

ASSESSMENT OF THE PREVALENCE AND ASSOCIATED RISK FACTORS OF POST DURAL PUNCTURE HEADACHE AFTER CESAREAN DELIVERY UNDER SPINAL ANESTHESIA AT SPHMMC LABOR WARD

PROSPECTIVE CROSS-SECTIONAL STUDY



A RESEARCH PAPER TO BE SUBMITTED TO THE DEPARTMENT OF GYNECOLOGY AND OBSTETRICS, SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE CERTIFICATE OF SPECIALITY IN GYNECOLOGY AND OBSTETRICS

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List of abbreviations

ASA.....	American society of anesthesiologist
BMI.....	body mass index
CD.....	cesarean delivery
CS.....	Cesarean section
CSF.....	cerebrospinal fluid
GA.....	general anesthesia
LP.....	lumbar puncture
SA.....	spinal anesthesia
SPHMMC.....	saint Paul hospital millennium medical college
SPSS.....	statistical package for social science
PDPH.....	post Dural puncture headache

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Abstract

Background: Post-Dural Puncture Headache (PDPH) is a common problem after a deliberate puncture of the dura-arachnoid for the purposes of diagnosis, therapy, spinal anesthesia, or unintentionally during epidural procedures. It is a clinically main complication which affects the daily life of patients with marked restriction of their physical activities. Spinal anesthesia is the frequent anesthetic procedure for obstetric patients which identified as cause for PDPH. The aim of the study was to assess the prevalence and associated risk factors of PDPH after Cesarean Section (CS) delivery under spinal anesthesia.

Method: An institution based cross sectional study design was conducted on all eligible obstetric patients who came for operation under spinal anesthesia from December, 2018 to April, 2019. The data collection method was including chart review and patient follow up for seven days of post operative period.

Results: 106/328 (32.3 %) patients developed PDPH. Among those patients with PDPH big needle sizes (OR=2.4; 95% CI: 1.47-3.96) and repeated number of attempts (OR= 3.6; 95% CI: 2.212 – 6.014), BMI (OR= 2.4; 95%CI (1.4_4.2)) were found to be significantly associated with the dependent variable of PDPH on the multi variants logistic regression.

Conclusion and recommendation: In this study, we showed the prevalence of PDPH was higher compared to other country, 106/328 (32.3 %) compared with other literatures. The study also showed that big spinal needles and repeated number of attempts and BMI were the independent associated risk factors for PDPH in SPHMMC labor ward operation theater Addis Abeba, Ethiopia.

1 .Introduction

1.1 Background

Nowadays spinal anesthesia for cesarean section is well established because of its safety, low cost and reliability [1,2]. Epidural anesthesia although it is a reliable alternative with better blood pressure control and pain less labor, but because of high cost and lack of personnel still not widely used in our developing country [2] . Therefore spinal anesthesia is the first choice; unfortunately the spinal anesthesia especially in obstetrics associated by postdural puncture headache (PDPH) which may restrict the patient acceptance to this type of anesthesia and increase the mother suffer postoperatively [1]

It is believed to be caused through penetration of Dura matter by spinal needle with continuous cerebrospinal fluid (CSF) outflow. The concern of the new born and the bond of family member be affected by post operative headache [2]

The PDPH is defined as "a headache occurring after Dural puncture and has a significant effect on the patients postoperative wellbeing i.e., headache which is not only postural but also continues for more than 24 h at any level of intensity or so severe at any time that the patient is unable to maintain upright position[3].

There are many variables that are suggested to be the main risk factors for pathogenesis of this complication [1-5]. Some of well known and statistically proved risk factors in pathogenesis of PDPH are: type of needle tips (cutting), bigger needle size, younger age, parturient, multiple puncture, female gender, needles bevel direction [3, 4,5] .

The risk of PDPH is directly related to the needle diameter that pierces the Dura mater. The incidence is significantly higher when large bore needles greater than 22 G than when smaller needles (<25 G) were used. Although smaller diameter needle punctures used for spinal block decrease the risk of PDPH, these needles are technically difficult to use and are associated with a lower success rate in spinal anesthesia [1-4]. Not only the size of the needle affects the incidence of PDPH, but also the type of needle tips [1,2,4]. The cutting needle bevels are more common to cause PDPH than the less traumatic pencil point needle bevels. The direction of the needle bevel during insertion also contributes to the occurrence of PDPH. If the bevel of the spinal needle is inserted perpendicular to the fibers of the Dura (which are believed to run longitudinally) an increased incidence of PDPH is expected [6,7].

1.2. Problem Statement

PDPH remains a frequent complication of spinal anesthesia in the obstetrical population. It occurs most commonly in young female patients, particularly parturient and correlates with the configuration of spinal needle used [8].

The incidence of PDPH is high in obstetric population because of their young age, sex and wide spread use of central neuroaxial blocks[9]. the period from 1930 to 1950 has often been referred to “dark ages of obstetric anesthesia”. In 1951, after the development of pencil point spinal

needles by Whitacre and Hart, and changes in needle tip design, there was a significant reduction in incidence of post dural puncture headache [9].

The incidence of post dural puncture headache was 66% in 1898. High incidence was likely due to large bore needle, medium bevel and cutting spinal needle. Recent literature shows incidence of PDPH after intentional dural puncture varies from 0.1-36%, the highest incidence of 36% was found after ambulatory diagnostic lumbar puncture using a 20-22 gauged standard quincke spinal needle [10]

The Incidence of PDPH with 27 gauge Quincke needle ranges from 1.1% to 12.8%. However, in a recent study by Muhammad et al, frequency of PDPH was 0% with 27G Quincke spinal needle when spinal anesthesia was administered for Caesarean section[11]

In Ethiopia so far there were two study done on the prevalence and associated risk factors in Ethiopia both were done in northern parts of the country and the first study put prevalence of PDPH at 38.8% which involved surgical and obstetric patient and predilection for needle size, females and younger age was observed [7]and the second study was done on obstetric patient after cesarean delivery and the prevalence was 42.6% [2].in both case larger needle size was contributed higher incidence rate than other African and worldwide studies

In SPHMMC which is one of the busiest obstetrics center with high rate of cesarean delivery by use of spinal anesthesia so far there is no study done on the prevalence and associated factors that published on peer review journal and due to shortage of resource larger needle size is used which associated with higher rate of PDPH and no effort was done to decrease size of needle used which improved prevalence worldwide.

1.3. Significance of the study

PDPH is associated with significant patient discomfort and impaired mother newborn bonding which was given less attention in our set up

This study was primarily used to study the prevalence of PDPH and associated risk factors for mothers who had C/D at labor ward of SPHMMC. The result was used to know the prevalence and associated risk factors/ to know the magnitude of problem, the effects of different needle size used at labor and delivery ward of this hospital and effects of obstetrics characteristics of patient on PDPH and gave important consideration and also used as baseline for further study

It may also help the concerned body to decrease size of the needle used for SA, so that decrease risk associated with larger needle size after clearly knowledge of associated risk.

2. Literature review

Spinal anesthesia was developed in late 1800s with the work of Wynter, Quincke and Corning. German surgeon, Karl August Bier in 1898, who probably gave the first spinal anesthetic. Bier also gained firsthand experience of PDPH. Bier injected cocaine 10-15 mg into the subarachnoid space of seven patients, including himself and his assistant. He also described the most important sign of PDPH, that all symptoms disappeared immediately when laid horizontal, but came back when got upright. He correctly summarized that the headache was related to excessive loss of CSF. Whitacre and Hart developed the pencil point needle, based on the observation of Greene in 1926[12,13]

By the early 1900s, there were numerous reports in the medical literature of the application of spinal anesthesia using large spinal needles. Headache was reported to be a complication in 50% of subjects. At that time, the headache was said to resolve within 24 h[13]

Postdural puncture headache is an important iatrogenic cause of patient morbidity in modern anesthesia, especially after spinal anesthesia. The incidence of PDPH ranges from 0.16% - 1.3% in experienced hands. Any breach in the Dura mater can result in PDPH. A breach can be spontaneous or iatrogenic. Dural puncture resulting while performing spinal or epidural anaesthesia can produce PDPH. PDPH may result immediately or as long as 48 hours post procedure [14]

Over the past one century, the incidence of PDPH was sharply decreased from ~70% to ~1%, whereas the recently reported occurrence of PDPH is still seeing a big difference in various clinical settings from different regions when diverse techniques were used in patients with different ages. A Nordic survey found the incidence of ADP in Obstetric setting is 1%, and 73% of the ADP patients developed PDPH. The incidence of PDPH in Obstetric in Middle East is 2-4.6%, 22.7% in Western Africa, 16.9% in Southeast Asia, 16.6% in North Europe, and 6% in North America[15].

Dagmarhobenhofer et al compared the frequency and clinical significance of PDPH in two groups of patients considered to be at high risk for the development of PDPH, using standard anesthesia technique and 26-G and 27-G Quincke spinal needle. The study included 56 parturient undergoing Caesarean section and 59 orthopedic patients undergoing arthroscopic knee surgery, who received standard spinal anesthesia using 26-G or 27-G Quincke needles. All patients were less than 40 years of age. The rate of PDPH in this study was high in both parturient and orthopedic patients (14.3% and 13.6%, respectively) [16]

prospective study that analyzed the incidence, onset and severity of postdural puncture headache among pregnant women who had cesarean section under a subarachnoid block in Aminu Kano Teaching Hospital, Kano, Nigeria. Spinal anesthesia was performed on 146 patients using size 25- or 26-gauge Quincke, Whitacre, or Sprotte needles. Patients were followed up to determine the incidence, onset, and severity of post spinal headache and it shows The overall incidence of postdural puncture headache was 15.8% with all cases presenting within the first 24 hours. Most patients rated their headache as mild to moderate on a 10-cm visual analogue scale. [17]

The prospective study done in Tabriz University of Medical Sciences, Tabriz, Iran compared the incidence of post-Dural puncture headache (PDPH) in obstetric patients undergoing spinal anesthesia for caesarean section from April 2012 to April 2013 in one year and also evaluated the relationship between needle size, number of Dural punctures, timing of ambulation and PDPH after cesarean section which enrolled A total of 319 American Society of Anesthesiologists (ASA) I-II full term pregnant women, scheduled for caesarean section under spinal anesthesia from April 2012 to April 2013 were evaluated. Spinal anesthesia was performed with hyperbaric bupivacaine plus fentanyl 10 µg, from L3-4 intervertebral space. Recorded the number of attempts for spinal anesthesia, and the timing of ambulation. Each patient was monitored every day for 4 days following caesarean section. Frequency and severity of PDPH were recorded. Needles used were 25G Quincke spinal needle in 243 patients (76.2%) and 27G Quincke spinal needle in 76 patients (21.9%). Of 319 patients, there were 315 (95.6 %) in the late ambulation group and 14 (4.4%) in the 6 hour bed rest group. In this study only one patient had the classic symptoms of PDPH, whose spinal block were performed with 25G Quincke spinal needle by residents with more than 2 attempts of lumbar puncture (LP). Severe PDPH was not observed in 27G Quincke group. [18]

Hassan et al studied Over a period of six months (from February to August 2011) the PDPH incidence in 2627 female patients had cesarean section under spinal anesthesia in kasr el aini teaching hospital in Egypt ,Cairowas 32.58% and 32.86% using 22 G and 20 G Quinke needles respectively[1]

The study done in North West Ethiopia at felegehiwohospital byTarekegn et al the overall postdural puncture headache in this study was 42.6%. The high percentage of prevalence of PDPH in this study might be related with the most 77.8 % of participants were received spinal anesthesia's using big spinal needle. Specifically, the contribution of big needle was strongly significant association for the over all of PDPH as compared with small needles. This higher PDPH percentage after spinal anesthesia by using big needles were 8.6 times more likely to develop PDPH than small needles (AOR= 8.6; 95% CI: 0.06, 0.46; p = 0.000). This might be linked with larger needles put down wider opening on the dura which allowed more CSF pour out than smaller hole caused by smaller needles. However, this study couldn't see the associations to the outcome variable on type of design of needle. This also found that significant association between number of attempts and the development of PDPH. The spinal anesthesia was successful at first attempts with 79.3% which is less likely to develop PDPH than those patients who have repeated attempts. In addition, patients who had an attempt of more than once are about 4.5 times at risk to develop PDPH than those patients who had a single attempt (AOR=4.54; 95% CI: 0.52, 39.14; p=0.015). [2]

An institution based cross sectional study was conducted from February 25-April 10, 2013 in University of Gondar teaching and referral hospital, Gondar, Ethiopia. A total of 116 patients aged 17-74 years were included in the study. Data was collected by interviewing patients using structured and pre-tested questionnaire and reviewing chart. Both bivariable and multivariable logistic

regressions were used to determine the association between post dural puncture headache and independent variables. Out of 116 patients who have undergone spinal anesthesia 45 (38.8%) patients developed post dural puncture headache. Sex [AOR=0.2; 95% CI: 0.058, 0.67], repeated attempts [AOR=0.22; 95% CI: 0.09, 0.54], and needle sizes [AOR=5.3; 95% CI: 1.66, 16.93] were found to be significantly associated with Post Dural puncture headache [7]

A hospital based cross sectional study conducted from April to June 2014 at Tikur Anbessa specialized hospital and Gandhi memorial hospital, Addis Ababa, Ethiopia. During study period there were 1713 deliveries, with overall cesarean delivery rate of 32.5% and overall proportion of cesarean delivery with spinal anesthesia was 68.2% and post Dural puncture headache after cesarean section with SA was 34.2% and 90.3% of mothers were happy with type of anesthesia that was given [21]

3. OBJECTIVES

3.1 General Objective

- To assess the prevalence and associated risk factors of PDPH after Cesarean Section (CS) delivery under spinal anesthesia at labor ward of SPHMMC

3.2 Specific Objectives

- To assess the prevalence of PDPH after spinal anesthesia for C/S
- To assess effect of different needle size used as risk factors associated with PDPH

4. Methodology

4.1 Study area and period

4.1.1 Study area

- The study was conducted in Saint Paul's Hospital Millennium Medical College, which is located in Addis Ababa, the capital city of Ethiopia. St. Paul's Hospital was built in 1969 by Emperor Haile Selassie in collaboration with the German Evangelical Church, as a source of medical care for underserved populations. It's the second largest hospital in the country with a catchment population of more than 5 million. Currently it has 392 beds, with an annual average of 200,000 patients. Approximately 75% of the patients receive medical services free of charge. It has over 1,300 clinical and non-clinical staff. There is more than 3000 ANC and more than 8000 delivery annually and CD delivery rate is 32%.

4.1.2 Study Period

- The study was conducted from December 31, 2019 to April 20, 2019.

4.2 Study Design

- Prospective cross sectional study design

4.3 Source Population

- All admitted at St. Paul's Hospital; LABOR wards within the study period.

4.4 Study Population

- All patients at St. Paul's Hospital; labor wards that underwent C/S and full filled eligibility criteria.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

- All emergency and elective C/D mothers who had spinal anesthesia and accepted to be enrolled into the study after informed consent.

4.5.2. Exclusion criteria

- all mothers who had given G/A from decision
- critically sick patient who required ICU admission after cesarean delivery
- Uncooperative patients and patient with impaired cognitive function
- Mothers who had pre-existing chronic or recurrent headache
- Hypertensive and preeclampsia mothers

4.6 Sample Size determination

- Determination of the sample size was based according to a previous study done which was hospital based cross sectional study conducted from April to June 2014 at Tikur Anbessa specialized hospital and Gandhi memorial hospital, Addis Ababa, Ethiopia that put post Dural puncture headache after cesarean section with SA was 34.2%. Using a margin of error of 5% ($\alpha=0.05$) and confidence interval of 95% (standard value of 1.96).

- The actual sample size will be calculated using a single population proportion formula of:

$$n = \frac{(Z_{\alpha/2})^2 P (1-P)}{d^2} = \frac{(1.96)^2 (0.34) (1-0.34)}{(0.05)^2} \quad n = 344$$

- Where:

n=the required sample size

p=the proportion of PDPH in study

$Z_{\alpha/2}$ =the critical value at 95% confidence level of certainty (1.96)

d=the margin of error between the sample and the population 5%.

- To compensate for non-response rate due to unseen conditions 10% of the sample was added. Finally a total of 378 women was to be sampled for the study.
- As the population to be studied in a year is less than 10,000 (In our case 2560 which is the number of C/S patients that undergo SA at the labor ward theatre per year), the following correction formula Which uses the required sample size got from the above formula was applied,
- $nf = n / (1+n/N)$

Description:

nf : is the desired sample size when the population studied is <10,000.

n: the sample size required if the population would have been >10,000(378 in our case got from the above formula).

N : the estimated population size, in our case which is the estimated Number of C/S that undergo SA in SPHMMC per year which is 2560.

Therefore

$$\begin{aligned} nf &= n / (1+n/N) \\ &= 378 / (1+378/2560) \\ &= 328 \end{aligned}$$

4.7 Sampling Technique

Every 3rd cases of CD mother that full fill the eligibility criteria was included in the study until the calculated sample size was achieved.

4.8 Study variables

4.8.1 Dependent variables

-post Dural puncture headache

4.8.2 Independent variable

-age

-parity

-stage of labor

-BMI

-size of needle used for SA

-Number of attempt

-Previous PDPH

-previous SA

-Successful block

4.9 data collection instrument and method

- Data was collected through chart abstraction and patient questioning and via phone communication on 7th day.
- Information pertaining to socio demographic and obstetrics characteristics, size of needle used for SA ,Number of attempt, Previous PDPH, previous SA ,successful block and associated symptoms was collected using a structured questionnaire.
- Such data was collected by following the patient from time of C/S to discharge and by phone call on 7th day of delivery.
- The data collectors were Intern Doctors and mid wife, OR nurse at the labor wards and maternity.
- One day training was given to the data collectors regarding the contents of the questionnaire and the objective of the study.
- The principal investigator was monitoring the data collectors on a daily basis and problems were fixed on the spot.

4.10. Data quality control

- Data was entered after thorough scrutiny and validation of any information that may have been incomplete or conflicting.
- In order to avoid double participant recruitment, the participants' medical registry number was registered on a register upon recruitment for serialization.
- This register was counter-checked on a daily basis for any double entries and if it was so discovered, one of the data collection sheets was withdrawn and discarded and the serialization rectified before recruitment was continued.

4.11. Operation definitions

SPINAL ANESTHESIA: is a form of regional anesthesia involving the injection of local anesthetic into the subarachnoid space, generally through a fine needle

EPIDURAL ANESTHESIA: is a form of regional anesthesia by which local anesthetic injected into epidural space

DURA MATER: is a thick outermost of the three layers of the meninges that surround the brain and spinal cord

CEREBROSPINAL FLUID: is a clear, colorless body fluid found in the brain and spinal cord, which is produced in choroid plexuses of the ventricles of the brain and absorbed in the arachnoid granulations

SPINAL NEEDLE: is a needle provided with a stylet for entering the spinal canal with a bore of at least 1mm and 40mm or more in length

QUINCKE NEEDLE: is a standard needle with a medium cutting bevel and an orifice at the needle tip. Its advantages are that CSF is identified as soon as it enters the subarachnoid space, paraesthesias and neurotrauma are less likely and it is cheaper compared to a traumatic needles. Its disadvantages include a high incidence of PDPH compared to a traumatic needle.

WHITACRE Needles: a pencil point or a traumatic needle which has a small orifice and a diamond shaped tip.

CESAREAN DELIVERY: a surgical procedure involving incision of the abdomen and uterus for delivery of the baby

PDPH; Headache that worsens within 15 minutes after sitting or standing and improves within 15 minutes after lying down, with at least one of The following; Neck stiffness, Tinnitus, Hypacusia, Photophobia, Nausea, Dural puncture has been performed and Headache develops within five days after dural puncture

Headache resolves either spontaneously within one week Within 48 hours after effective treatment of the spinal fluid leak; usually by epidural blood patch.

4.12. Ethical consideration

- Ethical clearance was obtained from St Paul's hospital millennium medical college's Department of gynecology and obstetrics Research Review committee. This study was purely observational and has not undertaken extra invasive procedures, apart from the primary scheduled procedure.
- The nature and purpose of the research was explained to the research participants.
- Verbal Informed consent was obtained for each participant recruited into the study.
- It was made clear that there would be no cost associated with participating in the study.
- At any time during the course of the research, the respondent was told to be free to withdraw consent /participation without any penalty.
- The information obtained from each participant was treated confidentially

4.13 Data Analysis Procedures

- Data was analyzed using SPSS for windows version 20.0.
- Dependent variable was PDPH. Independent variables were age, parity, stage of labor, BMI, needle size, needle design, position, and number of attempts and previous history of PDPH, previous SA.
- The Simple frequencies, proportions and odds ratios were determined when possible. P-value less than 0.05 was considered statistically significant

4.14 . Dissemination of findings.

- The results of the study were presented using tables and figures. will be presented to Department of Gynecology and Obstetrics,SPHMMC.
- Findings will also be presented on different conferences and professional society meetings.
- Attempts will be made to publish in peer reviewed and reputable national and international journals.

5. RESULTS OF STUDY

5.1 Socio-demographic & physical characteristics of the study participants

Three hundred twenty eight Patients were included in this study with fulfilling the criteria. The mean age of patients participated in study was 27.25 years old with a standard deviation of 5.23 years old and 17 years old is the minimum age of patients participated in this study, where as 45 years old is the maximum age . 86.6% of study participants were in the age range of 20 to 34 yrs

Table 1: Socio-demographic and physical characteristics of the study participants who underwent spinal anesthesia cesarean section at SPHMMC labor and delivery ward OR December 2018 to April 2019

Variables	Frequency; n (%)
Age	
<20yrs	7(2.1)
20-34 yrs	284(86.6)
35-49 yrs	37(11.3)
BMI	
<18.5(underweight)	35(10.7)
18.5-24.9	219(66.8%)
➤ Or =25	74(22.6%)

5.2 Obstetrics characteristics of study participant

Two hundred eighteen (66.5%) of the participant were term pregnancy while 27(8.2%) were preterm and 14(4.3) were post term pregnancy at time of cesarean delivery

One hundred seventy four (52.4%) of the participants were primigaravidas and 153(46.6%) were multiparous but only 3 mothers were grandmultiparas.256 (78%) of the mothers had cesarean delivery for the first time but 55(16.8%) had one prior cesarean delivery and 17(5.2%) had more than one cesarean delivery

Two hundred sixty two (79.9%) of delivery were emergency but 66(20.1%) were elective CD. labor started in 213(64.9%) of the participants and 151(46%) were in latent first stage of labor 51(15.5%) were in active first stage of labor 15(4.6%) were in second stage of labor.

Table 2; obstetrics charactestics of study participants who underwent spinal anesthesia cesarean section at SPHMMC labor and delivery ward OR from December 2018 to APRIL 2019

Variables	Frequency; n(%)
Gestational age	
<37 wks	27(8.2)
37_42 wks	218(66.5)
>42	14(4.3)
Unknown	69(21)
Parity	
0	172(52.4)
1_4	153(46.6)
>4	3(0.9)
Number of prior cesarean delivery	
0	256(78)
1	55(16.8)
2 and above	17(5.2)
Types of C/D	
Emergency	262(79.9)
Elective	66(20.1)
Labor started at delivery	
Yes	213(64.9)
No	115(35.1)
Stage of labor at delivery	
Latent	147(44.8)
Active first stage	51(15.5)
Second stage	15(4.6)

5.3 Spinal anesthesia related history of patients

Sixty seven patients (20.4%) had a previous history of spinal anesthesia (SA) exposure and 24(7.3%) of them complained a PDPH like headache after the procedure but 12(3.2) patient couldn’t recall that they had headache. All patients (100%) had been given SA on a sitting position using bupivacaine by anesthetist with experience of 2 and above years. 23G was the most frequently used spinal needle to administer SA (39.3% of patients) whereas 21G was used only in five patient. There were 4 cases (1.2%) of failed block that were converted to general anesthesia (GA) and none of these patients have developed PDPH.

Table 3: spinal anesthesia related characteristics of the study participant

Variable	Frequency; n (%)
Previous SA	
YES	67(20.4)
No	261(79.6)
Headache in previous SA	
Yes	24(7.3)
No	31(9.5)
Not remember	12(3.2)
Number of attempt	
Once	161(49.1)
Twice	158(48.2)
>2	9(2.7)
Size of spinal needle used for current SA	
20	42(10.3)
21	5(1.5)
22	51(15.5)
23	129(39.3)
24	38(11.6)
25	63(19.2)
Successful block	
Yes	324(98.8)
No	4(1.2)

5.4 The prevalence

In this study PDPH was observed on 106 patients (32.3%) (Figure1).

The proportion of PDPH varies greatly when different needle sizes were used. For instance the proportion of PDPH was high (59.5%) when 20G spinal needles were used, whereas the proportion was low (14%) when the smallest needles were used (25G)

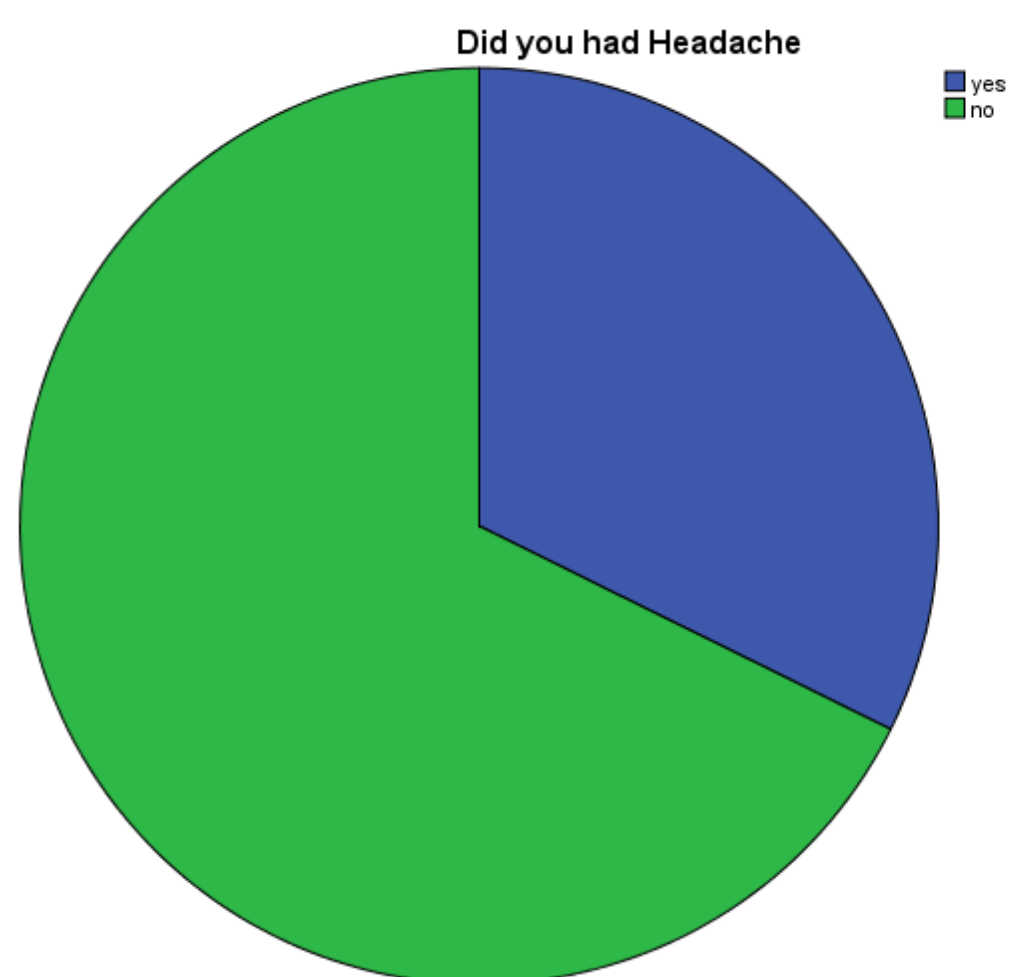
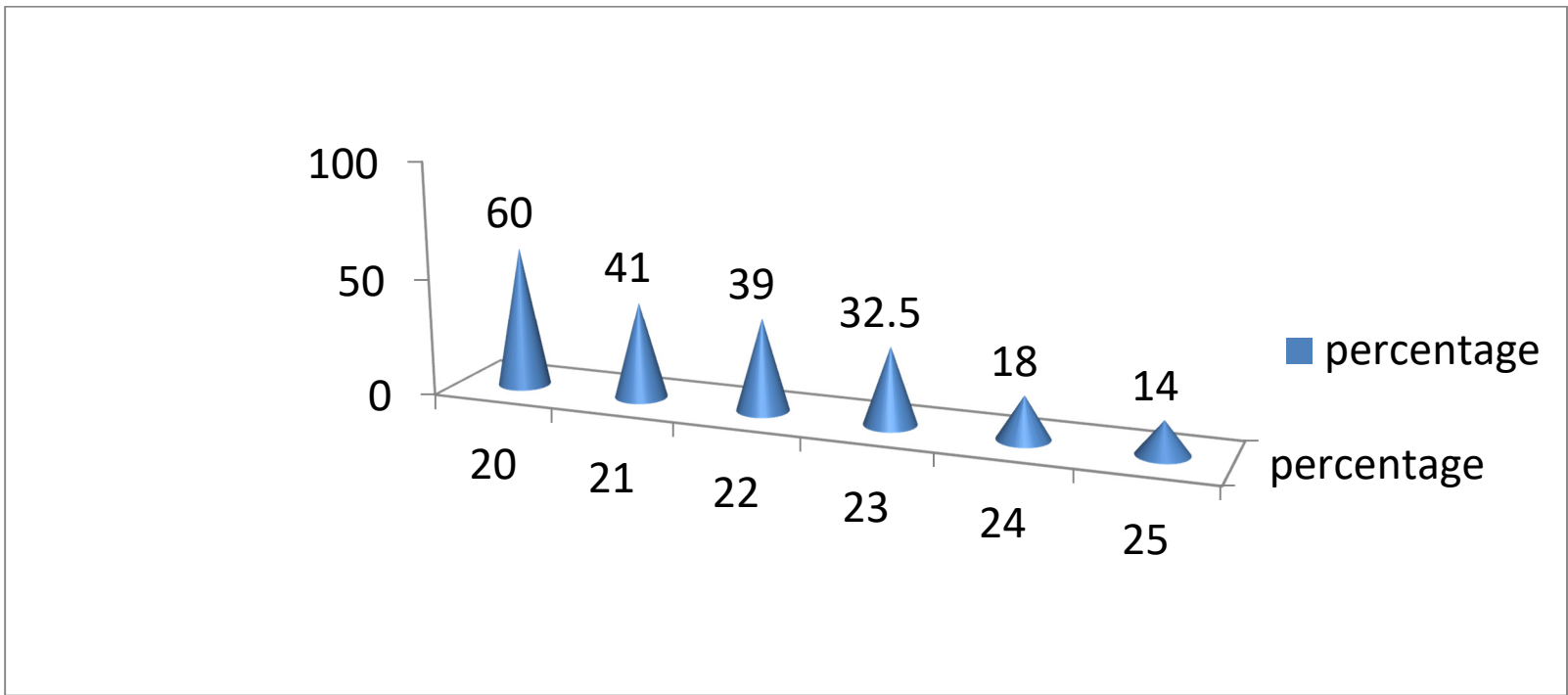
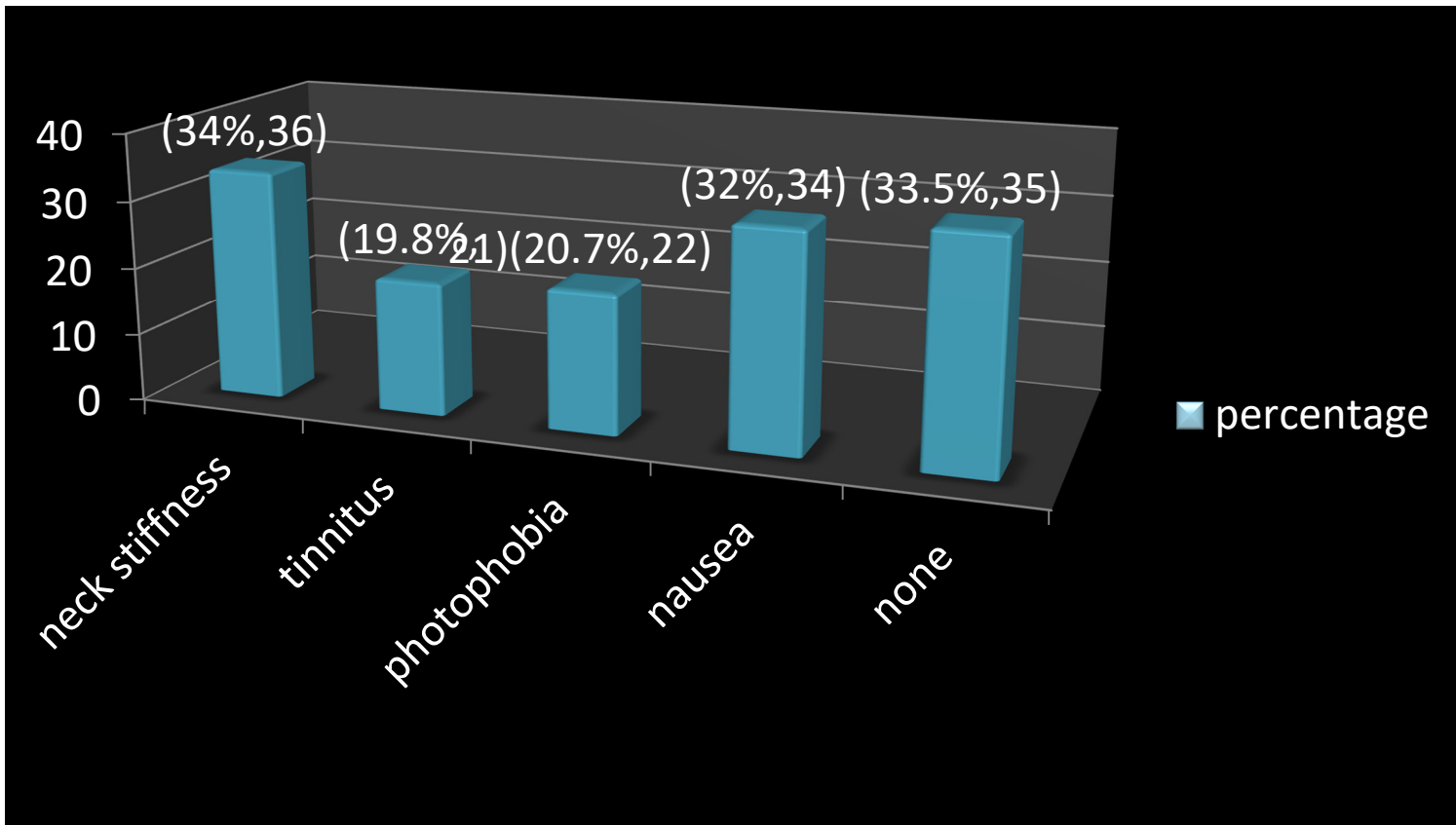


Figure 1 Proportion of patients who developed PDPH among participants underwent cesarean section using spinal anesthesia at SPHMMC labor ward OR during December 2018 to April 2019

Figure 2 proportion of PDPH to each needle size that were used at SPHMMC labor ward cesarean delivery SA during December 2018 t0 April 2019



Figures 3 proportion of symptoms associated with PDPH



5.5 Factors associated with PDPH

The result of bivariate logistic regression indicated that needle size and number of attempts were significantly associated with PDPH of patients. However, by multivariate logistic regression analysis BMI, needle size and number of attempts were found to be statistically significant at $p\text{-value} < 0.05$ (Table 5).

Size of the needle used to administer SA is significantly associated with the development of PDPH. Patients received SA using bigger spinal needles were more than 2.4 times more likely to develop PDPH than patients who received SA using smaller needles (OR=2.4, 95% CI: 1.47, 3.96).

Another significant association was found between number of attempts and PDPH. Patients who received SA on the first attempt were 80% less likely to develop PDPH than their counter part patients who had a repeated attempt (OR=0.27, 95% CI: 0.16, 0.45)

BMI is found to be associated with PDPH significantly (OR 2.4, 95% CI 1.4, 4.8), BMI lower than 24.9 was 2.4 times associated with headache compared to obese and overweight mothers

Table 4: Factors associated with PDPH of patients who had cesarean section under SA in SPHMMC, December 2018-April 2019

Variable		PDPH		% of PDPH	COR (95% CI)		P-value
		Yes	No				
BMI							
	< or =24.9	95	179	65.1	2.4(1.4_4.2)		0.03
	➤ 25	5	74	13.5	0.2(0.12_0.52)		6.5
No of attempt	Single attempt	30	131	19	0.27(0.17_0.45)		0.35
	Multiple attempt	76	91	45	3.6(2.21_6.01)		0.0001
Needle size	Larger needle size(20G,21G,22G)	45	52	65	2.4(1.47_3.96)		0.0004
	Smaller needle size(,23G,24G,25G)	58	136		0.76(0.48_1.22)		0.2600

6. Discussion

Different researches showed different values of the prevalence of PDPH. In this study the overall prevalence of PDPH was 32.3%. This result is found to be comparable to figures reported by Hassen et al, Bilal et al, but much lower than studies done at Gonder hospital medical college and Felege Hiwot hospital studies [1,2,7,21] which put the prevalence at 46.2% and 38.6% respectively. The possible cause for this could be because most of previous studies were used larger needle size than this study which used 70.1% was smaller needle size (22,23,24 and 25G). But generally when compared internationally this study shows higher figure of prevalence of PDPH as reported by Abdullayev et al, Rasooli et al and Sheikh JM et al put the prevalence of PDPH at 9%, 1.9% and 4.8% which used smaller needle size and pin point needle that are atraumatic compared with our studies which used larger bore needles. [26,27,28]

Size of the needle used was significantly associated with the development of PDPH in this study. Patients who received SA using larger needle size (20,21,22G) were about 2.5 times more likely to develop PDPH than those patients who received SA using smaller spinal needle [AOR=3.1; 95%CI:1.43, 6.58]. The reason behind this is bigger needles leave bigger opening on the Dura, so more CSF leak than smaller opening caused by smaller needles. Many studies support our finding [1, 2, 5, and 21].

Another significant association was found between the number of attempts and the development of PDPH. Patients for whom SA was successful at the first attempt were 80% less likely to develop PDPH than those patients for whom attempt was repeated [AOR=0.27; 95%CI: 0.16, 0.45]. This could be due to as the number of attempt increase the probability of piercing the Dura matter repeatedly will increase, which increases the volume of CSF leak, thereby increasing the probability of development of CSF hypotension & PDPH. This finding is in line with findings of different studies [2, 5, 22,].

Lower BMI was found to be 2.4 times more likely to develop PDPH with (AOR=2.4, 95% CI 1.4, 4.8) this was due to the suggestion that morbidly obese pregnant women exhibited a lower incidence of PDPH due to increased intra-abdominal pressure that leads to reduced cerebrospinal fluid (CSF) leakage this is in line with most studies but BMI was not a risk in a number of studies (2,4,5,7)

On the other hand, age of the patients and previous history of PDPH were not associated with the development of PDPH even though these variables (younger age, and previous history of PDPH) have reported as risk factors for PDPH in different studies []. This could be most likely due to the small sample size to compare different categories of age, and patients with and without previous history of PDPH in our study.

7. Conclusion

The prevalence of post Dural puncture headache at SPHMMC was 32.3%

The big spinal needle and repeated number of attempt were indepent risk factor for PDPH at SPHMMC labor and delivery ward.

The needle size needs to be decreases to smaller size to further decrease the incidence of post Dural puncture headache

8. Strength of the studies

- The patients were followed for 7 days which is the most possible time post partum where PDPH can develop.
- It was done in one of the biggest maternity center in the country with the largest delivery per month.

9. STUDY LIMITATIONS

Despite the study having been successfully carried out, it was not without some limitations/problems encountered during the study period

Important variable like the effect of needle tip on the prevalence of PDPH, and direction of the needle bevel during insertion were not studied

The amount of CSF fluid that leaks during the procedures were not included in study

Annex I QUESTIONNAIRE

Questionnaire on assessment of prevalence and associated of post spinal

Headache after spinal anesthesia for C/D at SPHMMC labor ward

Card no Code no Ht, wt. BMI

I socio demographic character of the patient

- 1. How old are you? A,<20yrs B,20_34yrs C,35_49yr
- 2. What is your educational status? A. No formal education B. Primary school C. High school D. College E. Graduated/professional
- 3. What is your occupation?
A. House wife B. Student C. Employed D. Farmer E. Merchant F. others
- 4. What is your marital status?

A. Single B. Married C. Divorce D. Widow

II. OBSTETRIC CHARACTERISTICS

- 1. What is the Gestational age of this pregnancy?-----
A. <37 B.37-42 C.>42 D. Unknown
- 2. What is the number of your previous delivery?----- A.PRIMI B. PI-PIV C. P>IV
- 3. What is the no of previous c/s delivery-? A. 0 B. 1 C. 2 D. 3 or more
- 4. What is type of C/S-? A. Emergency B. Electives
- 5. Was labor started? A. Yes B. No
- 6. If yes on no 5 what was stages of labor? A. Latent B. Active first stage C. Second stage

III. SPINAL ANAESTHESIA RELATED CHARACTERISTICS

- 1. Was SA given previously? A. Yes B. No
- 2. If yes on no1 did you had developed, PDPH? A. Yes B. No
- 3. What was position of patient when SA was given A. Sitting B. Lateral position
- 4. What was number of attempt? A. Once B. Twice C. >2
- 5. Size of spinal needle? A. 18G B. 20G C. 21G D. 22G E. 23 F-24 G. 25
- 6. Successful block? A. Yes B. No
- 7. Type of medication that was used?
- 8. Level of anesthetist experience in yrs A, resident B,1yrs C,2yrs D,3yrs and above

IV-HEADACHE AND ASSOCIATED SYMPTOMS

- 1. Do you have headache? A. Yes B. No
- 2. If yes, when was it started? A. Within first 24hr B. Within3rd day C. After 3rd day
- 3. If yes on no 1 duration of headache? A. Less than 1hr B. Less than 6hr C. Less than 24hr
D. Greater than 24hr
- 4. Is it improved with lying on the flat bed? A. Yes B. No
- 5. If yes on no 4 within how many minutes of lying flat? A. Within 15minute B. Greater than 15min
- 6. Do you have any of the following associated symptoms? Circle if yes A. Neck stiffness B. Tinnitus C. Photophobia D. Nausea E. None

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