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## OBSTETRICS

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# Prevalence of Illicit Drug use during Pregnancy between Teenage and Non-teenage in Thailand

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### ABSTRACT

**Objectives:** The primary outcome was to compare the prevalence of illicit drug use during pregnancy between teenage and non-teenage. The secondary outcomes were to investigate the possible factors predicting of illicit drug use before and during pregnancy and also to compare the incidence of adverse maternal/neonatal outcomes and overall adverse pregnancy outcomes between the participants who had a history of illicit drug use during pregnancy and those who did not.

**Materials and Methods:** This prospective cross-sectional study was conducted at HRH Princess Maha Chakri Sirindhorn Medical center, Srinakharinwirot University, Thailand, between September 2024 and May 2025. The participants were asked to complete a questionnaire to provide their information.

**Results:** 310 participants were enrolled. The prevalence of participants who had a history of any illicit drug use before pregnancy was 50/62 (80.6%) and 170/248 (68.5%) in the teenage and non-teenage group, respectively. Teenage pregnancy was not actually found to be a factor that predicted the risk of illicit drug use during pregnancy (adjusted odds ratio 0.716, 95%CI 0.305, 1.682,  $p = 0.443$ ), while a lower educational level (junior high school or lower), more than 7-hour social media use per day, and age at first sexual intercourse were statistically significantly associated with illicit drug use. Adverse neonatal outcomes were significantly higher in the participants who had a history of illicit drug use during pregnancy than those who did not.

**Conclusion:** Prevalence of illicit drug use during pregnancy in teenage was not different from in non-teenage. Teenagers alone were not at risk of engaging in illicit drug use. A level of education of junior high school or lower, more than 7 hours per day social media use, and a young age at first sexual intercourse were significant factors associated with a higher prevalence of illicit drug use during pregnancy.

**Keywords:** teenage, pregnancy, illicit drug, alcohol, smoking, pregnancy outcome.

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## ความชุกการใช้น้ำยาเสพติดติดมดลูกหมายระหว่างตั้งครรภ์ระหว่างหญิงตั้งครรภ์วัยรุ่นและไม่ใช่วัยรุ่นประเทศไทย

ชฎานิศ ขอบประเสริฐ, กิตติพงษ์ คงสมบูรณ์, ธาธารัตน์ หาญประเสริฐพงษ์

### บทคัดย่อ

**วัตถุประสงค์:** วัตถุประสงค์หลักเพื่อเปรียบเทียบความชุกของการใช้น้ำยาเสพติดติดมดลูกหมายระหว่างตั้งครรภ์ระหว่างหญิงตั้งครรภ์วัยรุ่นและไม่ใช่วัยรุ่น วัตถุประสงค์รองเพื่อศึกษาปัจจัยเป็นไปได้อันเนื่องมาจากการใช้น้ำยาเสพติดติดมดลูกหมายก่อนและระหว่างการตั้งครรภ์ และเปรียบเทียบอุบัติการณ์ของการตั้งครรภ์ไม่พึงประสงค์ต่อมารดา/ทารกในครรภ์และโดยรวมระหว่างหญิงตั้งครรภ์ที่มีประวัติการใช้น้ำยาเสพติดติดมดลูกหมายระหว่างตั้งครรภ์กับหญิงตั้งครรภ์ที่ไม่ใช่

**วัสดุและวิธีการ:** การศึกษาแบบตัดขวาง ไปข้างหน้า ดำเนินการที่มหาวิทยาลัยศรีนครินทรวิโรฒ ประเทศไทย ระหว่างเดือนกันยายน พ.ศ. 2567 ถึงเดือนพฤษภาคม พ.ศ. 2568 อาสาสมัครได้รับการขอให้กรอกแบบสอบถามเพื่อให้ข้อมูลของตน

**ผลการศึกษา:** อาสาสมัครเข้าร่วมการศึกษา 310 คน ความชุกของผู้เข้าร่วมที่มีประวัติการใช้น้ำยาเสพติดติดมดลูกหมายก่อนตั้งครรภ์คือ 50/62 (ร้อยละ 80.6) และ 170/248 (ร้อยละ 68.5) ในกลุ่มวัยรุ่นและไม่ใช่วัยรุ่นตามลำดับ การตั้งครรภ์ในวัยรุ่นไม่เป็นปัจจัยที่นำความเสี่ยงของการใช้น้ำยาเสพติดติดมดลูกหมายในระหว่างตั้งครรภ์ ในขณะที่ระดับการศึกษาที่ต่ำกว่า (ระดับมัธยมต้นหรือต่ำกว่า) การใช้ไอซีซีเฉลี่ยมีเดียมากกว่า 7 ชั่วโมงต่อวัน และอายุเมื่อมีเพศสัมพันธ์ครั้งแรก มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับการใช้น้ำยาเสพติดติดมดลูกหมาย ผลลัพธ์ที่ไม่พึงประสงค์ต่อทารกแรกเกิดสูงกว่าอย่างมีนัยสำคัญในผู้เข้าร่วมที่มีประวัติการใช้น้ำยาเสพติดติดมดลูกหมายในระหว่างตั้งครรภ์เมื่อเทียบกับผู้ที่ไม่ใช่ประวัติ

**สรุป:** ความชุกของการใช้น้ำยาเสพติดติดมดลูกหมายระหว่างตั้งครรภ์ในกลุ่มวัยรุ่นไม่แตกต่างกับกลุ่มที่ไม่ใช่วัยรุ่น การตั้งครรภ์ในวัยรุ่นไม่เป็นปัจจัยเสี่ยงของการใช้น้ำยาเสพติดติดมดลูกหมายทั้งก่อนและระหว่างตั้งครรภ์ ระดับการศึกษาในระดับมัธยมต้นหรือต่ำกว่า การใช้ไอซีซีเฉลี่ยมีเดียมากกว่า 7 ชั่วโมงต่อวัน และการมีเพศสัมพันธ์ครั้งแรกตั้งแต่อายุน้อย เป็นปัจจัยสำคัญที่เกี่ยวข้องอย่างมีนัยสำคัญกับอัตราการใช้น้ำยาเสพติดติดมดลูกหมายที่สูงขึ้นในระหว่างตั้งครรภ์

**คำสำคัญ:** วัยรุ่น, ตั้งครรภ์, ยาเสพติด, แอลกอฮอล์, สูบบุหรี่, ผลการตั้งครรภ์

## Introduction

Substance-use disorder is a medical impairment or condition caused by the use of one or more harmful substances<sup>(1)</sup>, legal or illegal, such as cigarettes, alcohol-containing beverages, marijuana, cocaine, amphetamine and opioids<sup>(2-4)</sup>. Alcohol-containing beverages are any beverage that contains ethyl alcohol (EA), such as wines made from a variety of fruits, such as grapes, peaches, plums or apricots, where the fruits are crushed and fermented in large vats to produce wine. Moreover, while different types of alcohol-containing beverages will have different levels of EA the EA will still have the same effect on the fetus. Fetal alcohol spectrum disorders (FASDs) can occur when the mother intakes alcohol either periconception or during later pregnancy. FASDs cover a wide range of abnormalities, including fetal alcohol syndrome (dysmorphic facial features, prenatal and/or postnatal growth impairment, abnormal brain growth/morphogenesis/physiology and neurobehavior impairment), partial fetal alcohol syndrome, alcohol-related birth defects (cardiac and renal anomalies, orthopedic problems, abnormalities of the eyes and ears, ventral wall defects), alcohol-related neurodevelopmental disorder, and neurobehavioral disorder associated with prenatal alcohol exposure. No amount of EA is considered safe in pregnancy<sup>(5)</sup>.

Smoking is another harmful behavior, depending on the substance, in which a person inhales substances into the body, mostly gases, which may contain chemical agents, natural essential substances, such as herbs or natural fragrances, and even addictive substances that are harmful to the body<sup>(2)</sup>. In addition to natural substances, such as lavender<sup>(6)</sup>, which have been reported to be inhaled for pain relief in pregnant women, cigarettes (common forms of tobacco) and marijuana are addictive but harmful substances that are smoked and may be used by some pregnant women. Cigarette smoking has been linked to several adverse pregnancy outcomes, including ectopic pregnancy, placenta previa, abruptio placenta, preterm premature rupture of membranes,

low birthweight, intrauterine growth restriction, intrauterine fetal death, neonatal respiratory and gastrointestinal disease, and may necessitate neonatal admission to the intensive care unit (ICU)<sup>(2)</sup>. Meanwhile, marijuana, which is often combined with tobacco, has both depressant and stimulating effects on the central nervous system (CNS) of pregnant women<sup>(3)</sup>. CNS stimulant, facial cleft, cardiac anomalies and fetal growth restriction have been reported in infants exposed to amphetamine, and cocaine in utero<sup>(4)</sup>. Marijuana and cocaine have been associated with developmental delay, preterm birth and low birth weight<sup>(7, 8)</sup>.

A teenager is defined as a young person aged between 13 to 19 years old<sup>(9)</sup>. They are considered to have a uniquely vulnerable status related to their growth and development stage. Teenagers are exposed to intense physical, emotional and social changes, which make them prone to several potential problems, including mental health disorders, abuse or violence and harmful behaviors, including alcohol and drug use<sup>(10)</sup>. Although, there has been research into illicit drug use in teenagers, there are few reports about it in regard to pregnancy. Furthermore, there is limited information about illicit drug use in teenagers in Thailand, and, to the best of our knowledge, there has been no reported study on illicit drug use in teenage pregnancy in Thailand. Consequently, we conducted this study. The primary outcome was to compare the prevalence of illicit drug use during pregnancy between teenage and non-teenage. The secondary outcomes were to investigate the possible factors predicting of illicit drug use before and during pregnancy and also to compare the incidence of adverse maternal/neonatal outcomes and overall adverse pregnancy outcomes between the participants who had a history of illicit drug use during pregnancy and those who did not.

## Materials and Methods

This prospective cross-sectional study enrolled pregnant women who visited the Obstetric Unit of the Department of Obstetrics and Gynecology, HRH

Princess Maha Chakri Sirindhorn Medical center, Faculty of Medicine, Srinakharinwirot University, Thailand, between September 2024 and May 2025. Pregnant women who could not understand Thai were excluded from the study. The study was approved by the institute's ethics committee (SWUEC-671006) and was registered on the Thai Clinical Trials Registry (TCTR 20230918001). Informed consent was obtained from all the participants. The participants were asked to complete a questionnaire to provide their general information, which included their maternal age, race, education, parity, gravidity, occupation, religion, family income, legal personal status in Thailand, duration of social media using in a day, marriage status, maternal family status (pregnant women's parents' statuses), age at first sexual intercourse, and history of a diagnosis of sexually transmitted diseases (STD). Then, the patient history was taken concerning illicit drug use before and during pregnancy by the 1st (C.K.) or 3rd (T.H.) author of this study and recorded in a private and confidential section. All participants were reassured that all their information was confidential and securely stored and they were asked to be frank and to provide as much true information as possible. In cases of patients' presenting with illicit drug use, which they properly and voluntarily introduced, they were offered the opportunity to be referred to an expert physician for substance abuse treatment, without any formal legal notification.

Following, all the participants routinely received antenatal, intrapartum and postpartum maternal/neonatal care at the Department of Obstetrics and Gynecology, Faculty of Medicine, Srinakharinwirot University. Pregnancy and neonatal outcomes were recorded.

In terms of drug use and the different types, we defined these as follows.

Alcoholic beverages, meaning all beverages that contain EA, regardless of the raw material the EA was made from or the EA concentration in the beverage. Furthermore, alcohol drinkers were classified into different categories based on their

drinking patterns. The definition was modified for clarity in clinical data collection<sup>(11, 12)</sup>:

I. Social drinking: pattern corresponding to consuming alcohol in social settings without reaching the point of being drunk.

II. Binge drinking: pattern corresponding to consuming alcohol to the point of intoxication, regardless of the frequency of drinking.

III. Problem drinking: pattern corresponding to regularly consuming alcohol to the point of intoxication.

IV. Alcoholism: pattern corresponding to consuming alcohol to the point of it causing physical or mental health problems that require medical treatment.

Cigarette smoking or vape use, classified into<sup>(13)</sup>:

I. Social smoking: pattern corresponding to cigarette smoking in social settings.

II. Less than 3 years smoking (L3): history of regular smoking of more than 10 cigarettes per day for less than 3 years.

III. More than 3 years smoking (M3): history of regular smoking of more than 10 cigarettes per day for more than 3 years.

IV. Vape smoking: history of vape smoking, either with/without cigarette smoking.

V. Junior smoking: history of starting smoking at junior age of less than 18 years old.

In cases whose smoking characteristics could be categorized into multiple groups, the participants were classified into the higher numbered group, e.g., a participant who started cigarette smoking at an age less than 18 years old and who also vaped would be classified into group V (junior smoker).

In terms of illicit drugs, amphetamine users were defined as anyone who had a history of using amphetamine-containing drugs or substances regardless of the form, amount, or dosage. Similarly, marijuana users were defined as anyone who had a history of marijuana use, including marijuana-containing food and beverages, regardless of the amount or type of cannabis used.

The required sample size was estimated using a formula for two independent proportions and with

consideration of prior research. For instance, in a previous study, it was found that 17% of the non-teenage pregnant women in the study had a history of illicit drug use<sup>(9)</sup>. We therefore expected about 34% of the teenage pregnant women would have a history of illicit drug use, while the ratio of the non-teenage to teenage pregnant women who attended antenatal care at our institute was around 4:1. To achieve an alpha error of 0.05 and beta error of 0.20, we determined that the sample size required for the non-teenage group and teenage group would be around 236 and 59 participants, respectively, or 295 overall. Allowing for a 5% loss or missing data, approximately total 310 participants were required.

### Statistical analysis

The baseline characteristics of the participants within each group were examined and recorded as percentages. The Shapiro–Wilk normality test was used for the normal distribution data, while comparisons of the numbers of participants who had a history of illicit drug use between the teenage and non-teenage groups were performed using the chi-square test or Fisher–Freeman–Halton exact test. Comparisons of the number of participants who had a history of illicit drug use during pregnancy between the teenage and non-teenage groups were also done

and the risk factors for predicting illicit drug use during pregnancy were identified using Co-linear test and multiple logistic regression analysis. The prevalence of illicit drug use in the teenage and non-teenage groups before and during pregnancy were recorded and presented as percentages. Lastly, the overall adverse pregnancy, maternal and neonatal adverse outcomes were recorded and presented as percentages and compared between the participants who had a history of illicit drug use and those who did not by chi-square test. In all the statistical tests, p-value < 0.05 was considered statistically significant.

## Results

Overall, 310 pregnant women were enrolled in the study, and split into two groups: a teenage group (62 participants) and non-teenage group (248 participants), respectively. The median (interquartile range, IQR) maternal ages in the teenage and non-teenage groups were 19 (18, 19) and 29.5 (26, 33) years old, respectively. All the enrolled participants completed questionnaires to give their personal data. All the participants in the teenage group and non-teenage group were followed until delivery, except for 2 participants in the non-teenage group who spontaneously lost the fetus in the first trimester of pregnancy (Fig. 1).

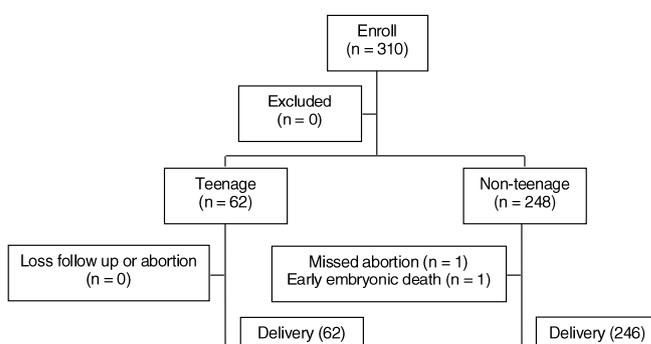


Fig. 1. Flowchart for study inclusion.

Table 1 presents the participants' baseline characteristics in both groups. The participants' religion, occupation, level of education, maternal

family status, age at first sexual intercourse, family income, primigravida or nulliparous status, and gestational age at enrollment were analyzed and were

found to be significantly different between both groups. The prevalence of a history of any illicit drug use (alcohol or cigarette smoking or marijuana or

amphetamine) before pregnancy was 50/62 (80.6%) in the teenage group and 170/248 (68.5%) in the non-teenage group, respectively.

**Table 1.** Baseline characteristics of the study participants (n = 310).

Characteristics	Teenage group (n = 62)	Non-teenage group (n = 248)	p value
Religion, n (%)			0.005*
- Buddhist	44 (71%)	215 (86.7%)	
- Muslim	18 (29%)	31 (12.5%)	
- other	0 (0%)	2 (0.8%)	
Race, n (%)			0.432*
- Thai	44 (71%)	193 (77.8%)	
- SEA	18 (29%)	54 (21.8%)	
- other	0 (0%)	1 (0.4%)	
Occupation, n (%)			< 0.001*
- Monthly income	11 (17.7%)	126 (50.8%)	
- Daily income	6 (9.7%)	35 (14.1%)	
- Government officer	0 (0%)	14 (5.6%)	
- Unemployed	45 (72.6%)	73 (29.4%)	
Location, n (%)			0.848*
- Nakhon Nayok & Pathum Thani	56 (90.3%)	227 (91.5%)	
- Bangkok	2 (3.2%)	5 (2%)	
- Others	4 (6.5%)	16 (6.5%)	
Level of education, n (%)			0.030*
- Junior high school or lower	33 (53.2%)	88 (35.5%)	
- Senior high school or higher	29 (46.8%)	157 (63.3%)	
Legal status			0.503*
- Thai citizen	46 (74.2%)	194 (78.2%)	
- legally entered foreigner	11 (17.7%)	43 (17.3%)	
- illegally entered foreigner	5 (8.1%)	11 (4.4%)	
Duration of social media use per day			0.359*
- less than 7 hours	32 (51.6%)	144 (58.1%)	
- more than 7 hours	30 (48.4%)	104 (41.9%)	
Marriage status			0.425**
- stay as couple	59 (95.2%)	241 (97.2%)	
- divorced/widowed	3 (4.8%)	7 (2.8%)	

**Table 1.** Baseline characteristics of the study participants (n = 310). (Cont.)

Characteristics	Teenage group (n = 62)	Non-teenage group (n = 248)	p value
Maternal family status			< 0.001*
- stay as family	33 (53.2%)	187 (75.4%)	
- broken family	29 (46.8%)	61 (24.6%)	
Multiple sex partners (≥ 2 at the same time)			1.000**
- Yes	1 (1.6%)	4 (1.6%)	
- No	61 (98.4%)	244 (98.4%)	
Age at first sexual intercourse			< 0.001*
- < 15	16 (25.8%)	11 (4.4%)	
- 15–18	45 (72.6%)	125 (50.4%)	
- ≥ 19	1 (1.6%)	112 (45.2%)	
Family income (Baht)			< 0.001*
- < 15,000	27 (43.5%)	48 (19.4%)	
- 15,000–29,999	25 (40.3%)	92 (37.1%)	
- 30,000–50,000	9 (14.5%)	84 (33.9%)	
- > 50,000	1 (1.6%)	24 (9.7%)	
Primigravida, n (%)			< 0.001*
- Yes (G = 1)	53 (85.5%)	90 (36.3%)	
- No (G ≥ 2)	9 (14.5%)	158 (63.7%)	
Nulliparous n (%)			< 0.001*
- yes (P = 0)	59 (95.2%)	115 (46.4%)	
- no (P ≥ 1)	3 (4.8%)	133 (53.6%)	
History of abortion, n (%)			0.071*
- Yes	54 (87.1%)	190 (76.6%)	
- No	8 (12.9%)	58 (23.4%)	
GA			0.002*
- First trimester	10 (16.1%)	27 (10.9%)	
- Second trimester	21 (33.9%)	41 (16.5%)	
- Third trimester	31 (50%)	180 (72.6%)	
STD history			0.795*
- presence	7 (11.3%)	31 (12.5%)	
- absence	55 (88.7%)	217 (87.5%)	

SEA: Southeast Asian, GA: gestational age, STD: sexually transmitted disease

\* Pearson chi-square.

\*\* Fisher–Freeman–Halton exact test.

Table 2 presents the details of each illicit drug used before pregnancy, classified by the teenage and non-teenage groups, respectively. During pregnancy, the prevalence of participants who had a history of any illicit drug use (alcohol or cigarette smoking or marijuana or amphetamine) was reduced to 20/62 (32.3%) and 46/248 (18.5%)

in the teenage and non-teenage groups, respectively.

Table 3 presents the details of each illicit drug type used during pregnancy, classified by the teenage and non-teenage groups. No participants were diagnosed with alcoholism before or during pregnancy in this study.

**Table 2.** Prevalence of participants who had a history of each type of illicit drug use before pregnancy according to the teenage and non-teenage groups.

Group	Before pregnancy	Teenage group (n = 62)	Non-teenage group (n = 248)
Alcohol n,(%)	Not use	14 (22.6%)	79 (31.9%)
	Social drinker	23 (37.1%)	102 (41.1%)
	Binge drinker	15 (24.2%)	45 (18.1%)
	Problem drinker	10 (16.1%)	22 (8.9%)
Cigarette n, (%)	Not use	31 (50%)	204 (82.3%)
	Social smoker	0 (0%)	3 (1.2%)
	Regular smoker for less than 3 years	1 (1.6%)	3 (1.2%)
	Regular smoker for more than 3 years	1 (1.6%)	3 (1.2%)
	E-cigarettes smoker	6 (9.7%)	28 (11.3%)
	Smoked before 18 years old	23 (37.1%)	7 (2.8%)
Marijuana uses n, (%)	No	57 (91.9%)	237 (95.6%)
	Yes	5 (8.1%)	11 (4.4%)
Amphetamine uses n, (%)	No	60 (96.8%)	244 (98.4%)
	Yes	2 (3.2%)	4 (1.6%)

**Table 3.** Prevalence of participants who had a history of each type of illicit drug use during pregnancy according to the teenage and non-teenage groups.

Group	During pregnancy	Teenage group (62)	Non-teenage group (248)
Alcohol n, (%)	Not use	44 (71%)	208 (83.9%)
	Social drinker	7 (11.3%)	17 (6.9%)
	Binge drinker	4 (6.5%)	10 (4%)
	Problem drinker	7 (11.3%)	13 (5.2%)
Cigarette n, (%)	Not use	49 (79%)	235 (94.8%)
	Still smoking	13 (21%)	13 (5.2%)
Marijuana uses n, (%)	No	61 (98.4%)	248 (100%)
	Yes	1 (1.6%)	0 (0%)
Amphetamine uses n, (%)	No	61 (98.4%)	247 (99.6%)
	Yes	1 (1.6%)	1 (0.4%)

Table 4 presents comparisons of the number of participants who had taken illicit drugs during pregnancy (by multiple logistic regression). Being a teenager, less than junior high school status, more than 7-hour social media use per day and age at first sexual intercourse were statistically significantly associated with illicit drug use during pregnancy in univariate analysis. Interestingly, after statistical

adjustment, teenage pregnancy was not found to be a factor that reduced the risk of illicit drug use during pregnancy (adjusted odds ratio (OR) 0.716, 95%CI 0.305, 1.682,  $p = 0.443$ ), while a lower educational level (junior high school or lower), more than 7-hour social media use per day and age at first sexual intercourse were still statistically significantly associated with illicit drug use during pregnancy.

**Table 4.** Teenage and other possible risk factors for predicting participants who had engaged in illicit drug use during pregnancy.

Variable	Crude OR	95%CI	p value	Adjusted OR	95%CI	p value	
Teenager	Yes	2.091	1.123–3.892	0.020	0.716	0.305–1.682	0.443
	No	1	-	-	1	-	-
Occupation	Monthly income	0.547	0.301–0.993	0.047	1.085	0.512–2.300	0.831
	Daily income	0.530	0.214–1.314	0.171	0.586	0.218–1.579	0.291
	Government	0.429	0.091–2.023	0.285	0.621	0.104–3.709	0.601
	Unemployed	1	-	-	1	-	-
Education	Junior high school or lower	2.430	1.398–4.226	0.002	2.651	1.355–5.190	0.004
	Senior high school or higher	1	-	-	1	-	-
Family income	< 15,000	3.451	0.940–12.665	0.062	1.211	0.270–5.431	0.802
	15,000–29,999	1.892	0.522–6.855	0.331	0.838	0.200–3.511	0.808
	30,000–50,000	1.410	0.374–5.315	0.612	0.648	0.149–2.817	0.563
	> 50,000	1	-	-	1	-	-
Nulliparous	Yes	1.613	0.916–2.839	0.098	1.477	0.722–3.022	0.286
	No	1	-	-	1	-	-
Marital status	Divorced/separated	2.559	0.700–9.349	0.155	2.878	0.632–13.096	0.172
	Married/living together	1	-	-	1	-	-
Parent marital status	Divorced/separated	1.541	0.867–2.740	0.141	1.058	0.550–2.035	0.866
	Married/living together	1	-	-	1	-	-
Duration of social media use per day	7 h up	2.092	1.205–3.632	0.009	1.912	1.029–3.552	0.040
	< 7 h	1	-	-	1	-	-
Age at first sexual intercourse	< 15	7.418	2.780–19.793	< 0.001	5.737	1.796–18.332	0.003
	15–19	3.140	1.541–6.397	0.002	3.368	1.509–7.517	0.003
	> 19	1	-	-	1	-	-

OR: odds ratio, CI: confidence interval.

Table 5 presents a comparison of the incidence of adverse maternal outcomes, adverse neonatal outcomes and adverse pregnancy outcomes between the participants who had a history of illicit drug use during pregnancy and those who did not. The incidence of adverse neonatal outcomes (preterm delivery, intrauterine growth restriction, and respiratory problem) was significantly higher in the participants who had a history of illicit drug use than those who did not (33.3% vs 19%,  $p = 0.013$ ). While the incidences of adverse maternal outcomes

(pregnancy-induced hypertension, placental abruption and placenta previa/placenta accreta spectrum) and overall adverse pregnancy outcomes were comparable between both groups. We found that 18/66 (27.3%) of participants used  $\geq$  two types of illicit drug together. 16/18 (88.9%) of participants took combined alcohol with cigarette smoking. When subgroup analysis between participants using each illicit drug individually, did not reveal a statistically significant difference in overall, maternal or neonatal adverse outcomes.

**Table 5.** Comparison of the incidence of adverse maternal outcomes, adverse neonatal outcomes and adverse pregnancy outcomes between the participants who had a history of illicit drug use during pregnancy and those who did not.

Outcome		History of illicit drug use (n = 66)	No history of illicit drug use (n = 242)	p value
Adverse maternal outcome n, (%)	Yes	14 (21.2%)	50 (20.7%)	0.922*
	PIH	10	33	
	Placental abruption	0	1	
	Placenta previa/PAS	4	16	
	No	52 (78.8%)	192 (79.3%)	
Adverse neonatal outcome n, (%)	Yes	22 (33.3%)	46 (19%)	0.013*
	Preterm delivery	10	19	
	IUGR	6	192 (79.3%)	
	Respiratory problem	6	46 (19%)	
	No	44 (66.7%)	196 (81%)	
Adverse pregnancy outcome n, (%)	Yes	27 (40.9%)	75 (31%)	0.129*
	No	39 (59.1%)	167 (69%)	

PIH: pregnancy induced hypertension, PAS: placenta accreta spectrum, IUGR: intrauterine growth restriction

Respiratory problems: including meconium aspiration syndrome and early neonatal sepsis

\*Pearson chi-square

## Discussion

Although both teenage pregnancy and illicit drug use are important concerns for obstetricians, few studies have been conducted on either of these topics in Thailand, especially in the past decade<sup>(14, 15)</sup>. However, in 2002, a study in Bangkok reported that 66 of 44,640 (0.15%) intrapartum pregnant women used amphetamines or derivatives<sup>(15)</sup>. A later study in

2017 reported the prevalence of alcohol, tobacco and illicit drug use during pregnancy was 5.6% in Southern Thailand<sup>(16)</sup>. Both these represent a lower prevalence than in our present study. This may be explained by the different times and the diagnostic definition. The latter reported the diagnostic definition based on a questionnaire completed by the study participants, who also reported mental health problems.

According to the baseline characteristics of the participants in the teenage pregnancy group, it was found that the majority of the teenage pregnancy participants in this study were Buddhist, unemployed, had a level of education lower than junior high school, had divorced parents, had a younger age than 18 at first sexual intercourse, an income of less than 30,000 baht, and this was their first time of experiencing pregnancy and delivery (Table 1). These personal characteristics mostly lead to teenage pregnancy being categorized as a problem for those with a low socioeconomic status. From the findings, we also demonstrated that the characteristics of the teenage pregnant women were more compatible with a lower socioeconomic status than those of the non-teenage pregnant women. A previous study reported that a low socioeconomic status also increased the risk of pregnancy complications, such as miscarriage, preterm delivery, preeclampsia and eclampsia<sup>(17)</sup>. It has been suggested that this is caused by the inadequate prenatal care that low socioeconomic pregnant women may receive<sup>(18)</sup>. Thus, we suggest that medical healthcare providers should carefully monitor teenage pregnant women with low socioeconomic status and consider them as high-risk pregnancies. Moreover, health services should facilitate them receiving adequate prenatal care.

Next, it was very interesting for the possible factors associating with illicit drug use after univariate analysis, we found that being a teenager, having a regular monthly income, a level of education of junior high school or lower, a duration of social media use of more than 7 hours per day (more than 7 hours per day social media use was found that associated with illicit drug use and mental health consequence)<sup>(19)</sup>, and age at first sexual intercourse of less than 19 years old (i.e., first sexual intercourse at teenage) were all risk factors for illicit drug use during pregnancy. However, when adjusting for each of the factors, the factors that remained as significant factors after adjustment of the OR were a level of education of junior high school or lower, a duration of social media use of more than 7 hours per day, and first sexual

intercourse at teenage. This study was consistent with several previous reports that found a relationship between social media/online activity with accessibility to illicit drugs<sup>(20, 21)</sup>. It is possible that a prolonged duration of social media use per day increases the risk of illicit drug via encountering drug behaviors via that media. However, other previous studies have also found that teenage pregnancy is more likely to be a risk factor for substance use (tobacco, alcohol and marijuana) than non-teenage pregnancy and that depression is associated with persistent tobacco and marijuana use. However, at the time of that study, social media was not as prevalent as it is today<sup>(22)</sup>. Although it is difficult to separate being a teenager from socioeconomic problems, including social media use, in our opinion, we feel that education can help alleviate the problems. Moreover, it is encouraging that previous studies have found that pregnancy is an effective motivating factor that can prompt teenagers to quit their illicit drug use<sup>(23, 24)</sup>. Further study on the effectiveness of short courses of education in reducing drug use is warranted. Our study is the most recent report about illicit drug use in reproductive age women in Thailand and during pregnancy. Moreover, we also inquired about the four main types of illicit drugs of interest (cigarette, alcohol, marijuana and amphetamine) and also categorized drug users by their behavior characteristics, and frequency and duration of drug exposure, which could help medical providers to determine the possibility of an illicit drug effect on the physical and mental health of users. This is a key strength of study. Lastly, the types of adverse maternal or neonatal outcomes were similar to those observed in both teenage pregnancies and illicit drug use pregnancies<sup>(11, 25-27)</sup>. However, our study found that only adverse neonatal outcomes (preterm delivery, intrauterine growth restriction, and respiratory problems) were significantly associated with illicit drug use during pregnancy. It is similar to the previous study that abused amphetamine was more likely to develop anemia, preterm delivery, thick meconium-stained amniotic fluid and delivered small for gestational age neonates<sup>(28)</sup>. We found no significant association

between the overall and maternal adverse outcomes (pregnancy induced hypertension, placental abruption and placenta previa/placenta accreta spectrum) with illicit drug use during pregnancy. The explanation for this difference was that our sample size may have been too small to come to a firm conclusion on these outcomes, and so we suggest this should be investigated further in a future study.

The study was conducted as a prospective cross-sectional that based on our interview. Only two interviewers who were given standardized training and attempted to use similar questions, were a strength of this study. However, the limitation of this study was that no laboratory test to confirm the use or not of illicit drugs. If the laboratory confirmation was performed, the reliability of the illicit drugs use should be improved. The number of sample size using each illicit drug individually was limited to clearly determine the specific effect on adverse outcomes.

## Conclusion

Prevalence of illicit drug use during pregnancy in teenage was not different from in non-teenage. Teenagers alone were not at risk of engaging in illicit drug use. The level of education of junior high school or lower, more than 7 hours per day social media use, and first sexual intercourse at teenage were significant factors associated with a higher prevalence of illicit drug use during pregnancy. Our interview-based study found a higher prevalence of illicit drug use during pregnancy (alcohol, tobacco, marijuana and amphetamine). We also found that teenage pregnant women were more likely to have a low socioeconomic status.

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## Author Contribution

CK: protocol/project development, Data collection or management, Data analysis, Manuscript writing

KK: protocol/project development, Data analysis, Manuscript editing

TH: protocol/project development, Data collection or management, Data analysis, Manuscript writing/editing

## Potential conflicts of interest

The authors declare no conflicts of interest.

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