0.95). In addition, adolescents had a significantly higher risk of LBW (OR: 1.47, 95%CI: 1.01–2.73), IUGR (OR: 1.96, 95%CI: 1.31–2.45), and meconium fluid (OR: 1.74, 95%CI: 1.41–2.32), but there was no statistically significant difference after adjusting the confounding factors. There was no difference in the risk of preeclampsia, placenta abruption, placenta previa, fetal distress, preterm labor, shoulder dystocia, perineal lacerations, childbirth trauma, congenital malformation, postpartum hemorrhage, intensive care unit admission, maternal death, and unfavorable neonatal outcome including stillbirth, neonatal intensive care unit admission, neonatal death in adolescent pregnancies (Table 3).

4. Discussion

In our study, the adolescent pregnancy rate was 7.6%, lower than the rate reported in most developing countries.[1] In line with previous research[6,10] adolescent pregnant women had significantly lower levels of education than adult pregnant women. However, the access to prenatal care facilities and the number of prenatal care visits were similar to the adult group. Previous studies reported fewer numbers of prenatal care,[6,11] and less access to health insurance among adolescents.[12] Our study found that adolescent pregnant women living in rural areas were more common than adults, consistent with previous research.[13] Similar to the adults, all adolescents in our study population were married. In Iran and most Islamic nations, teenage pregnancies occur under married status. Parents may arrange marriages for their young daughters for financial reasons or to preserve the girls' safety or honor.[14,15] When underlying diseases in adolescent pregnant women were compared to adults, adults had a higher prevalence of thyroid dysfunction and COVID-19. Anemia, cardiovascular disease, overt diabetes, pyelonephritis, hepatitis, and HIV were not statistically different between the two groups. However, gestational diabetes in adolescents was lower than in adults. These findings were consistent with previous studies.[6,16]

In our study, the risk of adverse events such as preeclampsia, placenta abruption, placenta previa, fetal distress, preterm labor, shoulder dystocia, perineal lacerations, childbirth trauma, congenital malformation, postpartum hemorrhage, maternal death, stillbirth, maternal and neonatal intensive care unit admission, and neonatal death was not high in adolescents. According to the findings of this study, adolescent mothers were more likely than adults to have meconium fluid, LBW, and IUGR rates based on the chi-square test; however, we found that when covariates were adjusted for in the regression models, teenage pregnancy did not increase the risk of poor birth outcomes. Adults, on the other hand, had a higher risk of CS than adolescents, which was expected given that most adults were multiparous and some of them had previous CS, so it is possible that a significant amount of CS in adults was repeated CS. However, it should be mentioned that even after adjusting for the history of previous CS, the risk of CS in adults was higher than in adolescents. Analyzing the indications of CS revealed that for teenage mothers, the indications were mostly due to fetal distress, whereas for adults, the indications were mal-presentation and previous CS. The COVID-19, which was significantly higher in adults, could be one reason for the higher rate

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.

Table 1
Demographic and clinical characteristics of adolescents compared to adults n(%).

Variables		Total	Adolescents (13–19)	Adults (20–34)	*p*-value
Demographic Factors	**Educational level**				<0.001
	Illiterate	407 (5.8)	36 (6.7)	371 (5.7)	
	Elementary	1996 (28.4)	256 (47.9)	1740 (26.8)	
	High school	679 (9.6)	108 (20.2)	568 (8.7)	
	Diploma	2738 (38.9)	125 (23.4)	2615 (40.2)	
	Advanced	1213 (17.3)	9 (1.7)	1204 (18.5)	
	Living place				<0.001
	Urban	4617 (65.6)	308 (57.7)	4309 (66.3)	
	Rural	2416 (34.4)	226 (42.3)	2190 (33.7)	
	Medical insurance				0.327
	Yes	6751 (96)	504 (94.4)	6247 (96.1)	
	No	282 (4)	30 (5.6)	252 (3.9)	
	Access to prenatal care				1.000
	Yes	6967 (99.1)	529 (99.1)	6438 (99.1)	
	No	66 (0.9)	5 (0.9)	61 (0.9)	
	Number of prenatal care visits				0.781
	Less than 5	189 (2.7)	13 (2.5)	176 (2.8)	
	6-10 visits	5803 (82.5)	443 (82.5)	5360 (82.4)	
	More than 10 visits	1041 (14.8)	78 (14.6)	963 (14.8)	
	Smoking				0.817
	Yes	19 (0.3)	1 (0.2)	18 (0.3)	
	No	7014 (99.7)	533 (99.8)	6481 (99.7)	
Comorbidities	**Anemia**				0.102
	No	6825 (97)	516 (96.6)	6309 (97.1)	
	Hemoglobin 7-10	189 (2.7)	14 (2.7)	175 (2.7)	
	Hemoglobin less than 7	19 (0.3)	4 (0.7)	15 (0.2)	
	Cardiovascular disease				0.871
	No	6969 (99.1)	529 (99.1)	6440 (99.1)	
	Yes	64 (0.9)	5 (0.9)	59 (0.9)	
	Pyelonephritis				0.575
	No	7026 (99.9)	534 (100)	6492 (99.9)	
	Yes	7 (0.1)	0	7 (0.1)	
	Hepatitis				0.704
	No	7009 (99.7)	532 (99.6)	6477 (99.7)	
	Yes	24 (0.3)	2 (0.4)	22 (0.3)	
	HIV				0.729
	No	7029 (99.9)	534 (100)	6495 (99.9)	
	Yes	4 (0.1)	0	49 (0.1)	
	COVID-19				0.007
	No	6933 (98.6)	533 (99.8)	6400 (98.5)	
	Yes	100 (1.4)	1 (0.2)	99 (1.5)	
	Overt Diabetes				0.760
	No	7012 (99.7)	533 (99.8)	6479 (99.7)	
	Yes	21 (0.3)	1 (0.2)	20 (0.3)	
	Thyroid dysfunction				0.001
	No	6332 (90)	501 (93.8)	5831 (89.7)	
	Yes	701 (10)	33 (6.2)	668 (10.3)	

of CS, given that approximately 64% of pregnant women with COVID-19 delivered via cesarean route according to one study.[17] Another study in Wuhan, China found that 93% of pregnant women with COVID-19 had CS.[18] Another reason for the higher rate of CS in adults could be the higher rate of gestational diabetes, leading to fetal macrosomia. Women with gestational diabetes have a higher risk of CS than glucose-tolerant women.[19]

Adolescent pregnancy is frequently associated with poor outcomes for both mother and child. The effect of maternal age on obstetric and neonatal outcomes has been studied in different parts of the world, with varying results. In contrast to our findings, previous research has found an increase in poor maternal and neonatal outcomes such as LBW,[6,20] stillbirth,[21] preterm labor,[6,20] and maternal death.[10,22] Adolescent mothers were at higher risks of eclampsia, puerperal endometritis, and systemic infections than mothers aged 20–24 years in a WHO multi-country study involving 29 low- and middle-income countries [23]. Another study by Aka et al. found that adolescent pregnancy was associated with adverse pregnancy outcomes [24]. A variety of factors, including differences in sample size, medical service quality, and the social and cultural backgrounds of women and their families, could account for the contradictory results found in previous studies and this one.

Adolescent mothers are more likely to have a poor pregnancy outcome because of social determinants of health. For example, poor pregnancy outcomes in adolescent mothers are associated with rural residence, insufficient education, and low socioeconomic status.[5] Based on our findings, even though more adolescents than adults lived in rural areas and had lower levels of education, they had comparable levels of medical insurance, access to prenatal care, and an adequate number of prenatal care visits. Cities in Iran provide free prenatal care to nearly all pregnant women, including visits to general practitioners and midwives. Specialized maternity units in public hospitals handle almost all obstetric patients and births. As a result, regardless of socioeconomic status or place of residence, everyone has access to comprehensive prenatal care. This reduces the confounding effects that frequently complicate such studies. In addition, all of the adolescents were married, so we can infer that they had the support of their families. We hypothesized that the previously mentioned factors are protective against a poor prenatal outcome even though they were not explicitly tested in our research. However, it remains unclear whether poor pregnancies among adolescent mothers result from biological immaturity or poor socioeconomic circumstances. More research is needed to gain a more comprehensive perspective.

We found contradictory data here; adolescent women had no worse pregnancy outcomes. We believe this is due to adequate access to

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.

Table 2
Comparison of obstetrical (pregnancy and childbirth) outcomes of adolescents compared to adults n(%).

Variables	Total	Adolescents (13–19)	Adults (20–34)	*p*-value
Gestational age				0.589
Less than 37 weeks	896 (12.7)	62 (11.6)	834 (12.8)	
37–40 weeks	5126 (72.9)	386 (72.3)	4740 (72.9)	
40^{+1}–41 weeks	846 (12)	73 (13.7)	773 (11.9)	
More than 41 weeks	165 (2.3)	13 (2.4)	152 (2.3)	
Parity				<0.001
Primiparous	2336 (33.2)	434 (81.3)	1902 (29.3)	
Multiparous	4697 (66.8)	100 (18.7)	4597 (70.7)	
Gestational Diabetes				0.002
No	6115 (86.9)	502 (94.1)	5613 (86.4)	
GDM controlled with diet	580 (8.2)	29 (5.5)	551 (8.6)	
GDM controlled with medications	317 (4.5)	2 (0.4)	315 (5)	
Preeclampsia				0.095
No	6645 (94.5)	508 (95.1)	6137 (94.4)	
Yes	388 (5.5)	26 (4.9)	362 (5.6)	
Placenta abnormalities (previa/acreta)				0.393
No	7015 (99.7)	534 (100)	6481 (99.7)	
Yes	18 (0.3)	0	18 (0.3)	
Placenta abruption				0.897
No	6813 (96.9)	517 (96.8)	6296 (96.9)	
Yes	220 (3.1)	17 (3.2)	203 (3.1)	
Chorioamenionities				0.179
No	7006 (99.6)	529 (99.1)	6477 (99.7)	
Yes	27 (0.4)	5 (0.9)	22 (0.3)	
Meconium fluid				0.002
No	6129 (87.1)	441 (82.6)	5688 (87.5)	
Yes	904 (12.9)	93 (17.4)	811 (12.5)	
Fetal distress				0.103
No	6445 (91.6)	479 (89.7)	5966 (91.8)	
Yes	588 (8.4)	55 (10.3)	533 (8.2)	
Fetal presentation				0.356
Cephalic	6789 (96.2)	520 (97.4)	6249 (96.1)	
Breech	239 (3.4)	14 (2.6)	225 (3.5)	
Transverse	25 (0.4)	0	25 (0.4)	
Method of delivery				<0.001
Normal vaginal delivery	4816 (68.5)	413 (77.4)	4403 (67.7)	
Vacuumed delivery	73 (1)	4 (0.7)	69 (1.1)	
Cesarean section	2144 (30.5)	117 (21.9)	2027 (31.2)	
Indications of cesarean section				<0.001
Previous cesarean section	789 (26.8)	19 (16.2)	770 (38)	
Failure to progress	211 (9.8)	11 (9.4)	200 (9.9)	
Fetal distress	588 (27.4)	55 (47)	533 (26.3)	
Placenta abnormalities	238 (11.1)	17 (14.5)	221 (10.9)	
Mal-presentation	264 (12.3)	0	264 (13)	
Maternal comorbidities	54 (2.5)	15 (12.8)	39 (1.9)	
Grade 3 or 4 of perineal lacerations				0.674
No	7028 (99.9)	534 (100)	6494 (99.9)	
Yes	5 (0.1)	0	5 (0.1)	
Post-partum hemorrhage				0.121
No	6907 (98.2)	520 (97.4)	6387 (98.3)	
Yes	89 (1.3)	14 (2.6)	112 (1.7)	
Unfavorable maternal outcome				0.201
No	6962 (99)	524 (98.1)	6438 (99.1)	
Intensive care unit admission	69 (0.67)	10 (1.9)	32 (0.87)	
Death	2 (0.03)	0	2 (0.03)	
Low birth weight				0.003
No	6127 (87.1)	443 (83)	5684 (87.5)	
Yes	906 (12.9)	91 (17)	815 (12.5)	
Intra uterine growth retardation				0.006
No	6792 (96.6)	504 (94.4)	6288 (96.8)	
Yes	241 (3.4)	30 (5.6)	211 (3.2)	
Childbirth trauma[a]				0.902
No	7017 (99.7)	533 (99.8)	6484 (99.7)	
Yes	16 (0.3)	1 (0.2)	15 (0.3)	
Shoulder dystocia				0.125
No	6978 (99.2)	533 (99.8)	6445 (99.2)	
Yes	55 (0.8)	1 (0.2)	54 (0.8)	
Neonatal congenital malformation				0.120
No	6957 (98.9)	525 (98.3)	6432 (99)	
Yes	76 (1.1)	9 (1.7)	67 (1)	
Need for neonatal resuscitation				0.912
No	6427 (91.4)	490 (91.8)	5937 (91.4)	
The primary levels of resuscitation	420 (6)	33 (6.2)	387 (6)	
Advanced levels of resuscitation	186 (2.6)	11 (2)	175 (2.6)	

(*continued on next page*)

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.

Table 2 (*continued*)

Variables	Total	Adolescents (13–19)	Adults (20–34)	*p*-value
Unfavorable neonatal outcome				0.335
No	5694 (81)	435 (81.5)	5251 (80.9)	
Stillbirth	65 (0.9)	7 (1.3)	58 (0.9)	
Neonatal intensive care unit admission	1245 (17.7)	91 (17)	1154 (17.8)	
Death	29 (0.4)	1 (0.2)	28 (0.4)	

[a] Childbirth trauma: Clavicle fracture, Erb palsy, Klumpke palsy.

Table 3
Risk of adverse outcome of pregnancy and childbirth in adolescents.

Outcome	OR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Gestational Diabetes	0.53 (0.41–0.91)	<0.01	0.78 (0.51–0.95)	0.013
Preeclampsia	0.78 (0.56–0.99)	0.217	0.91 (0.35–2.42)	0.480
Placenta previa	0.88 (0.09–1.03)	0.304	0.89 (0.77–1.44)	0.393
Placenta abruption	1.08 (0.74–1.23)	0.561	1.01 (0.61–1.12)	0.770
Chorioamenionities	1.23 (1.01–1.76)	0.209	1.31 (1.07–1.59)	0.359
Meconium fluid	1.74 (1.41–2.32)	0.004	1.17 (0.99–1.22)	0.096
Fetal distress	1.66 (0.53–4.22)	0.109	1.35 (1.73–2.58)	0.780
Cesarean section	0.52 (0.48–0.81)	<0.001	0.67 (0.51–0.77)	<0.001
Grade 3 or 4 of perineal lacerations	–		–	
Post-partum hemorrhage	1.55 (0.99–1.79)	0.176	1.04 (0.241–1.52)	0.354
Maternal intensive care unit admission	1.92 (1.56–2.87)	0.247	1.86 (1.05–1.99)	0.428
Maternal death	–		–	
Low birth weight	1.47 (1.01–2.73)	<0.01	1.35 (1.17–2.96)	0.081
Intra uterine growth retardation	1.96 (1.31–2.45)	<0.01	1.88 (1.12–1.95)	0.095
Childbirth trauma	0.75 (0.34–0.98)	0.561	0.99 (0.69–1.04)	0.649
Shoulder dystocia	0.87 (0.31–0.90)	0.4.5	0.86 (0.65–0.95)	0.962
Neonatal congenital malformation	1.73 (1.33–2.01)	0.871	1.38 (1.45–1.87)	0.887
Stillbirth	2.8 (1.77–3.04)	0.376	1.98 (1.11–2.56)	0.871
Neonatal intensive care unit admission	0.78 (0.60–0.93)	0.587	0.88 (0.73–0.92)	0.997
Neonatal death	0.57 (0.31–0.99)	0.491	0.73 (0.56–0.87)	0.312

OR: Odds ratio; AOR: Adjusted odds ratio.

prenatal care, health insurance, and family support. We believe that these can be used in other countries. We understand that some ethnic differences might be in the way to fulfil them; however, the present data might be of use and generalizable to any other countries which faced many difficulties due to adolescent pregnancies.

The strength of our study is that our study registers are of high quality and in accordance with childbirth records. We investigated various factors associated with adolescent pregnancies, including pregnancy, childbirth, and neonatal outcome. The population study sample size was large enough to reflect the situation regarding obstetric challenges among all adolescent pregnancies during the study period. Our study was conducted retrospectively, which is still a limitation. The database did not allow for the precise timing of the various events during pregnancy. More data was missing for some variables, such as body mass index and weight gain during pregnancy, known as risk factors for adverse prenatal outcomes. Because our study group of 13- to 15-year-olds was small in size, we lacked the power to detect risks of rare outcomes; thus, we did not conduct a subgroup analysis to determine the effect of very young age on the risk of adverse obstetric outcomes.

5. Conclusions

Overall, as expected, prenatal clinic attendance was high, given that antenatal care is provided free of charge to all pregnant women in Iran. Adolescent pregnancy was not related to adverse pregnancy, childbirth, and neonatal outcomes. The risk of adverse events such as preeclampsia, placenta abruption, placenta previa, fetal distress, preterm labor, shoulder dystocia, perineal lacerations, childbirth trauma, congenital malformation, postpartum hemorrhage, maternal death, stillbirth, maternal and neonatal intensive care unit admission, neonatal death was not higher in adolescents compared to adults. Adolescents had a lower risk for gestational diabetes and CS. Although we found no serious consequences of adolescent pregnancy, more research is needed to reach a more accurate conclusion about teenage pregnancy.

Ethical approval

This study complies with the Declaration of Helsinki and was performed according to ethics committee approval. The Ethics and Research Committee of the Hormozgan University of Medical Sciences approved the study.

Consent to participate from patients

The records of all patients who provided informed consent for using their data for research purposes were analyzed. In cases of illiteracy, their legal guardians provided informed consent. Statistical analysis was performed with patient anonymity following ethics committee regulations.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interest

The authors declare that they have no competing interests.

Acknowledgement

All of the authors acknowledged Hormozgan University of Medical Sciences.

References

1. Chandra-Mouli V, Camacho AV, Michaud P-A. WHO guidelines on preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. *J Adolesc Health*. 2013;52(5):517–522.
2. New York: UN. *UN, Millennium Development Goals Report 2015*; 2015. Available from: http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20%28July%201%29.pdf.

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.

3. Darroch JE, Woog V, Bankole A, et al. *ADDING IT UP : Costs and Benefits of Meeting the Contraceptive Needs of Adolescents*. 2016.
4. Wong SPW, Twynstra J, Gilliland JA, et al. Original report risk factors and birth outcomes associated with teenage pregnancy : a Canadian sample. *J Pediatr Adolesc Gynecol*. 2019;33(2):153–159. https://doi.org/10.1016/j.jpag.2019.10.006.
5. Amjad S, MacDonald I, Chambers T, et al. Social determinants of health and adverse maternal and birth outcomes in adolescent pregnancies: a systematic review and meta-analysis. *Paediatr Perinat Epidemiol*. 2019;33(1):88–99. https://doi.org/10.1111/ppe.12529.
6. Chen X-K, Wen SW, Fleming N, et al. Increased risks of neonatal and postneonatal mortality associated with teenage pregnancy had different explanations. *J Clin Epidemiol*. 2008;61(7):688–694. https://doi.org/10.1016/j.jclinepi.2007.08.009.
7. Malabarey OT, Balayla J, Klam SL, et al. Pregnancies in young adolescent mothers: a population-based study on 37 million births. *J Pediatr Adolesc Gynecol*. 2012;25(2):98–102. https://doi.org/10.1016/j.jpag.2011.09.004.
8. Leppälahti S, Gissler M, Mentula M, et al. Is teenage pregnancy an obstetric risk in a welfare society? A population-based study in Finland, from 2006 to 2011. *BMJ Open*. 2013;3(8), e003225. https://doi.org/10.1136/bmjopen-2013-003225.
9. Hunley TE, Desai N, Jones DP. In: Flynn JT, Ingelfinger JR, Redwine KM, eds. *Hypertension in the Pregnant Teenager BT - Pediatric Hypertension*. Springer International Publishing; 2018:581–603. https://doi.org/10.1007/978-3-319-31107-4_28.
10. Conde-Agudelo A., Belizán J.M., Lammers C. Maternal-perinatal morbidity and mortality associated with adolescent pregnancy in Latin America: cross-sectional study. Am J Obstet Gynecol. 2005;192(2):342–349.doi:10.1016/j.ajog.2004.10.593.
11. Suzuki S. Clinical significance of pregnancy in adolescence in Japan. *J Matern Fetal Neonatal Med*. 2019;32(11):1864–1868. https://doi.org/10.1080/14767058.2017.1421928.
12. Kozhimannil KB, Abraham JM, Virnig BA. National trends in health insurance coverage of pregnant and reproductive-age women, 2000 to 2009. *Womens Health Issues*. 2012;22(2):e135–e141. https://doi.org/10.1016/j.whi.2011.12.002.
13. Kassa BG, Belay HG, Ayele AD. Teenage pregnancy and its associated factors among teenage females in Farta Woreda, Northwest, Ethiopia, 2020: a community-based cross-sectional study. *Population Medicine*. 2021;3:19. https://doi.org/10.18332/popmed/139190.
14. Nations U. Adolescent Fertility since the International Conference on Population and Development (ICPD) in Cairo.New York New York United. *Nations*. 2013.
15. Dehghan-nayeri N, Tajvidi M. Experiences of pregnancy among Iranian adolescents. *A qualitative study*. 2014;19(7):S7–S12.
16. Marvin-dowle K, Kilner K, Burley VJ, et al. Impact of adolescent age on maternal and neonatal outcomes in the Born in Bradford cohort. *BMJ Open*. 2018;8(3), e016258. https://doi.org/10.1136/bmjopen-2017-016258.
17. Vardhelli V, Pandita A, Pillai A, et al. Perinatal COVID-19: review of current evidence and practical approach towards prevention and management. *Eur J Pediatr*. 2021;180(4):1009–1031.
18. Chen L, Li Q, Zheng D, et al. Clinical characteristics of pregnant women with Covid-19 in Wuhan, China. *N Engl J Med*. 2020;382(25), e100. https://doi.org/10.1056/NEJMc2009226.
19. Phaloprakarn C, Tangjitgamol S. Risk score for predicting primary cesarean delivery in women with gestational diabetes mellitus. *BMC Pregnancy Childbirth*. 2020;20(1):607.
21. de Vienne CM, Creveuil C, Dreyfus M. Does young maternal age increase the risk of adverse obstetric, fetal and neonatal outcomes: a cohort study. *Eur J Obstet Gynecol Reprod Biol*. 2009;147(2):151–156. https://doi.org/10.1016/j.ejogrb.2009.08.006.
22. Granja ACL, Machungo F, Gomes A, et al. Adolescent maternal mortality in Mozambique. *J Adolesc Health*. 2001;28(4):303–306. https://doi.org/10.1016/s1054-139x(00)00205-6.
23. Ganchimeg T, Ota E, Morisaki N, et al. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization multicountry study. *BJOG*. 2014;121:40–48. https://doi.org/10.1111/1471-0528.
24. Kacou Aka E, Horo A, Fanny M, et al. Obstetrical specificities of Ivorian adolescent mothers on a single-center hospital series of 1040 cases. *Gynecol Obstet Clin Med*. 2022;2(2):86, 90.10.1016/j.gocm.2022.04.002.

gocm: first published as 10.1016/j.gocm.2023.02.002 on 1 June 2023. Downloaded from http://gocm.bmj.com/ on November 13, 2024 by guest. Protected by copyright.