



COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF ANESTHESIA

INCIDENCE, SEVERITY AND ASSOCIATED FACTORS OF BACK PAIN AFTER SPINAL ANESTHESIA IN SURGICAL PATIENTS AT ADDIS ABABA GOVERNMENTAL HOSPITALS, ETHIOPIA, 2021 GC.

BY: BELETE ALEMU

A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF ANESTHESIA, SCHOOL OF MEDICINE, COLLEGE OF HEALTH SCIENCES, AND ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS OF SCIENCE IN ANESTHESIA.

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DEPARTMENT OF ANESTHESIA

Name of Investigator	Belete Alemu
Name of Advisors	Adugna Aregawi (MSc. Assistant professor) Fiseha Fentie (MSC)
Full title of the research	Incidence, severity and associated factors of back pain after spinal anesthesia in surgical patients at Addis Ababa governmental hospitals, prospective observational study.
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Study Area	Black lion specialized hospital, St. Paulos hospital, Zewditu memorial hospital, and Minilik hospital.
Address of investigator	Tel: +251 912638791 Email: beletealemu728@gmail.com

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Acronyms/abbreviation

ASA	American society of anesthesiologist
BMI	Body mass index
DVT	Deep vein thrombosis
G	gauge
IASP	International association for the study of pain
NSAID	Non-steroidal anti-inflammatory drugs
NPRS	Numeric pain rating scale
PSBP	Post spinal back pain
RCT	Randomized control trial
SA	Spinal anesthesia
SPSS	Statistical package for social sciences
TASH	Tikur Anbessa specialized hospital
ZMH	Zewditu memorial hospital

Abstract

Background: Spinal anesthesia is a kind of central neuraxial anesthesia and a better choice for operations below the umbilicus. However most patients refuse it for future surgeries because of post-spinal back pain.

Objective: To assess the Incidence, severity and associated factors of back pain after spinal anesthesia in surgical patients at Addis Ababa governmental hospitals.

Methods: Multi-center prospective observational study was conducted in 404 patients operated under spinal anesthesia at selected Addis Ababa governmental hospitals from February 1-April 30,2021. A systematic random sampling technique was used to select the patients. A structured questionnaire was used to collect the data. Back pain after Spinal anesthesia was assessed using a numeric pain rating scale. The data was analyzed with Statistical software version 24. The data was described by texts, tables, and graphs. Binary logistic regression was used to see the association between each independent variable with dependent variable. A P-value < 0.05 was considered statistically significant.

Results: The overall incidence of back pain was 42.32%. The Mean severity of back pain in each three post-operative days was mild to moderate. Body mass index, history of backache, spinal needle size, number of attempts, and number bone contacts were associated with the incidence of acute post-spinal backache.

Conclusion: The incidence of back pain was high at Addis Ababa governmental hospitals. To minimize this, the anesthesia provider should use fine-gauge spinal needle, minimize multiple attempts and multiple bone contacts.

Key words: Spinal Anesthesia, back pain

CHAPTER ONE: INTRODUCTION

1.1 Back ground

According to the revised International Association for the Study of Pain definition, pain is a discomfort in sensory and feeling of one's circumstances related with, to be like that associated with, actual or potential tissue injury.(1) Pain management is a vital component of patient care, particularly in anesthesia practice as poorly treated pain leads to a lot of unwanted burden to the patient. Low back pain is not a disease but it is a collection of symptoms that is a major health problem, causing economic burden globally and affects all age groups irrespective of their culture. Acute low back pain persists less than three months without treatment(2).

spinal anesthesia is one form of neuraxial regional anesthesia achieved by injecting small doses of local anesthetics into subarachnoid space. It is indicated for different types of elective and emergency operations below the umbilicus. Currently, it is rarely used for surgery above this anatomical landmarks due to challenges in maintaining spontaneous breathing and difficulties in controlling pain which originates from pulling of the peritoneum and pushing of the diaphragm during operation(3). It was first used in the 20th century till the incidence of permanent neurological injury happened. But large epidemiological study conducted in the 1950s ascertained the complication is not very often when it is done by well-trained expertise(4). It has still unwanted complications with most of them can be prevented if recognized and treated early.

One of the most feared side effects of spinal anesthesia is back pain after the procedure(5). During the spinal procedure, the spinal needle traumatizes soft tissue structures when it passes through the skin to subarachnoid space. This may cause post spinal back pain due to confined inflammatory reaction in the presence or absence of reflex muscle spasm(6).

1.2 Statement of the problem

Compared to General anesthesia, spinal anesthesia reduces morbidity, mortality, and costs, better postoperative pain relief, avoid intubation, significantly reduces intraoperative blood loss and transfusion requirement, reduce risks of low blood glucose level, decrease DVT and pulmonary embolism(7–13).

Although spinal anesthesia is better than GA, it is associated with many undesirable effects. The complications range from minor self-limiting to disability and loss of life. Post spinal back pain is one of the side effects of spinal anesthesia which may persist few weeks after the procedure(14).It is a major clinical problem and remains a common complaint in clinical practice. It is associated with reduced quality of life, the suffering of patients, reduce productivity, and adds unwanted costs for the patient and the health system.

It is the most common causes of patient dissatisfaction and mentality that results in the main reason to refuse spinal anesthesia for another operation(15,16). In addition, back pain after spinal anesthesia increases the frequency of post-operative headache (17).

There is also a wide variation in the result of the previous studies on the magnitude of back pain after spinal anesthesia (5.8 -39.4 %)(18–22).

So far different treatment option was tried to treat post spinal back pain after rule out serious neurological complication associated with epidural hematoma or abscess. The management modality used now a days are counseling the patient about reversibility of pain, hot and cold massage, NSAIDs, paracetamol and follow up to rule out persistence back pain which needs extensive treatment(23)

1.3 Justification of the study

Safe and effective practice of spinal anesthesia requires adequate evidence about potential complications and factors associated with it. Most of the complications are preventable or can be treated if the incidence, severity, and associated factors are clearly understood.

In Ethiopia, limited data are available on the severity and associated factors of acute post spinal back pain. The study done in this setup has not evaluated the severity of back pain using standard pain assessment tools and has not included all types of patients performed under spinal anesthesia. And also, currently different size spinal needles are widely used which has a potential effect on the occurrence of back pain after the procedure. In addition, anesthetists and other health professionals give little attention to post spinal back pain even if it is devastating to the patient.

The result of this study will help to reduce patient dissatisfaction and suffering by providing adequate information about potential sources of back pain and its severity after a spinal procedure. As a result, Anesthesia providers will use the evidence to prevent as well as to plan a treatment strategy. The information also will aid administrators to plan cost effective preventive methods.

Therefore, the study is aimed to investigate incidence, severity, and associated factors of back pain following SA which will be used for minimization, prevention, and treatment protocol.

CHAPTER TWO. LITERATURE REVIEW

2.1 Characteristics of acute post spinal back pain

Low backache is a discomfort, muscle tension, or stiffness in the spinal area confined below the costal margin and above the inferior gluteal folds, with or without radiation to the lower extremity(24).

PSBP occurs within two to six hours post procedures after the duration of local anesthetic terminates. In the majority of the patients, the pain disappears in few days but in few cases, the pain may persists even become permanent if it is associated with spinal nerve injury during spinal procedure (20). It is not long-lasting and resolves without treatment, but if the pain is severe and persists the patient must be evaluated for more serious complication such as bleeding and abscesses in spinal epidural (19). Continuous back pain after the spinal procedure is a rare event and if it occurs it is mainly due to the previous history of back pain and previous exposure to SA(25).

2.2 Magnitude of post spinal back pain

Previous works have been done to assess the prevalence (incidence) of post spinal-back pain in different countries. The results of these studies show variation in the magnitude of post spinal back pain.

Joudi et al (2014) compared GA and SA on 148 patients with elective lower extremity surgeries on the prevalence of post-spinal back pain (39.2%) and they concluded spinal anesthesia may be possibly considered as the only indicative factor to cause back pain (26).

In another prospective observational study done in Heidelberg, Germany (2004) on 112 pediatric patients after lumbar puncture 40% of patients complained post spinal back pain(17).

Prospective observational study done in Izmir, Turkey(2015) on 649 patients 29.3% and 5.2% developed post-spinal back pain in the first post-operative day and 4th week respectively (22).

Another study conducted in China by Gao W. et al (2018) on 160 patient's taking spinal anesthesia indicates the prevalence of back pain was 39% at the first, 37% at the second, and 31% at the third post-operative days(27).

A recent prospective 1-Year Follow-Up study done by Mohammad Forozeshfard et al (2020) on 410 non-obstetric patients shows 5.9% of them suffered from low back pain within the first week(19).

A single hospital-based cross-sectional study conducted in Asela, Ethiopia in 2015 also found that 38.0%, 29.9%, and 16.0% at the 1st, 2nd, and 3rd postoperative days respectively(20). In the same year, multi-center cross-sectional study conducted in Addis Ababa governmental hospitals, Ethiopia in 317 non-obstetric patients show the magnitude post spinal back pain was 39.4%, and 12.5% at 1st day, and 4th week respectively(18).

Another study done in Gonder university specialized hospital (2020) on 215 patients who underwent operation under spinal anesthesia show 18.1%, 11.3%, and 17.9% suffered from post spinal back pain in the 1st, 2nd, and 3rd post-operative days respectively(28).

2.3 Associated factors of post spinal back pain

The results of different studies show many factors have a potential association with the incidence of backache after spinal procedures.

3.2.1 Spinal needle type

A study done on 150 patients scheduled for cesarean section in comparing 22 vs 25 G spinal needle shows back pain was higher in 22 G Spinal needle group (29).

In Diyarbakir state hospital, Turkey comparing 26-gauge Atraucan and 26-gauge Quincke spinal needles in 682 elective cesarean operations Mehmet Salim Akdemir et al (2017) concluded there is no statistical significant difference in PSBP regarding the use of these type of spinal needle(30).

Another RCT done in Turkish in comparing 26 gauge atraumatic and 26-gauge Quincke needles on 256 women undergoing cesarean delivery under spinal anesthesia, found PSBP is higher in Atraucan than Quincke needle (31).

2.3.2 Spinal needle size

A study done in Korea in 2010 in Comparison the incidence of post-Dural puncture headache and low back pain between 23 and 25-gauge Quincke spinal needles in patients over 60 years and found, both needle-type has no significant effect on the occurrence PSBP(32)

On contrary, research done by Marjan Joudi et al in (2014) shows a difference in the incidence of low back pain with the use of five different gauge spinal needles (26)

Another study done in London in 2008 comparing Incidence of post- Dural puncture headache and back pain after diagnostic or therapeutic lumbar puncture for 162 oncology pediatric patients aged between 2 -17 years using a 22G cutting spinal needle and 25G pencil-point spinal needle, they found the incidence of Back pain was 11% in 22G cutting spinal needle and none of the patients complain back pain in 25 G pencil point spinal needle (33).

Another study done (2002) on the effect of spinal introducer needle on postoperative back pain, they concluded the use of small Gauge spinal needle has no effect on the intensity and percentage of the pain (34)

2.3.3 Miscellaneous

In addition to Previously mentioned factors, many studies show post spinal back pain is associated with many other factors. These include bed rest after Dural puncture, previous history of PSBP, the number of attempts of a lumbar puncture during spinal anesthesia procedure, previous history of back pain, previous history of SA, body mass index, duration of the surgery, number of bony contacts, angle of lumbar puncture and the drug used for skin infiltration.

Another prospective study done in 2012 in ASA I and II orthopedic patients operated under SA shows prior exposure to spinal anesthesia may be the possible cause for post-spinal back pain(35).

Honorio T et al in 2015 identified risk factors of back pain after neuraxial anesthesia. Lithotomy position, multiple attempts, surgery longer than 2.5 hours, body mass index ≥ 32 kg/m², and a history of back pain are highly associated with PSBP(21).

Cross-sectional study conducted in Asela, Ethiopia shows a history of previous back pain, history of previous spinal anesthesia, longer duration of surgery, position during surgery, number of bony contacts, lumbar puncture attempts, the experience of the anesthetist, infiltration at the site of injection with local anesthesia have significant relationship with the occurrence of PSBP(20).

2.4 Severity of post spinal back pain

Pain management protocol roots its reference on the severity of the pain. To manage back pain after a spinal procedure with appropriate analgesics and adjuvants, it is very important to investigate its severity. But only a few studies were done on the severity of post-spinal back pain.

A Study conducted in 220 patients of general and orthopedic surgery under spinal anesthesia between medial and Paramedian approach shows the severity of PSBP was mild and it was 2.27 vs 1.45 respectively(36).

Another study conducted in India in 2018 comparing back pain in patients delivered under SA and spontaneous vaginal delivery mean score of pain shows 6.11 vs 3.95 which shows significantly more severe pain in spinal anesthesia groups(37).

A recent Institutional Based Cross-Sectional Study conducted in University of Gondar Comprehensive and Specialized Hospital, North West Ethiopia indicates the mean severity of pain was 4.2,4.3, and 4 in the first, second, and third postoperative days respectively(28).

2.5 Conceptual frame work

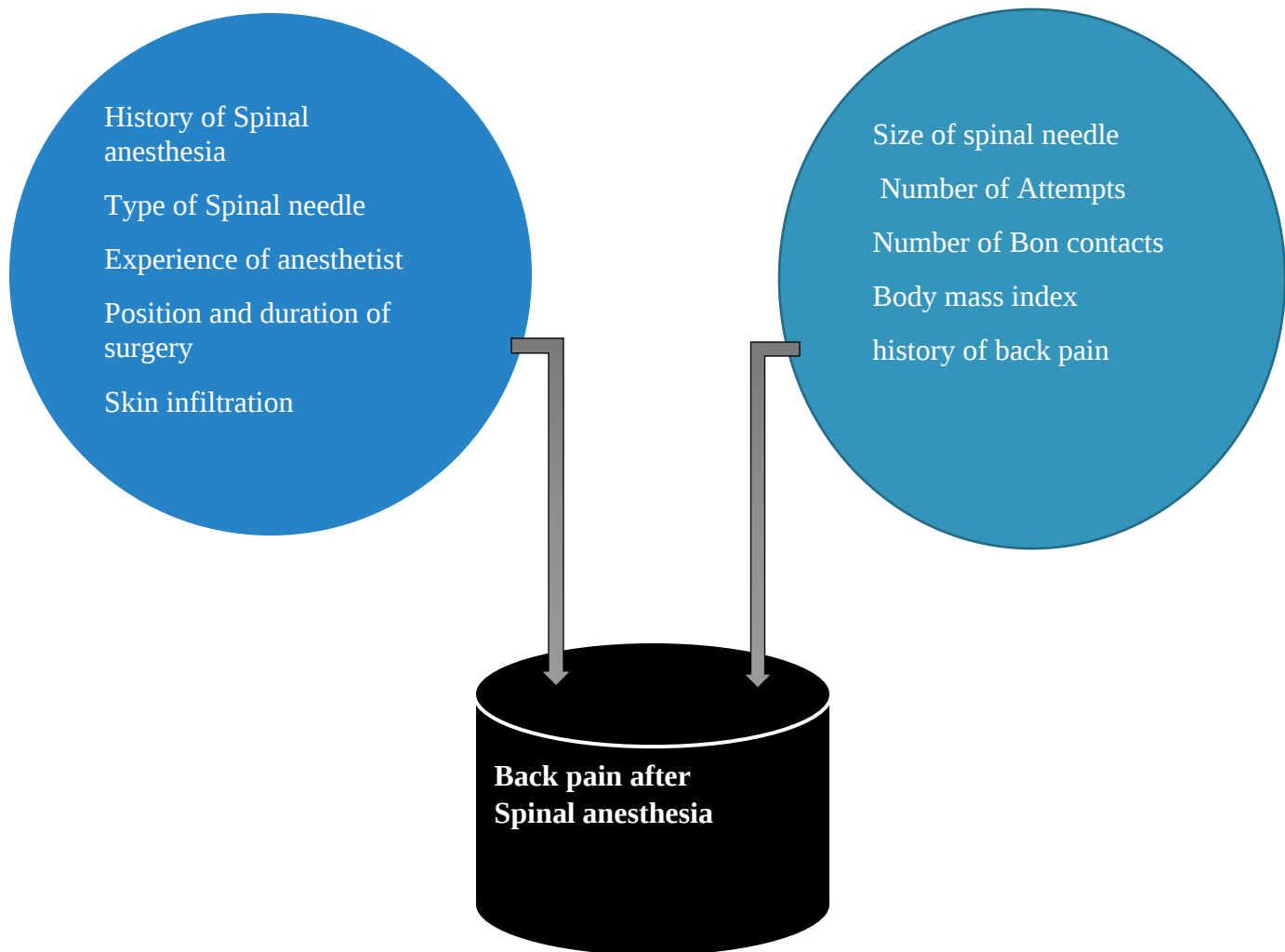


Figure 1. Possible associated factors of post-operative back pain after spinal anesthesia.

CHAPTER THREE: OBJECTIVES

3.1 General objectives

- To assess the incidence, severity, and associated factors of back pain after spinal anesthesia at governmental hospitals in Addis Ababa, Ethiopia, 2021.

3.2 Specific objectives

- To assess the incidence of back pain after spinal anesthesia at governmental hospital in Addis Ababa.
- To evaluate the mean severity of back pain after spinal anesthesia at governmental hospital in Addis Ababa.
- To identify factors associated with back pain after spinal anesthesia at governmental hospital in Addis Ababa.

CHAPTER FOUR: METHOD AND MATERIALS

4.1. Study area and period

The current study was carried out in operation rooms and wards of selected governmental hospitals in Addis Ababa from February 1-April 30,2021.

We Included TASH, Zewditu memorial hospital, Minilik hospital, and Paulos hospital.

TASH is the biggest specialized referral hospital in Ethiopia with 15 operation rooms. The hospital gives services for wider range of operations. Surgeries performed in this hospital include; gynecologic, obstetric, maxillofacial and EENT, orthopedics, urology, cardiothoracic, neurology, and emergency operations. Minilik hospital contains 10 operation theatres and gives operation services for cardiothoracic, orthopedics, neurology, pediatrics, general, emergency, ophthalmologic, urology, and gynecologic /obstetric cases. Zewditu hospital consists of 7 operation tables and general, emergency, neurology, gynecology, obstetric, and plastic surgery are performed in this hospital. Paulos hospital has also 12 operation rooms and serves for gynecologic, obstetric, maxillofacial and EENT, ophthalmology, pediatric urology, general, emergency, and kidney transplant surgeries.

4.2 Study design

A multicenter prospective observational study was conducted

4.3 Population.

4.3.1. Source population

All patients who were operated under spinal anesthesia at selected public hospitals in Addis Ababa during data collection.

4.3.2 Study population

Selected patients who were operated under Spinal anesthesia in selected governmental hospitals At Addis Ababa from February 1-May 30,2021.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

Study participants who were included in this study were selected patients that underwent operation under SA from February 1-April 30,2021.

4.4.2 Exclusion criteria

A patient who has recent back pain

Once the patient is selected and comes for the next operation under SA within the study period.

4.5 Variables

4.5.1 Dependent variable

Back pain after spinal anesthesia

4.5.2 Independent variables

Age, Sex, Body mass index, ASA status,

Educational status, types of occupation,

Urgency of surgery, type of surgery, duration of surgery,

Previous history of spinal anesthesia, previous history of back pain, skin infiltration,

Spinal needle type and size, angle of the needle,

spinal interspace, number of attempts and number of bone contacts,

Experience of the anesthesia provider

4.6 Sampling technique and sample size determination

4.6.1 Sample size determination

A single population proportion formula was used to calculate the sample size. The sample proportion(P) was determined based on a study conducted at Addis Ababa, Ethiopia on the prevalence of post-spinal back pain at the first postoperative day (prevalence= 39.4%)(18).

$$n = (Z\alpha/2)^2 P (1-P)/d^2$$

where: where $\alpha=5\%$, $P=39.4\%=0.394$, $Q=1-P=0.606$ and $d=0.05$, Z at 95 % CI=1.96

By replacing the values in the above equation and adding a 10% non -response rate the actual total sample size for this study was 404.

4.6.2 Sampling technique

In Addis Ababa, there are thirteen governmental hospitals that perform a wide range of operation. Out of these we selected four hospitals based on high surgical patient flows. The selected hospitals were Tikur Ambesa specialized hospital, Zewditu memorial, Paulos hospital and Minilik hospital.

From the situational analysis of post-operative surgical patient logbook of selected hospitals, 1224 patients operated under SA within three months (November 1, 2020-January 30, 2021). Then patients who underwent operation under spinal anesthesia was proportionally allocated for each selected Addis Ababa governmental hospitals.

From the log book record in three months, operations done under SA in each selected hospital were;

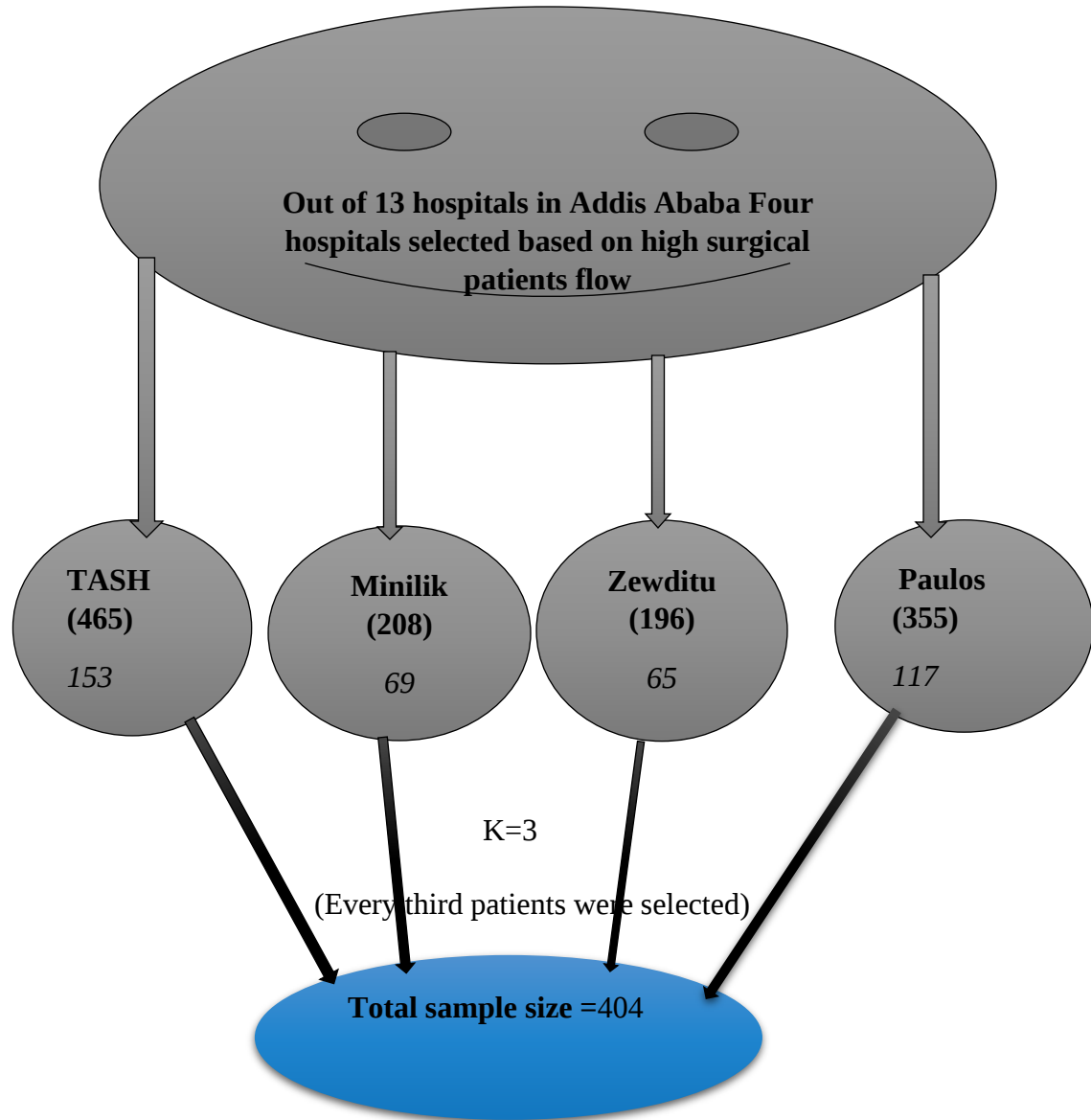
- 462 in Tikur Ambesa specialized hospital
- 355 in St. Paulos hospital,
- 208 in Zewditu Memorial Hospital and
- 196 in Minilik Hospital.

Finally, the sample size was allocated proportionally to selected hospitals based on their average three months report (total population = 1224). Then Participant was selected by systematic random sampling technique.

Skip interval (K) was calculated by $K = N/n$,

Where; **N** is the number of patients operated under SA in selected hospitals from the three-month report and **n** is the sample size of this study.

$K = 1224/404 \approx 3$; then a random number between 1 and 3 was selected by lottery method. After that, every third patient was selected in each hospital for each specialty operation who undergo under SA until we get 404 patients.



Key -Bold Numbers; number of patients operated during situational analysis

-Italic numbers; number of selected participants during data collection

Figure 2: proportional allocation of study participants for each selected Addis Ababa governmental hospitals, Ethiopia from February 2021- April 2021 GC.

4.7 Operational definitions

Back pain after spinal anesthesia: pain that is confined from subcostal margin to gluteal folds which occurs within two to six hours after SA.

Large size spinal needle: Spinal needle which is less than 23 Gauge

Small size spinal needle: Spinal needle which is greater than or equal to 23 Gauge

Number of punctures: is a number that the anesthesia practitioner attempts to get free flow of Cerebrospinal fluid during SA procedure.

Number of bone contact: the number of the striking either spinal process or lamina of lumbar bone with a spinal needle while performing spinal anesthesia.

Numerical pain rating scale (NRS): it is one type of pain assessment tool where patients are asked to score their pain intensity on a scale of zero to ten which relates to the current pain status.

History of back pain: back pain experienced by the patient one month before the spinal procedure.

Recent back pain: Back pain experienced by the patient within one month before SA procedure

Student: Either undergraduate BSC anesthesia student or anesthesiology resident.

4.8 Data collection tool and procedures

Data collectors observed the selected study participants for three post-operative days. Informed consent was taken, Socio-demographic data of the patients, the urgency of operation, position and duration of surgery, and type of operation were recorded from patients' chart. Patients were interviewed about the history of back pain, previous exposure to SA, and educational level. Patient weight and height was measured and BMI was calculated ($BMI = \text{Weight in Kilogram} / \text{height square in meter}$). The anesthesia provider who administered SA was asked about his/her experience and the number of bone contacts he/she faced during SA procedure. Type and size of the spinal needle, spinal interspace, angle of the needle, and number of spinal attempts were observed and recorded by the data collector.

The intensity of back pain was measured using a numeric pain rating scale after the patients were given adequate information about the tool. The assessment tool contains a labeled line that ranges

from 0 to 10. Study Patients were asked to rate their back pain severity depending on the labeled number on numeric pain rating scale.

4.9 Data quality control

Training on every step of data collection was provided for data collectors for two days (four BSc anesthetists and two nurses) and supervisor. Adequate information was given for the study participants about numeric pain rating scale. The questionnaire was pretested on 20 patients. The supervisor examined each of the collected data for missing value.

4.10 Data analysis

The data was entered and analyzed by using SPSS version 24. The data was described by text, tables, and graphs. Each Predictor variable was examined with the outcome variable by a binary logistic regression model. Variables with $p\text{-value} < 0.2$ on bivariable logistic output were transferred to multivariable logistic regression. A $P\text{-value} < 0.05$ in multivariable logistic regression output was considered a statistically significant. An adjusted odds ratio with a 95% confidence interval was used to judge the strength of the association.

4.11. Ethical consideration

Ethical clearance was received from the Institutional Review Board (IRB) of the Addis Ababa University, College of Health Sciences. After official letters were sent to selected hospitals, permission was obtained from responsible administrators. The aim of the study was described to the participant and informed verbal as well as written consent was gained. Patient information during the process of the data was kept secret by using codes and strictly keeping the collected data in a secret location which was only approached by the data collectors and the researcher. Personal information of the patients was not taken. They were also informed they have full right to withhold from the study at any time they wish. And also, they were told that the study has no special gain or harm to them.

4.12 Dissemination of the findings

The final results of this study will be submitted to the Addis Ababa University, College of Health Science. The result will also be submitted to included hospitals during the study periods, the Ethiopian association of anesthetist and anesthesiologist, Federal ministry of health. It will be also presented at different workshop and national professional assemblies. To reach the finding for the

international research community, great effort will be made in publishing the results in reputable journals.

CHAPTER FIVE: RESULTS

5.1. Socio-demographic characteristics

A total of four hundred four ASA I- III patients between the age of 16-84 years who operated under SA were involved in the current study. The mean age of the participants was 34.72 years with a standard deviation of 14.96. With regard to body mass index of study participants, 200(49.5%) were normal weight, 61(15.1%) were overweight, and 32(7.9%) were underweight (table 1).

Table 1: Socio-demographic characteristics of patients operated under SA at selected public hospitals in Addis Ababa, Ethiopia, from February 1-April 30 2021 G.C(n=404).

Variables	Category	Frequency(n)	Percentage (%)
Sex	Male	128	31.7
	female	276	68.3
BMI (kg/m ²)	< 18.5	32	7.9
	18.5-24.9	200	49.5
	25-29.99	111	27.5
	≥30	61	15.1
ASA	I	87	21.5
	II	283	70
	III	34	8.4
Educational status	Illiterate	49	12.1
	Read and write	28	6.9
	Elementary	106	26.2
	High school	102	25.2
	Preparatory	35	8.7
	College/University	84	20.8
Type of occupation	Student	42	10.4
	Teacher	20	5
	Merchants	44	10.9
	Housewife	140	34.7
	Farmer	41	10.1
	Others	117	29

Most of the spinal anesthesia (78.5%) was performed with Quincke type spinal needle and in the majority of the patients (71.3%), spinal needle was introduced without numbing of the area with

local anesthetics. About 21% of study participants have history of back pain. With regard to the urgency of operation, about 54% were elective cases. More than half (56.44%) patients were obstetric cases (Table 2).

Table 2. Anesthetic, surgical and clinical characteristic of patients operated under spinal anesthesia at selected public hospitals in Addis Ababa, Ethiopia, from February -April 2021 G.C

Variables		Frequency	%
History of back pain	yes	85	21
	no	319	79
Previous exposure to SA	yes	105	26
	no	299	74
Urgency of operation	emergency	186	46
	elective	218	54
Skin infiltration	yes	116	28.7
	no	288	71.3
Spinal needle type	Whitacre	60	14.9
	Quincke	317	78.5
	sprottee	27	6.7
Types of operation	Obstetrics	228	56.44
	Urology	65	16.09
	Orthopedics	74	18.32
	General surgery	23	5.69
	Gynecology	14	3.47
Position during operation	Supine	338	83.7
	Lithotomy	66	16.3
Duration of surgery	30 minutes	54	13.4
	30-60 minutes	246	63.4
	> 60 minutes	94	23.3
Experience of anesthesia provider	Anesthesia Student	130	32.2
	< 1 year	38	9.4
	1-4 years	70	17.3
	>4 years	166	41.1

5.2 post-operative incidence of back pain

The study shows, the overall incidence of back pain was 42.32%. Seventy-seven (19.06%) patients suffer from back pain in the first post-operative day. Fifty-one (12.62%) patients and forty-three (10.64%) patients complained of back pain after spinal anesthesia at the second and third postoperative days respectively.

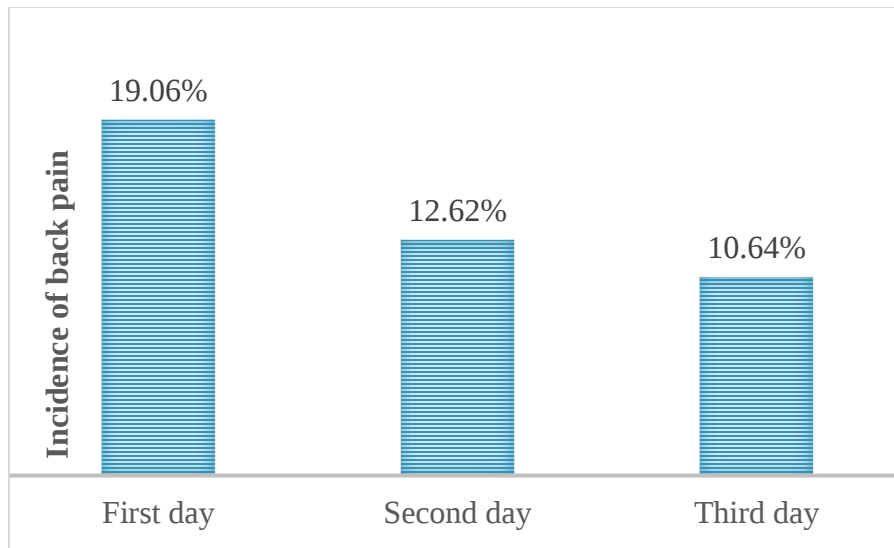


Figure 3. Incidence of post-operative back pain following spinal anesthesia at selected Addis Ababa governmental hospitals, Addis Ababa Ethiopia ,2021.

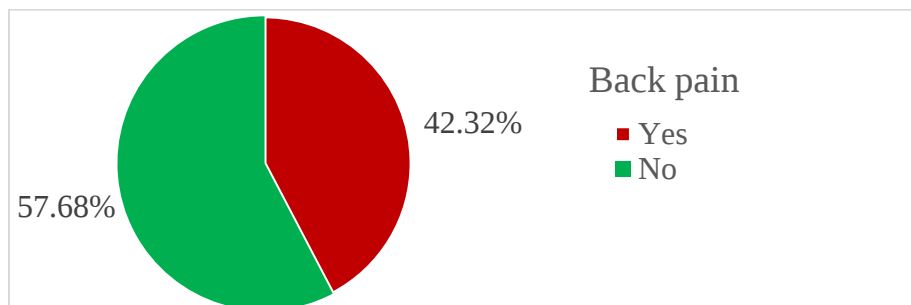


Figure 4. over all incidence of back pain after spinal anesthesia at selected public hospitals in Addis Ababa from February -April ,2021 GC.

5.3 The mean severity of back pain after spinal anesthesia

Our result shows, back pain after anesthesia is mild to moderate based on the mean values. The mean value of the intensity of the back pain was higher in the first day as compared to the second and the third post-operative days.

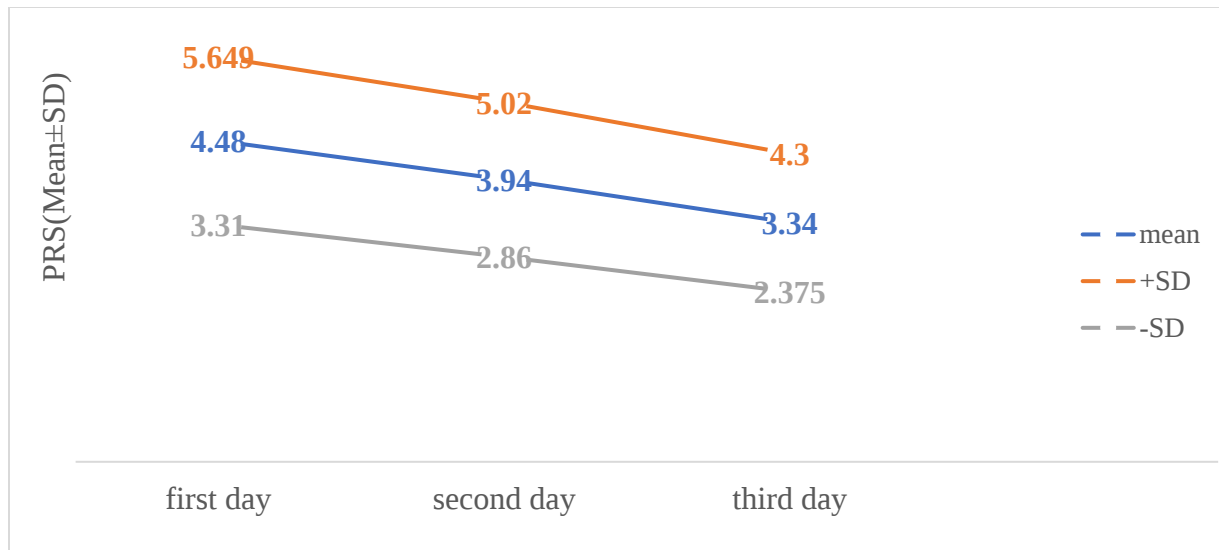


Figure 5. The severity of back pain after SA at selected Addis Ababa governmental hospitals from February 1-April 30,2021.

5.4 Factors Associated with back pain after spinal anesthesia

Patients with a body mass index of ≥ 30 kg/m² were 6 times more likely to complain of back pain than underweight patients. Those with a history of back pain were 4.2 times risk to develop a backpack than those who did not have a history of back pain. During the SA procedure clients who had more than one times attempts were 2.6 times risk to suffer from a backpack as compared to those who had one attempt. Patients who had more than one bone contact were 5.6 times at risk to get back pain as compared to those with no bone contacts. clients who had received SA with less than 23 G spinal needle were almost 3 times at risk to develop post spinal back pain than clients who had received with ≥ 23 G spinal needle (Refer table 3).

Table 3: Factors associated with back pain after spinal anesthesia in surgical patients operated under spinal Anesthesia in Addis Ababa governmental hospitals, Addis Ababa, Ethiopia, from February 1- April 30 12, 2021 (n=404).

Independent variables		COR (95% CI)	AOR (95% CI)	P-value
Body mass index	< 18.5	1	1	
	18.5-24.9	2.053(.846,4.980)	1.439(.465 ,4.458)	.528
	25-29.9	2.174(.846,4.980)	1.606(.499,5.174)	.427
	≥ 30	11.990(.865 ,5.464)	6.005(1.577,22.864)	.009*
Occupation	Student	1	1	
	Teacher	2.231(0.747,6.660)	2.668(.634,11.236)	.181
	Merchants	2.443(1.011,5.902)	3.484(.979,12.432)	.055
	Housewife	1.401(0.670,2.928)	2.309(.780,6.830)	.131
	Farmer	1.927(0.786,4.725)	1.319(.362,4.803)	.674
	Others	1.665(0.787,3.523)	1.368(.470,3.982)	.565
Educational status	Illiterate	1.976(0.963,4.052)	1.412(.510,3.911)	.507
	Read and write	2.188(0.963,4.052)	1.766(.541,5.765)	.346
	elementary	1.149(0.918,5.214)	.602(.259,1.397)	.237
	High school	1.497(0.633,2.088)	1.327(.594,2.963)	.490
	preparatory	1.422(0.825,2.717)	1.162(.382,3.533)	.791
	College	1	1	
ASA	ASA I	1	1	
	ASA II	0.659(0.427,1.132)	.648(.324,1.299)	.222
	ASA III	1.781(0.770,4.121)	1.501(.462,4.873)	.499
History of back pain	No	1	1	
	yes	6.211(3.600,10.717)	4.270 (2.066,8.828)	0.000*
Previous exposure to SA	No	1	1	
	yes	2.258(1.437,3.549)	1.512 (.784,2.916)	.218

Skin infiltration	Yes	1.376(0.891,2.125)	1.242(.665,2.319)	.496
	No	1	1	
Spinal needle type	sprottee	1	1	
	Whitacre	1.816(0.688,4.796)	851 (.392,1.847)	.683
	Quincke	1.762(0.749,4.145)	.425 (.105,1.721)	.231
Spinal needle size	≥ 23	1	1	
	<23	3.491(2.292,5.316)	2.781(1.581,4.891)	0.000*
Number of attempts	Once	1	1	
	>one	6.455(4.161,10.012)	2.649(1.462,4.800)	0.001*
Number of bone contacts	No	1	1	
	1	3.455(1.995,5.983)	1.994 (1.009,3.941)	0.047*
	> 1	9.302(5.517,15.682)	5.633 (2.769,11.460)	0.000*
Duration of surgery	< 30 minutes	1	1	
	30-60 minutes	1.1240(0.609,2.074)	1.032(.454,2.344)	.940
	> 60 minutes	2.381(1.193,4.754)	1.307(.507,3.370)	.580

1= Reference group * = significant COR= Crudes Odds Ratio AOR =Adjusted Odds Ratio
CI = Confidence Interval

CHAPTER SIX: DISCUSSION

The present study shows the overall incidence of back pain was 42.32% (95% CI:37.4%;46.8%). This result was in line with a prospective observational study conducted on 112 pediatric patients in 2004 (17).

According to our result, the incidence of back pain in the first, second and third post-operative days was 19.06% (95% CI:15.3%;22.8 %),12.62% (95% CI: 9.4;16.1%) and 10.64% (95% CI: 7.7-13.6%) respectively. The results are consistent with the study done at the University of Gondar at the first and second postoperative days but lower at the third postoperative day(28). Lower incidence of back pain at the third postoperative day in this study could be the differences in the distribution of in spinal needle size used between the studies. In the current study, 38% of patients were given spinal anesthesia by using large size spinal needles as compared to 91% in that study that may result more trauma and increased the incidence of back pain.

Our result is lower as compared to the study conducted in Asela hospital (38%,29 .9%, and 16% in the first ,second, and third postoperative days respectively)(20). That study shows spinal procedure was performed by small gauge spinal needle (18G,20G,21G) but in this study, most of the patients were given spinal anesthesia with larger gauge-spinal needle. That may be why the incidence of back pain becomes lower.

The prevalence of back pain at Addis Ababa governmental Hospitals (2015) in 317 non-obstetric operated under spinal anesthesia at first postoperative day was 39.4 %.(18) The result is higher than the present study. The variation could be the differences in inclusion criteria. They included patients who had recent back pain that could result in a higher prevalence of acute post-spinal back pain.

This study found 19.06% of patients complained back pain at the first postoperative day which was lower than the study conducted in Turkey on Six hundred and forty-nine patients operated under spinal anesthesia where the magnitude was 29.3% in the first post-operative day(22). The disparity of the results most probably be the differences in the distribution of study participants who had a history of back pain between the studies. In the current study, 15.4% of participants had a history of back pain as compared to 29.8% in that study that could affect the magnitude.

According to this study, the mean severity of back pain was mild to moderate. The results are in line with the study done in Gonder university(28). But it was higher as compared to the study done on Two hundred twenty elective patients operated under SA which indicates a mean severity of 2.27 and 1.45 in the median and paramedian approach respectively(36). The most probable reason for the variation in the result could be differences in the study design between the studies.

In terms of body mass index, obese were riskier than normal or underweight patients. Our finding shows patients with BMI of $\geq 30 \text{ kg/m}^2$ were 6 times higher risk to develop back pain than those with $< 18.5 \text{ kg/m}^2$ after spinal anesthesia. This might be due to the challenges in inserting spinal needle in obese patients than normal weight or underweight patients(38) as a result there would be a higher probability of repeated punctures with spinal needle and increases tissue injury. In addition to this, obese individuals are at higher risk to get backache than those with normal or underweights and could result in aggravation of backache after the procedure. The finding is supported by the study conducted at the university of Gondar(28).

In this study, spinal needle size was one of the explanatory variables significantly associate with post-operative back pain after spinal anesthesia ($P < 0.001$). Patients who had received spinal anesthesia with a $< 23 \text{ G}$ spinal needle were almost 3 times more likely to develop back pain than with those who had been punctured with a $\geq 23 \text{ G}$ spinal needle. The reason might be due to more damage of tissue with larger diameter spinal needle. This finding is lower as compared to the result of Lidia et al.at Addis Ababa hospital in 2015 which was 43 times (AOR; 43.2,95% CI:3.72; 497.16)(18). The probable reason for this variation could be a cut point used to compare the spinal needle size. They compared 18G,22G, and 25G but the present study classified spinal needle into small and large size considering 23G as a cut point.

Patients who had bone contacts of more than one with a spinal needle were 5.6 times more likely to suffer from postoperative back pain as compared to those with no bone contact. A study done in Turkey also shows number of bone contact was one of the associated factors of back pain(22).In addition, this finding revealed during the SA procedure clients who had more than one times attempts were 2.6 times risk to suffer from a backpack as compared to those who had one attempt. These results are also supported by the finding of Ashebir et al.in 2015 (20). The possible explanation for these finding could be more attempts and repeated bone strike cause more tissue

injury in that area. This ends in more release of inflammatory and chemical mediators of pain which results in the incidence of backache.

History of back pain was another variable that was strongly associated with the incidence of back pain. Patients who had a history of back pain were 6.2 times at risk of suffering from back pain as compared to those who had no history of back pain. Our finding was similar to the study conducted in 2015 in 317 non-obstetric patients operated under SA(18). The possible reasons could be aggravation of preexisting back pain that was caused by ligament or muscle strain as the spinal needle cross through these structures.

In contrast to this finding, a study conducted in Asela hospital, Ethiopia indicates the experience of anesthesia provider was statistically associated with the incidence of acute post spinal back pain(20). The possible explanation for discrepancy of the results could be an improvement in the training of BSC anesthesia students on the doll before they practice SA on actual patient and inclusion of anesthesiology resident in the current study who were more experienced technically in performing spinal anesthesia.

In addition, our result is also in contrast with the study done in 2013 on seventy-five orthopedic patients operated under spinal anesthesia that shows previous exposure to spinal anesthesia was a statistically significant effect on the incidence of Post spinal back pain (25). The possible justification for this variation could be the differences in samples, sampling technique, and study area. The present study was multicenter, the sample size was large and study participants were a variety of surgical patients who were selected by probability sampling technique.

CHAPTER SEVEN: STRENGTH AND LIMITATION OF THE STUDY

7.1 Strength of the study

- The study was a multicenter and included patients with ranges of different operations performed under spinal anesthesia who were selected by probability sampling. So, our result can be generalized.

7.2 limitation of the study

- A patient who has severe surgical pain could report as having back pain to get additional analgesia.
- The pain rating scale was not easy to understand by illiterate participants which could affect the result of the severity of back pain.
- We followed the study participants only for three days. Therefore, we cannot conclude whether back pain persists or not.

CHAPTER EIGHT: CONCLUSION

In this study, a high incidence of back pain and their association was observed in Addis Ababa governmental hospitals. The mean severity of back pain in each of three postoperative days was mild to moderate. Factors that significantly associated with post-spinal back pain were, body mass index, history of back pain, spinal needle size, number of punctures, and number bone strike.

CHAPTER NINE: RECOMMENDATIONS

Based on the results of this research, the following recommendations are forwarded.

For anesthesia providers

- All anesthesia providers should know potential risk factors of back pain and they should advise patients on the possibility of postoperative back pain.
- They should use fine-gauge spinal needle and should minimize multiple bone strike and multiple punctures during spinal procedure.
- They should follow the patients post-operatively to see whether back pain present or not and treat it with appropriate analgesia based on the intensity of the pain.

For hospital administrators

- The hospital managers should provide fine needles (>22G) which are associated with less incidence of post-spinal back pain.

For Ethiopian association of anesthetist and anesthesiologist

- Prepare training for anesthesia providers to widen their understanding about higher burden and determinant factors of back pain after SA anesthesia.

For future researchers

- Researchers should conduct cohort or RCT to see cause and effect relationships.
- Longitudinal observational study should be done to see whether post spinal back pain persists.

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Annexes

Annex I: Information sheet to get permission for the research

Introduction

The information sheet is prepared to explain the study project that you are asked to join by a group of research members.

The research members include the investigator, two senior advisors from Addis Ababa university, six data collectors and one supervisor.

Investigator name: Belete Alemu (graduating MSc student)

Name of Advisors: 1. Adugna Aregawi

2. Fiseha Fentie

Name of sponsor: Addis Ababa university

Risk of the study

There is no any danger or loss you encounter by involving in the study. Every piece of information is only acceded by the data collector/ principal investigator.

Benefits of the study

There is no service in exchange or incentive gained by involving in this study. This research project will be reviewed and approved by ethical committee of Addis Ababa university.

Address. Tel: +2519163891 E-mail: beletealemu728@gmail.com

Annex II: Consent form English version

Hello, my name is _____. I'm here on the behalf of Belete Alemu, master student in anesthesia in Addis Ababa University, school of medicine. He is conducting research on "incidence, severity and associated factors of acute back pain after spinal anesthesia" at Addis Ababa governmental hospital. He got permission from Addis Ababa University ethical review board. The aim of the study is to assess the incidence, severity and associated factors of acute back pain after spinal anesthesia.

Involving to the study, you are contributing valuable evidence for understanding and identifying factors associated with back pain following spinal anesthesia. Some information will be taken from your chart to identify factors for the pain. Every piece of information about you will be secrete and only accessed by the data collector and the researcher himself. you have full right to refuse taking part in the study. By taking part in the study, you will not be either harmed or not get additional benefit. The results that we find will be used as a base line data for further actions in reducing post spinal back pain. The interview will only take 10 minutes.

If you have drought, please ask the nearby data collector for unclarity or contact the principal investigator (Belete Alemu) through mobile number 0912638791or email, beletealemu728@gmail.com).

My I proceed?

1. If yes, continue to get the required information
2. If no, skip to the next participant

Interviewer: _____name _____signature_____

Date of interview _____Time started _____ Time completed_____

Supervisor (Checked): Name_____signature _____Date_____

Annex III: Consent form Amharic version

የመጠይቅ ፈቃድ

የተከበራችሁ የጥናቱ ተካፋዮች

እንደምን ስንብተውዋል እኔ _____ እባላለሁ፡፡

በአዲስ አበባ ዩንቨርሲቲ በአንስቴዥያ ት/ት ክፍል ተማሪ የሆነውን በለጠ አለሙ በመወከል በሚሰራው ጥናት ላይ መረጃ ለመስብስብ ነው፡፡ የጥናቱ አላማ ቀዶ ህክምና ሲከናወን ከውገብ በታች በሚሰጠው የአንስቴዥያ አይነትን ተከትሎ ሊመጣ ስለሚችለው የታችኛውን የወገብ ህመም፣ የህመሙን መጠን እንዲሁም ተያያዥ ጉዳዮች ነው፡፡ ጥናቱ ለእርሶ ምንም አይነት የተለየ ጥቅም አያስገኝም፡፡ ነገር ግን የጥናቱ ውጤት በህክምና ዘርፍ ላይ ያሉትን ችግሮች ለመቅረፍ እና የታካሚዎችን ደህንነት የሚያረጋግጡ ህጎች እንዲስተካከሉ እና ሥራ ላይ እንዲውሉ የበኩሉን አስተዋፅዖ ያበረክታሉ፡፡

ስምዎ በዚህ ጥናት ላይ አይፃፍ ስለዚህም የእርሶ ምላሽ ሚስጥራዊነቱ የተጠበቀነው፡ በዚህ መጠይቅ ላይ ለመሳተፍ መስማማትም ሆነ አለመስማማት ይችላሉ፡፡ ባለመስማማቶ ምንም የሚጎዱት ነገር የለም፡፡ ጥያቄዎቹን በሚጠየቁበት በማንኛውም ሰዓት ላይ የማይመች ነገር ካጋጠመዎት ለማቋረጥ የምትችሉ እና በሚመችዎት በማንኛውም ሰዓት መቀጠል የምትችሉ መሆኑን ልናረጋግጥልዎት እንደምናገኘው መረጃ ወደፊት በችግሩ ላይ ለመወሰድ ለሚታቀደው ተግባር እንደመሰረት የሚያገለግል ይሆናል፡፡ ቃለ መጠይቁ ከ አስር ደቂቃ በላይ አይወስድም፡፡

በምርምሩ ላይ ለመሳተፍ ፈቃድዎን አግኝቻለሁ?

1. መልሱ አዎከ ሆነ ቃለ መጠይቁ ይቀጥላል
2. መልሱ አይደለም ከሆነ ወደሚቀጥለው ተሳታፊ እለፍ፡፡

ቃለመጠይቁን የሞላ ስም _____ ፊርማ _____

ቃለመጠየቁ የተጀመረበት ሰዓት _____ ያለቀበ ትስዓት _____ ፊርማ _____

ቃለመጠየቁ የተካሄደበት ቀን _____

የተቆጣጣሪ ስም _____ ፊርማ፡፡

Annex IV Data collection questionnaire

For each of the questions please circle the alternative letter that fit the response or fill the black space provided.

Part I: Socio-demographic and basic characteristics of the patient

S. No.	Question	Answer
101	Age(years)	
102	Sex	A. Female B. Male
103	Weight (kg)	_____
104	Height (meter)	_____
105	Body mass index (kg/m ²)	_____
106	Type of occupation	A. Student B. Teacher C. Merchants D. Housewife E. Farmer F. Others
107	Educational status	A. No education B. Elementary C. High school D. Preparatory E. College/University
108	ASA status	A. ASA I B. ASA II C. ASA III D. ASA IV

Part 2: patient interview and document review

S. No.	parameters	Value
201	Urgency of Operation	A. Elective

		B. Emergency
202	Type of Operation	A. Obstetric B. Gynecology C. Orthopedic D. Urology E. General
203	Previous history of back pain	A. Yes B. No
204	Previous history of spinal anesthesia	A. none B. one C. $\geq$ two

Part 3: Intra operative observation of SA procedure, patient document review and anesthesia provider interview.

S. No	Question	Answer
301	Position of patient during spinal anesthesia procedure	A. Sitting B. Lateral
302	Skin infiltration	A. Yes B. No
304	Spinal needle type	-----
305	Spinal needle size(G)	-----
306	Angle of the needle	A. Parallel B. Perpendicular
307	Spinal inter space	A. Between L2 – L3 B. Between L3– L4 C. Between L4 – L5
308	Number of attempts	A. Once B. Twice C. $\geq$ three
309	Number of bone contacts	A. None B. Once

		C. Twice D. $\geq$ three
310	Position of Surgery	A. Supine B. Lithotomy C. Lateral D. Others
311	Duration of the surgery	A. < 30 minutes B. 30 - 60 minutes C. > 60 minutes
312	Experience of anesthesia provider	A. student B. < 1 year C. 1 - 4 years D. $\geq$ 4 years

Part 4. Assessment of incidence of post spinal back pain and its intensity (severity).

Numeric pain rating scale



The measurement will be taken once in three days. Patients will be asked to show back pain intensity from the label 0 to 10 and will be rated.

When the information about the tool is not clear to the patient, detailed explanation is given by data collector.

የህመም መለኪያው



የህመም መጠኑ በሶስት ቀን ውስጥ ታካሚው ህመም በተሰማው ጊዜ ይለካል። ህመምተኛው የህመም መጠኑን በዚህ የህመም መለኪያ ከ 0 እስከ 10 ባሉ ቁጥሮች እንዲያሳይ ይጠየቃል። ታካሚው ግራ የሚያጋባ ነገር ካጋጠመው በደንብ እንዲረዳ ተጨማሪ ማብራሪያ ይደረግለታል።

S.NO	QESTION	DAY 1	DAY 2	DAY 3
401	DO YOU HAVE BACK PAIN?	A.YES B.NO	A.YES B.NO	A.YES B.NO
402	IF QUESTION NO.401 IS YES, PAIN INTENSITY USING NPRS?			

Annex V: American Society of Anesthesiologists grouping of clients based on their medical condition

RANK	DESCRIPTION
ASA I	Client without coexisting disease
ASA II	Client diagnosed with mild systemic disease
ASA III	client diagnosed with severe systemic disease
ASA IV	Client with disease that is repeated threat to death
ASA V	moribund patient who needs surgery within 24 unless not expected to survive
ASA VI	A declared brain-dead patient who comes for organ donation
Emergency (E)	Emergency operation

Source: Barash eight edition (39)

Annex VI: Assurance of principal investigator

The undersigned person agrees to take any responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research Publications.

Name of the student: _____

Date_____ Signature _____

Approval of the Advisors

1.Name _____ Date_____ Signature _____

2.Name_____ Date_____ Signature _____