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Relationships among knowledge and attitude toward practice and behavior of caffeine consumption in pregnant Thai women

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Introduction

Popular stimulant drinks worldwide contain caffeine, and individuals consume them as part of a fashionable lifestyle. Caffeine is one of the most commonly consumed stimulants in the general population and is a frequent element of pregnant women's diet (Care Study Group, 2010; Kuczkowski, 2009). Pregnant women have slower caffeine metabolism which is conditioned by many endogenous and exogenous factors (Eskenazi, 1999; Grosso et al., 2006; Nawrot et al., 2003). Caffeine is easily crosses the placenta into

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the fetus which, due to the immaturity of its liver, is unable to metabolize caffeine (Aldridge et al., 1979 and 1981; Bakker et al., 2010; Grosso and Bracken, 2005; Maslowa et al., 2010). Caffeine may also influence cell development by increasing cellular cyclic adenosine monophosphate concentrations (Weathersbee and Lodge, 1977) and decreasing intervillous placental blood flow by increasing circulating catecholamine (Kirkinen et al., 1983). Previous studies have found that, although most pregnant mothers knew that caffeine is passed through breast milk, only 24.8 per cent were aware that caffeine metabolism significantly slows as pregnancy progresses (Anderson et al., 2009). The influence of caffeine on pregnancy has not been determined once and for all. However, some studies have shown that high caffeine intake may result in miscarriage, preterm birth or deterioration of fetal growth (Bakker et al., 2010; Bech et al., 2005; Bracken et al., 2003; Care Study Group, 2010; Cnattingius et al., 2000; Parazzini et al., 1998; Signorello and McLaughlin, 2004).

The first such recommendation was issued by the United States Food and Drug Administration in 1981 and is still valid today. Maximum daily caffeine intake during pregnancy was determined to be 300 mg (Eskenazi, 1999; Higdon and Frei, 2006; Food Standards

Agency, 2008). However, the most recent recommendation of the British Food Standards Agency limits intake further – to no more than 200 mg per day (Weng et al., 2008). In Thailand, 80 types of beverage contain caffeine. They are registered as a specific controlled food according to notification of the Ministry of Public Health, warning of potential teratogenic effects and advising pregnant women either to avoid altogether or to use sparingly food or drugs that contain caffeine. However, the dangers of caffeine consumption during pregnancy are not presented prior to pregnancy, so researchers need to study factors that influence overall consumption behavior, especially of those attending an antenatal care clinic (ANC).

Materials and methods

The target population comprised pregnant women receiving antenatal care at Siriraj Hospital. Subjects comprised pregnant women older than 18 years of age without any limitation on the number of their pregnancies or gestational age. The researchers were able to contact them, understand and communicate with them in Thai. The women agreed to participate in the present study. Exclusion criteria included pregnant women younger than 18 years

and those who had experienced complications during pregnancy, such as hypertension, diabetes mellitus and heart disease, positive serology test, and history of drug and substance abuse, including alcohol consumption and smoking.

Sample size was determined by using the Cochran formula (Cochran, 1963). Thus, the number chosen for the sample size was 896 cases; this number was increased by 10 per cent to give a total of 1,000 cases. This study involved simple random sampling without replacement. The study instrument for data collection was a questionnaire divided into five parts: demographic characteristics; attitude toward caffeine consumption; self-care behavior during pregnancy; caffeine consumption before pregnancy; caffeine consumption during pregnancy; and knowledge about caffeine. The reliability of the questionnaire was determined using **Cronbach's alpha** coefficient and the Kuder-Richardson Formula 20 (KR-20) reliability coefficient.

All data were analyzed using the SPSS (version 11.0) software package at a significance level of 0.05. Descriptive analyses included demographic characteristics and multivariate analysis. A stepwise discriminant was used to predict caffeine consumption in

pregnancy, and odds ratio (OR) was used to determine the relationship between caffeine consumption before pregnancy and miscarriage.

This research was approved by the Ethics Committee of the Siriraj Institutional Review Board (SIRB) and the Social Sciences and Humanities Institutional Review Board of Mahidol University (MU-SSIRB) (COA no. Si 003/2013).

Results

1. The demographic characteristics of pregnant women showed that the subjects with no caffeine consumption during pregnancy totaled 313 persons and subjects who had consumed caffeine totaled 687 persons. The average age of all subjects was 28.60 ± 5.83 years (ranging from 18-44 years), and the majority were married (about 96%). No significant difference was found in education, family income, job and gestational age (>28 weeks). Pregnant women who had a miscarriage totaled 15.8 per cent for those who had consumed caffeine during pregnancy and 8.6 per cent for those who had not consumed caffeine during pregnancy.

2. Total score of attitude toward caffeine consumption held a mean value of 36.04, which was considered the medium level

(minimum score 23 points; maximum score 52 points). Self-care behaviors during pregnancy averaged 46.85 points, which was considered the medium level of self-care behavior (minimum score 30 points; maximum score 60 points), and knowledge about caffeine was 10.39 points, which was considered the medium level of knowledge (minimum score 0; maximum score 15 points).

3. The amount of caffeine pregnant women consumed each day was determined. Before pregnancy, 13.2 per cent had consumed more than 200 mg of caffeine each day, but the level decreased to 2.3 per cent during pregnancy. The study investigated the association concerning attitude toward caffeine consumption, self-care behavior during pregnancy, knowledge about caffeine and content of caffeine consumption. In addition, pregnant women who had higher positive attitude levels toward caffeine consumption and more positive levels of self-care behavior during pregnancy showed a decrease in the average amount of caffeine consumed. However, pregnant women who had higher levels of knowledge about caffeine showed an increase in the average amount of caffeine consumed. The most popular types of beverage accounting for the caffeine consumed before pregnancy included coffee, 51.0 per cent; cola drinks 40.3 per

cent; and ice cream and chocolate/coffee/green tea-flavored drinks, 38.3 per cent. The most popular types of such drinks during pregnancy included cola drinks, 36.4 per cent; chocolate/coffee-flavored milk, 32.8 per cent; and chocolate/coffee/green tea-flavored ice cream, 30.7 per cent (Table 1).

4. Using unstandardized canonical discriminant function coefficients, it was found that a total of six variables had influence in classifying caffeine-intake behavior of the pregnant women during pregnancy, being ranked from type of caffeine consumption before pregnancy, number of pregnancies, attitude toward caffeine consumption, and knowledge about caffeine to age and gestational age (Table 2). The six independent variables could classify the caffeine consumption behavior of pregnant women during pregnancy according to dependent variables. Canonical correlation explained the percentage as equal to 0.399, or 15.92 per cent. The data revealed unstandardized canonical discriminant function coefficients that were used to create the discriminant function (equation), as shown below:

$$Y = 2.514 + 0.333 (X12) + 0.203 (X7) - 0.123 (X9) + 0.069 (X11) - 0.042 (X1) + 0.036 (X6)$$

For example, a pregnant women at age = 20 years, experiencing her second pregnancy, having a gestational age = 30 weeks, attitude toward to caffeine consumption = 40, type of caffeine consumption before pregnancy = 3 and knowledge about caffeine = 12 could be represented in the formula below:

$$Y = 2.514 + 0.333 (3) + 0.203 (2) - 0.123 (40) + 0.069 (12) - 0.042 (20) + 0.036 (30) = 1.068$$

This applied to pregnant women reporting caffeine consumption during pregnancy etc.

5. Our study found that 15.8 per cent of pregnant women who reported caffeine consumption during pregnancy experienced spontaneous abortion at least one time. No association was found between caffeine consumption before pregnancy and miscarriage (OR = 1.06, 95%CI: 0.61-1.81, P = 0.845).

Discussion and conclusion

The prevalence of caffeine consumption in our study was 68.7 per cent and demographic data between caffeine consumption and no caffeine consumption showed no significant difference. Women with a history of abortion totaled 15.8 per cent, signifying that at least one abortion had occurred during pregnancy when caffeine had been

consumed. The report by Thaithumyanon et al. (2004) showed that 22.7 per cent had a history of previous abortion to a maximum number of four abortions. Infante-Rivard et al. (1993) reported that an association between caffeine intake and miscarriage was found for every 100 mg of caffeine consumed each day, and the OR for miscarriage increased to 1.10. Therefore, if a woman consumed only 300 mg each day, her risk of miscarrying increased to an OR of 1.35.

The Public Health Agency of Canada recommends that pregnant women should limit their intake of caffeine to 200 mg daily (Health Canada, 2010). Our study found that 13.2 per cent of pregnant women had consumed more than 200 mg of caffeine each day before pregnancy but that figure decreased to 2.3 per cent after pregnancy. The decrease in caffeine consumption during pregnancy may be related to attitude toward caffeine and self-care behavior factors. However, some subjects still consumed cola drinks to reduce pregnancy side effects, such as sleepiness, fretting, wanting to consume caffeine, thirstiness and inactivity. On the other hand, pregnant women increased caffeine consumption at a medium to high level of knowledge.

This study was similar to a previous study by Heedshim et al. (2011) who found that most collegians had proper knowledge

about caffeine but 39.5 per cent still continued to consume caffeine. This study differed from a previous study by Panthumas et al. (2012) who reported that knowledge about self-care during pregnancy was a factor associated with overall self-care behavior ($r = 0.24$) and knowledge about self-care during pregnancy was a predictor for 25 per cent of the variance in the self-care behaviors of Thai teenagers with primigravidarum.

This study found that a total of six variables influence the classification of caffeine consumption behavior in pregnant women beginning with type of caffeine consumption before pregnancy, number of pregnancies, attitude toward caffeine consumption, knowledge about caffeine, age, and gestational age. The variables could classify caffeine consumption behavior in pregnant women with the percentage of canonical correlation at 0.399, or they could explain caffeine consumption behavior in pregnant women at 15.92 per cent. This overall predictive accuracy of the discriminant function was called the “hit ratio” classification, revealing that 66.3 per cent of all respondents were classified correctly in their group. From this study, the authors intend that health care should determine groups of caffeine consumption behavior in pregnant women using the

discriminant equation. When health-care staff applies the data to a new case of a pregnant woman who attended an ANC and interpret them by discriminant equation, the staff could classify pregnant women as belonging to the group that consumes or does not consume caffeine. The results can help health-care staff to take care of pregnant women displaying caffeine consumption behavior by advising about caffeine, the adverse side effects of caffeine, caffeine compounds in food and beverages, and nutrition from food that gives more energy and contains more nutrients, and food that is cheap and easy to find to replace caffeine. In this manner, they would have knowledge and positive attitude toward caffeine consumption and change their behavior to avoid or quit consuming caffeine when they intend to become pregnant and during their pregnancy.

From this study, the authors expect the government to focus on caffeine consumption behavior in pregnant women by advising about caffeine, the adverse side effects of caffeine, caffeine compounds in food and beverages, and nutrition from food that gives more energy and more nutrients, and food that is cheap and easy to find to replace caffeine. In addition, television, newspapers or booklets should be used to disseminate knowledge and promote

positive attitudes toward limiting caffeine consumption and to change caffeine consumption behavior so that women will avoid or quit consuming caffeine when they intend to become pregnant and during their pregnancy. The government should conduct training of health-care staff, focusing on caffeine, adverse side effects of caffeine and caffeine compounds in food and beverages. Moreover, trainers should have knowledge and skills to transfer knowledge, motivate and counsel pregnant women to avoid or quit consuming caffeine when they intend to become pregnant and during their pregnancy.

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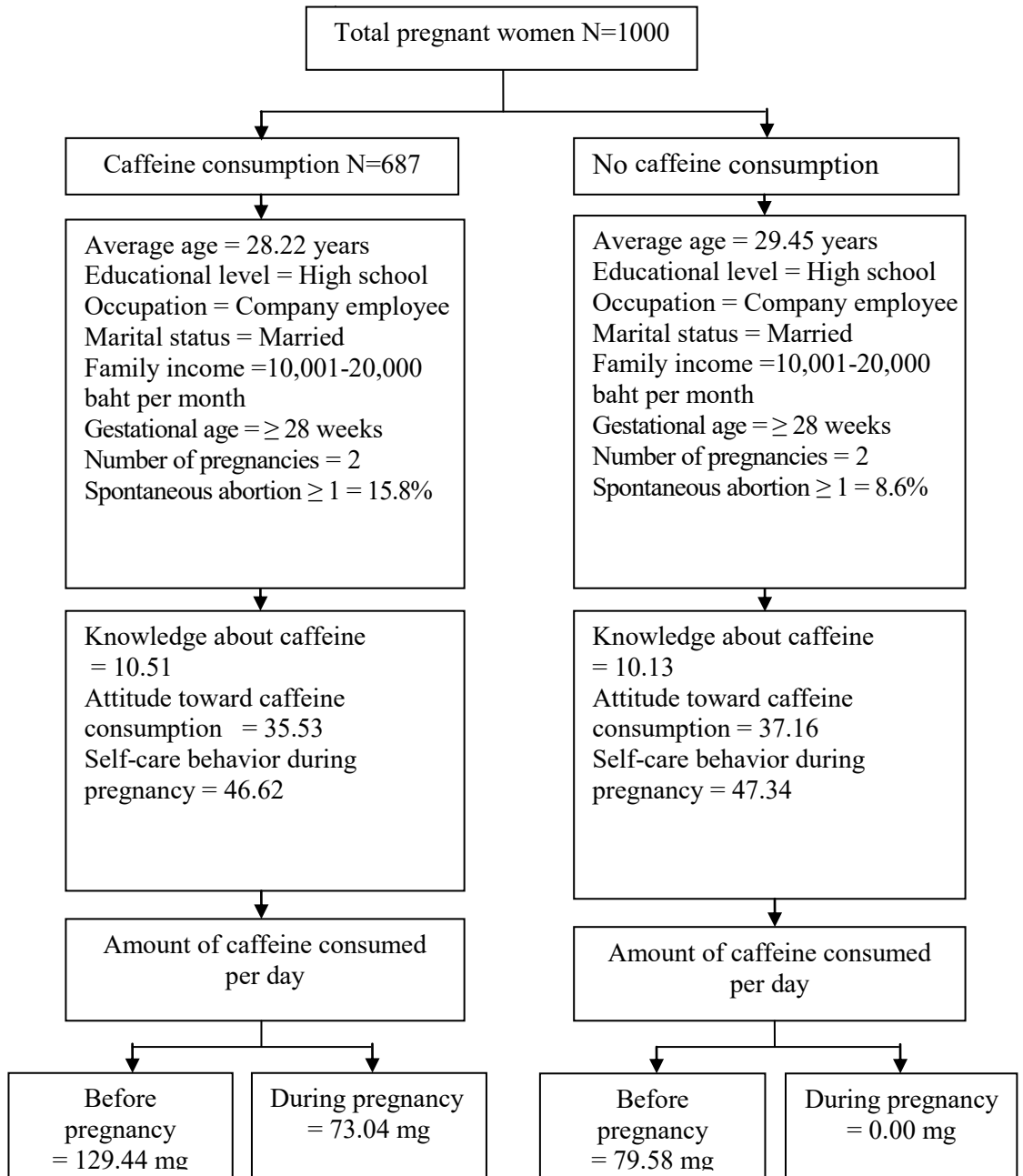
Table 1 Caffeine consumption before and during pregnancy

Variables	Before pregnancy		During pregnancy	
	N	%	N	%
Caffeine consumption				
No caffeine consumed	75	7.5	313	31.3
Caffeine consumed	925	92.5	687	68.7
Type of food item containing caffeine (multiple response)				
Coffee	472	51.0	80	11.6
Cola drinks	373	40.3	250	36.4
Ice cream (chocolate/coffee/green tea flavor)	354	38.3	211	30.7
Iced tea	335	36.2	144	21.0
Milk (chocolate or coffee-flavored)	326	35.2	225	32.8
Caffeine content of food consumed per day				
< 100 mg/day	479	47.9	825	82.5
100-199 mg/day	389	38.9	152	15.2
≥ 200 mg/day	132	13.2	23	2.3

Table 2 Classification of behavior of pregnant women who consumed caffeine and those who did not consume caffeine during pregnancy

Variables	Function
Type of caffeine consumption before pregnancy (X12)	0.333
Attitude toward caffeine consumption (X9)	-0.123
Gestational age (X6)	0.036
Age (X1)	-0.042
Number of pregnancies (X7)	0.203
Knowledge about caffeine (X11)	0.069
Constant = 2.514	
Eigen = 0.189	
Canonical Correlation = 0.399	
Wilk's lambda = 0.841	
$X^2 = 172.087$	
df = 6	
Sig. = 0.000	
Group mean of no caffeine consumption = -0.643	
Group mean of caffeine consumption = 0.293	

Figure 1 Conclusion diagram of caffeine consumption during pregnancy



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