ORIGINAL ARTICLE

Obstetric and Neonatal Outcomes of Adolescent Pregnancies Compared with Adult Pregnancies at a Tertiary Care Hospital in Tak Province, Thailand

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Objective: To compare obstetric and neonatal outcomes of adolescent pregnancies with adult pregnancies at Somdej Phrachao Taksin Maharat Hospital, a tertiary hospital in Tak Province, Thailand.

Materials and Methods: A retrospective cohort study was conducted at Somdej Phrachao Taksin Maharat Hospital in Tak province. Singleton pregnant women aged 12 to 34 years who delivered between January 2020 and December 2022 were recruited. Data on pregnancy and neonatal outcomes were collected and analyzed using descriptive and inferential statistics, including one-way ANOVA, Pearson correlation, Spearman's rho correlation, and Pearson chi-square tests.

Results: One thousand four hundred sixty-one pregnant women data was collected and divided into three groups, 20 to 34 years with 1,029 participants, 16 to 19 years with 358 participants, and 12 to 15 years with 74 participants. Pregnant women aged 19 or below had significantly higher rates of complications, such as anemia, preterm birth, and caesarean delivery, compared to those over 19 years ($p<0.05$).

Conclusion: Adolescent pregnancies showed more obstetric and neonatal complications. To reduce the problems, enhance sex education, birth control methods for teenagers, and appropriate antenatal care.

Keywords: Adolescent pregnancy; Pregnancy complications; Tak province; Thailand

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Adolescent pregnancy remains a significant public health concern worldwide, with far-reaching consequences for maternal and child health[1]. The World Health Organization (WHO) reveals that approximately 21 million girls aged 15 to 19 years old conceive in developing regions annually, including an estimated 2.5 million pregnancies among girls younger than 16 years old[2]. Adolescent pregnancies are linked to increased risks of unfavorable maternal and neonatal outcomes, such as anemia, preterm birth, low birth weight, and neonatal deaths[3,4].

Between 2000 and 2021, the worldwide adolescent birth rate had diminished from 64.5 to 42.5 births per 1,000 women. Thailand's adolescent birth rate in 2021 was 31.7 births per 1,000 women[2]. Notwithstanding, the general decline throughout Thailand's provinces, Tak, a border province, has an adolescent pregnancy rate exceeding the global average (Figure 1). In 2021, adolescent birth rate of approximately 42.7 births per 1,000 women[5]. There are studies that reported the effects of maternal age on pregnancy outcomes. However, the data in high-risk areas, particularly in Thailand, is limited[6,7].

The present study aimed to explore the effects of maternal age on maternal and neonatal outcomes at a tertiary care hospital in Tak Province, Thailand. The present study hypothesis was adolescent pregnancies in Tak Province, Thailand, were subject to have more adverse maternal and neonatal outcomes than adult pregnancies.

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Materials and Methods

Study setting and population

The present study was a retrospective cohort study conducted at Somdej Phrachao Taksin Maharat Hospital, a tertiary care center in Tak, Thailand,

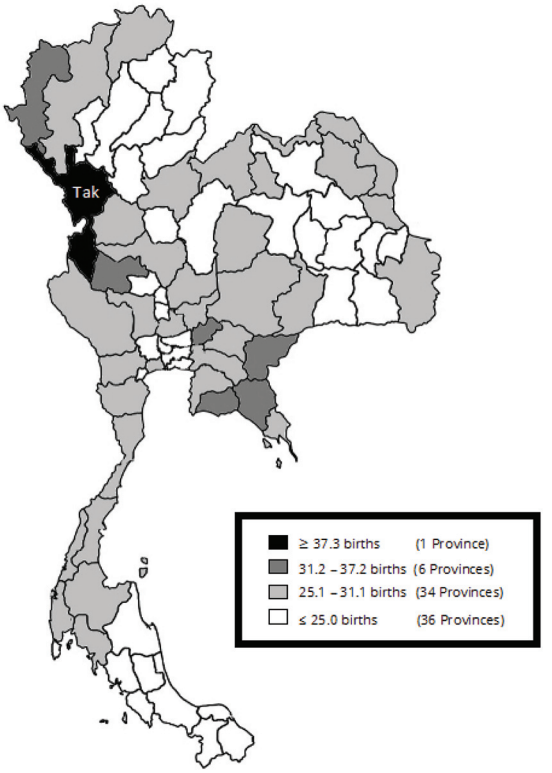

Figure 1. A map of Thailand emphasizing Tak Province as the only region with an adolescent birth rate (mothers aged 15 to 19 years old) surpassing 37.2 per 1,000 women, which is above the global average according to the WHO.

between January 2020 and December 2022. The study population consisted of primigravida mothers aged 12 to 34 years old with singleton pregnancies. Multiparous women were excluded because previous studies, such as one reported in the Public Health Reports in 2011, suggested that women with at least a second-time pregnancy may have different obstetrics and neonatal outcomes, such as lower rates of preterm birth and higher birth weights compared to primigravida mothers, which could introduce bias into the research findings[8]. Women with underlying diseases such as hypertension, which could lead to superimposed severe pre-eclampsia, thyroid diseases, or systemic lupus erythematosus (SLE) were excluded due to their known association with increased risks of preterm birth and low birth weight, factors that could confound the study's analysis[9,10]. Similarly, those with sexually transmitted infections (STIs) were excluded because of the potential to result in preterm birth and low birth weight[11]. Lastly, those with COVID-19 infection during pregnancy were also excluded as the infection could lead to the same adverse outcomes[12]. Pregnancies less than 28 weeks were considered as miscarriages and thus were not included. This exclusion criteria aimed to minimize the impact of known confounding factors on the outcomes, providing more accurate insights into the influence of maternal age on maternal and neonatal outcomes. The sample size reflected the cohort of eligible participants available for analyses, allowing for robust outcome comparisons across maternal age groups.

Data collection

Demographic information, including maternal age, marital status, frequency of prenatal care, and gestational age at delivery, was extracted from medical records. Data on maternal and neonatal outcomes were also collected, with maternal outcomes encompassing anemia, defined as a blood hemoglobin level below 11.0 g/dL in the third trimester[13], gestational diabetes mellitus (GDM), pre-eclampsia, cesarean delivery (CD), preterm birth, placenta previa, postpartum hemorrhage (PPH), and maternal death. Neonatal outcomes covered birth weight, an Apgar score of less than 7 at 5 minutes, admission to the neonatal intensive care unit (NICU), and neonatal death. Definitions and diagnostic criteria for these outcomes were based on established guidelines[14-17].

Statistical analysis

Data analysis was conducted using IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized demographic and outcome data. One-way ANOVA compared demographic data means across maternal age groups. Pearson correlation and Spearman's rho correlation coefficients evaluated the relationship between maternal age and neonatal birth weight. To examine neonatal birth weight differences among maternal age groups and between individual groups, one-way ANOVA and independent t-tests were performed. Pearson chi-square tests compared the incidence of anemia, pre-eclampsia, preterm birth, NICU admission, neonatal death, PPH, and placental abnormalities among maternal age groups, with Fisher's exact Test further analyzing incidence differences between specific groups. The statistical significance level was set at p-value less than 0.05.

Ethics approval and informed consent

The Human Ethics Committee at Somdej Phrachao Taksin Maharat Hospital (project number 2/2566) approved the study protocol.

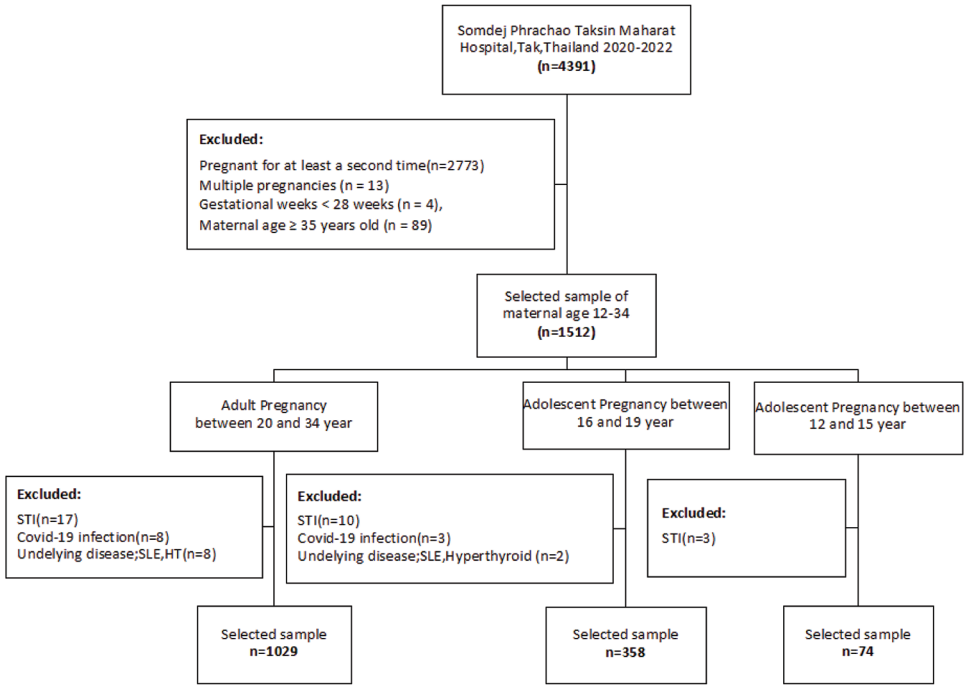

Figure 2. Flow chart of participants.

Table 1. Demographic data of participants

Characteristics	20 to 34 years (n=1,029)	16 to 19 years (n=358)	12 to 15 years (n=74)	Total (n=1,461)	p-value
Age (years); mean [SD]	25.47 [3.91]	17.64 [1.11]	14.59 [0.74]	23.00 [5.10]	-
Marital status; n (%)					
Married	826 (80.27)	279 (77.93)	54 (72.97)	1,159 (79.33)	-
Single	203 (19.73)	79 (22.07)	20 (27.03)	302 (20.67)	-
Number of prenatal visits; mean [SD]	9.74 [2.92]	7.97 [3.06]	7.41 [2.94]	9.19 [3.08]	<0.001*
Gestational age; mean [SD]	38.74 [1.51]	38.69 [1.75]	38.59 [1.83]	38.72 [1.59]	0.661

SD=standard deviation

* Statistical significance, p<0.05

Results

The present study collected data from 4,391 pregnant women between 2020 and 2022. Out of these, 1,512 pregnant women were initially included. However, after applying specific exclusion criteria, 1,461 cases were analyzed. Pregnancies with the following characteristics were excluded, 30 participants with STIs and 11 participants with COVID-19-infected mothers. Furthermore, 10 participants with a history of underlying disease were excluded due to their association with adverse maternal and neonatal outcomes.

The participants were divided into three age groups, adult pregnancy between 20 and 34 years old with 1,029 cases, adolescent pregnancy between 16 and 19 years old with 358 cases, and adolescent pregnancy between 12 and 15 years old with 74 cases (Figure 2). Participant characteristics, including maternal age, marital status, number of prenatal cares, and gestational age at delivery are shown in Table 1.

A significant positive correlation was observed between maternal age and neonatal birth weight, demonstrated by both Pearson correlation ($r=0.144$, $p<0.001$) and Spearman's rho correlation coefficient ($rho=0.120$, $p<0.001$). One-way ANOVA revealed significant differences in neonatal birth weight among the groups ($p<0.001$). Post-hoc pairwise comparisons using t-tests showed statistically significant differences between the adult group and both adolescent groups ($p<0.001$ and 0.020), while the difference between the two adolescent groups was not significant ($p=0.989$). Significant

Table 2. Maternal and neonatal outcomes in each age group

Outcomes	20 to 34 years	16 to 19 years	12 to 15 years	Pearson chi-square (value)	p-value
Maternal complications					
Anemia	12.30%	19.00%	21.60%	18.988	<0.001*
GDM	1.30%	0.30%	1.40%	2.628	0.453
Pre-eclampsia	0.90%	2.50%	0.00%	6.844	0.077
CD	20.30%	30.20%	25.70%	15.120	0.002*
Preterm birth	5.40%	10.90%	6.80%	12.428	0.006*
Placental previa	0.10%	0.60%	0.00%	2.921	0.404
PPH	0.90%	2.00%	3.10%	2.144	0.543
Maternal death	0.2%	0.00%	0.00%	0.844	0.639
Neonatal outcomes					
Mean birth weight (g)	3069.22	2957.36	2958.11	-	<0.001*
APGAR score <7 at 5 minutes	1.00%	1.40%	0.00%	1.290	0.732
NICU admission	5.60%	7.80%	5.40%	2.325	0.508
Neonatal death	0.90%	0.20%	0.00%	0.844	0.839

GDM=gestational diabetes mellitus; CD=cesarean delivery; PPH=postpartum hemorrhage; NICU=neonatal intensive care unit

* Statistical significance, p<0.05

differences were found in the incidence of anemia, CD, and preterm birth among maternal age groups, while other maternal and neonatal outcomes did not show statistically significant differences between the groups (Table 2).

Preterm birth rate significantly differed among the groups (Pearson chi-square=12.428, df=3, p=0.006), with the highest incidence of 10.9% observed among adolescents aged 16 to 19 year. Anemia was significantly more prevalent in adolescent pregnancies than adult pregnancies (Pearson chi-square=18.988, df=3, p<0.001). No significant difference in pre-eclampsia was found across all three groups (p=0.077). However, subgroup analysis using Fisher's exact test revealed a significant difference between adult pregnancies and adolescent pregnancies aged 16 to 19 years old, with a p-value of 0.027.

Discussion

This retrospective cohort study aimed to evaluate the effect of maternal age on maternal and neonatal outcomes at a tertiary care hospital in Thailand. The results revealed a significantly higher incidence of pre-eclampsia, anemia, preterm birth, and CD in the 16-to-19-year group.

One notable finding was that adolescent pregnancies had significantly less prenatal care visits than adult pregnancies, which is consistent with previous studies[18]. Potential reasons for this situation include factors such as poverty, low education, or lack of economic independence[19]. Inadequate prenatal care can lead to late detection of high-risk pregnancies and no intervention to prevent complications such as preeclampsia and preterm labor[20].

In addition, the present study found significant differences in anemia and preterm birth between specific age groups, in line with other studies[19-21]. Anemia is more prevalent among adolescent pregnancies and can be attributed to both physiological and social factors. Rapid growth and the onset of menstruation during puberty deplete the body's iron levels. Additionally, adolescent pregnancies may have poor understanding of proper nutrition. This combination of insufficient nutritional intake and inadequate iron levels predisposes adolescent pregnancies to anemia, which in turn increases the risk of preterm birth, low birth weight, and infant mortality[21]. Moreover, the immaturity of blood supply in the uterus and cervix during puberty heightens the risk of subclinical infections, which precipitate preterm birth, a primary cause of low birth weight[22,23].

Another important observation was the higher risk of CD in adolescent pregnancies compared to adult pregnancies, which is different from previous studies[18,21]. The present study focused on adolescent women aged 13 to 17 years old, a stage when physical growth and development are immature, resulting in an increased risk of cephalopelvic disproportion in adolescent pregnancies[24]. As in other studies[18,21], the majority of the present study teenage group comprised late adolescents of 18 to 19 years who have already reached full bone maturity, increasing

the likelihood of successful vaginal deliveries for adolescent pregnancies.

In conclusion, the present study highlights the significant impact of maternal age on adverse maternal and neonatal outcomes. The findings emphasize the need for enhanced sex education, contraception availability, and reproductive health services in Thailand to mitigate the risks associated with adolescent pregnancies. The study's primary strength lies in its demonstration of adverse maternal and neonatal outcomes in a problematic area of a border province in Thailand. Nonetheless, the authors recognize the necessity for future research to extend beyond maternal age as a risk factor. Studies that encompass variables such as race, educational level, and specifically target larger cohorts within the youngest maternal age group of 12 to 15 years could provide a more comprehensive understanding of the causing factors. The authors acknowledge the limitation in retrospective study due to the unavailability of data to adjust for confounding variables such as socioeconomic status, lifestyle choices, and prenatal care access. Consequently, the authors recommend that subsequent research employs multiple logistic regression analyses to discern the relationship more precisely between maternal age and adverse outcomes. The present findings, while indicative of an association, should be interpreted with caution, as the potential for unmeasured confounding factors exists and may obscure the true nature of these relationships.

What is already known on this topic?

The WHO has shown that adolescent pregnancies are associated with higher risks of adverse maternal and neonatal outcomes, including anemia, preterm birth, low birth weight, and neonatal mortality. However, these findings focus on adolescents aged 15 to 19 years old. Notably, in Thailand, there is limited information regarding these risks among the extremely young age group of below 15 years old.

What does this study add?

This study showed obstetric and neonatal outcomes in adolescent pregnancies, specifically focusing on the age group of 12 to 15 years old. It found that the risks of preterm birth and pre-eclampsia did not significantly increase compared to adult pregnancies. However, like the 16 to 19-year-old adolescent group, this younger age group also faced a higher likelihood of anemia, and CD.

Conflicts of interest

The authors declare no conflict of interest.

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