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RESEARCH ARTICLE

Benefit of coffee consumption on the postdural puncture headache related to pain score and biophysical parameters

Lt Col Jyotsana, Lt Col Sreeja L

Corresponding author: Lt Col Jyotsana, Dept. of Obstetrics and Gynaecology, Command Hospital Air Force, Bangalore, Karnataka, India; Email: jyotsanamoudgil37@gmail.com

ABSTRACT

Objective: The objective of the present study was to know the effect of coffee on occurrence of postdural puncture headache (PDPH) in post-operative patients related to bio-physical parameters among the patients who underwent spinal anaesthesia procedures. **Methods:** The samples were recruited of about 60 nos. of patients from the accessible population and were further distributed randomly to group - I (30) and group – II (30). The patients were compared the biophysical parameters related to earlier PDPH pain score for both groups after administration of three doses of coffee at intervals 24hrs, 48hrs and 72hrs of spinal anaesthesia were considered as observation one, two and three (O1, O2 and O3), respectively for group - I patients and normal routine care for group - II patients. **Results:** The main findings in this study were that the incidence of PDPH is lower in group-I after coffee consumption but no statistically significant difference were observed on different biophysical parameters viz. pulse rate, respiration rate, SBP, DBP and BMI related to NRS pain score observations at O1, O2 and O3, respectively but respiration rate and SBP were found statistically significant ($P<0.01$) change between the group at O1 and O2 respectively. **Conclusion:** The results of present study found a lower incidence of PDPH in group-I compared to group-II patients after coffee consumption.

Keywords: Spinal anaesthesia, postdural puncture headache, coffee supplement, numerical rating scale, pain therapy, biophysical parameters.

Postdural puncture headache (PDPH) is a common incidence among patients who undergone spinal anaesthesia, which is believed the safest and widely recognized form of anaesthesia for obstetric and gynaecological surgical practice majorly in the case of caesarean section (CS)[1]. Moreover, the incidence of PDPH is estimated between 30-50% due to diagnostic or therapeutic lumbar puncture followed by spinal anaesthesia of about of 0-5% and up to 81% due to unintentional dural puncture during epidural insertion in pregnant mothers[2]. The incidence of this entity has been reported between 5-30% worldwide [3], whereas in India, the incidence of PDPH was obtained about 14% due to spinal anaesthesia[4]. About 90% of PDPHs was recorded within three days of the procedure while 66% found in the first 48 hours[5]. The causative factors such as needle gauge, needle orientation, bevel orientation, operator's skill level and mostly found in young age or earlier history of PDPH and body mass index (BMI) of patients may be induced as the risk factors[5]. It was also reported that occurrence of PDPH varies from 1% to 40% as per needle size and mostly in females [6].

The pain score assessment is an important parameter along with other biophysical parameters such as pulse rate, respiration rate, blood pressure especially systolic and diastolic pressure, BMI, etc. are also found to be altered due to the incidence of PDPH [4, 7].

In 1949, caffeine was first investigated for the treatment of PDPH, which is well known central nervous system stimulant[8]. The caffeine is believed to treat PDPH by causing cerebral vasoconstriction. The oral intake of caffeine is more safe, easy and acceptable by large population and is used for treatment of multiple headache situations and proved to be

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helpful by earlier studies [9 -10]. This may generate immediate adjuvant analgesic characteristics in many pain circumstances [11]. It is also known to cause cardiovascular vasoconstriction and may be helpful to relieve postprandial hypotension and other hypotension conditions as PDPH[12]. In addition, worldwide coffee is the most popular drink, and it contains caffeine[13]. The medical benefits had been discovered for coffee as protect against Parkinson's and Alzheimer disease due to its stimulant effect[14]. Many investigators have been emphasized the benefit of drinking coffee after spinal anaesthesia post-operative care of PDPH [15-17].

It was attempted to know the effect of coffee on occurrence of PDPH in post-operative patients of interventional group (group-I) compared between control group (group-II) related to biophysical parameters among the patients who underwent spinal anaesthesia procedures.

Materials and methods

The study was carried out at the obstetrics and gynaecological ward of a selected tertiary care centre at Kolkata during the period of 2016. In this study, two categories were made as interventional group as group-I (administration of coffee) while the control group as group-II (without administration of coffee) maintained under routine care. Patients admitted to the ward for obstetrical and gynaecological surgeries under spinal anaesthesia during the study period fulfilling the inclusion criteria were selected. A total sample size of 60 patients was considered in which allocated 30 patients in each group as group-I and group-II.

The inclusion criteria such as 1) patients above 18yrs and up to 70 years of age, 2) patients who were scheduled to undergo obstetrical and gynaecological surgeries with ASA I grading as per pre-anaesthetic check-up, and 3) patients who are willing to participate in the study.

The exclusion criteria such as 1) patients who were at a high risk to develop immediate post operative complications, 2) patients with high risk co morbidities like pregnancy induced hypertension, renal ailments, severe anaemia, and metabolic disorder, and 3) patients on regular pain medications for any chronic ailments.

As per our earlier study of a PDPH pain assessment through NRS pain tool was estimated.[18] In the present study, different biophysical parameters viz. pulse rate, respiration rate, blood pressure especially systolic and diastolic pressure, and BMI related to earlier PDPH pain score were studied between group-I and II. A research tool or instrument is a device used to measure the above mentioned parameters to collect data. A PDPH pain assessment tool, numeric rating scale for pain assessment, mercury BP apparatus, stethoscope, heightometer and weighing machine were used to determine biophysiological parameters as well as BMI.

PDPH pain score assessed by numerical rating scale values after 24hrs, 48hrs and 72hrs of spinal anaesthesia were considered as observation one, two and three (O1, O2 and O3), respectively for group-I and II patients. Above-mentioned biophysical parameters were tested after 24hrs, 48hrs and 72hrs of spinal anaesthesia considering it as O1, O2 and O3, respectively between group-I and II.

Statistical analyses were done in which unpaired and paired student 't' test for comparing the means of PDPH pain scores and observations of biophysical parameters among group-I and II. ANOVA was also used to compare the selected for BMI variable with the mean PDPH pain scores in group-I compared to group-II.

Results

The biophysiological parameters like pulse rate, respiratory rate and systolic and diastolic blood pressure and BMI were measured in the present study. These parameters were compared with PDPH pain score in the case of group-I and II, respectively.

Table 1: Pulse rate on various observations within and between the group-I and II (Mean ± SD)

Pulse rate (per minute)	Group		P - Value	
	Group-I (n = 30) Mean ± SD	Group-I (n = 30) Mean ± SD		
O1	81.80±10.38	84.53±11.26	0.332	NS
O2	81.67±8.91	82.87±9.92	0.624	NS
O3	81.73±7.29	81.67±8.26	0.974	NS
P value between O1 and O2	0.951	0.278		
P value between O2 and O3	0.945	0.312		

n = Number; SD = Standard deviation; NS = Not significant

Table 1 compares the mean pulse rate (per minute) in different observations of group-I and group-II as well as within the group. The data revealed that the mean pulse rate at O1, O2 and O3 in group-I was 81.80 ± 10.38, 81.67 ± 8.91, 81.73 ± 7.29 respectively, whereas in group-II, the value was found 84.53 ± 11.26, 82.87 ± 9.92, and 81.67 ± 8.26, respectively. There was not found statistically significant ($p>0.05$) change in pulse rate between and within the groups at different observations.

Table 2 describes the comparison of mean respiratory rate (per minute) of samples in group-I and II. The mean respiratory rate of samples in group-I at various observations were estimated as19.80 ± 1.10 at O1, 19.80 ± 1.35 at O2 and 19.53 ± 1.14 at O3 respectively when compared to group-II

(20.20 ± 1.69 at O1, 19.87 ± 1.74 at O2 and 19.80 ± 1.32 at O3), respectively. There was not found statistically significant (p>0.05) change in respiratory rate between the groups at different observations except O2 (p<0.01). Moreover, significant value was observed within the group-I between O1 and O2 (p<0.001) and O2 and O3 (p<0.05). Therefore, it is concluded that within group-I obtained statistical difference and between group-I and II, O2 observed significant change.

Table 2: Respiration rate on various observations within and between the group-I and II (Mean ± SD)

Respiration rate (per minute)	Group		P - Value
	Group-I Mean ± SD	Group-II Mean ± SD	
O1	19.80 ± 1.10	20.20 ± 1.69	0.281
O2	18.80 ± 1.35	19.87 ± 1.74	<0.01
O3	19.53 ± 1.14	19.80 ± 1.32	0.406
P value between O1 and O2	<0.001	0.378	
P value between O2 and O3	<0.05	0.884	

n = Number; SD = Standard deviation.

Table 3 describes the comparison of mean blood pressure (SBP in mm Hg) within and between group -I and II. The mean SBP of samples in group-I at various observations were measured as 123.67 ± 11.92 at O1, 121.60 ± 7.47 at O2 and 120.13 ± 11.17 at O3 respectively when compared to group-II (117.73 ± 10.23 at O1, 118.07 ± 9.10 at O2 and 118.73 ± 9.03 at O3), respectively. There was not found statistically significant (p>0.05) difference in blood pressure (SBP) within and between the groups at different observations except between group-I and II at O1 significant (p<0.05) difference was observed. Therefore, it is concluded that no statistical difference could be established between the two groups.

Table 3: Blood pressure (SBP) on various observations within and between the group-I and II (Mean ± SD)

SBP (mm Hg)	Group		P value
	Group-I Mean ± SD	Group-II Mean ± SD	
O1	123.67 ± 11.92	117.73 ± 10.23	<0.05
O2	121.60 ± 7.47	118.07 ± 9.10	0.106
O3	120.13 ± 11.17	118.73 ± 9.03	0.595
P value between O1 and O2	0.222	0.857	
P value between O2 and O3	0.462	0.598	

n = Number; SD = Standard deviation.

Table 4 describes the comparison of mean blood pressure (DBP in mm Hg) within and between group - I and II. The mean DBP of samples in group - I at various observations were estimated as 74.73 ± 7.19 at O1, 73.67 ± 4.93 at O2 and 73.73 ± 8.18 at O3 respectively when compared to group - II (73.40 ± 12.22 at O1, 73.47 ± 7.79 at O2 and 75.80 ± 7.07 at O3), respectively. There was not found statistically significant (p>0.05) change in blood pressure (DBP) within and between the groups at different observations. Therefore, it is concluded that no statistical difference could be established between the two groups.

Table 4: Blood pressure (DBP) on various observations within and between the group -I and II (Mean ± SD)

DBP (mm Hg)	Group		P Value
	Group-I Mean ± SD	Group-II Mean ± SD	
O1	74.73 ± 7.19	73.40 ± 12.22	0.608
O2	73.67 ± 4.93	73.47 ± 7.79	0.906
O3	73.73 ± 8.18	75.80 ± 7.07	0.300
P value between O1 and O2	0.467	0.857	
P value between O2 and O3	0.964	0.598	

n = Number; SD = Standard deviation.

Table 5 shows the comparison of mean PDPH pain scores at various observations with BMI of group -I and II. The computed 'F' value using the ANOVA test inferred a value 0.923(p value = 0.345) at O1, 0.491(p value = 0.489) at O2, and 0.639 (p value = 0.431) at O3 for group-I, when compared to group-II with the values of 0.118 (p value = 0.889) at O1, 0.914 (p value = 0.413) at O2 and 1.035 (p value = 0.369) at O3, respectively. There was not found statistically significant (p>0.05) difference in the case of BMI value between the groups at different observations.

Table 5: Comparison of BMI between the group -I and II (Mean ± SD)

Groups	BMI (Kg/m2)	O1	O2	O3
Group-I	18-26	0.05 ± 0.22	0.15 ± 0.67	0.25 ± 0.79
(n = 30)	>26	0.20 ± 0.63	0.00	0.50 ± 0.85
(Mean ±	F value	0.923	0.491	0.639
SD)	P value	0.345	0.489	0.431
	Significance	NS	NS	NS
Group-II	<18	2.00	5.00	5.00
(n =30)	18-26	2.53± 2.95	3.11 ± 2.90	3.00 ± 3.09
(Mean ±	>26	2.00±2.67	1.90 ±2.68	1.70 ±2.31
SD)	F value	0.118	0.914	1.035
	P value	0.889	0.413	0.369
	Significance	NS	NS	NS

SD = Standard deviation, df = 58; NS = Not significant

Discussion

The present study was investigated the effect of coffee on occurrence of PDPH in post-operative patients of group-I compared to group-II based on bio-physical parameters among the patients who underwent spinal anaesthesia procedures.

The data for mean ± SD describes the comparison of PDPH pain scores between group-I and II at different observations of 24hrs, 48hrs and 72hrs (O1, O2 and O3) were observed significant difference (P<0.001) in our earlier study, which is supported by other research workers that PDPH pain score and intensity was reduced after the

administration of coffee in the interventional groups compared to control group [17-19].

The significant findings of this study are in contrary to a double blinded study conducted by Zeger et al in which the comparison was done on the effectiveness of cosytropin versus caffeine for PDPH therapy. It was confirmed that caffeine was ineffective in the treating PDPH when compared with cosytropin [20]. However, the caffeine group was benefitted more. Another review work basically highlighted the superiority of caffeine to resolve the unwanted complication like PDPH [21].

A similar finding was observed in an earlier study by Beigh et al for the comparison of biophysiological parameters of the participants, which clearly indicated that the mean SBP (mm of Hg) of the group was 119.82±6.472 in non PDPH patients whereas it was observed to be 119.43±5.591 in PDPH patients while the DSB (mm Hg) recorded a mean of 79.43±3.515 in the non PDPH group and 79.90±2.931 in the case of PDPH group [4]. However, it was derived that no statistically significant difference was established between mean PDPH pain scores and mean systolic and diastolic blood pressures values. Similar evidence has been mentioned in literature related to pulse rate and respiration. Changes in the biophysiological parameters are related to intensity of pain. As the present study highlighted mild PDPH, so the chances were less likely to cause any changes in the biophysiological parameters in the patients.

In the present study, both group - I and II were comparable in respect to BMI of studied subjects. Amazingly, it was observed that majority of samples in group - I and II i.e., 66.67% and 66.5% had a BMI (Kg/m^2) of 18-26 whereas about 33.33% of samples in group - I had BMI >26. One sample of group - II reported a BMI value of <18. Most of the subjects selected for this study in both groups had BMI of 18-26 and the samples at a low risk for developing PDPH. This is in accordance with a study conducted by Kuntz et al to correlate the incidence of PDPH with BMI, which suggested that the lower BMI has been shown to be associated with higher risk of PDPH. It was astonishing to obscure that incidence of PDPH was lesser in morbid obesity, which may be attributed to the larger abdominal subcutaneous tissues which acts like an abdominal binder thereby raising the intra-abdominal pressure thus reducing the leak of CSF through the dural defect [7]. Hence, the study results can be compared with the present study since both studies had normal BMI values in patients with PDPH. So, the presumption of lesser BMI being at greater risk for PDPH is negated by the present study while low or high BMI cannot be considered a reliable factor to presume the occurrence of PDPH among patients after spinal anaesthesia.

Conclusions

In conclusion, PDPH after spinal anaesthesia is a common problem, which can encounter a post-operative patient and can be treated with coffee as an established intervention. The results of present study can aid clinicians to use coffee as an effective, safe, non-invasive treatment for prevention of PDPH, which is found a lower incidence in group - I compared to group-II patients but the PDPH and prevention by using coffee drink cannot be influenced by the biophysical parameters related to NRS pain score. Moreover, it is suggested with more sample size to validate the present outcomes.

Conflict of interest: None. **Disclaimer:** Nil.

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Lt Col Jyotsana [1], Lt Col Sreeja L [2]

[1] Dept. of Obstetrics and Gynaecology, Command Hospital Air Force, Bangalore, Karnataka, India; [2] Dept. of Obstetrics and Gynaecology, College of Nursing, Command Hospital, Lucknow, Uttar Pradesh, India.