Research Article
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Magnitude of post dural puncture headache and associated factors in obstetric mothers undergone spinal anesthesia for caesarean section

Abstract

Background: Although modern anaesthesiology has made great progress in the last decades, neuraxial anesthesia (NA) is still the keynote of regional blockade. It is popular for its effectiveness in producing anesthesia and analgesia. As the NA techniques popularly used in clinics, Post-Dural puncture headache (PDPH), a common iatrogenic complication resulted from post-spinal taps or accidental dural puncture (ADP) subsequent to epidural block, frequently reported and becomes a challenging to health caregivers. The objective of the study was to assess the magnitude of post-dural puncture headache (PDPH) and Associated Factors in Obstetric Mothers Undergone Spinal Anesthesia for Cesarean Section from February 1–June 30, 2018.

Methods and materials: Institutional based cross-sectional study design conducted in Dilchora Hospital and Sabian Primary Hospital from February 1–June 30, 2018. Three hundred ninety one (391) obstetric mothers was systematically selected every two other patient interval. The data was collect from both patient chart review and interview using structured checklist.

Results: 85/391 (21.7%) obstetric mothers present with headache characteristic of post-dural puncture headache (PDPH). Mothers who had spinal anesthesia with 22-gauge spinal needle were seven time (7X) more like to develop PDPH [AOR=7.22, 95% CI (1.792-29.091), P=.005] as compared to obstetric mothers who had SA with 26-gauge spinal needle. 23-gauge spinal needle were also significantly associated with PDPH after Spinal anesthesia [AOR=4.75; 95% CI (1.396-16.21), P=.013]. While 26-gauge spinal needle were protective against PDPH [AOR=0.222, 95% CI (.095-.518), P=.01] Single spinal attempts were also protective against PDPH [AOR 0.374; 95% CI (0.220-0.635) P=0.000].

Conclusion and recommendation: Larger gauge spinal needle (22-gauge & 23-gauge) significantly increase the risk of developing PDPH after spinal anesthesia. While, smaller gauge spinal needle (26-gauge spinal needle) and single spinal attempt were protective against PDPH. Therefore, Anesthesia department and administration of the respective hospitals should develop a guideline to minimize a relatively high prevalence of PDPH in the hospitals, and utilization of large gauge spinal needles, and repeated spinal attempt should be avoid during Spinal Anesthesia.

Keywords: post-dural puncture headache, spinal anesthesia

Volume 11 Issue 2 - 2019

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Received: February 11, 2019 | **Published:** March 19, 2019

Introduction

Although modern anesthesiology has made great progress in the last decades, neuraxial anesthesia (NA) is still the keynote of regional blockade.[1] Neuraxial anesthesia is popular for its effectiveness in producing anesthesia for providing excellent intra-operative neuromuscular paralysis and in generating analgesia for relieving postoperative pain if continuously infused.[2] As the NA techniques are used popularly in clinic, post dural puncture headache (PDPH), a common iatrogenic complication resulted from post-spinal taps or accidental dural puncture (ADP) subsequent to epidural block, is frequently reported[3] and becomes a challenge to health caregivers. PDPH believed to originate from persistent leakage of cerebrospinal fluid (CSF) greater than the cerebrospinal fluid production after lumbar puncture.[4] According to the diagnostic criteria of International Headache Society (IHS) in 2004, the PDPH can appear up to the fifth day after lumber puncture and disappears spontaneously within a week, or up to 48 hours after an epidural blood patch (EBP). In addition, it accompanied by neck stiffness, tinnitus, hypoacusia (partial loss of hearing), photophobia, and nausea.[5]

Certain factors that may affect the incidence of PDPH include age, gender, pregnancy, history of PDPH, shape of needle tip, size of needle, needle bevel orientation to dural fibers, midline vs lateral lumber puncture (LP) approach, number of LPs, and clinical experience of the operator.[6–8] Although, continuous spinal technique and timing of patient's ambulation does not increase the incidence of PDPH[9] but some data indicate that early ambulation may actually decrease its incidence.[10,11] The parturient are at particular risk of dural puncture and the subsequent headache because of their sex, young age, and the widespread application of epidural anesthesia.[12] The incidence of post-dural puncture headache inversely related to the experience of the anesthetist,[13] and believed to be reduce by orientation of the needle bevel parallel to the dural fiber (14). The optimum needle sizes for spinal anesthesia are probably the 25G, 26G, and 27G needles.[15,16] Spinal anesthesia is widely performed in Dilchora Hospital as well as Sabian Primary Hospital for obstetric mothers undergoing cesarean section. Although those mothers frequently complain a debilitated headache after spinal anesthesia, its magnitude and associated factors was not been well studied. Therefore, conducting this research enabled us to identify the prevalence and associated factors with PDPH. As a

result, concerned body will take action based on the recommendation from this study.

Methods

Study design setting and period

An institution based cross sectional study was conducted at Dilchora Hospital and Sabian Primary Hospital to assess the magnitude and associated factors of post-dural puncture headache in obstetric mother who undergone spinal anesthesia for cesarean section from February 1–June 30, 2018. Dilchora Hospital is one of regional hospitals in the eastern Ethiopia, located 515 km away from the capital city Addis Ababa. Sabian Primary Hospital is the other governmental Hospital located in Dire Dawa City.

Sample size and sampling technique

The sample size calculated using single population formula by taking P =0.39 from similar study conducted in Gonder referral and teaching hospital.[23] Then, the total 403 samples distributed proportionally to collect 270 samples from Dilchora Hospital and 133 samples from Sabian Primary Hospital. In each Hospital, the sample selected systematically every two other patient and finally 391 illegible sample was studied.

Study variables

The dependent variable was Post dural puncture headache and the Independent variable were Age of the patient, previous history PDPH, time of ambulation, experience of the anesthetist, number of lumbar puncture, gauge of the Spinal Needle, body mass index (BMI), Blood Loss during Operation, and amount of fluid Preload.

Data collection procedure

On the arrival of the patient in the operation theatre, the patient age, ASA classification, weight and indication for cesarean section was reviewed from the chart. In the operation theatre, gauge of the spinal needle used, position of the patient during SA, type of local anesthetics used for SA and the number of spinal attempts was observed and recorded by the data collectors. During post-operactive period, the patient was interviewed for prevalence of post-dural puncture headache and associated symptoms on 12 hour of post spinal anesthesia and on the 3rd post-operative day. The patient was identified as having PDPH if the headache get worsens when sitting or during situational movement and relieves or improves by lying in flat position. For patients who experienced PDPH, the severity of the PDPH was evaluated using Numerical Rating Scale and it was categorized as mild headache,[1–3] moderate headache,[4–7] or severe headache(>7). To ensure the quality of data, the checklist was pretested in Black Lion Referral Hospital and training was provided for data collectors before data collection.

Data analysis procedures

The collected data were coded, and entered in to EPI info 7 and then exported to SPSS version 20 for further analysis. All independent variables were analyzed using binary logistic regression with the dependent variable PDPH using SPSS version 20 and those which were significant at a p-value of <0.2 were fitted to a multivariate logistic regression to check their association with the outcome variable, PDPH at a p-value of <0.05. On Multiple Logistic Regression, those independent variable who had P-value of <0.05 was consider significantly association with the dependent variable PDPH.

Ethical considerations

Before starting data collection, ethical clearance was obtain from Dire Dawa University RTI office and a written informed consent was taken from each patient. Patient identification was coded and confidentiality was maintained at all levels during data collection.

Results

Socio-demographic & physical characteristics of the study participants

Among 403 obstetric patient included in the study, 12 mothers lost follow up postoperatively and they were excluded from the study. A total of 391 ASA II obstetric mothers aged 18–43 years old with mean age of 29 and a standard deviation of ± 4.6 was analyzed in the study. Among those obstetric mothers, 129 (33%) undergone elective caesarian section while 262 (67%) undergone emergency caesarian section (Table 1). Sitting position was used to provide spinal anesthesia in all 391 obstetric mothers. In 198 (50.6%) mothers the Body Mass Index/BMI was normal (18 - 24 kg/m^2) while the rest half of obstetric mothers 193 (49.4%) the Body Mass Index/BMI was above 24kg/m^2 (overweight). When we see the type of local anesthetics used for spinal anesthesia, 0.5% plain bupivacaine was used in 275 (70.3%) mothers, while 0.5% heavy bupivacaine used in 83 (21.2%) mothers, and in the rest 33 (8.5%) mothers, 5% lidocaine with dextrose was used. After administration of spinal anesthetics the level of spinal anesthesia was assessed and adequate sensory block was achieved in 252 (64.5%) obstetric mothers while it was supplement with Intra-Venous/IV Adjunct in 138 (35.2%) obstetric mothers. Spinal anesthesia was failed in one (0.3%) case and then it was converted to general anesthesia and the baby was delivered safely.

Table 1 Characteristics of obstetric patient who undergone spinal anesthesia for caesarian section from February 1–June 30, 2018

S. No	Variables	Categories	Frequencies: n (%)
1.	Age of the obstetric mothers	15 – 30 years	309 (79%)
		31 – 50 years	82 (21%)
2.	Type of caesarian section	Emergency C/S	262 (67%)
		Elective C/S	129 (33%)
3	Body Mass Index /BMI of the obstetric mothers	18 - 24 kg/m2	198 (50.6%)
		>24 kg/m2	193 (49.4%)
4.	Types of local anesthetics	0.5% Plain Bupivacaine	275 (70.3%)
		0.5% Heavy Bupivacaine	83 (21.2%)
		5% Lidocaine with dextrose	33 (8.5%)
5.	Level of the spinal anesthesia	Adequate sensory block without adjuncts	252 (64.5%)
		Adequate sensory block with supplement of IV Adjunct	138 (35.2%)
		Failed block	1 (0.3%)

Prevalence and factors associated with PDPH

PDPH was observed in 85/391 mothers (21.7%) who undergone spinal anesthesia for caesarian section. Factors like Age, previous history PDPH, time of ambulation, experience of the anesthetist, number of lumbar puncture, gauge of the Spinal Needle, body mass index (BMI), Blood Loss during Operation, and amount of fluid Preload was assessed for independent association with PDPH. Among those listed factors, the gauge of the spinal needle and number of spinal attempt was statistically significantly related (P<0.005) with Post-Dural Puncture Headache/PDPH (Table 2).

Table 2 Factors associated with PDPH in obstetric patient who undergone spinal anesthesia for caesarian section from February 1 – June 30, 2018

S. No	Variables		Headache after SA		P – Value	95% CI for the EXP (B)
			No	Yes		
1	Age of the obstetric mothers	15 – 30 years	242 (78.3%)	67 (21.7%)	0.958	.984 (.546 - 1.774)
		31 – 50 years	64 (78.0%)	18 (22.0%		
2	Gauge of SA needle	23 and larger gauges	221 (73.9%)	78 (26.1%)	0.03	3.105 (1.116 - 8.638)
		25 and 26 gauge	85 (92.4%)	7 (7.6%)		
3	Number of spinal attempt	Single attempt	236 (84.3%)	44(15.7%)	0	.374 (.220 - .635)
		Two or more attempt	70 (63.1%)	41(36.9%)		
4	Number of baby in current pregnancy	Single pregnancy	293 (78.3%)	81(-21.7%)	0.855	.898 (.285 - 2.830)
		Twin and/or multiple pregnancy	13(76.5%)	4(23.5%)		
5	Body Mass Index /BMI of obstetric mothers	18– 24 kg/m2	160(80.8%)	38(19.2%)	0.217	.738 (.455 - 1.196)
		>24 kg/m2	146 (75.6%)	47(-24.4%)		
6	Amount preload before SA	< 500 ml of crystalloid	132 (76.3%)	41(23.7%)	0.403	1.228 (.759 - 1.989)
		≥ 500 ml of crystalloid	174 (79.8%)	44(20.2%)		
7	Experience of Anesthetist	SA performed by undergraduate student	10 (55.6%)	8 (44.4%)	1.81	2.087 (.710 - 6.134)
		SA performed by anesthetist with < 2 year of experience	114 (77.0%)	34(-23%)	0.854	.951 (.557 - 1.623)
		SA performed by anesthetists with ≥ 2 year of experience	182 (80.9%)	43(-19.1%)		
8	Estimated blood loss during surgery	< 1000ml of blood	289 (77.5%)	84 (22.5%)	0.386	2.533 (.309 - 20.763)
		≥ 1000ml of blood	17 (94.4%)	1 (5.6%)		
9	Type of C/S	Emergency C/S	200 (76.3%)	62(-23.7%)	0.462	.790 (.422 - 1.480)
		Elective C/S	106 (82.2%)	23(-17.8%)		
10	History of Headache from Previous SA	No headache from Previous SA	26(83.9%)	5(16.1%)	0.462	.688 (.254 - 1.864)
		Has History of headache from Previous SA	51(76.1%)	16(23.9%)	0.718	1.123 (.600 - 2.100)
		No history of SA	229(78.2%)	64(21.8%)		
11	Time of ambulation after SA	< 6 hour after SA	143 (85.6%)	24(14.4%)	0.45	.784 (.416 - 1.474)
		≥ 6 hour after SA	161 (72.9%)	60(27.1%)		

Mothers who undergone spinal anesthesia with 23 or larger gauge (18G & 20G) spinal needle were 3 time more like to develop PDPH as compared to mothers who had SA with 25 or 26 gauge spinal needle. [AOR=3.105; 95% CI (1.116 - 8.638), P = 0.03] Another significant association was found between number of attempts and PDPH. Mothers who undergone spinal anesthesia with single spinal needle injection were 62.6% less likely to develop Post-Dural Puncture Headache/PDPH as compared to mothers having SA with two or more injections. [AOR0.374; 95%CI (0.220-0.635) P=0.000] Our study does not find any statistically significant association (P>0.05) between age of the obstetric mothers, body mass index /BMI, number of pregnancy, amount preload, experience of anesthetist, history of post-dural puncture headache from previous SA, time of ambulation after SA, between emergency or elective cesarean section and development of PDPH after spinal anesthesia (Figure 1). Among 85 obstetric mothers, who develop PDPH after SA, 33 (39%) mothers reported their headache occur within 12 hour of post spinal anesthesia. While majorities of obstetric mothers; 52 (61%) mothers report their PDPH occur after 12 hour of post spinal until the 3rd day of post cesarean section (Figure 2).

Among 85 mothers who developed PDPH, majorities of them 46(54%) reported to have moderate pain while 28(33%) mothers report mild pain and 11(13%) mothers reported their pain as sever. In all mothers who develop PDPH, headache was treat and responded

with bed rest, fluid hydration, and oral NSAIDs analgesics (Figure 3). When we observe symptoms associated with PDPH, 70(82.4%) mothers complain neck-stiffness, 45(53%) mothers had nausea and/or vomiting, 29(34.1%) had photophobia, and 23(27.1%) obstetric mothers has tinnitus. Only 4 mothers doesn't report any symptoms associated with post-dural puncture headache/PDPH.

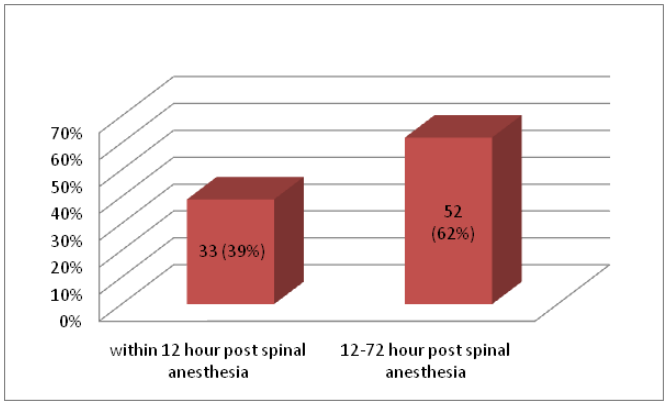

Figure 1 Onset of Post Dural Puncture Headache/PDPH.

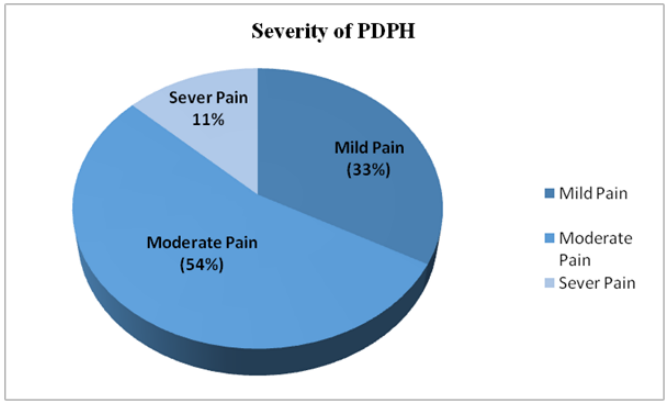

Figure 2 Severity of PDPH.

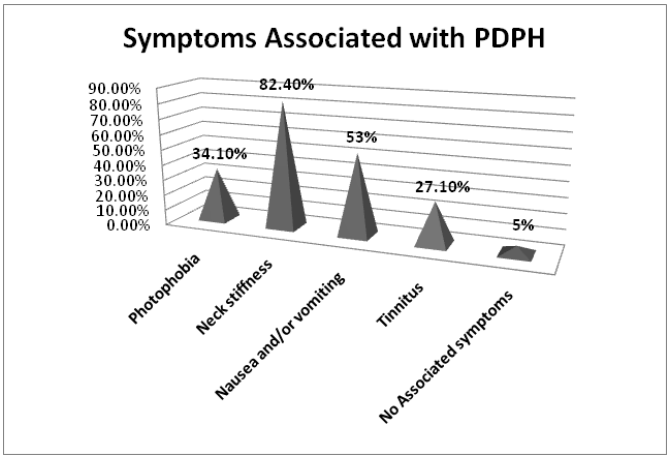

Figure 3 Symptoms associated with PDPH.

Description

Researchers conducted in different parts of the world shows various prevalence of PDPH in obstetric surgical mothers. In our study, 85/391 obstetric mothers (21.7%) develop PDPH. This finding is relatively higher as compared to studies conducted by Abdullayev et al,[17] Rasooli et al,[18] and Shaikh JM et al,[19] which report the prevalence of PDPH as 9%, 1.9%, and 4.8% respectively. We concluded that, the higher prevalence of PDPH in our study is contributed by wide spread utilization of large bore and quincke type spinal needle (18G, 20G & 23G) as compared to the previous studies which used fine quincke type as well as a traumatic needle spinal needle. Meanwhile, in line with our observation, other researchers' such as Ghaleb A,[6] HM Ali, et al[20] E Gisore et al,[21] & Samuel I Nuhu[22] report a relatively high prevalence of PDPH as 38.8%, 43.2%, 20.3%, and 22% respectively. Similarly, those studies also used large and quincke type spinal needle in their study. In our study, we found the gauge of the spinal needle statistically significantly related with PDPH. An obstetric mothers who undergone spinal anesthesia with 23 or larger gauge spinal needle were 3 time more likely developed PDPH as compared to mothers who undergone spinal anesthesia with 25 or 26 gauge spinal needle [AOR=3.105; 95% CI (1.116-8.638), P=0.03]. These probably arise from the size of the dural tear, which is directly proportionate to the amount of CSF leakage. As a smaller needle diameter produces a smaller tear in the dura, there is a less potential for leakage and incidence of headache after lumbar puncture. Similarly, other researchers[23–25] also report statistically significant relationship between gauge spinal needle and prevalence of PDPH.

However, some other studies[17,26,27] failed to demonstrate a statistically significant deference in the incidence of PDPH between 26-G cutting spinal needle and 26-G a traumatic spinal needle, 25-G Quincke spinal needle and 27-G Quincke spinal needle, and 25-G quincke needle versus 27-G quincke needle versus 27-G whitacre needle, respectively. From these findings, we recognize that, the needle design become more determinant for the development of PDPH than gauges of the spinal needle as the gauges of the spinal needle become smaller (≤ 25 G) In addition, our study also found a statistically significant relation between the numbers of spinal attempt and PDPH. Other studies[23,25,28] also reports similar finding with our study. An obstetric mothers who undergone SA with single spinal injection were 62.6 % less likely to develop PDPH as compared to mothers having SA with two or more injections [AOR 0.374; 95% CI (0.220-0.635) P=0.000]. However, other some studies[17,20,26] fail to demonstrate a significant relationship between the number of spinal attempt and PDPH.

In line with some other studies, we did not also find statistically significant relationship between the amount of preload,[21] time of ambulation,[28–30] history of previous PDPH,[31,32] age of the obstetric mother,[33] and the prevalence of PDPH after spinal anesthesia. In our study, we did not assess the relationship between the types of needle design and the orientation of the needle bevel relative to the longitudinal ligament because all spinal needles used was quincke type and parallel bevel orientation was used during the observation.

Conclusion

In our study, we observe a high prevalence of PDPH (21.7%) in obstetric mothers, undergone SA for cesarean section as compared to others studies. This study also found, statistically significant relationship between the gauge of the spinal needle and multiple spinal attempts and the prevalence of PDPH.

Recommendations

The hospital management and the anesthetists of Dilchora Hospital and Sabian Primary Hospital should minimize a relatively high prevalence of PDPH by avoiding use of large gauge spinal needles and repeated spinal attempt.

Citation: Tafesse D, Melkamayew A. Magnitude of post dural puncture headache and associated factors in obstetric mothers undergone spinal anesthesia for caesarean section. *J of Anes & Cri Open Access*. 2019;11(2):46–50. DOI: 10.15406/jaccoa.2019.11.00410

Competing interests

The authors of this study declare that there were no conflicts of interests.

Acknowledgments

We would like to express our deepest gratitude to Dire Dawa University for providing the financial support to conduct this study and our special gratitude goes to all data collectors participated in this study for their tireless effort and corporation during data collection.

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