ECRONICON OPEN ACCESS

EC GYNAECOLOGY
Research Article

Maternal Caffeine Consumption during Pregnancy and the Risk of Miscarriage

Yusof J*, Che Jaafar NF, Mohd Yusof FA, Che Shamsuri CJ, Mazme EE and Abdul Fuad N

Faculty of Medicine, University Institute Technology of MARA, Malaysia

***Corresponding Author:** Juliana Yosuf, Faculty of Medicine, University Institute Technology of MARA, Malaysia.

Received: July 29, 2017; **Published:** August 17, 2017

Abstract

Objectives: The main objective for this study is to determine the relationship of caffeine consumption and amount of caffeine consumed with miscarriage and to identify the most common type of caffeine beverage that is associated with miscarriage.

Methodology: This is a cross-sectional study involving 67 pregnant women from Early Pregnancy Assessment Unit (EPAU) of Hospital Sg. Buloh, Selangor, Malaysia. A validated questionnaire was made and used in this study. These questionnaires were randomly distributed among women who were diagnosed to have miscarriage. The data was analyzed using SPSS version 22.

Results: A total of 67 respondents' data were collected among pregnant woman who were diagnosed with miscarriage in EPAU of Hospital Sg. Buloh. Forty six (68.7%) of the patients consumed caffeine which showed majority of them took tea. However, there was no association between caffeine consumption with type of miscarriage ($p = 0.54$). There was also no association between amount of caffeine consumption with type of miscarriage ($p = 0.89$).

Conclusion: There was no significant association between caffeine consumption and amount of caffeine consumed with miscarriage. Tea was the most common type of caffeine beverage consumed in our study. However, further studies need to be done with larger sample of patients for significant results.

Keywords: *Caffeine Consumption; Pregnancy; Miscarriage*

Introduction

Caffeine is a xanthine found in coffee, tea, chocolate and colas. It is a central nervous system stimulant, diuretics, striated muscle stimulants and acts on the cardiovascular system [1]. It is among the most frequently ingested pharmacologically active substances in the world [2]. For most people, the amount of caffeine in two to four cups of coffee a day is not harmful. However, too much caffeine can cause problems. Some people are more sensitive to the effects of caffeine than others. They should limit their use of caffeine. So should pregnant and nursing women. Mean daily caffeine consumption is 100 - 300 mg in most pregnant women whereas only very few women consume 400 mg caffeine or more per day [3].

Several mechanisms have been postulated by which caffeine might produce miscarriage. Firstly, through the inhibition of phosphodiesterases, caffeine increases cellular cyclic adenosine monophosphate levels, which may influence embryo–fetal development. Moreover, it reduces hCG and estradiol by deregulating corpus luteum function and placental blood flow increasing circulating catecholamine. Finally, the structural similarity between caffeine, adenine and guanine could justify a direct action of the chemical on nucleic acids, with possible consequent chromosomal anomalies. In the past, after in utero exposure of monkeys to methylxanthines, reproductive failure was observed [3].

Miscarriage is defined as the loss of a pregnancy before 22 weeks of gestation and is either first trimester (≤ 12 weeks) or second trimester miscarriage (13 - 22 weeks). From Wikoff., *et al*. there was no increased risk of spontaneous abortion identified at maternal caffeine levels at or below the comparator of 300 mg/day [4].

Besides that, a recent study by American Society of Reproductive Medicine concluded that caffeine consumption did not increase the hazard of miscarriage, even after adjusting for relevant covariates. However this finding have important methodological limitations, including potential measurement error in caffeine intake, less exposure data on women who conceived during the first cycle compared with women requiring more time, and the highest consumption among women who withdrew from the study, albeit amounts similar to women with live births [5]. We therefore aim to look at this different attributes and assess the relationship of caffeine consumption to miscarriage.

Methodology

This is a cross-sectional study involving 76 pregnant women from Early Assessment Pregnancy Unit (EPAU) of Hospital Sg. Buloh. A validated questionnaire were made and used in this study. These questionnaires were randomly distributed among women who are diagnosed to have miscarriage. Patients were diagnosed based on symptoms presented and ultrasound examination; transabdominally and transvaginally. The study was conducted from 1st June to 15th July 2017. Ethical approval was obtained from the ethics committee of UiTM.

The collected data were analyzed with statistical analysis method (SPSS). Pearson Chi-Square test and correlation test were used to analyze the association of caffeine with miscarriage. Descriptive statistics were used to summarize the data collected.

Based on study by Pollack., *et al*. (2009), which shown that the prevalence of those having miscarriage was 20%. After taking 95% CI (Confidence Interval) and power of 80%, sample size was calculated through Power and Sample Size Program ver. 2.1.30 showed that minimum sample size needed per arm will be 10. Therefore, after taking consideration of 20% defaulters, the number of sample arm was 12 patients and the total of sample size for this particular study was 60 patients (maximum 5 arms).

Exclusion Criteria

1. Maternal age > 40 years old.
2. Patient with chronic medical illness.
3. Cervical incompetence or trauma was the cause of miscarriage.
4. Maternal smoker/alcoholic/drug abuse.
5. History of recurrent miscarriage (more than 3 consecutive first trimester miscarriage).

Results

Descriptive statistic

A total of 76 respondents' data were collected among pregnant woman who were diagnosed with miscarriage in EPAU of Hospital Sg. Buloh. However, we excluded 9 patients because they have exclusion criteria, 4 of them were age more than 40 year old and 5 of them due to chronic illness. This makes our total respondents 67. The patients were recruited with the mean age of 29.64 year old (SD 4.804). Sixty two (92.5%) of the patients were Malay which make it the majority race. Housewife, teacher and clerk were the majority group of the respondents with (n = 10, 14.9%), (n = 8, 11.9%) and (n = 5, 7.5%) respectively.

Based on clinical characteristics of patients, thirty five (52.5%) of the patients were diagnosed with miscarriage at 5 to 10 weeks period of gestation, which is more than half of the patients and followed by 40.3% of them were at 11 to 16 weeks period of gestation. Only five (7.5%) patients came at 17 to 22 weeks period of gestation. Most of them were multipara with (n = 36, 53.7%) and nulliparous with (n = 28, 41.8%). They came with symptoms such as per vaginal bleeding, abdominal pain and passing out product of conception.

Characteristics	Frequency (%)
Age, years	
• Mean (SD)	29.64 (4.804)
• Range	20 (ranging from 40 - 20 years old)
• Median	29.00
• IQR (Interquartile range)	8.00
Race	
• Malay	62 (92.5)
• Chinese	2 (3.0)
• Indian	2 (3.0)
• Other	1 (1.5)
Period of gestation (POG), (weeks)	
• 5-10	35 (52.2)
• 11-16	27 (40.3)
• 17-22	5 (7.5)
Parity	
• Primigravida	21 (31.3)
• Multigravida	36 (53.7)
• Grandmultipara (> gravida 5)	10 (14.9)
Occupation	
• Housewives	10 (14.9)
• Teacher	8 (11.9)
• Clerk	5 (7.5)
• Others	44 (65.67)
Symptoms of miscarriage presented	
• Per-vaginal bleeding,	
Yes	58 (86.6)
No	9 (13.4)
• Abdominal pain	
Yes	42 (62.7)
No	25 (37.3)
• Passing out product of conception	
Yes	26 (38.8)
No	41 (61.2)

Table 1: *Demographic and clinical characteristics of patients, (N = 67).*

Characteristics	Frequency (%)	p-value	
		Type of miscarriage	Period of gestation (POG)
Caffeine consumption			
• Yes	46 (68.7)	0.54	0.55
• No	21 (3.3)		
Type of caffeine intake			
• Coffee			
Yes	18 (26.9)	0.75	0.79
No	49 (73.1)		
• Tea			
Yes	34 (50.7)	0.39	0.13
No	33 (49.3)		
• Energy drink			
Yes	0 (0.0)	0.54	0.0
No	67 (100.0)		
• Dark chocolate			
Yes	8 (11.9)	0.65	0.64
No	59 (88.1)		
Frequency of consumption			
• No consumption	21 (31.3)		
• Daily	22 (32.8)		
• Weekly	6 (9.0)	0.93	0.9
• Twice a week	14 (20.9)		
• Once a month	4 (6.0)		
Number of caffeine consumption per day (cup/s)			
• No consumption			
• 1	21 (31.3)		
• 2 - 3	32 (47.8)	0.83	0.64
• > 3	13 (19.4)		
	1 (1.5)		

Table 2: *History of caffeine consumption, (N = 67).*

Table 2 summarizes the history of caffeine consumption. Forty six (68.7%) of the patients consumed caffeine which show majority of them took caffeine. However, there was no association between caffeine consumption and miscarriage (p = 0.54). Types of caffeinated beverages that they consumed majority were tea followed by coffee and dark chocolate. None of them took energy drink such as Livita, Red Bull and etc. Twenty two (32.8%) of them consumed caffeine daily and most of the patients only took 1 cup for every consumption with (n = 32, 47.8%).

Characteristics	Frequency (%)
Type of miscarriage	
• Complete	34 (50.7)
• Threatened	15 (22.4)
• Incomplete	0 (0.0)
• Missed	18 (26.9)
• Cervical incompetence	0 (0.0)

Table 3: *Data collection.*

Table 3 shows the type of miscarriage diagnosed among patients who came to EPAU in our hospital.. Complete miscarriage accounts for more than half of the diagnosis with (n = 34, 50.7%). Eighteen (26.9%) of the patients were diagnosed with missed miscarriage and less than a quarter of the patients were diagnosed with threatened miscarriage which counts for 15 (26.9%) patients. None of them had incomplete miscarriage nor cervical incompetence.

Data analysis

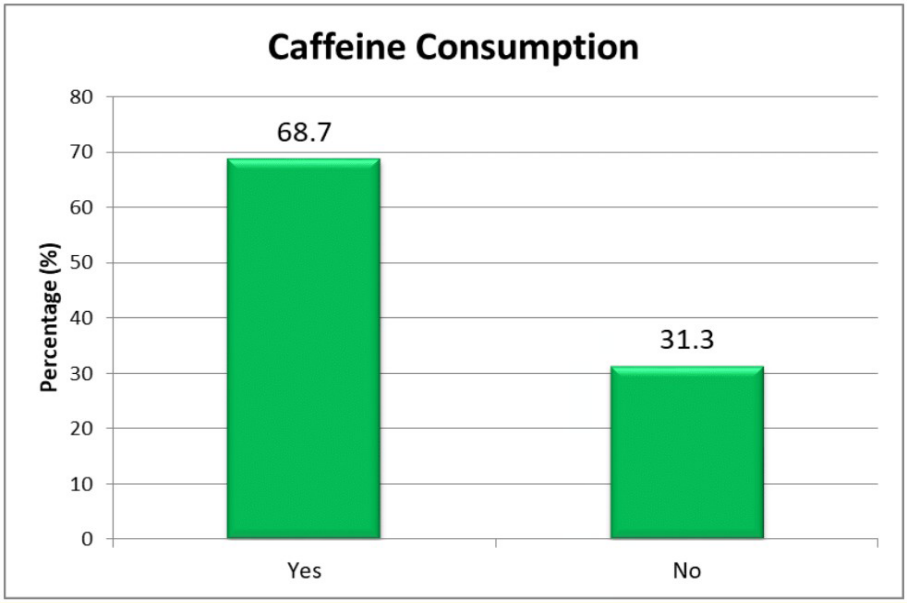

Figure 1: *Majority of respondents consumed caffeine.*

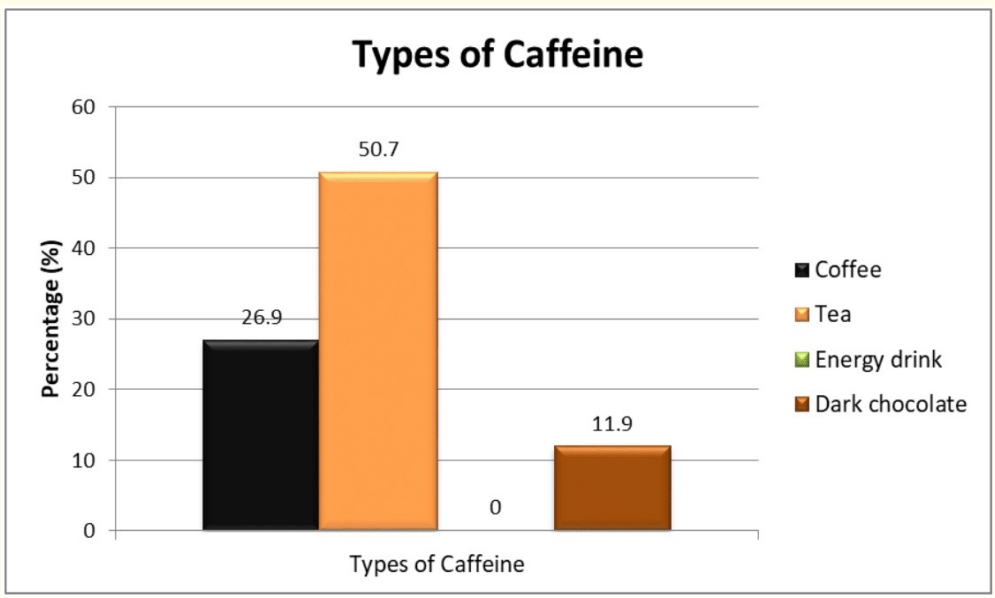

Figure 2: *Tea was the most consumed type of caffeine among the respondents.*

Caffeine consumption * Type of miscarriage Cross tabulation

Count

		Type of miscarriage		
		Complete, incomplete, missed	Threatened	Total
Caffeine consumption	no	15	6	21
	yes	36	10	46
Total		51	16	67

Figure 3: *Caffeine consumption and threatened miscarriage*

p = 0.54

Frequency of caffeine consumed * Type of miscarriage Cross tabulation

Count

		Type of miscarriage		
		Complete, incomplete, missed	Threatened	Total
Frequency of caffeine consumed	No	15	6	21
	Daily	18	4	22
	Others	18	6	24
Total		51	16	67

Figure 4: *Frequency of caffeine consumed and miscarriage.*

p = 0.72

Number of cups of caffeine consumed per day * Type of miscarriage Cross tabulation

Count

		Type of miscarriage		
		Complete, incomplete, missed	Threatened	Total
Number of cups of caffeine consumed per day	no	15	6	21
	2-3 cups	11	2	13
	Others	25	8	33
Total		51	16	67

Figure 5: *Number of cups caffeine consumed and miscarriage.*

p = 0.68

Caffeine consumption * Period of gestation (POG) Cross tabulation

Count

		Period of gestation (POG)			
		5-10	11-16	17-22	Total
Caffeine consumption	no	13	7	1	21
	yes	22	20	4	46
Total		35	27	5	67

Figure 6: *Caffeine consumption and gestational week of miscarriage.*

p = 0.55

There was no significant association between caffeine consumption and type of miscarriage (p = 0.72). We also did not find any significant association between miscarriage with frequency of caffeine intake and number of cups of caffeine intake per day (p = 0.68). Most of the miscarriage among caffeine consumers occur at 5 - 10 weeks, but this was not significant (p = 0.55).

Discussion

We conducted a cross sectional study on women presenting to Early Pregnancy Assessment Unit (EPAU) of Hospital Sungai Buloh in the 5th to 22nd weeks of gestation that was diagnosed to have miscarriage to examine the association between caffeine consumption and miscarriage. We excluded patients that were more than 40 years old, patient with chronic medical illness, cervical incompetence or trauma as the cause of miscarriage, maternal smoker/alcoholic/drug abuse and patient who has history of recurrent miscarriage (more than 3 consecutive first trimester miscarriage).

In our study, we found there was no association between caffeine consumption and miscarriage. However in study done by Weng., *et al*. in Oakland, California in 2008 [2] they concluded that high dose of caffeine intake during pregnancy increase the risk of miscarriage, independent of pregnancy-related symptoms. In another study done by *Tan., et al*. in Singapore on 2014 [6], they also concluded that any consumption of caffeine had association with miscarriage but they did not differentiate between regular caffeine consumer and non-frequent caffeine consumer. They also did not discuss on association between the amounts of caffeine consumed with miscarriage.

Even though we have included the association between amounts of caffeine consumed with miscarriage in our study, unfortunately it was not significant. There were some limitations as we did not quantify the amount of caffeine in every serving. Besides that, we did not standardize the size of the cup so we could not get the exact amount of caffeine consumed.

In a study done by Anna., *et al*. in America on 2010 [5], they concluded that caffeine consumption in sensitive windows was not associated with miscarriage. Our study also has the same outcomes but we did not take into account the exact time (period of gestation, weeks) of caffeine consumption as one of our variable.

Conclusion

There was no significant association between caffeine consumption, frequency of caffeine consumption and number of cups of caffeine intake per day with miscarriage. Tea is the most common type of caffeine beverage consumed. However, further research needs to be done with larger sample of patients.

Bibliography

1. In Dorland's Pocket Medical Dictionary (28th edition). Philadelphia, PA: Elsevier Saunders (2009): 127.
2. Anna Z., *et al*. "Caffeine Consumption and Miscarriage: A Prospective Cohort Study". *Fertility and Sterility* 93.1 (2010): 304-306.
3. Erato M Stefanidou, *et al*. "Maternal caffeine consumption and sinecausa recurrent miscarriage". *European Journal of Obstetrics and Gynecology and Reproductive Biology* 158.2 (2011): 220-224.
4. Wikoff D., *et al*. "Systemic review of the potential adverse effects of caffeine consumption in healthy adults, pregnant women, adolescents and children". *Food and Chemical Toxicology* (2017).
5. Weng X., *et al*. "Maternal caffeine consumption during pregnancy and the risk of miscarriage: a prospective cohort study". *American Journal of Obstetrics and Gynecology* 198.3 (2008): 279.
6. Tan TC., *et al*. "Lifestyle Risk Factors Associated with Threatened Miscarriage: A Case-Control Study". *Journal of Fertilization: In Vitro - IVF-Worldwide, Reproductive Medicine, Genetics and Stem Cell Biology* 2 (2014): 123.

Volume 5 Issue 3 August 2017