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Original Article

Effect of Coffee Intake on Post-Dural Puncture Headache Parameters among Post-Cesarean Section Women

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ABSTRACT

Context: Coffee intake is one of the strategies developed to relief post dural puncture headache (PDPH). It is considered a safe choice for many post-cesarean section women. **Aim**: This study aimed to examine the effect of coffee intake on post-dural puncture headache parameters among post-cesarean section women. **Methods**: A quasi-experimental (time series) design was adopted. A convenience sample of 166 post-caesarean section women were recruited. This study was conducted at postpartum department at El-Manial University hospital, Cairo governorate, Egypt. Data were collected using two tools: Structured interview schedule and post-dural puncture headache assessment tool. **Results**: Concerning incidence of PDPH the study findings revealed that, 71.1%, 53.0%, and 27.7% of the study group suffering from PDPH at first, second, and third evaluation respectively as compared to 100.0%, 96.4%, and 92.8% of the control group. The mean PDPH severity of the study group was documented at 4.4±1.7, 3.1±1.0, and 1.1±0.5 at first, second, and third evaluation respectively while for the control group it was documented at 8.3±2.7, 7.5±2.6, and 6.8±1.5. Regarding analgesic need, it was significantly lower in the study as compared to the control at first, second, and third evaluation (63.6%, 12.7% and 7.2% vs. 86.7%, 61.3% and 56.4% respectively). **Conclusion**: There were statistically significant differences in favor of the study group compared to the control in relation to three parameters of PDPH i.e., incidence, severity, and analgesics need ($p<0.001$). **Recommendation**: Coffee intake could be used by midwifery nurses as a non-pharmacological method to manage PDPH among post-cesarean section women.

Keywords: Coffee intake, post dural puncture headache parameters, post-cesarean section women**.**

Introduction

Caesarean Section (CS) is a common surgical procedure in obstetrics and its rate continues to increase globally Now CS accounting for 21 % of all deliveries, and in 2030 the percentage of CS will be rise to 29 % **(WHO, 2021)**. CS birth had many maternal side effects such as, surgical site infection, deep veins thrombosis, primary or secondary hemorrhage, and post-dural puncture headache is linked with basically excessed postpartum dangers of main neurologic and others **(Singdaeng et al., 2020; Guglielminotti & Landau, 2019)**.

Spinal Anesthesia is the extreme commonly utilize anesthesia technique for cesarean section birth with 80%–95% prevalence.

The most popular risk of spinal anesthesia is post-dural puncture headache (PDPH) which is associated with cerebrospinal fluid drain and dural puncture **(Butterworth et al., 2018; Yaya et al., 2018; Akdemir et al., 2017).** According to **the international headache society (2018),** post-dural puncture headache (PDPH) refers to a headache which happens through three to five days of dural puncture described by dull bilateral pain finding in the frontal area and eradiate to occiput which will be worse through fifteen minutes of sneezing, sitting/standing position, coughing straining and that will be recovered through fifteen minutes of lying down. There are symptoms related to PDPH such as nausea, vomiting, stiffness in neck, disorder in optical, photophobia, loss in hearing, hypacusis, and tinnitus. In serious cases, palsy in cranial nerve and decrease in cerebrospinal fluid volumes **(Patel et al., 2020; Zoilla-Vaca et al., 2018).**

There are several risk factors for PDPH such as female sex, history of headache, depressed in cerebrospinal fluid opening pressure, increase body max index greater than 30 kg/m2, women who experience an anesthetist less than three years and spinal needles using was low gauge and more than three times tries through spinal anesthesia. Also, pregnancy and young age have both been displayed to be independent adverse factors for promoting PDPH **(Girma et al., 2022; Haller et al., 2018**).

Several recent studies reported that, post cesarean section birth morbidities caused by PDPH involve 5.2% hospital readmission, rise in persistent headache, post-traumatic stress disorder, increased prorated adverse for cerebral venous thrombosis and subdural hematoma, raised incidence of depression after birth, pain in back and neck, and post-dural puncture headache is affected on women's recovery after CS birth. Furthermore, it prevents timely contact between women and newborn, reduced successful breast feeding, decrease women's ability to work, disturbance in sleeping pattern, and anxiety **(Mims et al., 2022; Orbach-Zinger et al., 2021; Guglielminotti & Landau, 2019).**

Obstetric Anesthetists Association (2018) recommended that, alternative treatment in the shape of supportive treatment such as abdominal binders, bed rest, oral caffeine, rehydration, and analgesics may minimize the symptoms of PDPH but usually do not supply full comfort. As well as **Russell et al. (2019)** reported that, bed rest, abdominal binders and supine posture, might have no advantage or are unpractical in clinical setting. Furthermore, prolonged and complete bed rest are not recommended because they associated with an increased risk of thromboembolic complications.

Most CS cases usually utilize a pharmacological pain relive medications to improve their comfort through controlling headache. Almost all obstetricians prescribe pain medication through the 1st days after CS birth, however they have potentially severe untoward adverse impacts. Oral coffee has the capacity to control and decrease manifestation of PDPH following spinal anesthesia **(Aly & Elazeem, 2019; Wierzejska, 2017; Baratloo et al., 2016**). **Ragab and Facharzt (2014)** reported that, coffee produces cerebral vasoconstriction. So, its enteral assimilation is fast with a peak grade through thirty minutes. They were advised the dose for PDPH is 300- 500 mg of oral caffeine every day. About 50-100 mg of caffeine equal one cup of coffee.

Significance of the study

From reading of the recent researches, the researchers observed that the incidence of post dural puncture headache in cesarean section done under spinal anesthesia raises gradually. Types of non-pharmacological and pharmacological interference to promote better PDPH comfort are obtainable; however, women's responses are personalized. There is an excessing international benefit in implementing alternative shapes and non-pharmacological paths for PDPH relief to cope the reverse effects of drugs, such as coffee intake. Nurses play an important role in post CS interventions, prevention of pain and treatment after dural puncture by promoting post CS utilize of coffee. Coffee is the ultimate much expended pharmacological material worldwide. Caffeine extends anti-inflammatory impacts on the gastrointestinal and cardiovascular systems, intermediated by its antagonistic impacts on A2A receptors on immune cells, such as T and B cells and macrophages (**Abalo, 2021; Joós et al., 2017**).

Coffee intake during postpartum period is safe, noninvasive and healthy if utilized in adequate amount and it have other benefit such as decrease or help mothers to cope with PDPH and its improve post CS maternal outcome. These lead to mother became comfortable and introduce the care for her baby in complete manner. In order to examine the effect of coffee intake on post-dural puncture headache parameters among post-cesarean section women, the current study was devised and is being conducted.

1.2 Aim of the study:

The current study aimed to examine effect of coffee intake on post-dural puncture headache parameters among post-cesarean section women.

1.3 Research hypotheses

H.1. Post-cesarean section women who drink coffee exhibit a lower incidence of PDPH than controls.
H.2. Post-cesarean section women who drink coffee experience less sever PDPH than controls.
H.3. Post-cesarean section women who drink coffee experience less PDPH continuity than controls.
H.4. Post-cesarean section women who drink coffee exhibit less need of analgesics for PDPH than controls.

Operational definition

In this study, post-dural puncture headache parameters refer to incidence, severity, continuity of headache and need for analgesics. These parameters were measured using post-dural puncture headache assessment tool.

2. Subjects and Method

2.1 Research design

A quasi-experimental (time series) design was adopted in this study. Time series is a quasi-experimental research design in which periodic measurements are made on a defined group of individuals after implementation of an intervention. In this design, subsequent measures are compared among both the control and intervention groups, and the changes that emerge are assumed to be due to the intervention (**Rajesh, 2016**).

2.2 Setting

The current study was accomplished at postpartum department at El-Manial University hospital. The department is located at the second floor of the hospital and consisted of three room containing 25 beds for caring with post-cesarean delivery women. According to local statistics department, the total number of deliveries is approximately 6563 annually (El-Manial University hospital statistics, 2021).

2.3 Sample

A convenience sample of 166 post-caesarean section women was recruited and divided into two groups i.e., 83 women for control group and 83 women for study group. Women were recruited according to the following inclusion criteria: Age ranged between 18 - 35 years, term gestation, elective cesarean section with spinal anesthesia, and suffering of PDPH. While, the exclusion criteria included: emergency cesarean section, history of migraine and/or chronic headache, history of analgesic consumption, and pre-pregnancy medical conditions including diabetes, hypertension, or renal disease. As well as, woman with obstetrical conditions arising during current pregnancy including antepartum hemorrhage, gestational hypertension, and gestational diabetes.

2.3.1 Sample size calculation

Based on data from literature (**Elgzar & Ghattas, 2019**), considering level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula (**Charan & Biswas, 2013**):

$$n = \frac{2(Z\alpha/2 + Z\beta)^2 \times p\,(1-p)}{(d)^2}$$

Where, p = pooled proportion obtained from previous study; d = expected difference in proportion of events; Zα/2 =1.96 (for 5% level of significance) and Zβ = 0.84 (for 80% power of study). Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.133\ (1-0.133)}{(0.148)^2} = 82.5$$

Accordingly, the sample size required is 83 in each group.

2.3.2 Sample recruitment and group allocation

A total of 298 women were screened for eligibility and invited to participate in the study. Thirty-five women refused to participate in the study and 97 women did not meet the eligibility criteria. After confirmation of eligibility and obtaining informed written consent, the researchers begin to enroll women for the control group until it is completed (i.e., 83 women). Then, the researchers begin to enroll women for the study group. The statistical analysis was performed on 166 subjects.

Tools for Data Collection

Two tools were used for data collection: 1) Structured interview schedule and 2) post-dural puncture headache assessment tool.

1) Structured interview schedule:

This tool was developed by the researchers and divided into two parts. Part (I) concerned with the collection of personal background data such as age, place of residence, educational status, and occupation. Part (II) concerned with reproductive data such as gravidity, parity, mode of previous delivery, and gestational age at time of current delivery.

2) Post-dural puncture headache assessment tool:

It entails two main parts. Part (I) was developed by the researchers after reviewing related literatures. It includes questions related to incidence of PDPH, and continuity of PDPH, and the need to analgesics for relieving PDPH. Part (II) was concerned with assessment of PDPH severity using Numeric Pain Rating Scale (NPRS), a self-report pain scale **(McCaffery et al., 1989)**. The NPRS is a horizontal bar numbered from zero to ten, which reflects the pain intensity of the respondents. Respondents were asked to select a whole number that best reflects pain intensity they feel on a scale from 0, "no pain," to 10, "severe pain". A Score given by the respondent was categorized and interpreted as follows: "0" interpreted as "no pain," "1 to 3" as "mild pain," "4 to 6" as "moderate pain," and "7 to 10" as "worst or sever pain.

Tool validity

The content validity of the tool was tested and confirmed by three scholastic nursing specialists in the field of woman's health and midwifery nursing. The tools were validated for clarity, relevance, and completeness of its contents. Accordingly, the recommended modifications were performed.

Tool reliability

The reliability of the instruments used for the study was tested using Cronbach's alpha coefficient test. Cronbach's alpha for the structured interview schedule was valued at 0.81 and thus evinced a positive correlation between the tool's items. While test–retest reliability of the NRPS was 0.95 **(Alghadir et al., 2018).**

Pilot study

A pilot study was conducted to test the reliability and validity of the study tools and the clarity of the questions and to estimate the time needed to complete the instruments. A total of 10% (17 post-cesarean section women) of the sample was recruited for the pilot study. All subjects included in the pilot study met the inclusion criteria set for the study. The pilot study revealed that the tools did not require modification. The subjects included in the pilot study were excluded from the main study sample.

Ethical consideration

Post-cesarean section women were informed about the aim, procedure, benefits, and nature of the study. After that an informed written consent was obtained from those who accepted to participate in the study. The researchers were emphasized that participation in the study was voluntary and women had the right to withdraw from the study at any time without having to offer a justification. The anonymity and confidentiality issues were assured and collected data was only used for the research purpose.

Procedure

The data were collected over a period of four months, from the beginning of July 2022 to the end of October 2022. The researchers visited the study setting two days a week from 10:00 am to 3:00 pm. The study was carried out through four phases: preparation, interviewing, implementation, and evaluation phase.

Preparation phase: During this phase official permission was taken from the university and administrative personnel at El–Manial Cairo University hospital. Also, it includes construction and preparation of different data collection tools.

Interviewing phase: The researcher was met the expectant woman who has inclusion criteria explained the nature, aim of the study, its importance, and its benefits. After that, an informed written consent was obtained from each post-cesarean section woman who accepted to participate in the study. Each post-cesarean section woman was interviewed to collect data related to personal background data and reproductive data using structured interview schedule. The interview was taken place at postpartum department at El – Manial University hospitals. The interview was last for about twenty to thirty minutes.

Implementation phase: The control group received a routine hospital postnatal care which consists of measuring vital signs and bed rest in supine position without pillow. While, the study group was received a routine hospital postnatal care plus oral coffee intake. The therapeutic dose of coffee consumed per day was 450 mg instant coffee per day divided into three doses i.e., 150 mg each time. In the hospital, the researcher was provided each post-cesarean section women 200 ml cup containing 150 mg instant coffee 4 hours post CS. Then, the women were instructed to drink three cups per day after meals. Also, the women were instructed to consume the coffee at day not at night to prevent interference with sleeping time. The type of coffee was fixed and no additive was allowed except sugar and the researcher was given to women packets of coffee for used.

Evaluation phase: The researchers followed all post-cesarean section women in both groups to evaluate post-dural puncture headache parameters (incidence, severity, continuity and need for analgesic) using post-dural puncture headache assessment tool. Follow-up was performed three times: First evaluation was carried out during day one postpartum after 10 hours of drinking coffee; the second evaluation was carried out during day three postpartum; and finally, the third evaluation was carried out during day five postpartum. This evaluation was conducted through telephone interview for about 10 minutes.

Statistical analysis

The Collected data was coded, categorized, and entered into a computer. Statistical software for social science version 20.0 was used for all statistical studies (SPSS, Chicago, IL). Statistics were used for both descriptive and inferential data analysis. Continuous data were reported as mean standard deviation and had a normally distributed distribution (SD). Numbers and percentages were used to express categorical data. The chi-square [X2] test or Fischer's exact test was used to compare categorical variables, if appropriate. The t-test was used to determine the significance of the difference between two means. P-values were regarded as significant when they were lower than 0.05 and highly significant when they were lower than 0.01.

Results

Findings of this study are presented as follows in three main sections: I. Personal background data. II. Reproductive data and III. Post dural puncture headache parameters (incidence, severity, continuity of headache and need of analgesics for PDPH).

I. **Personal background data**

Findings of the present study revealed homogeneity of the women and matching between the two groups, as there were no statistically significant differences between the two groups in relation to age, place of residence, educational level, and occupational status (p= 0.061, 0.199, 0.506 and 0.066 respectively). As shown in table (1), the mean age of the study group was 28.9 ±5.8 years as compared to 29.7 ±4.9 years for control group. Concerning place of residence, 67.5% of

the study group, as compared to 57.8% of the control group lived in urban areas. In relation to education, 34.9% of the study group as compared to 24.1% of the control group had completed their secondary education. Regarding occupation, 77.1%, and 88.0% of the study and control group respectively were housewives.

II. Reproductive data

As shown in table (2) there were no statistically significant differences between the two groups in relation to gravidity, parity, mode of previous delivery, and gestational age (p= 0.359, 0.061, 0.435 and 0.592 respectively). In relation to gravidity and parity 49.4% and 56.6% of the study and control group respectively were 3 or more gravida and para. Regarding mode of previous delivery, findings of the present study revealed that, 49.4% of the study group delivered by CS as compared to 54.2% of the control group. Concerning the mean gestational age of the study group was 38.2 ±1.2 weeks as compared to 38.3 ±1.2 weeks for control group.

III. Post-Dural Puncture Headache Parameters

A. Incidence of PDPH

Post-dural puncture headache was recorded and compared at 1st, 2nd, and 3rd evaluation after birth. Figure (1) illustrates that, the incidence of PDPH at 1st, 2nd, and 3rd evaluation after birth in study group were 71.1%, 53.0%, and 27.7% respectively as compared to 100.0%, 96.4%, and 92.8% for control group respectively. There were statistically significant differences in favor of the study compared to control group regarding incidence of PDPH at 1st, 2nd, and 3rd evaluation (p< 0.001).

B. Severity of PDPH

In relation to the mean of headache severity scores within 1st, 2nd, and 3rd evaluation after birth, there were significant differences in favor of the study compared to control group (p< 0.001). The mean of severity of PDPH scores within 1st, 2nd, and 3rd evaluation in the study group were (4.4±1.7, 3.1±1.0 and 1.1±0.5) versus (8.3±2.7, 7.5±2.6 and 6.8±1.5 respectively) of control group (Table, 3).

C. Continuity of PDPH

Concerning continuity of headache at 1st, 2nd, and 3rd evaluation after birth, the present results revealed that the study group have 44.1%, 28.7% and 17.4% respectively compared to 45.2%, 38.7%, and 36.4% respectively of control group. There were no statistically significant differences between study and control groups (p= 0.839, 0.259 and 0.086 respectively) (Figure, 2).

D. Need of analgesics for PDPH

Figure (3) illustrates that, 63.6%, 12.7% and 7.2% of the post-cesarean section women in the study group reported needs for analgesics to relieve PDPH during1st, 2nd, and 3rd evaluation respectively as compared to 63.6%, 12.7% and 7.2% in the control group. Furthermore, there was a highly statistically significant difference between both groups in terms of need to analgesics for PDPH (P<0.001).

Table 1. Distribution of post-cesarean section women according to personal background data

Variable	Study group		Control group		Chi-Square / Fisher's exact test	
	Freq.	%	Freq.	%	X^2	P
Age (Years)						
< 30	57	68.7	47	56.6	5.595	0.061
30 – 35	10	12.0	22	26.5		
> 35	16	19.3	14	16.9		
Mean ±SD	28.9 ±5.8		29.7 ±4.9		1.010#	0.314
Residence						
Rural	27	32.5	35	42.2	1.648	0.199
Urban	56	67.5	48	57.8		
Educational level						
Read and write	8	9.6	12	14.5	3.318	0.506
Primary education	11	13.3	13	15.7		
Preparatory education	20	24.1	25	30.1		
Secondary education	29	34.9	20	24.1		
Higher education	15	18.1	13	15.7		
Occupation						
Housewife	64	77.1	73	88.0	3.384	0.066
Working	19	22.9	10	12.0		

 # t value, Student's t test

Table 2. Distribution of post-cesarean section women regarding to reproductive data

Variable	Study group		Control group		Chi-Square	
	Freq.	%	Freq.	%	X^2	P
Gravidity						
1	25	30.1	17	20.5	2.044	0.359
2	17	20.5	19	22.9		
3 or More	41	49.4	47	56.6		
Parity						
1	30	36.1	17	20.5	5.585	0.061
2	12	14.5	19	22.9		
3 or More	41	49.4	47	56.6		
Mode of previous delivery						
Normal vaginal delivery	6	7.2	5	6.0	2.726	0.435
Vaginal delivery with episiotomy	11	13.3	16	19.3		
Cesarean section	41	49.4	45	54.2		
None	25	30.1	17	20.5		
Gestational Age (Mean ±SD)	38.2 ±1.2		38.3 ±1.2		0.536#	0.592

 # t value, Student's t test

Figure 1. Comparison between both groups regarding to incidence of PDPH

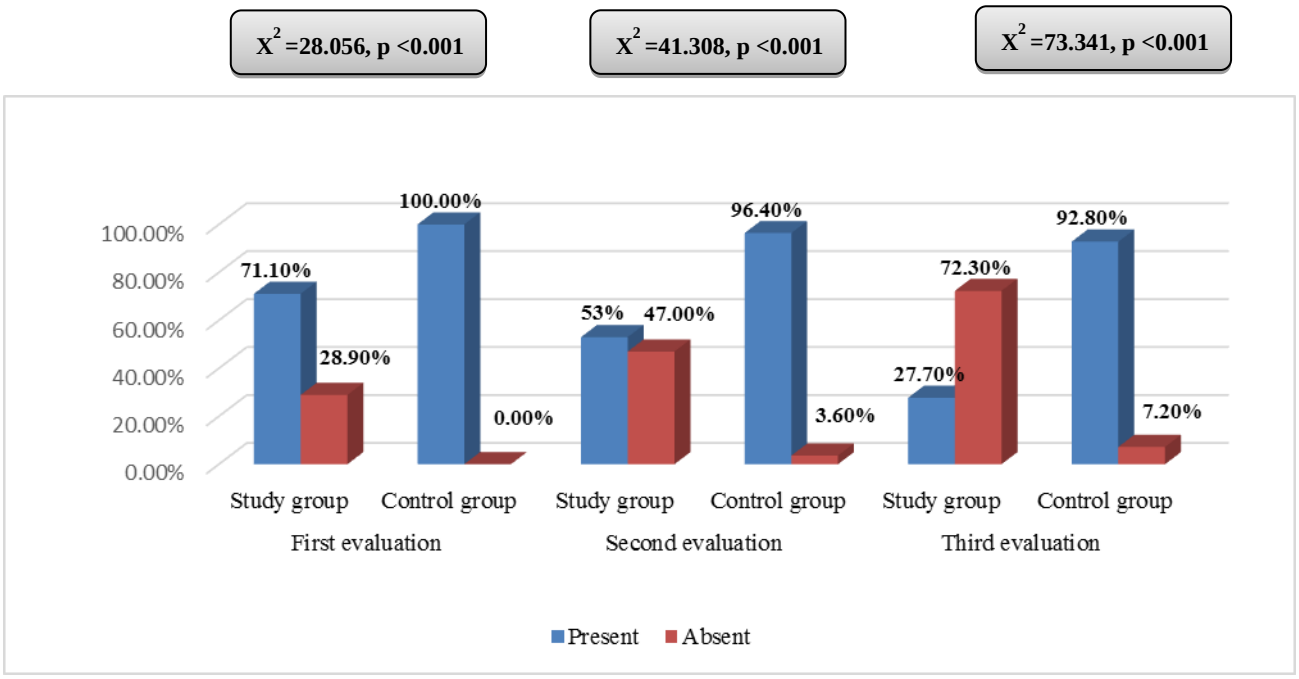


Table 3. Comparison between both groups regarding to severity of PDPH

Severity of headache	Study group		Control group		Chi-Square	
	Freq.	%	n	%	X^2	P
First evaluation	**(N=59)**		**(N=83)**			
Mild	20	33.9	32	38.6		
Moderate	39	66.1	21	25.3		
Severe	0	0.0	30	36.1	35.116	<0.001**
Mean ±SD	4.4±1.7		8.3±2.7		9.795#	<0.001**
Second evaluation	**(N= 44)**		**(N= 80)**			
Mild	33	75.0	43	53.8		
Moderate	11	25.0	19	23.8		
Severe	0	0.0	18	22.5	12.009	0.002*
Mean ±SD	3.1±1.0		7.5±2.6		10.779#	<0.001**
Third evaluation	**(N= 23)**		**(N=77)**			
Mild	19	82.6	28	36.4		
Moderate	4	17.4	38	49.4		
Severe	0	0.0	11	14.3	15.651	<0.001**
Mean ±SD	1.1±0.5		6.8±1.5		17.874#	<0.001**

 # t value, Student's t test

Figure 2. Comparison between both groups in relation to continuity of PDPH

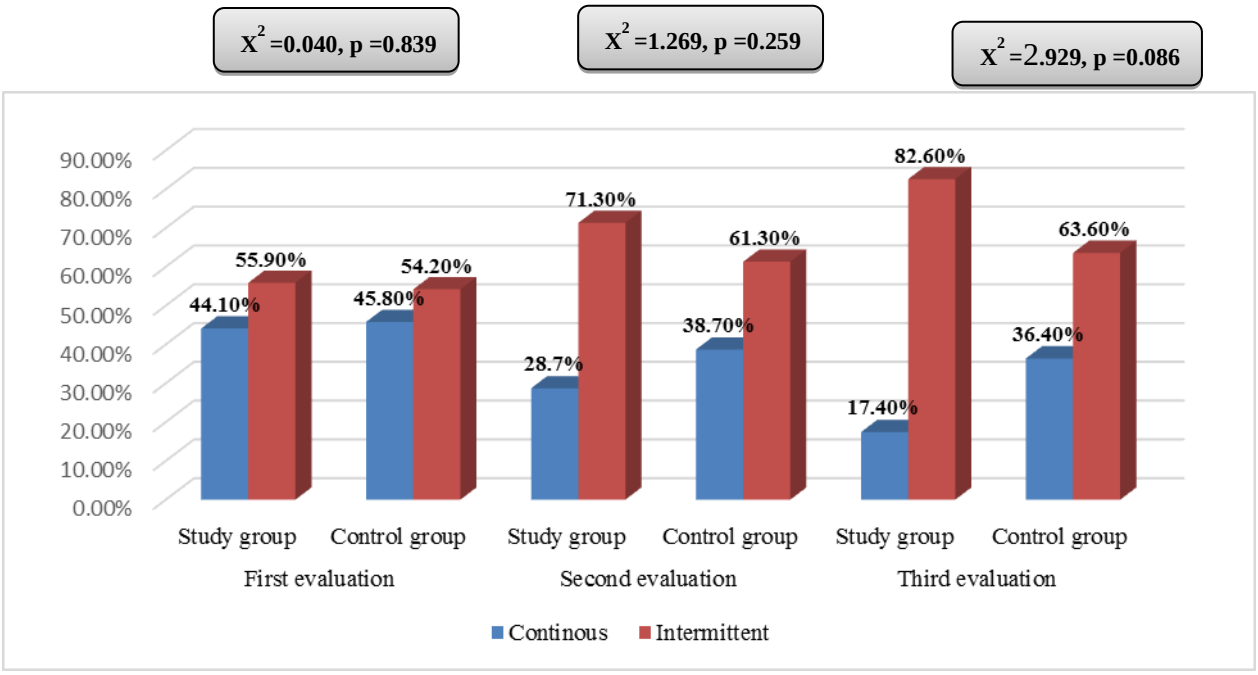
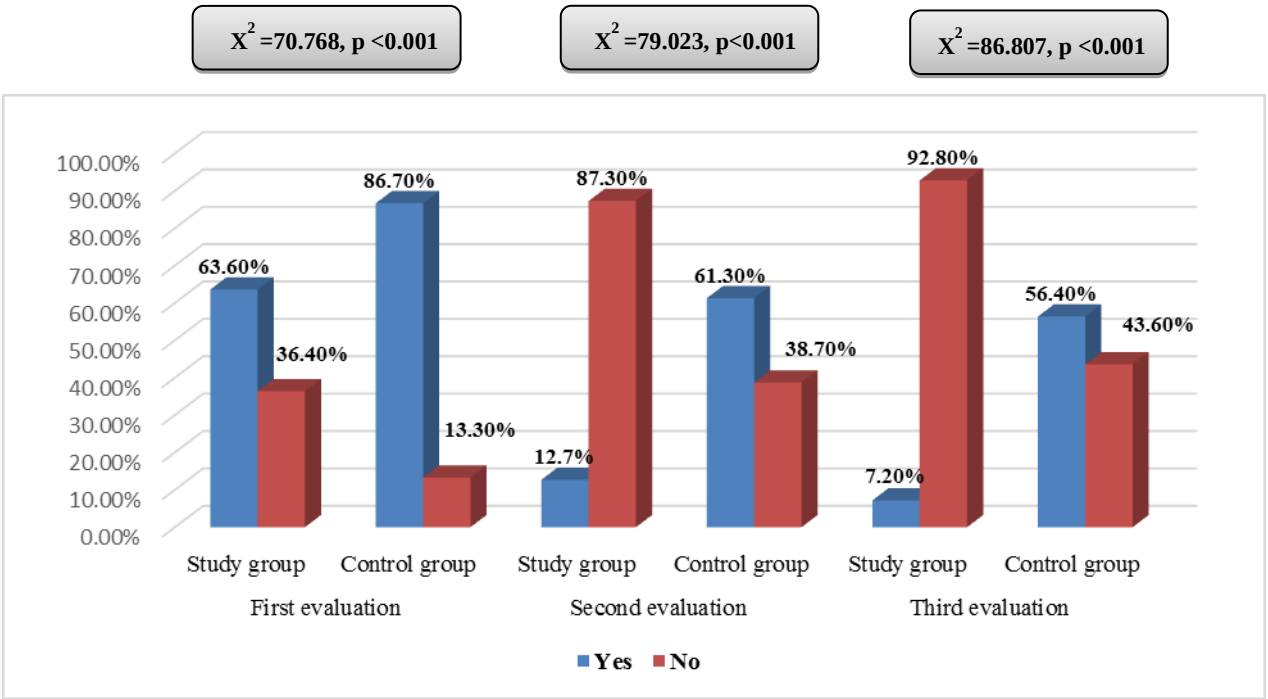


Figure (3). Comparison between both groups in relation to analgesia need for PDPH.



Discussion

PDPH is one of complication occurred after spinal anesthesia. Conservative treatment of PDPH such psychological support, comprehensive hydration, bed relief and abdominal binders as well as vasoconstrictors for example caffeine that set up in coffee. Therefore, the present study was carried out post-cesarean section women were receiving spinal anesthesia, to examine the effect of coffee intake on post-dural puncture headache parameters among post-cesarean section women.

Regarding the incidence and severity of post-dural puncture headache the present study revealed that, the incidence and severity of PDPH was lower among study than control group and the difference between two groups was highly statistically significant ($p<0.001$). This finding highlights the importance of coffee intake for post-cesarean section women in order to decrease incidence and severity of PDPH. These might be owed to that coffee intake has many benefits such as raise cerebrospinal fluid production, thereby supporting to decrease headache pain severity in those with spinal cerebrospinal fluid leakage. Therefore, these findings support the first and second hypothesis post-cesarean section women who drink coffee exhibit a lower incidence and experience less severity of PDPH than controls. The present findings are in agreement with those from studies **Elgzar & Ghattas (2019)** who carried out a study regarding the effect of coffee consumption on the incidence and severity of post dural puncture headache among post cesarean section women. They reported that, the incidence and severity of PDPH is lower among coffee group than control.

In the same line **Eshghizadeh et al. (2015)** who conduct a study regarding the effect of coffee consumption on the headache caused by spinal anesthesia for cesarean section. They found that, the incidence and severity of PDPH decrease among coffee group than control and the differences in PDPH incidence and severity were statistically significant between coffee and control group. Also, these findings congruent with **Aly & Elazeem (2019)** who studied the effect of coffee consumption on the incidence of PDPH among patients receiving spinal anesthesia they mentioned that, the incidence and severity of PDPH is lower in postoperative patients who expended coffee than in those who don't expend coffee.

The present study revealed that, At 3rd evaluation post-cesarean section women in the study group had lower in continuity of headache than control group and the differences between the study and control groups were not statistically significant. Therefore, these findings reject with the third hypothesis post-cesarean section women who drink coffee experience less PDPH continuity than controls. These results conflict with **Elgzar & Ghattas (2019)** reported that the differences between the coffee group and control groups was statistically significant regarding to the continuity of headache pain.

The present study revealed that, there were statistical significant differences between the two groups related to need for analgesic. At 3rd evaluation only seven point two post-cesarean section women in the study group need to analgesic versus to fifty six point four post cesarean section women in the control group. These findings support the fourth hypothesis: Post-cesarean section women who drink coffee exhibit less need for analgesics than controls. Therefore, our study compiles upholding to the concept that the effect of coffee intake on decreasing need of analgesic for PDPH is clinically useful and could be utilized in order to reduce PDPH of post-cesarean section women. This finding is with harmony with **Aly & Elazeem (2019)** found that, four patients in the intervention group versus to twelve patients in the control group need to analgesic and there was statistically significant difference between the coffee and control groups regarding need to analgesic. These findings were point to success of the coffee intake on lower severity of PDPH in post-cesarean section women who drank coffee.

Conclusion

In conclusion, the findings of the present study declared that coffee intake is an effective non-pharmacological measure in reducing incidence and severity of post-dural puncture headache among post-cesarean section.

Recommendations

Based on the results of our study, the following are recommended:

- Coffee intake could be used by midwifery nurses as a non-pharmacological strategy to manage PDPH among post-cesarean section women
- Awareness of maternity nurses about coffee intake could be promoted to be implemented into practice
- Replication of the present study on a larger probability sample and in other settings is necessary.
- Post-cesarean section women could be equipped with evidence-based knowledge regarding coffee intake as a strategy to manage PDPH.

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