

# ความสัมพันธ์ระหว่างความรู้ด้านสุขภาพเพื่อการป้องกันการตั้งครรภ์ กับการตั้งครรภ์ของวัยรุ่น

## The Association of Health Literacy for Pregnancy Prevention with Adolescent Pregnancy

นิพนธ์ต้นฉบับ

Original Article

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### บทคัดย่อ

**วัตถุประสงค์:** เพื่อทดสอบความสัมพันธ์ระหว่างความรู้ด้านสุขภาพเพื่อการป้องกันการตั้งครรภ์กับการตั้งครรภ์ของวัยรุ่น **วิธีการศึกษา:** การศึกษาแบบ matched case-control รวบรวมข้อมูลจากหญิงตั้งครรภ์วัยรุ่น (cases) และวัยรุ่นนักรียนหญิงที่ไม่ได้ตั้งครรภ์ (controls) กลุ่มละ 180 คน ที่อาศัยใน จ.ชลบุรี โดยการสุ่มแบบหลายขั้นตอน รวบรวมข้อมูลโดยใช้แบบสอบถามที่ตอบด้วยตนเอง ประกอบด้วยข้อมูลทั่วไป แบบวัดความรู้ทางสุขภาพเพื่อป้องกันการตั้งครรภ์ ซึ่งประกอบด้วย 3 ระดับ 6 ด้าน ได้แก่ 1) ทักษะทางปัญญาระดับพื้นฐาน (ความรู้ความเข้าใจทางสุขภาพ และการเข้าถึงข้อมูลและบริการระดับพื้นฐาน) 2) ทักษะทางสังคมระดับปฏิสัมพันธ์ (การสื่อสารเพื่อความร่วมมือ และการจัดการเงื่อนไขทางสุขภาพ) และ 3) ทักษะระดับวิจารณ์ญาณ (การรู้เท่าทันสื่อและสารสนเทศ และการตัดสินใจเลือกปฏิบัติที่ถูกต้อง) วิเคราะห์ข้อมูลความสัมพันธ์ระหว่างความรู้ทางสุขภาพระดับพื้นฐาน ระดับปฏิสัมพันธ์ และระดับวิจารณ์ญาณ กับ การตั้งครรภ์ในวัยรุ่นด้วยสถิติ Binary logistic regression **ผลการศึกษา:** วัยรุ่นหญิงที่มีระดับความรู้ด้านสุขภาพเพื่อป้องกันการตั้งครรภ์ระดับวิจารณ์ญาณต่ำมีแนวโน้มที่จะตั้งครรภ์สูงเป็นสี่เท่าของวัยรุ่นหญิงที่มีความรู้ทางสุขภาพระดับวิจารณ์ญาณดี [odds ratio (OR) = 4.12, 95% confidence interval (CI) = 1.43, 11.84] การวิเคราะห์ในแต่ละองค์ประกอบทั้ง 6 ด้าน พบว่าวัยรุ่นหญิงที่มีความรู้และความเข้าใจ การจัดการสภาวะสุขภาพ และการรู้เท่าทันสื่อในระดับต่ำมีความสัมพันธ์กับการเพิ่มขึ้นของความเสี่ยงที่จะตั้งครรภ์ด้วยอย่างมีนัยสำคัญทางสถิติที่  $P$ -value < 0.05 (OR = 4.69, 2.67 และ 2.53 ตามลำดับ) **สรุป:** การเรียนการสอนในโรงเรียนเพื่อป้องกันการตั้งครรภ์ในวัยรุ่นควรมีการจัดรายวิชาที่เน้นความรู้ทางสุขภาพ และเน้นพัฒนาทักษะระดับวิจารณ์ญาณ.

**คำสำคัญ:** ความรู้ด้านสุขภาพ, การตั้งครรภ์วัยรุ่น, การป้องกันการตั้งครรภ์, วัยรุ่นหญิง

### Abstract

**Objective:** To examine the relationship between health literacy (HL) for pregnancy prevention and teenage pregnancies. **Method:** This matched case-control study obtained data from 180 pregnant adolescents as cases and 180 non-pregnant female school adolescents as controls in Chon Buri province, Thailand, by the multi-stage sampling method. Questionnaires were used to collect personal information, and to assess sexual behavior and health literacy for pregnancy prevention (HLPP) including three cognitive levels and six components, i.e., 1) functional level (knowledge on health, and access to information skill), 2) interactive level (communication skill, and self-management scale), and 3) critical level (media literacy, and decision skill). Binary logistic regression was used to test associations of functional, interactive, and critical health literacy with adolescent pregnancy. **Results:** Female adolescents with poor critical HL were four times more likely to get pregnant than adolescents with good critical HL [odds ratio (OR) = 4.12, 95% confidence interval (CI) = 1.43, 11.84]. Female adolescents with low knowledge and understanding on health, management of health condition, and media and information literacy were associated with an increase in teenage pregnancy likelihood (OR = 4.69, 2.67, and 2.53, respectively,  $P$ -value < 0.05). **Conclusion:** The incorporation of health literacy courses based on critical skills into school education curricula is crucial to prevent teenage pregnancy.

**Keywords:** health literacy, adolescent pregnancy, pregnancy prevention, female adolescent

#### Editorial note

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## Introduction

Teenage pregnancy is a cause for concern worldwide. Nowadays, this problem is a priority for public health in developed and developing countries. The United Nations International Children's Emergency Fund (UNICEF) reported that worldwide every fifth child is born by an adolescent mother and 80% of these teenage pregnancies occur in third-world countries. Around 11% of all pregnancies are in

adolescents aged 15 – 19 years.<sup>1</sup> According to the World Health Statistics, 2017, the average global adolescent birth rate among 15-19-year-olds is 50 per 1,000 girls whereas the rate in Southeast Asia is 47 per 1,000 girls.<sup>2</sup> In Thailand, adolescent birth rate is one of the indicators of Millennium Development Goal 5 on the target of universal access to reproductive health.<sup>3</sup> Despite recent declines, teen pregnancy

rates remain high in some provinces. According to the Thai Health Statistics, 2017, the average country adolescent birth rate among 15-19-year-olds is 42.5 per 1,000 girls whereas provincial rates range from 22.3 to 65.3 births per 1,000 girls. The pregnancy rate among 15-19-year-olds was the highest in Chon Buri province (65.3 pregnancies per 1,000 females).<sup>4</sup>

Teen pregnancy and teen motherhood lead to adverse health consequences attributed to immediate and long-term impacts on teen parents and their children. The consensus of knowledge appears that teen pregnancies are associated with poor social and economic conditions and prospects. Teenage motherhood is significantly associated with dropping out of school, low educational level, low income, poverty and single parenting.<sup>1</sup> Additionally, in Thailand, giving birth during adolescence was associated with increased risks of adverse obstetric outcomes: anemia, preterm labor, very low birth weight babies, newborn admission to Intensive Care Units, postpartum complications, and a high rate of Cesarean sections.<sup>5-8</sup>

Over time, it became apparent that knowledge about contraception, safe sexual practices, healthy pregnancy and postpartum behaviors, and preventive care are important to keep young women healthy and leading productive lives. These competences are defined as health literacy. Health literacy represents the social determinants of health.<sup>9,10</sup> It is significantly influenced by health outcomes and health behaviors.<sup>11, 12</sup> In this study, health literacy was defined as “the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health.”<sup>9</sup>

Health literacy is known to be associated with a wide range of health-related outcomes among hospital-based and general populations, including important health outcomes in adolescent and young adults.<sup>13-16</sup> While some studies have explored the relationship between health literacy and adolescent health behaviors, and health outcomes,<sup>13,17</sup> the results of these studies were mixed, especially the relationship with teenage pregnancy remains unclear.<sup>16-18</sup> However, there was sufficient evidence to suggest that the relationship between health literacy and pregnancy in adolescents is meaningful<sup>17,18</sup> and several questions regarding this association remain unanswered. First, in existing studies, the measures of adolescent health literacy fail to capture all aspects of health literacy and they have also been shown to

have substantive psychometric weakness.<sup>11</sup> Second, while context is very important for health literacy, there is limited amount of data related to adolescent health literacy for pregnancy prevention in a Thai context.<sup>19,20</sup> Third, no study has reported on the relationship between health literacy and pregnancy among adolescents without chronic illness.<sup>13</sup> Knowledge gained from this study will contribute to the design of health literacy intervention to reduce teen pregnancy rates in Thailand. Specific objectives of the study were to determine level of health literacy for pregnancy prevention in female adolescents, and the relationship between health literacy for pregnancy prevention and teenage pregnancy.

## Methods

A matched case-control study design was used to ensure an adequate number of pregnant teenagers and to control for age which was anticipated to be the most important confounder. The research was conducted in Chon Buri province, representing the east of Thailand, reporting the highest adolescent birth rate in the country. Based on the multi-stage sampling method, the study settings to obtain cases were three community hospitals in the three selected districts in Chon Buri province; while those to obtain controls were 11<sup>th</sup> grade district high school students (including public vocational high schools) in the three districts selected for cases recruitment. From 11 districts in the province, three districts (Bang Lamung, Ban Bueng and Sattahip) were selected using the lottery sampling method.

### Sample size estimation

The ratio of cases to controls was 1:1. Based on the 14% rate of adolescent pregnancy in Chon Buri reported by Health Department (Ministry of Public Health) in 2017<sup>4</sup>, an expected odds ratio of 1.5, confidence intervals of 95%, and a power of 80%<sup>21,22</sup>, the required sample size was 180 cases and 180 controls.

### Cases and controls identification

Cases were adolescents who were currently pregnant for the first time, aged less than 19 years, and registered for the care at the ante-natal out-patient clinic at three public hospitals in the selected districts. The pregnancy was verified based on the physician's written diagnosis in medical chart. However, pregnant adolescents with a self-reported history of

pregnancy, abortion, ectopic pregnancy, or stillbirth in their lifespan were excluded.

Controls were non-pregnant female adolescents with a self-reported history of no pregnancy. They were matched with cases for age and neighborhoods. If cases resided in Bang Lamung district, controls were also taken randomly from school adolescents in Bang Lamung district. There was an average of 30 students per class in each school (three district high schools and three vocational schools).

### **Participant protection**

This study was approved by the Burapha University Institutional Review Board (Sci052/2018). At each study setting, the researcher informed prospective participants about objective, process, and voluntary, anonymity, and confidentiality of the study. Written informed consent was obtained before participation.

### **Data collection procedure**

The questionnaire survey had been conducted between January and March 2018. At each study setting, after the written informed consent was obtained, the research assistant (a nurse at the ante-natal out-patient clinic in each district) conducted the self-administered survey and addressed participants' questions. No participants, both cases and controls, declined to participate in this study. Both case and control participants received 100 baht for compensation for their participation.

### **Research instruments**

The questionnaire asked participants about demographic characteristics, pregnancy history (for case participants only), and health literacy pregnancy prevention. For demographic characteristics, the questions collected the participant's age, education level, school achievement (good, fair, or poor), and living with parents (yes or no), family relationship (good, fair, or poor), and life satisfaction (very high, high, fair, or low). Participants were also asked about their parents' marital status and education level of the parent that the participant depended on the most.

For pregnancy history, case participants were asked about their parents' and grandparents' history of adolescent pregnancy, their own pregnancy experience (i.e., first successful gestation, or second or third gestation with abortion), whether their present pregnancy was planned (yes

or no), and the use of dual protection for pregnancy, i.e., the use of condom together with another method (always, almost, often, sometimes, or never).

The second section of the questionnaire assessed health literacy for pregnancy prevention using the Health Literacy Scale for Unwanted Pregnancy Prevention (HLPP) of Thai Female Adolescents, which is a multidimensional and self-administered questionnaire.<sup>20</sup> The HLPP scale comprised 38 items was characterized by three cognitive levels, with six components including 1) functional level (five items of access to information component and eight items of knowledge component), 2) interactive level (six items of communication skill component and five items of self-management component), and 3) critical level (five items of media literacy component and nine items of decision skill component). The choice of a five-point rating scale differentiated the responses ranging from 1 "not performing" to 5 "every time." The possible total scores of overall literacy, functional level literacy, interactive level literacy, and critical level literacy were 38 – 190, 13 – 65, 11 – 55, and 14 – 70 points, respectively. Health literacy both overall and individual literacy cognitive levels (functional, interactive, and critical) was classified as low, fair, and high corresponding to actual total scores of below 60%, 60% to less than 80%, and 80% or higher of the possible total scores, respectively.

For the six components of health literacy, the possible total scores of access to the information and services, knowledge and understanding, communication skills, management of health condition, media and information literacy, and appropriate health decision making were 5 – 25, 8 – 40, 6 – 30, 5 – 25, 5 – 25 and 9 – 45 points, respectively. Health literacy in each of the six components was classified as low, fair, and high as for the literacy cognitive level. The Health Literacy Scale for Unwanted Pregnancy Prevention (HLPP) of Thai Female Adolescents had an acceptable internal consistency reliability with Cronbach's alpha coefficients of 0.87 - 0.90.<sup>20</sup>

### **Statistical analysis**

Descriptive statistics including mean with standard deviation (SD) and frequency with percentage were used to describe the participants' characteristics, levels of HLPP, and components of HLPP. Univariate logistic regression was used to examine the association of teenage first pregnancy with health literacy. The association was reported as unadjusted

odds ratio (OR) with 95% confidence interval (CI). ORs and 95% CIs of first pregnancy among those with low and fair literacy compared with those with high literacy as reference were obtained. The associations were tested for three individual cognitive levels of literacy, and six individual components of literacy. The test on the overall health literacy level was not done because it provides no conceptual meaning. Significance level was set at a type I error of 5%. All statistical analyses were performed using the software program SPSS version 26.

## Results

These analyses were based on 360 participants, i.e., 180 cases of pregnant adolescents and 180 controls of non-pregnant school adolescents (Table 1). Average ages of cases and controls were comparable (17.54 and 17.13 years old, respectively) and most of them were in their 16 – 19 years of age (92.2% and 99.4%, respectively). Majority of cases and controls had high school or associate degree (55.0% and 77.2%, respectively), and good school achievement (62.2% and 59.5%, respectively) followed by fair achievement (34.5% and 37.2%, respectively). While 55.6% of cases lived with their parents, as high as 86.1% of controls did so. While most parents of cases were reported to live together and separated relatively equally (46.7% and 50.0%, respectively); more parents of controls lived together (57.2%), and fewer of them were separated (37.2%). About half of cases reported that they parents had high school or associate degree (54.4%); while three-quarters of controls did so (76.6%).

Among 180 cases, 100% of pregnant adolescents reported having grandmother (85.0%) or mother (15.0%) who had an experience of adolescent pregnancy. Most cases reported that this present pregnancy was their first gestation (84.4%) and they did not plan to get pregnant (63.3%). For dual protection, 38.9% reported never using dual contraceptive protection, and 7.2% reported always using dual protection (Table 2).

### Level of health literacy for pregnancy prevention in female adolescents by cognitive levels

The results revealed that the overall mean HLPP scores among cases and controls were 96.7 and 98.2 points, respectively out of 149 points. Most cases (64.4%) and controls (58.3%) had a fair overall HLPP (Table 3). For functional cognitive level, there were fewer cases (41.7%) than controls

(56.1%) with low literacy level. Half of cases and controls reported low interactive level (58.9% and 52.8%, respectively). It was noteworthy that 59.4% of cases and 62.2% of controls reported fair critical literacy level.

**Table 1** Characteristics of pregnant adolescents (cases) compared with non-pregnant school adolescents (control) (N = 360).

Characteristics	N (%)	
	Cases (n = 180)	Controls (n = 180)
<b>Age (years)</b>		
14 – 15	14 (7.8)	1 (0.6)
16 – 19	166 (92.2)	179 (99.4)
Mean ± SD	17.54 ± 1.36	17.23 ± 0.59
<b>Education level</b>		
Primary school or lower	75 (41.7)	23 (12.8)
High school/associate degree	99 (55.0)	139 (77.2)
Undergraduate degree or higher	6 (3.3)	18 (10.0)
<b>School achievement</b>		
Good	112 (62.2)	107 (59.5)
Fair	62 (34.5)	67 (37.2)
Poor	6 (3.3)	6 (3.3)
<b>Living with parents</b>		
Yes	100 (55.6)	155 (86.1)
No	80 (44.4)	25 (13.9)
<b>Parent's marital status</b>		
Living together	84 (46.7)	103 (57.2)
Divorced	6 (3.3)	10 (5.6)
Separated	90 (50.0)	67 (37.2)
<b>Education level of parents</b>		
Primary school or lower	75 (39.4)	23 (12.8)
High school/associate degree	98 (54.4)	138 (76.6)
Undergraduate degree or higher	7 (3.9)	19 (10.6)
<b>Family relationship</b>		
Poor	6 (3.3)	6 (3.3)
Fair	51 (28.3)	55 (30.6)
Good	123 (68.3)	119 (66.1)
<b>Life satisfaction</b>		
Very high	36 (20.0)	45 (25.0)
High	106 (58.9)	78 (43.3)
Fair	33 (18.3)	55 (30.6)
Low	5 (2.8)	2 (1.2)

**Table 2** History of pregnancy of pregnant adolescents (cases) (N = 180).

History	N (%)
<b>Family history of teenage pregnancy</b>	
Grandmother	153 (85.0%)
Mother	27 (15.0%)
<b>Planned pregnancy</b>	
No	114 (63.3%)
Yes	66 (36.7%)
<b>Pregnancy experience</b>	
First gestation	152 (84.4%)
Second gestation	29 (15.6%)
<b>Dual pregnancy protection</b>	
Always	13 (7.2%)
Almost	12 (6.7%)
Often	8 (4.4%)
Sometimes	77 (42.8%)
Never	70 (38.9%)

Considering six components of HLPP, majority of cases had fair level (47.2%) followed by high level (38.9%) of knowledge and understanding component; while majority of controls had a high level (58.3%) (Table 4). Most of the participants in case and control groups had a low level of access to the information and services (63.3% and 73.3%, respectively) and communication skills (64.4% and 73.9%, respectively). However, obviously more cases (62.2%) than controls (45.6%) had a low level of management of health condition, and more cases (74.7%) than controls (62.2%) had a low level of media and information literacy. On the other hand, most cases and controls had a comparably high level of appropriate health decision making component (87.2% and 88.9%, respectively) (Table 4).

### The relationship between health literacy for pregnancy prevention and adolescent pregnancy

Female adolescents with low critical HLPP were 4.12 times more likely to have first adolescent pregnancy compared with those with a high level (OR = 4.12, 95% CI = 1.44, 11.84) (Table 3). The associations of adolescent pregnancy regarding differences in functional and interactive HLPP were not statistically significant.

For the six components of HLPP, components of knowledge and understanding, health condition management, and media and information literacy skills were associated with adolescent pregnancy (Table 4). Female adolescents with low and fair knowledge and understanding were 4.69 and 1.90 times more likely to get pregnant, respectively, compared with those with high knowledge and understanding (OR = 4.69, 95% CI = 2.00, 10.99 and OR = 1.90, 95% CI = 1.22, 2.96, respectively). Participants with low health condition management skills were 2.67 times more likely to get pregnant, compared with those with high skills (OR = 2.67, 95% CI = 1.50, 4.76). Participants with a low level of media and information literacy were 2.53 times more likely to get pregnant compared with those with a high level in media information literacy (OR = 2.53, 95% CI = 1.35, 4.75) (Table 4).

**Table 3** Levels of health literacy for pregnancy prevention by cognitive levels and risk of adolescent pregnancy of pregnant adolescents (cases) compared with non-pregnant school adolescents (control) (N = 360).

Level of health literacy by cognitive levels	Cases (n = 180)	Controls (n = 180)	OR (95% CI)	P-value
<b>Functional level</b>				
Low	75 (41.7%)	101 (56.1%)	0.67 (0.27, 1.67)	0.396
Fair	94 (52.2%)	69 (38.3%)	1.24 (0.50, 3.08)	0.645
High <sup>†</sup>	11 (6.1%)	10 (5.6%)		
<b>Interactive level</b>				
Low	106 (58.9%)	95 (52.8%)	2.05 (0.73, 5.74)	0.174
Fair	142 (37.8%)	74 (41.1%)	1.68 (0.59, 4.80)	0.329
High <sup>†</sup>	6 (3.3%)	11 (6.1%)		
<b>Critical level</b>				
Low	18 (10%)	5 (2.8%)	4.12 (1.44, 11.84)	0.008
Fair	107 (59.4%)	112 (62.2%)	1.09 (0.70, 1.71)	0.694
High <sup>†</sup>	55 (30.6%)	63 (35.0%)		
<b>Overall</b>				
Low	52 (28.9%)	58 (32.2%)	?	?
Fair	116 (64.4%)	105 (58.3%)	?	?
High <sup>†</sup>	12 (6.7%)	17 (9.4%)		

<sup>†</sup> Reference group.

**Table 4** Levels of health literacy for pregnancy prevention by literacy components and risk of adolescent pregnancy of pregnant adolescents (cases) compared with non-pregnant school adolescents (control) (N = 360).

Level of health literacy by components	Cases (n = 180)	Controls (n = 180)	OR (95% CI)	P-value
<b>Knowledge and understanding</b>				
Low	25 (13.9%)	8 (4.4%)	4.69 (2.00, 10.98)	< 0.001
Fair	85 (47.2%)	67 (37.2%)	1.90 (1.22, 2.96)	0.004
High <sup>†</sup>	70 (38.9%)	105 (58.3%)		
<b>Access to the information and services</b>				
Low	114 (63.3%)	132 (73.3%)	0.66 (0.31, 1.42)	0.287
Fair	49 (27.2%)	35 (19.4%)	1.07 (0.46, 2.49)	
High <sup>†</sup>	17 (9.4%)	13 (7.2%)		
<b>Communication skill</b>				
Low	116 (64.4%)	133 (73.9%)	1.74 (0.31, 9.70)	0.525
Fair	62 (34.4%)	43 (23.9%)	2.88 (0.50, 16.45)	0.233
High <sup>†</sup>	2 (1.1%)	4 (2.2%)		
<b>Management of health condition</b>				
Low	112 (62.2%)	82 (45.6%)	2.67 (1.50, 4.76)	0.001
Fair	45 (25.0%)	53 (29.4%)	1.66 (0.88, 3.15)	0.120
High <sup>†</sup>	23 (12.8%)	45 (25.0%)		
<b>Media and information literacy</b>				
Low	134 (74.4%)	112 (62.2%)	2.53 (1.351, 4.752)	0.004
Fair	29 (16.1%)	32 (17.8%)	1.92 (0.893, 4.124)	0.095
High <sup>†</sup>	17 (9.4%)	36 (20.0%)		
<b>Appropriate health decision making</b>				
Low	8 (4.4%)	2 (1.1%)	4.08 (0.85, 19.50)	0.078
Fair	15 (8.3%)	18 (10.0%)	0.85 (0.41, 1.74)	0.656
High <sup>†</sup>	157 (87.2%)	160 (88.9%)		

<sup>†</sup> Reference group.

## Discussions and Conclusion

This study explored and compared the health literacy for unwanted pregnancy prevention (HLPP) between pregnant adolescents (cases) and non-pregnant school adolescents

(controls) in a Thai context. Data were collected using a new self-administered questionnaire that was well developed in multi-dimensional scale, so that the cognitive level and components of could be measured. Both cases and controls had comparable mean scores of HLPP (96.7 and 98.2 points, respectively, out of 149 points). Most of the female adolescents in case and control groups had scores in the range of fair HLPP (64.4% and 58.3%, respectively). Consistently, the findings from the systematic review<sup>18</sup> reported an average of 46% of reproductive age women had less than adequate or fair health literacy skills. However, compared with the national survey among Thai female adolescents aged 15 – 21 years old,<sup>20</sup> it was found that 95.5% of young females had inadequate HLPP. Smaller proportions of adolescents with low or inadequate health literacy in the present study could possibly be because of a small age range and the characteristics of the adolescent sample.

In terms of HLPP cognitive level, female adolescents with low critical HLPP were more likely to get pregnant (OR = 4.12, 95% CI = 1.44, 11.84), while associations of functional HLPP and interactive HLPP with teenage pregnancy. This finding confirmed that health literacy is associated with health outcomes according to von Wagner's model and Paasche-Orlow and Wolf's 2007 model.<sup>12,15</sup> They proposed causal pathways between limited health and health outcomes. The critical aspect of health literacy is potentially a higher order process that could be developed through education to critically appraise information of relevance to health. Within this framework, critical health literacy is defined as "more advanced cognitive skills, which together with social skills, can be applied to critically analyze information, and to use this information to exert greater control over life events and situations."<sup>9</sup> Critical health literacy empowers individuals to act on the social, economic, and environmental determinants of health through individual and collective efforts.<sup>17,23</sup> The paucity of research examining association between adolescent pregnancy and self-report critical literacy skills, especially pregnancy prevention, indicates that more complex processes remain poorly understood.<sup>13,17,23</sup> Thus, comparable literature is lacking. However, by proxy, the findings from the systematic review<sup>18</sup> suggest that health literacy is related to women's reproductive health. There were inconsistent results regarding rate of unplanned pregnancy by health literacy. Several studies found no difference in rate of reported unplanned pregnancy by health literacy; but two studies found the

difference. Endres et al found that women with low health literacy were more likely to have an unplanned pregnancy compared with women with adequate health literacy (75% vs 40%,  $P$ -value = 0.02).<sup>24</sup> Lupattelli et al similarly reported a difference in incidence of unplanned pregnancy by health literacy status.<sup>25</sup> In their multinational cohort, 12%, 9.8% and 8.2% of women with low, medium, and high health literacy, respectively report unplanned pregnancy.

In association analyses, female adolescents with low media health literacy were at an increased risk for adolescent pregnancy (OR = 2.53, 95% CI = 1.35, 4.75). This was consistent with the association of low critical HLPP with an increased risk of adolescent pregnant (OR = 4.12, 95% CI = 1.44, 11.84) since critical HLPP consists of media health literacy skills and decision-making skills. The association of low media literacy with the risk of pregnancy has not been reported in Thai adolescents, but those in other countries. Levin-Zamir and colleagues' findings of critical analysis and action in media health literacy are most consistent with critical health literacy.<sup>26</sup> Another meta-analytic review demonstrated the particular importance of media literacy interventions.<sup>27</sup> The result of the meta-analysis supported that media literacy interventions have positive effects on adolescent attitudes and behavioral intentions towards substances, smoking, and risky sexual behavior. It indicates that critical health literacy in terms of media literacy is associated with teenage pregnancy.

Nevertheless, this study did not find significant relationships of functional health literacy and interactive health literacy with adolescent pregnancy. This no relationships could be due to the homogenous sample of the study. With participants from high schools and matched on age between cases and controls, the age and education level range could be relatively narrow. Our finding suggests that functional health literacy and interactive health literacy might be inadequate in explaining teenage pregnancy. It has been known that level of functional health literacy varies according to the characteristics of the sample, such as socio-demographic, cultural and age group characteristics.<sup>28</sup> Our finding could be different from studies in other countries due in part to the use of different instrument to evaluate health literacy which was the multi-dimensional scale in a Thai context. However, this study indicated that female adolescents with low knowledge and understanding were at an increased risk for adolescent pregnancy. Regarding the interactive health literacy, the study also found that female adolescents

with low health condition management were at an increased risk for adolescent pregnancy.

The findings of the study obviously reflect the importance of critical health literacy on adolescent pregnancy. The policymakers should move forward to accept the current situations and to support pregnancy prevention programs for adolescents that are designed with messages with critical health literacy level, especially media health literacy. Media sexual literacy program should be considered as an effective strategy to delay engaging in the first sexual intercourse of female adolescents until they are mature enough to take responsibility. Further, critical media health literacy skills related to pregnancy prevention should be integrated into the school curriculum and clinical settings as the ability to access, understand, critically evaluate, and apply sexual health information to health decisions as a life skill with important consequences.

The present study had a few strengths. First, the study used the measures of adolescent health literacy in Thai context with a good psychometric property. Second, because little is known about relationship between health literacy and health outcomes, especially teenage pregnancy, these findings provide a better understanding of social determinants of teenage pregnancy. This concern would be useful to develop a more effective intervention addressing media health literacy issues. Nevertheless, this study had limitations that should be considered when interpreting results. The sample in control group included only adolescents who were in public educational institutes in an urban area. Thus, the sample may not be representative of all Thai female adolescents. Another limitation was the small sample size did not allow for multivariate analyses involving cross comparisons by level of health literacy dimensions.

In conclusion, this case-control study showed that female adolescents with low critical health literacy, low media health literacy, low and fair knowledge and understanding, and low skills in health management were at significant, increased risks for pregnancy among Thai adolescents. These findings increase the knowledge base concerning the social determinants of teenage pregnancy.

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