

Socioeconomic risk factors and obstetric outcomes of adolescent pregnancies in Vietnam



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BACKGROUND: Adolescent pregnancy remains a pressing concern in the Pacific and Southeast Asia, with birth rates of 51 and 43 per 1000 girls. Teenage mothers face a heightened risk of complications and mortality, while their newborns are more likely to experience challenges such as preterm birth, low birth weight, and poor Apgar scores. In Vietnam, however, evidence on this issue remains limited.

OBJECTIVE: Our research aims to examine the socioeconomic characteristics and outcomes of adolescent pregnancy in Vietnam.

STUDY DESIGN: We conducted a cross-sectional study recruiting pregnant women aged 10 to 19 hospitalized for delivery at Can Tho Gynecology Obstetrics Hospital from September 1st, 2022, to March 31, 2024. For reference, we established a cohort of pregnant women aged 20 to 34 years who presented at our hospital during the same study period. This cohort was randomly selected (1:1 ratio) and matched with our adolescent cohort based on the delivery date and parity. Primary outcomes included maternal and neonatal outcomes.

RESULTS: Our final analysis included 432 adolescents and 432 adults with mean ages of 18.1 ± 1.1 years and 26.7 ± 3.7 years, respectively. Adolescent pregnancies were more likely to have disadvantageous sociodemographic backgrounds with limited resources, including ethnic minorities, rural residences, and low education. Adolescent individuals had lower prepregnancy weight (48 [43–53] kg vs 50 [46–55] kg, $P < .001$) and BMI (19.2 [17.7–21.8] vs 20 [18.7–22], $P < .001$) compared to adults. Their weight gain during pregnancy was also lower (12.8 ± 5.2 kg vs 15.6 ± 6.8 kg, $P < .001$). Regarding comorbidities, adolescents had fewer chronic conditions (14.4% vs 34.3%, $P < .001$). However, they tended to have a higher percentage of thyroid disease (1.6% vs 0.5%, $P = .09$) and anemia (5.6% vs 3.0%, $P = .07$) compared to adults. Adolescents experienced a higher percentage of maternal adverse outcomes (4.2% vs 1.6%, $P = .03$), particularly infection/sepsis (3.2% vs 1.2%, $P = .04$). Regarding indications for cesarean delivery, adolescents had a higher proportion of nonreassuring fetal status (56.3% vs 46.2%) and labor arrest (19.8% vs 11.6%) but lower percentages of fetal malpresentation (5.1% vs 24.9%) and cephalopelvic disproportion (10.2% vs 14.1%) compared to adults. Their newborns had higher rates of preterm birth (15.0% vs 7.2%, $P < .001$), low birth weight (12.0% vs 6.3%, $P < .001$), and a 1-minute Apgar score of less than 7 (3.9% vs 1.2%, $P < .001$).

CONCLUSION: Adolescent pregnancies had more adverse maternal and neonatal outcomes than adult pregnancies. Further policies and studies are warranted to address socioeconomic disadvantages and develop specific pregnancy care standards for this group.

Key words: adolescent pregnancies, birth, preterm, comorbidities, low birth weight, socioeconomic factors, Vietnam

Introduction

In 2021, the United Nations Population Fund emphasized the critical issue regarding adolescent pregnancies in Asia and the Pacific, where over 3.7 million births occur annually among

teenage girls aged 15 to 19.¹ Adolescent pregnancy rates are remarkably high in the Pacific and Southeast Asia (43–51 births per 1000 girls).¹ Approximately half of those pregnancies were unplanned, with a high incidence of

unsafe abortions. The demand for modern contraception among young women aged 15 to 24 is notable, with nearly 34 million lacking access.¹ Several causes leading to teenage pregnancy included socioeconomic factors,

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AJOG Global Reports at a Glance

Why was this study conducted?

Adolescent pregnancy is a significant concern across many Asian countries. Evidence on this issue in Vietnam remains limited.

Key findings?

Adolescent mothers often come from sociodemographic backgrounds with disadvantages, including minority ethnic groups, rural areas, significant educational deficiency, and a lack of sex education. Adolescent mothers had different comorbidities and pregnancy complication than their adult counterparts. Adolescent pregnancies are associated with worse maternal and neonatal outcomes.

What does this add to what is known?

Our research uncovered distinctive traits among Vietnamese adolescent mothers, including inadequate attitudes toward pregnancy care influenced by social, ethical, and cultural pressures. We identified distinct profiles of comorbidities unique to Vietnamese adolescent mothers, including lower average weight gain during pregnancy and a higher prevalence of underweight status, anemia, and thyroid disorders. Adolescent mothers exhibited a greater incidence of postpartum hemorrhage and maternal infections, nonreassuring fetal status, and labor arrest compared to the adult population.

shortage of sexuality education, and insufficient access to adolescent sexual and reproductive health services.¹ Moreover, poor parental communication about sex education and family support for traditional child marriage further worsens the problem.

Adolescent pregnancy has severe consequences for teenagers' health and well-being. Maternal mortality rates among adolescent mothers are significantly high in the Pacific and Southeast Asia, which calls attention to the pressing need to improve maternal care.² Unintended repeat pregnancies were another common issue that emphasized the necessity of effective postnatal and postabortion contraceptive counseling. Furthermore, neonates of teenage mothers tend to have worse outcomes, including preterm birth, small gestational weight, high maternal and neonatal complications, and mortality due to underdeveloped physical maturity and insufficient knowledge.^{3,4} While reports concerning risk factors and pregnancy outcomes of adolescent mothers exist in other Asian countries, similar studies are lacking in Vietnam.⁵ This gap challenges our understanding and providing appropriate healthcare services for this unique population. Our study is the first in Vietnam to examine the

characteristics, socioeconomic risk factors, and outcomes of adolescent pregnancy. The specific aims are to (1) identify the socioeconomic and pregnancy characteristics of adolescent mothers and (2) determine and compare the occurrence of adverse maternal and perinatal outcomes in the population of adolescent pregnancies vs a non-high-risk population.

Methods**Study design and population**

We conducted a cross-sectional study recruiting pregnant women who were hospitalized for delivery at the Obstetrics & Gynecology Department of Can Tho Gynecology Obstetrics Hospital, a tertiary hospital in the South Vietnam region, from September 1, 2022, to March 31, 2024.

The inclusion criteria encompassed pregnant women aged 10 to 19 years (age determined at day of delivery) admitted for normal delivery, cesarean delivery, or assisted delivery at the Obstetrics & Gynecology department during the study period, consented to participation, and had a live newborn.

Exclusion criteria comprised adolescent mothers who declined study participation, had psychiatric disorders, dementia, mutism, or hearing loss,

lacked communication abilities in Vietnamese, or provided incomplete or inappropriate responses (illogical or nonmeaningful answers).

The sample size for the primary cohort was determined using a formula for estimating a single proportion, with a 95% confidence interval level, a 5% margin of error, and a desired precision of 5%, assuming an expected proportion of maternal adverse outcomes such as preterm birth at 19.3%.⁶ It required a sample size of 240 participants for the primary cohort. Eligible pregnant women were informed about the study and asked to provide their agreement by signing the consent form. Subsequently, they underwent assessment using a questionnaire covering baseline demographic characteristics, level of education, pregnancy course status with comorbidities, and other relevant factors. Participants were then followed up and monitored throughout the labor process, including complications, methods of termination of pregnancy, and obstetric outcomes for both mother and neonate. Additional necessary information was gathered from digital medical reports.

For the comparison of socioeconomic and obstetric risk factors and maternal and perinatal outcomes, we established a cohort of nonadolescent pregnant women aged 20 to 34 years who presented for normal delivery, cesarean delivery, or assisted delivery at our hospital during the same study period. This cohort was randomly selected and matched with our adolescent cohort based on the date of delivery and parity (number of deliveries), with a 1:1 ratio. We divided the adolescent cases into 19 subgroups based on the delivery date, covering the 19 months from September 1, 2022, to March 31, 2024. Each month, we randomly selected a number of referents equal to three times the number of adolescent cases. We then collected parity data for these individuals and matched them with adolescent cases at a 1:1 ratio based on parity using SPSS. This approach ensures that the effects of parity and potential changes in hospital care policies over time are minimized. Subsequently, we contacted

them via telephone to explain the study and obtain verbal consent. Written patient consent will be obtained through the mail system. Demographic characteristics will be collected via phone communication by two research assistants. Maternal and perinatal information will be gathered from digital medical records.

Definition of demographic characteristics, and comorbidities

We gathered demographic information, including age, gravidity, parity, abortion history, residence, race, occupation, marital status, the highest level of education, and the number of prenatal visits. The educational gap was calculated by subtracting the actual highest level of education attained by the subjects from the highest expected level of education for their age.

Pregnancy characteristics included gestational age at the initial examination, weight gain compared to prepregnancy, and history of illnesses, particularly heart diseases, infectious diseases, thyroid diseases, anemia, gestational diabetes, and hypertension/preeclampsia. Contraceptive methods were categorized into two groups called physiological-based and medical-based approaches. Physiological-based contraception includes extra-vaginal ejaculation and estimation of period cycles (known as fertility awareness methods), which involves tracking the menstrual cycle to avoid intercourse during the fertile window. Medical-based contraception is comprised of contraceptive pills, intrauterine devices, and condoms. Heart, infectious, and thyroid diseases were defined as by ICD-10. Anemia, gestational diabetes, hypertension, and preeclampsia were defined as current guideline (see Methods, [Supplemental Appendix](#)).

For pregnancy outcomes, we documented gestational age at delivery, pregnancy duration, delivery methods (natural labor, induction of labor), types of delivery (vaginal, assisted vaginal, cesarean delivery), and indications for cesarean delivery (eg, maternal request, nonreassuring fetal status, nonprogressive labor, fetal malpresentation, suspicious

uterine rupture, twin pregnancy, and cephalopelvic disproportion). Perinatal complications recorded included postpartum hemorrhage, chorioamnionitis, postcesarean wound infection (see Methods, [Supplemental Appendix](#)). Pregnancy course was classified as preterm (less than 37 weeks), term (from 37 to 40 weeks), and post-term (over 41 weeks).⁷

Neonatal status was characterized by birth weight and APGAR (Appearance, Pulse, Grimace, Activity, and Respiration) score evaluated by physician at 1 and 5 minutes after birth and possibly up to 20 minutes if the score is below 7.⁸

Statistical analysis

The data were presented as mean and standard deviation for continuous variables and as numbers with percentages for categorical variables. The independence of continuous variables was assessed using the t-test, while Pearson's chi-square test was used for categorical variables. For non-normally distributed data, the Mann–Whitney U test was employed. Statistical significance was determined at a *P* value threshold of <.05, with all reported *P* values being two-sided. Multivariable logistic regression analysis was used to estimate adjusted odds ratios for maternal and perinatal outcomes in the adolescent cohort compared to the adult cohort. Statistical analyses and the random selection of the reference cohort were performed using IBM SPSS version 24.

Result

Study population

Between September 1, 2022, and March 31, 2024, our hospital facilitated 11,018 pregnancies and deliveries, including 472 adolescents aged 14 to 19 (4.3%), 8707 adults aged 20 to 34 (79.0%), and 1839 individuals over 34 (16.7%). After applying inclusion and exclusion criteria, our final cohort comprised 432 adolescent pregnant individuals aged 14 to 19 and a reference group of 432 adult pregnant subjects aged 20 to 34 ([Figure 1](#)). The mean ages for the adolescent cases and the reference group were 18.1 ± 1.1 and 26.7 ± 3.7 , respectively.

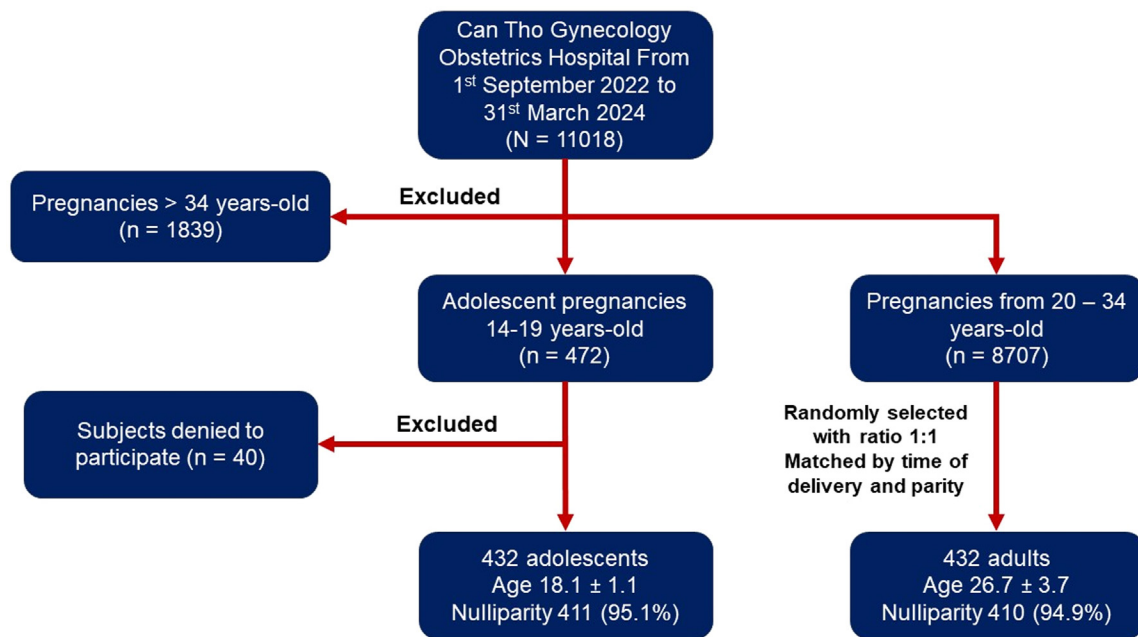
Socioeconomic and obstetric characteristics of adolescent and adult pregnant women

Our study observed that while most patients were of Kinh ethnicity, adolescent subjects showed a higher percentage of minority races such as Khmer and Chinese (5.2% vs 0.2%, $P < .001$). Additionally, they were more likely to reside in rural areas (61.6% vs 48.8%, $P < .001$) and had a wider educational gap (3 years [2–4] vs 1 year [0–2], $P < .001$) compared to their adult counterparts. In terms of sex education, only a minority (22.2%) of adolescents received education from family, school, or social media. Consequently, they exhibited a higher percentage of not using any contraceptive methods (76.9% vs 28.7%, $P < .001$) compared to adult subjects. Consequently, they had a higher proportion of unexpected pregnancies (53.7% vs 5.3%, $P < .001$) and miscarriages (7.2% vs 1.4%, $P < .001$) among adolescent pregnancies ([Table 1](#)).

During pregnancy, adolescent subjects were less likely to visit a gynecologist for prenatal care within the first trimester than their adult counterparts (95.4% vs 100%, $P < .001$) ([Figure 2](#)). However, both groups had a similar percentage of at least 8 prenatal counseling sessions. Adolescent subjects tended to have prenatal follow-up predominantly in private clinics (94.9% vs 51.9%, $P < .001$) compared to adult subjects. Moreover, adolescent individuals had lower prepregnancy weight (48 [43–53] kg vs 50 [46–55] kg, $P < .001$) and BMI (19.2 [17.7–21.8] vs 20 [18.7–22], $P < .001$), and higher percentage of underweight (36.6% vs 21.8%, $P < .001$) compared to adults. Their weight gain during pregnancy was also lower (12.8 ± 5.2 kg vs 15.6 ± 6.8 kg, $P < .001$).

Regarding comorbidities, adolescents had fewer chronic conditions (14.4% vs 34.3%, $P < .001$). However, they tended to have a higher percentage of thyroid disease (1.6% vs 0.5%, $P = .09$) and anemia (5.6% vs 3.0%, $P = .07$) compared to adults ([Figure 3](#)).

FIGURE 1
Selection flowchart of the study population



Lam. Socioeconomic risk factors and obstetric outcomes. *AJOG Glob Rep* 2025.

Maternal and perinatal outcomes of adolescent and adult pregnant women

When examining delivery outcomes, adolescent subjects exhibited a higher proportion of natural labor (94.2% vs 86.6%, $P<.001$) and vaginal delivery (54.4% vs 35.9%, $P<.001$). Infants born to adolescent mothers showed significantly higher rates of preterm birth (15.0% vs 7.2%, $P<.001$), low birth weight (12.0% vs 6.3%, $P<.001$), and an Apgar score at 1 minute of less than 7 (3.9% vs 1.2%, $P<.001$). Multivariable regression model adjusted with first prenatal visit age, BMI, maternal comorbidities, postpartum complication, and low birth weight showed adolescent pregnancies were associated with preterm birth (odds ratio 2.6, 95% confidence interval 1.5–4.5, $P<.001$).

Maternal adverse outcomes were also significantly more prevalent among adolescent mothers (4.2% vs 1.6%, $P=.03$), particularly maternal infection/sepsis (3.2% vs 1.2%, $P=.04$), compared to adult mothers (Table 2). Concerning the reasons for Cesarean delivery, adolescents had a higher proportion of cases due to nonreassuring fetal status

(56.3% vs 46.2%) and labor arrest (19.8% vs 11.6%). Conversely, they exhibited lower percentages of cases related to fetal malpresentation (5.1% vs 24.9%) and cephalopelvic disproportion (10.2% vs 14.1%) (Figure 4).

Comments

Principal findings

Our study is the first in Vietnam to investigate the socioeconomic and obstetric characteristics and maternal and perinatal outcomes of adolescent pregnancy and highlight the differences compared to adult pregnancy. We found that adolescent mothers often come from sociodemographic backgrounds with disadvantages, including minority ethnic groups, rural areas, significant educational deficiency, and a lack of sex education. These adolescent mothers had higher percentage of underweight, lower pregnancy weight gain, and different comorbidities than their adult counterparts. Our findings demonstrated that adolescent pregnancies are associated with worse maternal and neonatal outcomes, including a higher proportion of maternal complications, preterm births, low

birth weight, and a higher proportion of 1-minute Apgar less than 7.

Results of the study in the context of other observations

Our findings demonstrated that adolescent pregnancies were more likely to have disadvantageous sociodemographic backgrounds with limited resources, including rural residences and lower education. Teenagers residing in rural areas, especially with low socioeconomic levels, were reported to have higher risks of early pregnancy.^{9,10} Limited access to formal and sex education was also likely to increase the risk of teenage pregnancies, which was consistent with a previous study.^{5,9} Due to limited education and a lack of knowledge about sexuality and contraception, the majority of teenagers in our study engaged in sexual intercourse without using any birth control methods. Furthermore, the few who did use contraception tended to rely on physiological-based methods, which are more accessible but less effective, inducing a high rate of unexpected pregnancies.¹¹

In our research, pregnant adolescents tended to visit obstetrician clinics at a

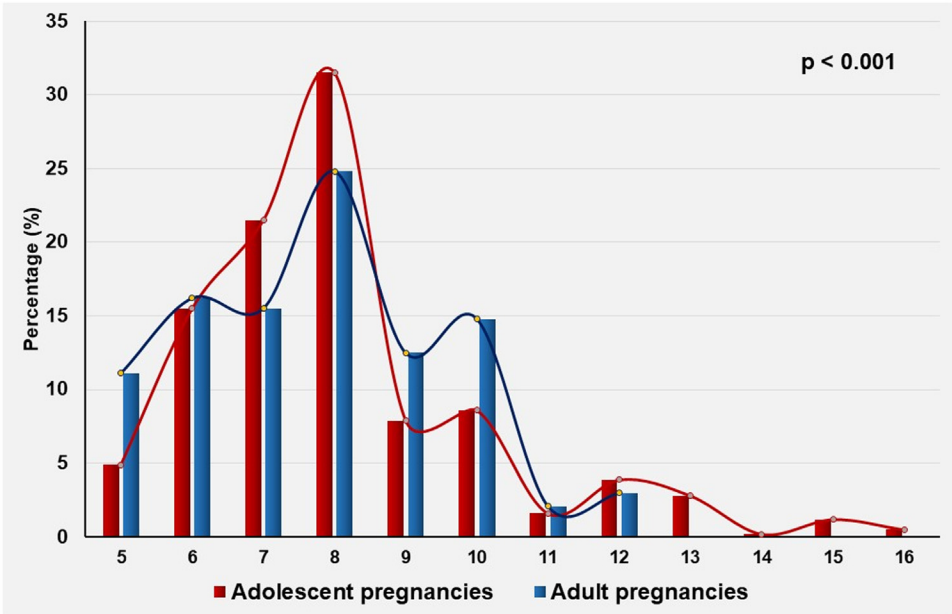
TABLE 1**Baseline characteristics of adolescent and adult pregnant subjects**

	Adolescent subjects (n=432)	Adult subjects (n=432)	P value
Age, mean±standard deviation, y	18.1±1.1	26.7±3.7	<.001
Race, n (%)			<.001
Kinh	411 (95.1)	431 (99.8)	
Khmer	18 (4.2)	1 (0.2)	
Chinese	3 (0.7)	0 (0)	
Rural region, n (%)	266 (61.6)	211 (48.8)	<.001
Educational gap, median (interquartile), y	3 (2–4)	1 (0–2)	<.001 ^a
Sex education, n (%) ^b	97 (22.2)	432 (100)	<.001
Parity, n (%)			.88
0	411 (95.1)	410 (94.9)	
1	21 (4.9)	22 (5.1)	
Contraceptive methods, n (%)			<.001
None	332 (76.9)	124 (28.7)	
Physiological-based	66 (15.3)	147 (34.0)	
Medical-based	34 (7.9)	161 (37.3)	
Unexpected carriage, n (%)	232 (53.7)	23 (5.3)	<.001
Miscarriage, n (%)	31 (7.2)	6 (1.4)	<.001
The first visit of a gynecologist within the first trimester, n (%)	412 (95.4)	432 (100)	<.001
Visits to prenatal counseling ≥8 times, n (%)	233 (53.9)	224 (51.9)	.54
Location of prenatal counseling, n (%)			<.001
Private clinic	410 (94.9)	224 (51.9)	
Hospital	22 (5.1)	208 (48.1)	
Prepregnancy weight, median (interquartile), kg	48 (43–53)	50 (46–55)	<.001 ^a
Prepregnancy BMI, median (interquartile), kg	19.2 (17.7–21.8)	20.0 (18.7–22.0)	<.001 ^a
Prepregnancy BMI classification, n (%)			<.001
Underweight	158 (36.6)	94 (21.8)	
Normal	244 (56.5)	305 (70.6)	
Overweight	24 (5.6)	28 (6.5)	
Obese	6 (1.4)	5 (1.2)	
Weight increased during pregnancy, mean±standard deviation, kg	12.8±5.2	15.6±6.8	<.001
Hypertensive disorder, n (%)	14 (3.2)	24 (5.6)	.10
Gestational diabetes, n (%)	10 (2.3)	49 (11.3)	<.001
Thyroid disease, n (%)	7 (1.6)	2 (0.5)	.09
Anemia, n (%)	24 (5.6)	13 (3.0)	.07
Infectious disease, n (%)	8 (1.9)	63 (14.6)	<.001
Pelvic disease, n (%)	1 (0.2)	7 (1.6)	.03
Chronic comorbidities, n (%)	62 (14.4%)	148 (34.3)	<.001

BMI, body mass index.

^a Mann–Whitney *U* test.; ^b Sex education refers to both formal and informal education about human sexual anatomy, reproduction, sexual intercourse, contraception, sexually transmitted infections. This education was provided through sources such as schools, families, and social media.Lam. Socioeconomic risk factors and obstetric outcomes. *AJOG Glob Rep* 2025.

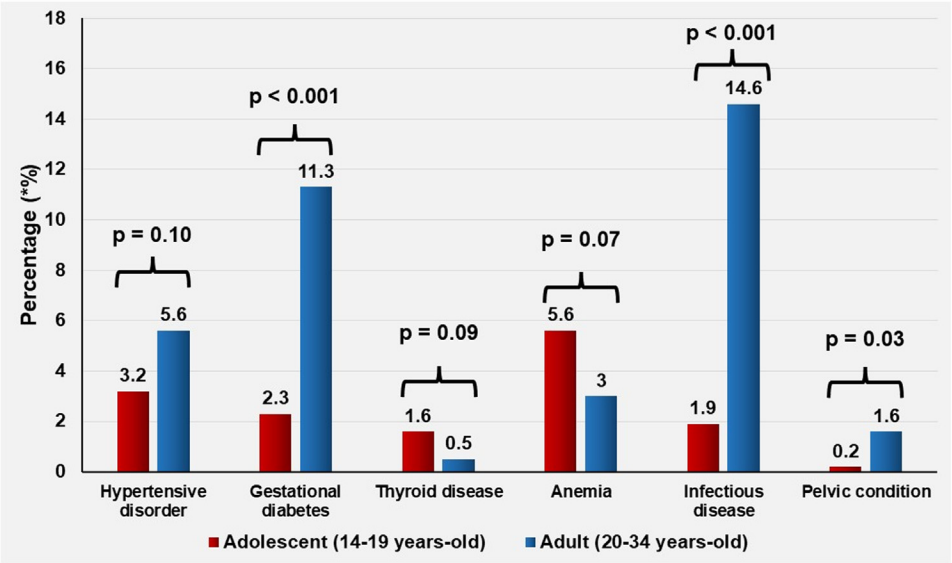
FIGURE 2
Percentage of fetal age at first prenatal visit



Adolescent pregnancies (red) had a lower percentage of first prenatal visits at an early stage (5 weeks) and a higher percentage of late visits (over 12 weeks) compared to adult pregnancies (blue), which had 100% of first prenatal visits within the first trimester.

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FIGURE 3
Differences of maternal comorbidities between adolescent and adult mothers



Adolescents (red) had a lower percentage of gestational diabetes (2.3% vs 11.3%, $P<.001$), infectious diseases (1.9% vs 14.6%, $P<.001$), and pelvic conditions (0.2% vs 1.6%, $P=.03$) than adult subjects. However, they tended to have a higher percentage of thyroid disease (1.6% vs 0.5%, $P=.09$) and anemia (5.6% vs 3.0%, $P=.07$) compared to adults.

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TABLE 2**Peripartum characteristics, maternal, and perinatal outcomes of adolescent and adult pregnancies**

	Adolescent subjects (n=432)	Adult subjects (n=432)	P value
Pregnancy course, n (%)			.001
Preterm	65 (15.0)	31 (7.2)	
Normal term	331 (76.6)	363 (84)	
Post-term	36 (8.3)	38 (8.8)	
Pregnancy termination, n (%)			<.001
Natural labor	407 (94.2)	374 (86.6)	
Inducing labor	25 (5.8)	58 (13.4)	
Delivery methods, n (%)			<.001
Vaginal delivery	235 (54.4)	155 (35.9)	
Cesarean delivery	197 (45.6)	277 (64.1)	
Cesarean delivery reason, n (%)			
Nonreassuring fetal status	111 (56.3)	128 (46.2)	
Labor arrest	39 (19.8)	32 (11.6)	
Fetal malpresentation	10 (5.1)	69 (24.9)	
Suspicious uterine rupture	2 (1.0)	2 (0.7)	
Twin pregnancy	1 (0.5)	4 (1.4)	
Cephalopelvic disproportion	20 (10.2)	39 (14.1)	
Maternal request	14 (7.1)	3 (1.1)	<.001
Maternal infection/sepsis, n (%)	14 (3.2)	5 (1.2)	.04
Antepartum and postpartum hemorrhage, n (%)	4 (0.9)	2 (0.5)	.69
Maternal adverse outcome, n (%)	18 (4.2)	7 (1.6)	.03
Birth weight, n (%), gram			.01
Low birth weight (<2500)	52 (12.0)	27 (6.3)	
Normal birth weight (2500–3500)	353 (81.7)	327 (75.7)	
High birth weight (>3500)	27 (6.3)	78 (18.1)	
Apgar score at 1 min <7, n (%)	17 (3.9)	5 (1.2)	<.001
Apgar score at 5 min <7, n (%)	1 (0.2)	2 (0.5)	.56

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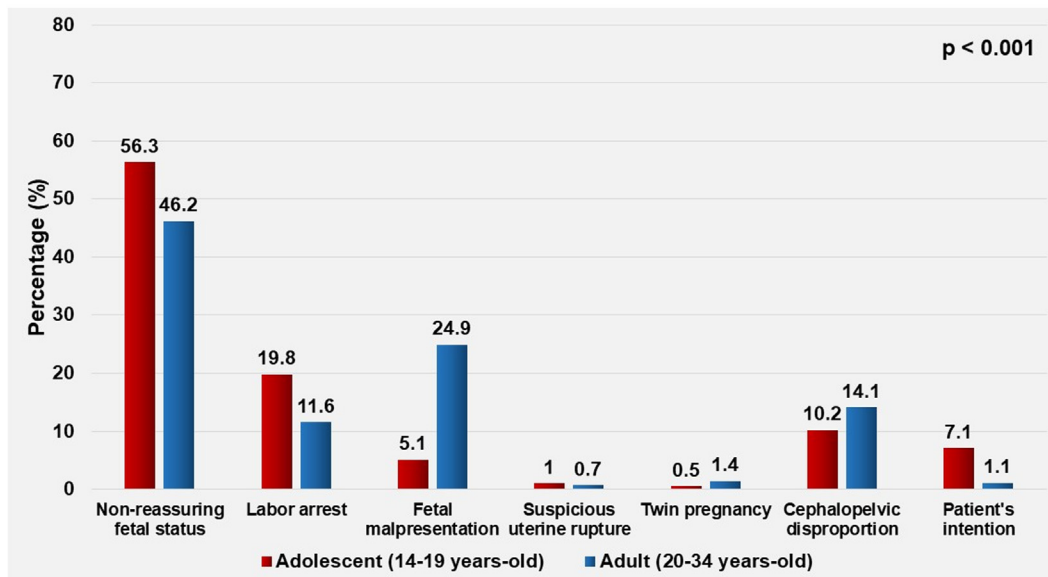
later gestational age compared to mature pregnant women, which validated the result of a previous study.¹² These findings can be explained by the late recognition of pregnancy and the lack of perceived importance of early prenatal care.¹³ Irregular menstruation and low reproductive health awareness contributed to this delay. Teens often experience anovulation, leading them to

attribute abnormal uterine bleeding to hormonal issues rather than pregnancy. The lack of awareness about the importance of first-trimester prenatal visits among pregnant adolescents is likely due to insufficient sexual education, compounded by socioeconomic constraints as well as the influence of peer pressure and social status on their perception of prenatal care.¹⁴ While both

registered private clinics and public hospitals provide similar quality prenatal care, private clinics tend to excel in certain aspects—particularly “confidentiality” and “basic amenities.”¹⁵ This may explain the higher preference for private clinics as a prenatal care service among adolescents in our study.

Our study showed that adolescent mothers had a higher percentage of underweight and lower average weight gain during pregnancy than mature women, which matched the results of a previous study.¹⁶ It was supposed that adolescents whose development was still incomplete, with disadvantageous physical conditions and, poor nutritional status, or low socioeconomic level are likely at an increased risk of adverse outcomes. Concerning comorbidities, we found that anemia and thyroid disease were more likely seen in adolescent subjects than in adult counterparts. Our findings agreed with a WHO international study that anemia was significantly higher among all adolescents.¹⁷ This condition was reported to be associated with adverse maternal and fetal outcomes, including maternal shock, admission to the ICU, fetal growth restriction, stillbirth in moderate/severe anemia and placental abruption, preterm labor, and severe postpartum hemorrhage, regardless of the severity of anemia.¹⁸ Thyroid disease, a common condition in adolescent groups, is reported to adversely affect teenagers’ development during puberty.¹⁹ Women with thyroid conditions, including hypothyroidism and thyroid antibodies, are considered to have a high risk of miscarriage, fetal central nervous system development disorder, and preterm delivery.²⁰ The distinct comorbidity profiles between adolescent and adult subjects—who show a higher prevalence of hypertension, gestational diabetes,²¹ and infectious diseases—underscore the need for targeted, individualized prenatal and intrapartum care, designed to manage and prevent the specific conditions affecting each population.

Our study identified a high cesarean delivery rate in both adolescent and adult pregnancies. This finding is

FIGURE 4**Percentage of the reasons for Cesarean delivery in adolescent and adult mothers**

Adolescents had a higher proportion of cases due to nonreassuring fetal status (56.3% vs 46.2%) and labor arrest (19.8% vs 11.6%). Conversely, they exhibited lower percentages of cases related to fetal malpresentation (5.1% vs 24.9%) and cephalopelvic disproportion (10.2% vs 14.1%).

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consistent with previous studies, which reported cesarean delivery prevalence in Vietnam ranging from 44.3% to 58.6%—significantly exceeding the WHO's recommendations.^{22–24} Several factors contribute to this result, including the unique characteristics of Vietnamese pregnancies, maternal requests, and the overdiagnosis of conditions without clear medical indications.^{25,26} Additionally, based on our findings, although having a higher proportion of natural labor and vaginal delivery, adolescent mothers had worse maternal and perinatal outcomes compared to their adult counterparts. Regarding maternal outcomes, we found that postpartum hemorrhage and maternal infection, including sepsis, were more common in teenage mothers, which is similar to previous studies.^{17,27} An underdeveloped immune system, nutritional deficiencies, and limited understanding and adherence to prenatal care, including infection screening and prevention, may contribute to the increased risk of puerperal endometritis and systemic infections among

teenagers.¹⁷ Regarding postpartum hemorrhage, it could be explained that episiotomies due to peripartum anxiety were more common in the teenage group, which is also found in a cohort study.²⁸

Our study suggested that neonates from teenage mothers were more likely to be born preterm and had lower birth weight compared to ones from mature mothers, which is similar to prior studies.^{29,30} A high proportion of preterm labor in teenage mothers might be caused by physical immaturity and socioeconomic deprivation, including insufficient maternal nutrient intake and inadequate routine prenatal care.^{31–33} Moreover, a higher proportion of nonreassuring fetal status and labor arrests were found in the adolescent group, as expected, which is compatible with data in other studies.^{29,34} These results may be associated with maternal nutrient deficiencies and accompanying medical problems in the antenatal and perinatal periods among adolescent mothers.³⁵ Our

results showed a significantly lower 1-minute Apgar score in the teenage group compared to the adult counterparts, which validated previous studies.^{28,36} This phenomenon could be explained by the higher rates of preterm labor, low birth weight, and insufficient weight gain in adolescent mothers, which was consistent with previous studies.^{37,38}

Strengths and limitations

Some limitations should be considered when interpreting these findings. Firstly, adolescent pregnancies in Vietnam have a high self-abortion rate, accounting for 20% of the total abortion rate in Vietnam.³⁹ The teenage group in our study included postpartum adolescent mothers who were admitted for either delivery or Cesarean delivery, which means that our adolescent sample solely reflected the population refusing to choose abortion to begin with and could not capture the complete picture of adolescent pregnancy concerning socioeconomic and obstetric characteristics. Therefore, our results

may underestimate the actual burden and outcomes. Secondly, although the hospital where we conducted our study is one of the biggest hospitals in the South of Vietnam, our study was still a single-center study, which might not reflect the situation in Vietnam, where cultural and social disparity across the North, Middle, and South of Vietnam was significant due to historical reason. However, despite these limitations, our study is the first in Vietnam to investigate the socioeconomic and obstetric characteristics and maternal and perinatal outcomes of adolescent pregnancy. Moreover, we selected a reference group randomly selected and matched with our adolescent cohort based on the delivery date and parity to reduce confounding bias.

Conclusions and clinical implications

Adolescent pregnancy is a significant issue in Vietnam, and addressing it requires a comprehensive approach that focuses on the socioeconomic, obstetric, maternal, and neonatal characteristics of this vulnerable population. Policymakers should prioritize reducing the incidence of premature pregnancies by targeting education and awareness, particularly in rural areas, among minority ethnic groups, and those with limited socioeconomic resources. Enhancing sex education, promoting pregnancy prevention, and increasing understanding of the consequences of early intercourse are critical steps. Furthermore, specific pregnancy care should focus on the unique needs of adolescent mothers, such as addressing physical underdevelopment, ensuring adequate nutrition to support maternal weight gain, and screening for comorbidities like thyroid disorders or anemia. Routine prenatal care, along with antepartum counseling to reduce peripartum anxiety, is essential for improving maternal outcomes. Additionally, proper prenatal care that includes routine screening and prevention of conditions like preterm labor and fetal growth restriction is crucial for enhancing neonatal outcomes. Our

findings suggest that future research and healthcare initiatives should focus on developing tailored pregnancy care standards for adolescent mothers, helping to address both maternal and neonatal health risks and ensuring better outcomes for this population. ■

CRedit authorship contribution statement

Tam Duc Lam: Writing – original draft, Project administration, Investigation, Data curation, Conceptualization. **Nhung Thi Tuyet Dau:** Writing – original draft, Investigation, Data curation. **Thao-Ngan Nguyen Pham:** Writing – original draft. **Bao Huy Le:** Writing – original draft. **Loc Duc Pham:** Investigation, Data curation. **Nghi Vinh Phan:** Investigation, Data curation. **Thu Thi Nguyen:** Investigation, Data curation. **Hung Tan Nguyen:** Resources, Investigation, Data curation. **Phung Kim Quan:** Investigation, Data curation. **Dien Thanh Doan:** Investigation, Data curation. **Huong-Dung Thi Nguyen:** Visualization, Software, Resources, Formal analysis. **Thien Tan Tri Tai Truyen:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.xagr.2025.100473](https://doi.org/10.1016/j.xagr.2025.100473).

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