Volume 3, Issue 10, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

A COMPARATIVE STUDY OF 25-G vs. 27 QUINCKE NEEDLES ON PDPH IN HOLISTIC PATIENTS IN RECOVERY AFTER ELECTIVE CAESAREAN SECTION

Muhammad Shoaib Raza[1], Muhammad Zeeshan khan[2], Rubama Javed[3], Naveed Ali Tariq[4], Unain Khalid[5], Kainat Habib[6], Kinza Andleeb[7], Mukhtiar Ahmad[8]

[*1,2,3,4,5,6,7,8] *Department of Emerging Allied Health Technology, FAHS, Superior University, Lahore*

[*1]shoaibasadullah250@gmail.com, [2]mzeeshankhan931@gmail.com, [3]rubamajaved14@gmail.com, [4]naveedalitariq3@gmail.com, [5]hassanayni14@gmail.com, [6]kaynathabib2@gmail.com, [7]kinzamaqbool068@gmail.com, [8]pk412999@gmail.com

DOI: https://doi.org/10.5281/zenodo.18125925

Keywords
PDPH, Quincke Needle 25G and 27G, C-Section, Obstetrics.

Article History
Received: 03 November 2025
Accepted: 17 December 2025
Published: 31 December 2025

Copyright @Author

Corresponding Author: *
Muhammad Shoaib Raza

Abstract

Background: *Post-Dural Puncture Headache (PDPH) is still considered to be one of the most common complications following spinal anesthesia, especially when it is used in obstetric clients undergoing elective Caesarean Section. The PDPH incidence highly depends on the gauge and design of the spinal needle deployed in the administration of anesthesia. The most widely used Quincke needles (25-G and 27-G) are used, but still, the relationship between their impact on PDPH occurrence, severity, and the overall patient recovery is a controversial topic. This research was intended to give empirical data on the comparison of these two sizes of needles in the long-term outcome of physiological and holistic recovery since PDPH greatly influences the postoperative well-being, length of stay, and patient satisfaction.*

Methods: *It was a prospective randomized clinical trial done in a tertiary care hospital in a period of four months. A randomized study (N=196 obstetric patients that planned to undergo elective Caesarean Section under spinal anesthesia) was performed wherein 25-G Quincke needle (Group A, n=98) and 27-G Quincke needle (Group B, n=98) was administered as the anesthesia. In PDPH presence and severity, a Visual Analogue Scale (VAS) was used to assess both 24 and 48 hours after surgery. Holistic recovery was measured using duration of stay in the hospital, need of further analgesia, and patient satisfaction survey.*

Results: The *research study indicated that the needle gauge has a major role in the rate and intensity of PDPH. Anaesthetized patients using the smaller 27-G Quincke needle had fewer headaches, lesser analgesic needs and a short hospital stay than the patients who underwent the spinal anesthesia with the 25-G needle.*

Conclusions and Recommendations.: *The paper concludes that 27-G Quincke spinal needles are characterized by significantly reduced incidence of PDPH, less severe forms of PDPH, reduced postoperative recovery and increased patient satisfaction as compared to 25-G needles in Caesarean Section anesthesia. It is advised that 27-G Quincke needles be used as a priority in routine obstetric spinal anesthesia in the anesthesia departments to increase patient comfort and minimize postoperative morbidity. Ongoing training of the staff and observance of aseptic spinal practice are also recommended to sustain these better results.*

Volume 3, Issue 10, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

INTRODUCTION

Spinal anesthesia has become the most popular method of performing an elective Caesarean Section due to its clinical reliability and fast acting nature and its high safety profile in both the mother and fetus. Spinal anesthesia has an advantage over general anesthesia which has a high level of risks including airway management difficulties, aspiration, and respiratory depression of the neonatal system: a smooth surgical experience is guaranteed by controlled and predictable sensory and motor block. It removes the exposure of the fetus to the inhalant agents and intravenous sedatives hence minimizing the chances of the fetus falling into depression at birth. Moreover, spinal anesthesia enables maternal alertness to enable instant maternal-infant bonding, which is one of the psychophysiological advantages. Spinal anesthesia has gained popularity in the modern obstetric anesthesia all over the world due to these benefits. (3)

The physiology of spinal anesthesia is based on the change of nerve conduction by specific blockage of sodium channels in the spinal nerve roots. When local anesthetic is injected into subarachnoid space, analgesia occurs in predictable and quicker reactions because the nerve fibers are directly affected by the local anesthetic as they are bathed in CSF. The agents like hyperbaric bupivacaine are still the norms in the obstetric anesthesia due to their dense blockade, stable cardiovascular events, and long-term application, which suits Caesarean deliveries. The anesthetic diffuses into the CSF on introduction depending on baricity, positioning of the patient and CSF volume. Pregnant women also have physiologic alterations in the form of engorged epidural veins and decreased CSF volume which increases the cephalad diffusion of anesthetic agents and produces a more intense block, and usually needs less amount of anesthetic agent to obtain surgical anesthesia. (4)

In addition to the pharmacodynamics, physiology of CSF is important in comprehending the complications that might arise as a result of spinal anesthesia. The CSF provides the environment within which anesthetics diffuse as well as being a cushioning fluid to the brain and spinal cord. A breakage of the dura mater and any other interruption of this system may result in major changes in the CSF pressure. In spinal anesthesia, the fluid can escape through the puncture point of the dura when there is a substantial puncture made with the needle. Continuous leakage of the CSF will lead to intracranial hypotension, and this pulls the pain-receptive structures (dura mater, meningeal vessels, and the cranial nerves) downward. The end product of this pathophysiologic cascade is Post-Dural Puncture Headache (PDPH) which turns out to be painful and disruptive particularly to postpartum mothers who need to move and be comfortable so that they can tend to their babies. (7)

The PDPH is specific to the postural headache, which on sitting or standing gets worse and is changed by lying flat, indicating the alteration in intracranial pressure. This characteristic symptom can be supplemented by photophobia, nausea, tinnitus, dizziness or even visual disturbances. The pain is usually seen around 2472hours after dural puncture. Despite the fact that PDPH usually subsides on its own in a span of a few days, the debilitating effects of the condition have a severe effect on postoperative recovery. In the case of the new mothers, PDPH may disrupt breastfeeding, newborn care, and early mobilization, which are key to the ideal postpartum outcomes. In the case of hospitals, PDPH leads to a long length of stay, analgesic utilization, and higher healthcare cost, which demonstrates its importance in the aftercare. (9)

The PDPH risk is determined by the type and gauge of spinal needle one uses, and this is one of the strongest determinants. Quincke needles are commonly used due to a cutting bevel tip, and because the needles are easy to insert due to their constant CSF flow. Their design however naturally causes a bigger dural incision which is more likely to cause the leakage of CSF. The needle gauge is crucial especially, the larger needles like 25-G Quincke produce larger dural defects compared to thinner ones like the 27-G Quincke. A wide range of clinical trials shows that smaller-gauge Quincke needles lead to the alleviation of PDPH due to their minimization of dural trauma. The literature presented in this case has indicated that the rate of PDPH reduced markedly with the replacement of needles of 25-G with 27-G Quincke needles, which will help uphold the principle that the

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

smaller the needle the better the results are achieved. (11)

Obstetric population has special physiological factors, which predispose to PDPH. Reduced age, female gender, increased baseline CSF pressure, and pregnancy-related changes in the anatomy of the spine are all factors that lead to increased vulnerability. Intra-abdominal pressure and filled epidural veins during pregnancy decrease the space of epidural and subarachnoid space. These modifications may simplify the dural puncture process and also cause such circumstances that even minor loss of CSF causes immediate changes in intracranial pressure and results in PDPH. The occurrence rate of PDPH in obstetric patients is much greater than other surgical groups and this underscores the need to select needles carefully and use expert technique. (13)

The importance of the reduction of PDPH is not confined to physical symptoms. Recovery requires physiological, emotional, and social aspects in the case of postpartum mothers. PDPH interferes with maternal-infant bonding, postpones ambulation and worsens fatigue, and helps in the postpartum suffering. In severe situations, untreated PDPH can lead to invasive procedures like epidural blood patch that though effective comes with its own threats. In the framework of patient-centered obstetric care, prevention of PDPH does not only entail the avoidance of the occurrence of headaches but directly improves the quality of postpartum recovery, efficiency of hospital workflow and maternal satisfaction. (18)

Considering the regularly stated correlation between needle gauge and PDPH, studies have been more keen on comparing the comparative effects of routinely used Quincke needles, particularly, 25-G and 27-G. Even though there are some studies that show no significant difference given that operator skill is optimal, majority of the literature points to the conclusion that smaller needles have great chances to reduce the probability of PDPH. Taking into account the sensitivity of the whole practice of obstetric anesthesia and the necessity of making certain that maternal comfort is achieved, the choice of spinal needle gauge becomes a significant clinical choice, the results of which matter significantly to their patient outcomes. (19)

Even though spinal anesthesia is commonly adopted as being effective and safe when used in Caesarian, it still faces a number of possible intra- and post-operative complications. Post-Dural Puncture Headache (PDPH) is the most dreaded and debilitating of them. Nevertheless, to grasp the idea of PDPH and its connection to needle gauge better, one would have to dig deeper into the area of spinal anesthesia complications in a more general context of a clinical environment. Spinal anesthesia is a direct puncture of the dura mater and any violation of this puncture is sure to have physiological implications. The closest complications entail, but not exhaustively, hypotension, bradycardia, high spinal block, backache, and transient neurological symptoms but of all, PDPH is the most lasting and restrictive complication of postpartum mothers. (21)

Risk factors of PDPH are more inherent to the obstetric population because of anatomical, physiological, and demographic factors. Obstetric patients are mostly comprised of younger women (20-35 years), and younger age has been reported over and over again to be a highly effective predictor of PDPH occurrence. Younger patients have greater amounts of elastin therefore the dura that is higher in their bodies is more flexible allowing it to open when punctured and slow to re-close, compared to older patients. This structural behaviour also adds to the augmented CSF leakage following spinal anesthesia. Pregnancy alone brings about several changes: the epidural space engorges with venous filled up, the CSF pressure is also affected by the contractions of the uterus and lumbar lordosis also results because of the gain of weight during pregnancy. All these complicate the technical nature of dural puncture and aggravate the effects of CSF loss. (23)

Within the dura, the CSF is a hydraulic skeleton of the intracranial structures. On the release of CSF by the needle puncture, its volume reduces and causes intracranial pressure to drop. This causes the brainstem to descend, leading to the traction of meninges, cranial nerves and bridging veins which contributes to the classic traction headache of PDPH. Greater punctures intensify this mechanism and consequently, the size of the needle is a crucial factor in the severity of PDPH. The Quincke needle is wider, a 25-G

ISSN: (e) 3007-1607 (p) 3007-1593

and, therefore, creates a much larger dural puncture than a 27-G needle. The bigger defects consist of a longer leak and a longer time to close. The patient can therefore have prolonged headache, photophobic, tinnitus or neck difficulty- symptoms that significantly lower maternal capacity to walk and interrelate with the newborn with ease. The time after delivery requires uninterrupted physical work, and PDPH has a dire effect on the early maternal-infant attachment, initiation of breastfeeding, and psychological comfort. (25)

Other than needle gauge, the end of the needle is also another significant area that determines dural injury. Quincke needles are cutting beveled needles that slice through tissues with minimal resistance that enhances the smoothness of the procedure and dural trauma. By comparison, pencil-point needles do not cut fibers but rather separate them. Research has repeatedly demonstrated that cutting needles cause linear incisions which slow down healing and allow an escape of more CSF. The 25-G Quincke needle is accordingly more dangerous due to its diameter as well as cutting design, which increases the risks of PDPH. Though the 25-G and 27-G Quincke needles are cutting needles, the 27-G forces less tissue movement because of its smaller diameter, though both have the same bevel structure. This is the reason why gauge itself has a significant influence on PDPH risk with no change in the needle design. (27)

The amount of CSF leakage does not depend only on the diameter but also on the geometries of the dural fibers. The dura consists of collagen filaments that are oriented majorly in longitudinal and oblique directions. The perpendicular cuts of cutting needle make a larger slit and a larger separation. Nevertheless, in practice in the clinical environment, and particularly in obstetric anesthesia when time constraints are very important, bevel orientation accuracy is never realized. Therefore, needle gauge is the main variable that will be controlled. It has been shown that even minor deviations in bevel alignment have a great consequence in PDPH incidence in the large needles but less in the small-gauge needles. That is to say that the smaller the needles, the less variability that is operator-dependent. (29)

The other complication that is very closely related to PDPH is the failure of the spinal anesthesia or repetition of the puncture attempts. The bigger needles like 25-G are less demanding due to their rigidity and the speed of the CSF returning when compared to the thinner ones like 27-G that require more practice. 27-G needles can bend/have false loss of resistance or take several tries in an inexperienced hand all potentially raising the risk of dural trauma and PDPH. This paradox presents the reason why other studies report like PDPH rates among gauges despite the mechanical superiority of smaller needles. As a result, training level of anesthesia providers becomes determining factor in interpreting differences in needle gauges. (31)

PDPH is a great source of functional restriction in the postpartum care. Mothers can hardly sit up without intense pain, postpone breastfeeding, infant attention, and even simple self-care processes. Hospitalization becomes longer and there are cases that need invasive therapy, such as epidural blood patch (EBP). Despite its high effectiveness, EBP has come with discomfort, risk of developing an infection or recurrent headache and high healthcare expenses. PDPH presence also escalates consumption of analgesics, such as the NSAIDs, caffeine, as well as opioids, which could cause undesirable maternal-neonatal reactions. Therefore, the prevention of PDPH with the right choice of needles is much more effective than the treatment once established. (32)

The holistic recovery definition is being broad and points out the importance of selecting needles besides the headache incidence. Holistic recovery encompasses maternal mobility, capacity to provide care to the newborns, emotional health, early ambulation, the comfort of sleeping, and satisfaction. PDPH influences all the dimensions of this recovery model. An effective obstetric anesthetic practice must be able to reduce complications and maximize comfort in the mother allowing early mobilization, easy interface with the newborn and psychological stability. In this regards, the use of smaller-gauge Quincke needles helps in enhancing the postpartum experience. (33)

Resource management of hospitals also depends on needle gauge. Patients experiencing PDPH are exhibiting longer hospital stay, slow

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

ambulation, and readmission. This imposes a strain on bed and nursing care demand. Considering the cost-effectiveness, it is beneficial to prevent PDPH by implementing 27-G needles. It has been shown that the 27-G needle group needed fewer intervention, minimal analgesia, and an earlier discharge, which means that the number of resources used in the hospitals was considerably lowered. (34)

Last but not least, the multifactoriality of PDPH implies that the choice of needle parameters, such as gauge and bevel type, insertion angle and procedure technique, should be selected carefully. Although operator expertise is required, there is overwhelming evidence that needle gauge is the only factor that clinician can adjust to decrease the risk of PDPH. This explains why a quality comparative researches, including the current one, on 25-G vs. 27-G Quincke needles in elective Caesarean Section, are necessary. (35)

Post-Dural Puncture Headache (PDPH) management has been a clinical issue of great concern to obstetric anesthesia because of the severe effect it has on maternal comfort, mobility and recovery after Caesarean Section. Though PDPH may resolve spontaneously in most patients, it is the severity of this condition, its postural character and its disabling symptoms that may tend to require active treatment. The general practice starts with conservative treatment, which consists of bed rest, increased oral fluids, taking caffeine, and basic analgesics. Caffeine is used as a cerebral vasoconstrictor that was shown to temporarily reduce the severity of a headache. Nevertheless, such interventions may be partial or temporary. More aggressive interventions like the epidural blood patch (EBP) are required in instances where PDPH continues even after 24-48 hours or is debilitating (functionally). The EBP is regarded as the gold standard given the fact that it replenishes CSF pressure by injecting autologous blood in the epidural space, which seals the dural defect. Although it is very effective, the procedure is invasive, painful and implies the risk of infection, back pain and uncommon neurological issues. (36)

The literature has always focused on prevention and not cure considering the drawbacks of treatment. The prevention is consequently greatly oriented toward technical decisions made in spinal anesthesia, namely the caliber of needles, type of bevel, or placement of the needle, and experience of the operator. Needle gauge is among the limited variables of measurement that make a lot of difference in the likelihood of dural trauma. Needles with larger gauge like 25-G generate larger punctures and more CSF leakage, whereas smaller gauges like 27-G generate smaller and self-sealing defects. The principle of the minimization of structural disruption is consistent with this concept so as to avoid intracranial hypotension. It has been proven that patients who received 27-G needles during anesthesia had improved postoperative recovery, decreased analgesic requirements, and reduced hospitalization than the patients who received spinal anesthetic treatment using 25-G needles. (37)

The contemporary obstetric anesthesia has turned to the holistic approach to recovery where recovery is a lot more than merely the immediate management of the surgical pain. The holistic recovery involves physiological, emotional, social, and functional aspects of the maternal wellbeing. Early ambulation in the postpartum patients is valuable in the prevention of venous thromboembolism, uterine involution, respiratory functions, as well as in overall mobility. Nevertheless, the PDPH severely limits the options of getting up or walking because of a postural character, which postpones the ambulatory and exposes them to the threat of further issues. Lack of the possibility to breastfeed and take proper care of the baby also helps in creating emotional devastation and discontent with the birth process. PDPH adversely affects the maternal-infant connection and the general post-delivery mental well-being, so it is necessary to reduce this complication with evidence-based anesthetic decisions. (38)

The psychological consequences of PDPH are also well known. Hormone fluctuations, sleep deprivation, and child birth physical requirements are some of the factors that may predispose postpartum women to mood disorders. This weakness is increased by the presence of a severe headache, which may be a contributing factor to postpartum depression or anxiety. Moreover, the long hospital stay as a result of PDPH affects the family structure, causes financial strain and raises the overall costs

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

of healthcare. Maternal satisfaction which is now regarded as a significant indicator of quality of anesthesia is greatly impaired in case of PDPH. The literature continues to indicate that when the needles given to the patients are smaller, they feel more satisfied because of reduced pain, faster recovery, and more pleasant experiences during the operation. (39)

Governing bodies in the field of anesthesia are starting to encourage the use of smaller needles in obstetric practice provided they are possible. The use of 27-G Quincke or 25-27G pencil-point needles in Caesarian Sections as a form of spinal anesthesia is now becoming commonplace in many high-resource countries. Some practitioners put forward that smaller needles need more technical skills but with the modern training courses they have proved that with sufficient practice the technical difficulties can be easily defeated. In addition, the continuous decrease in PDPH with the decrease of the gauge used renders them preferable in patient-centered care models. The high-quality randomized trials and systematic reviews provide substantial evidence that supports the use of fine-gauge needles as the best way of reducing the severity of PDPH and overall maternal recovery. (40)

Although there has been increased evidence, there are still various gaps in the literature. To begin with, numerous comparative studies comparing 25-G and 27-G Quincke needles are not uniform in their methodology, especially in the area of operator skill level, patient hydration status and puncture attempts. The variables play a major role in PDPH incidence and can possibly confuse the real role of needle gauge. Second, there is a small number of studies on holistic recovery parameters, including early ambulation, psychological well-being, and patient satisfaction. Third, a significant part of the studies is based on the headaches occurrence rather than the conduct of overall maternal postoperative conditions including the length of hospital stay, the necessity of the additional painkiller, the willingness to provide care to the newborn, and comfort in breastfeeding.

This is a limited field that restricts clinical experiences regarding the impact of needle gauge on the general childbirth process. (41)

Rationale of the Study

Spinal anesthesia is the ideal anesthetic method in the case of elective Caesarean Section, but Post-Dural Puncture Headache (PDPH) is still a significant complication that causes considerable discomfort in the mother, breastfeeding, mobility, psychological well-being, and the overall healing of the postpartum period. PDPH prevention is clinically significant since postpartum women are already vulnerable.

Aim of the Study

This study will compare and contrast the effects of 25-G and 27-G Quincke spinal needles in reducing the occurrence and the severity of Post-Dural Puncture Headache (PDPH) and to determine the overall effect of the needles on the holistic recovery of patients undergoing elective Caesarean Section.

OBJECTIVES

To compare the impact of 25-G and 27-G Quincke spinal needles on the occurrence and occurrence of Post-Dural Puncture Headache (PDPH), and the overall holistic recovery of patients undergoing elective Caesarean Section.

LITERATURE REVIEW

Gupta et al. (2018) contended that although the smaller-gauge spinal needles have clear benefits in terms of reducing Post-Dural Puncture Headache (PDPH), their use in practice in some of the patient groups is technically difficult. The authors described that 27-G needles, although they offer benefits of reducing dural trauma, are more flexible and hence hard to manage especially in obese parturients or women with distorted spinal anatomy. Among the concerns that were brought into the limelight were slower cerebrospinal fluid (CSF) flow using the finer needles, more time in the procedure, and higher chances of needle deviation that could result in fatigue among the operators during the insertion of the needles on the spine. These are particularly important in situations of emergent operations in which time efficiency in delivering anaesthetics is paramount. Nevertheless, Gupta et al. admitted that these do not limit them significantly when there is enough experience, training, and skill refinement. They inferred that even though smaller-gauge needles are technically challenging, their clinical advantage

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

of decreasing PDPH greatly outweighs the inconvenience of the procedure in the hands of trained anaesthetists.

Bissell et al. (2019) cited PDPH among the most disabling complications that occur in post partum mothers after spinal anaesthesia. They underlined that PDPH is not a mere physical headache, it is an obstacle to postpartum recovery. As per their discoveries, PDPH plays a significant role in inhibiting sleep patterns, playing a part in psychological distress, causing mood fluctuations and incapacitating maternal autonomy to a great extent. The impairment impacts on key postpartum duties including breastfeeding, neonatal care, ambulation, and family interactions. Bissell et al. also indicated that women with PDPH need more analgesic, longer clinical follow up and even invasive treatment, which result into higher healthcare expenses and hospital burden. Though this intervention is very effective, it is invasive and has a risk of procedures that underscores prevention than cure.

Choudhury et al. (2019) examined the pathophysiology of the spinal needle design and the incidence of PDPH with reference to the structural effects of needle-dura interaction. They described that Quincke cutting-tip needles cut into dural fibres resulting in a linear and quite large tear in the dura mater and thus enhancing the risk of CSF leakage and intracranial hypotension. Comparatively, the pencil-point needles like Whitacre and Sprotte fail to slice fibres instead pulling them apart leaving a smaller puncture point allowing tissue to be approximated earlier. Notably, even with Quincke needles, size of the gauge is determinant.Their argumentation was very convincing that the risks of PDPH are directly proportional to needle design and calibre.

Pereira et al. (2019) were found repeated dural puncture attempts as among the most significant independent predictors of PDPH and are more numerous in smaller-gauge needles, which means that multiple attempts increase dural trauma significantly. They indicated that technical mistakes like improper positioning of patients, midline distortions and anatomical differences are key factors that predispose traumatic puncture. Pereira et al. highlighted the effect of operator experience as a dominant factor to the occurrence of PDPH with an incidence of PDPH among trainee anaesthetists almost twice that of senior consultants. It was found that needle gauge is an essential factor, but PDPH is a multifactorial complication, which depends on the level of experience in a procedure, accuracy of alignment and repeated attempts, and patient-related anatomical aspects. In a large-scale meta-analysis study, including over 2,000 obstetric patients.

Lopergolo et al. (2019) was able to provide substantial evidence as to the use of smaller-gauge Quincke needles. Their results showed that 27-G Quincke needles decreased the incidence of PDPH by about 40 percent as compared to 25-G Quincke needles. This was caused by the significantly smaller dural perforation made by the smaller needle which would enable faster self sealing and minimization of CSF leakage. Nevertheless, the authors did not ignore technical constraints and claimed that 27-G needles are more flexible, slower in CSF access, and slightly have a higher chance of first-attempt failure because of needle deviation. Even with these technical issues, the use of 27-G Quincke needles was highly encouraged in terms of postoperative maternal comfort, decreased PDPH occurrence, as well as better clinical recovery, especially when used in elective Caesarean Section.

Gupta et al. (2018) contended that although the smaller-gauge spinal needles have clear benefits in terms of reducing Post-Dural Puncture Headache (PDPH), their use in practice in some of the patient groups is technically difficult. The authors described that 27-G needles, although they offer benefits of reducing dural trauma, are more flexible and hence hard to manage especially in obese parturients or women with distorted spinal anatomy. Among the concerns that were brought into the limelight were slower cerebrospinal fluid (CSF) flow using the finer needles, more time in the procedure, and higher chances of needle deviation that could result in fatigue among the operators during the insertion of the needles on the spine. These are particularly important in situations of emergent operations in which time efficiency in delivering anaesthetics is paramount. Nevertheless, Gupta et al. admitted that these do not limit them significantly when there is enough experience, training, and skill refinement. They determined that smaller-gauge needles are technically

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

challenging but the clinical advantages of reduced PDPH extremely match the inconvenience of the procedure when performed by qualified anaesthetists.

According to **Bissell et al. (2019),** PDPH has been identified as one of the most debilitating complications that can occur to postpartum mothers after spinal anaesthesia. They stressed that PDPH is a physical headache but an obstacle towards wholesome postpartum healing. In their findings, the PDPH has considerable effects on the disturbance of sleep cycles, is a contributor of psychological distress, causes mood fluctuations, and has serious impacts of limiting independence of mothers. This weakness impacts some of the key post partum roles including breastfeeding, neonatal, ambulation, and family interactions. Women with PDPH need more analgesic, a longer period of clinical monitoring, and even invasive interventions, thus raising healthcare costs and causing overload.. Even though this intervention is incredibly effective, it is invasive and has procure risks, which is why it is better to prevent than treat.

Choudhury et al. (2019), with the structural effect of needle-dura interaction being emphasized. They clarified how Quincke cutting tip needles cut through dural fibres, creating a linear and quite large tear through the dura mater, hence augmenting the risk of CSF exudation and intracranial hypotension. Notably, despite the Quincke needles, gauge size determines a determining factor. Both 25-G and 27-G Quincke needles cause much larger and more traumatic dural openings and narrower slits respectively. Such structural differences are the reason why smaller-gauge Quincke needles have always had low PDPH incidence. Their discussion had a strong backing to the conclusion that needle design and calibres were the direct determinants of PDPH risk.

Pereira et al. (2019) found repeated dural puncture attempts to be one of the most hazardous independent predictors of PDPH, featuring that despite smaller-gauge needles, repeated attempts result in numerous dural traumas. They noted that technical mistakes like improper positioning of a patient, midline deviation and anatomical differences are very high contributors to the risk of traumatic puncture. A key factor of PDPH incidence identified by Pereira et al. is the experience of the operator, as trainee anaesthetists had almost twice the PDPH incidence as senior consultants. It was determined in the study that needle gauge is also a significant factor, yet PDPH is a multifactorial complication that depends on the expertise of the procedure, accuracy of alignment, number of attempts, and anatomical peculiarities of a patient.

Lopergolo et al. (2019) as part of a large-scale meta-analysis of over 2,000 obstetric patients gave a good rationale in favor of the use of smaller-gauge Quincke needles. Their results showed that 27-G Quincke needles will decrease the incidence of PDPH by almost 40 percent relative to 25-G Quincke needles. This decrease was explained by the significantly smaller dural perforation made by the smaller needle, which allows quicker spontaneous closure and the decrease of CSF leakage. But the authors also admitted the technical shortcomings, as they mentioned that 27-G needles are more flexible, slower in CSF recovery and slightly more prone to failure on the first attempt because of needle deviation. Irrespective of these technical issues, postoperative maternal comfort, decreased PDPH rates, and enhanced clinical recovery were strongly in favour of 27-G Quincke needles especially when it comes to elective Caesarean Section surgeries.

Weji et al. (2020) described that PDPH is a frequent condition that occurs during the next 24-72 hours after spinal anaesthesia, which is also the most important stage of postpartum recovery. In these first days, ambulation, breastfeeding, maternal-infant bonding, and early mobilization are necessary in physiological and emotional stabilization of the mother. The development of PDPH in this critical interval has great negative effects on maternal health and postpones functional recovery. The authors have elaborated on the fact that conservative management measures such as bed rest, hydration, administration of caffeine and analgesic only bring partial and short-term relief since they do not resolve chronic cerebral spinal fluid leaking. The Epidural Blood Patch is the ultimate treatment in severe or persistent PDPH, but it is an invasive mode of treatment, uncomfortable, and carries risks, thus the significance of prevention interventions over a reactive model is essential.

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Kethireddy et al. (2020) highlighted that because of various physiological changes during a pregnancy, obstetric patients are predisposed to PDPH. These are low cerebrospinal fluid volume, high intra-abdominal pressure, full episodural veins, and a change in the dynamics of the spinal compartment. The authors have found that PDPH is common in the early postpartum phase when mothers require ambulation and breastfeeding and newborn bonding-processes that are especially reliant on comfort and mobility. Thus, the occurrence of PDPH in this stage is very detrimental to the maternal functioning and thus the need to ensure the spinal needle is selected in a manner that risks are minimized.

As **Smith et al. (2020)** noted, obstetric patients have a much greater rate of PDPH compared to non-obstetric surgical groups because they are much younger, experiencing greater dural compliance, and their cerebrospinal fluid dynamics during pregnancy are different. An important role of the proficiency of operators was also identified in the study, where consultant anaesthetists are reported to have higher success rates in the first attempts and record significantly lower rates of PDPH than trainee anaesthetists. Smith et al. also clarified that repeated dural puncture, the use of improper positioning at insertion, and anatomical complication are significant risk factors of PDPH despite the use of smaller-gauge needles. These results support the fact that even though needle gauge is significant, procedural expertise is still a significant outcome determinant.

Chen et al. (2025) provided solid evidence in the contemporary world, which went to gauge the needle and maternal recovery outcomes. They have found that incidence of PDPH was found to be 15 percent among women who received the spinal anaesthesia with a 25-G Quincke needle compared to 5 percent among women subjected to anaesthesia with 27-G Quincke needle. Also, the 27-G population had been found to have prior postoperative mobility, less analgesic need, more relaxing breastfeeding, faster maternal intervention in newborn care, and fewer hospitalization days. These results affirmed that needle gauge has a significant effect on not only the physiological progression of PDPH but also the general functional and psychological recovery indicators. Chen et al. concluded that finer-gauge spinal needles are more comfortable to women and lessen the workload of healthcare professionals, lead to an early discharge, and increase the efficiency of hospitals, making them a better clinical option in the present state of obstetric anaesthesia.

Kim et al. (2021) emphasized that PDPH is a clinical burden, as well as an important emotional and psychosocial issue of postpartum women. They claimed that mothers who had PDPH tend to feel more anxious, irritated, have sleep disruptions, and engage less in newborn bonding activities. The paper has highlighted that the first few months of the postpartum period are emotionally delicate and the fact that severe, posture-related headaches also increase the stress levels further makes women more susceptible to postpartum mood disorders. Kim et al. also elaborated that early ambulation, comfort at breastfeeding, and the capacity to take care of the newborn on their own, are all important elements of maternal satisfaction and confidence. PDPH interferes with all of these areas and it is imperative to ensure that its occurrence is minimized using evidence-based anaesthetic techniques such as the correct choice of spinal needles.

Hernandez et al. (2022) have mentioned the direct correlation of PDPH with delayed postoperative rehabilitation in patients in the obstetric unit. They found that PDPH is very much associated with lengthening bed confinement, limiting upright sitting, slows early physiotherapy and restricts routine mobilization following Caesarean Section. This slow mobility is a risk factor that causes mothers to develop secondary complications like muscle stiffness, back pain, venous stasis, constipation and limited pulmonary expansion. The authors of Hernandez et al. also reported that low mobility is likely to cause an extra workload on the health care staff since they tend to have more nursing support needs. In their results they presented that the best spinal technique and the application of fine-gauge Quincke needles can play a significant role in decreasing the PDPH-induced immobility, as well as enhancing the rate of postpartum recovery.

Ahmed et al. (2022) also stressed that institutional anaesthesia guidelines have a significant role in the PDPH outcomes in

patients with obstetric surgeries. In their examination, the healthcare centres that implemented standardised spinal procedures (including bevel guidance requirement, operator education, supervised spinal procedure, and small-gauge needles use) had significantly lower PDPH rates than clinics that did not. As also reported by Ahmed et al., despite the similarities in patient demographics, the hospitals with strict standpoints on the policy base showed to be more successful in maternal outcomes, smaller number of blood patches in epidurals, and shorter hospital stay. This implies that in addition to an individual level of technical proficiency, there exists an overarching level of governance and policy execution of systems that have a significant impact on PDPH prevention.
Martinez et al. (2023) investigated patient outcomes in PDPH after the spinal anesthesia in the Caesarean Section. They discovered that women who developed PDPH would always rate their experience in birth as unsatisfactory to those who had no complications. The participants complained about problems in breastfeeding position, the inability to enjoy the early interaction with the newborn, dependence on the caregivers, and a constant fear of prolonged pain. The researchers also pointed out that PDPH greatly affects the trust in the anaesthetic practice and causes fears of future neuraxial interventions (Martinez et al.). These results highlight the importance of the role of PDPH on the maternal perception of the quality of care, and it confirms the clinical role of selecting methods that guarantee the highest level of comfort and patient satisfaction.

MATERIAL AND METHODS

Study design

The paper employs a quantitative, comparative, randomized clinical trial research methodology to assess the impact of two tapered spinal needle gauges of Quincke, 25-G and 27-G, on the occurrence and severity of Post-Dural Puncture Headache (PDPH) and holistic recovery of patients who have had an elective Caesarean Section. The research was prospective and aimed to get quantifiable and similar results in the two groups. And the quantitative data were collected and statistically analyzed in order to find out their dependence on parameters of postoperative recovery and needle gauge.

Clinical Settings

The study was carried out at the Department of Anesthesia of a tertiary care hospital in which elective Caesarean Sections are regularly done under spinal anesthesia. The process of collecting data was conducted within the operating theatres and postoperative recovery wards. The study was done in collaboration with the anesthetists, obstetricians, and the nursing personnel and this meant that the normal protocols of doing the anesthetic procedures were adhered to during the study duration.

Study Duration

The study took place in a six months period following the synopsis approval by the institutional review committee. The data collection process was done on consecutive cases of elective Caesarean Section until the necessary sample size was reached.

Sampling Technique

To minimize selection bias, simple random sampling method was applied to assign the participants to the two groups of the study. Random number of eligible patients was to be selected and assigned to either Group A or Group B depending on computer generated random numbers. This provided all the participants with an equal choice of being selected and enhanced the validity of the findings.

Sample Selection

Inclusion Criteria:

- Female patients aged 18-40 years.
- The elective patients in Caesarean Section with a spinal anesthetic agent
- Patients giving informed consent to participate. Patients who do not have any contraindication to spinal anaesthesia.

Exclusion Criteria:

- Patients have history of the severe headache or the neurological disorders.
- The patients who are coagulopathic, infected or puncturally infected, or spinal deformed.
- Contraindicated patients of spinal anesthesia.

- Patients that declined to participate or revoked consent.
- Patients who need emergency Caesarean Section.

STUDY PARAMETERS

The experiment involved the impact of spinal needle gauge on the occurrence of Post-Dural Puncture Headache (PDPH) and the general recovery of patients who underwent an elective Caesarean Section.

DATA COLLECTION PROCEDURE

This part of the paper is an explanation of how the data was gathered systematically to attain the research objectives. There was the identification of the study variables, the appropriate data collection methods, the use of a structured proforma and a questionnaire, recording the appropriate postoperative outcomes and the categorization of the dependent and independent variables. All the data collection procedures were standardized to ensure reliability and uniformity in the data collection exercise.

Methods for Collection of Data

The data were gathered with the help of prospective observation method in the hospitalization period of the patients undergoing elective Caesarean under the spinal anesthesia. Patients were selected randomly and put in either of two categories under two conditions after receiving written informed consent: Group A (25-G Quincke needle) and Group B (27-G Quincke needle). All spinal blocks were done by certified anesthesia providers with the same aseptic practice and dosage of drugs. Patients were observed during the recovery ward and postoperative unit after surgery. The data on the frequency of the headache, the time when it started, the severity, and the related symptoms was collected at 6, 24, and 48 hours post anesthesia. The structured forms designed to be used in the current research were used to record the information on the need of additional analgesia, length of stay, and overall satisfaction. The primary investigator cross-examined all the collected data to ensure accuracy and then input into the analysis sheet.

Outcome Measurements

The outcomes measurements were conducted on both quantitative and qualitative data, which was gathered using the patient observation forms and structured questionnaires. All the outcome variables were characterized and measured on standardized scales and direct observations.

Key outcomes included.

Post-Dural Puncture Headache (PDPH) Incidence: Registered as a binary variable (Yes/No) according to the report of the patient and assessment by a medical worker within 48 hours of spinal anesthesia.

Severity of PDPH: Assessed on Visual Analogue Scale (VAS) with the presence of no pain (0) to the worst possible headache (10). The scores were used to classify the patients as mild, moderate, or severe.

Duration of PDPH: This was measured in terms of the number of hours or days since the headache began to its full relief. Requirement of the Additional Analgesia: Documented as the amount of additional doses of analgesics to be used on top of usual postoperative pain management through the hospitalization.

Duration of Hospital Stay: Measured by the total number of days between the surgery and discharge, obtained as hospital records.

Patient Satisfaction Level: Measured on a structured five-point Likert-scale questionnaire of comfort, mobility, pain control, and overall experience associated with spinal anesthesia. The data were analyzed by the principal investigator after they were checked to ensure the process was accurate and consistent.

DATA ANALYSIS PROCEDURE

The analysis was conducted after data collection was done in Statistical Package of the Social Sciences (SPSS) version 27 and Microsoft Excel as a mode of coding data, tabulating and statistically computing the data. There was data cleaning done to determine the values missing and rectify inconsistencies before ultimate processing. All categorical variables (including the presence of PDPH and the necessity of

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

additional analgesia) were numerically coded to conduct statistical analysis, whereas continuous ones (duration of headache and hospital stay) were represented in numerical forms which guaranteed accuracy and dependability of the findings.

ETHICAL CONSIDERATION

The research was done observing maximum ethical principles in order to protect the safety, rights, and dignity of every respondent. Since the study entailed human subjects whose elective Caesarian Section underwent the study, ethical compliance was upheld in the study. Prior to the collection of the data, the study was approved by the Institutional Review Board (IRB) and Research Ethics Committee. The operations were conducted in accordance with the general hospital anesthesia and surgical practices. Written consent was also given to all the potential subjects by giving them all the information on the purpose, procedures, potential risks, and benefits of the study in a language that they could easily comprehend.

RESULTS

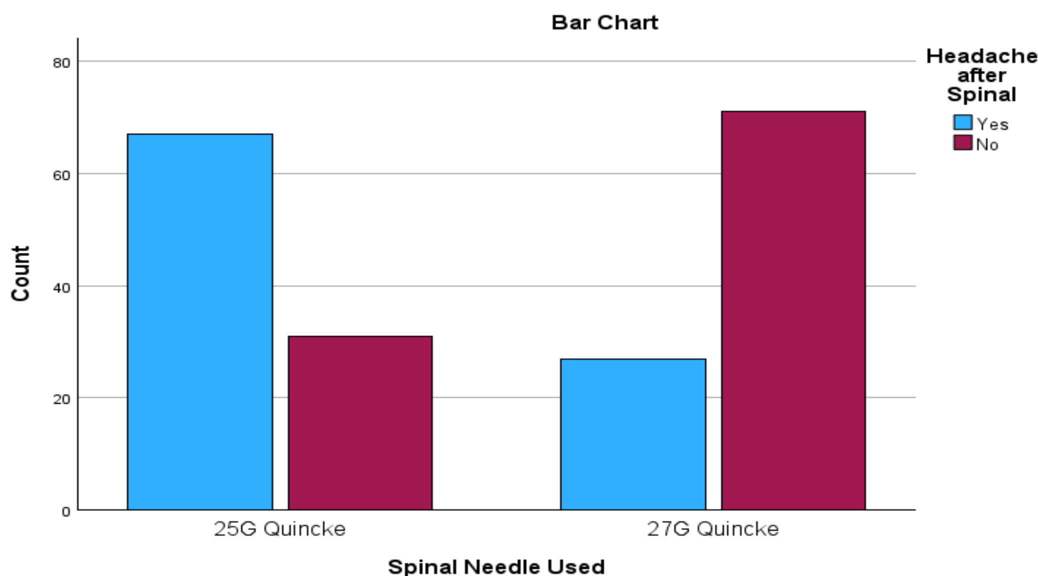
Table 7.1

Spinal Needle Used * Headache after Spinal Crosstabulation

Count

		Headache after Spinal		
		Yes	No	Total
Spinal Needle Used	25G Quincke	67	31	98
	27G Quincke	27	71	98
Total		94	102	196

Figure 7.1



The statistically highly significant statistical relationship between the gauge of spinal needle used and the incidence of Post-Dural Puncture Headache (PDPH) ($\chi^2 = 32.708$, df = 1, $p < 0.001$).). A very high rate of PDPH was observed among patients undergoing spinal anaesthesia using a 25G Quincke needle as compared to those undergoing spinal anaesthesia using 27G Quincke needle. On the other hand, lack of headache was significantly greater in the 27G group. Its results are statistically valid and reliable at adequate sample size with no anticipated cell count of less than 5. These findings suggest that the 27G Quincke spinal needle is far much better in the reduction of the PDPH occurrence.

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	32.708[a]	1	.000	.000	.000	
Continuity Correction[b]	31.093	1	.000			
Likelihood Ratio	33.692	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	32.541[c]	1	.000	.000	.000	.000
N of Valid Cases	196					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 47.00.
b. Computed only for a 2x2 table
c. The standardized statistic is 5.704.

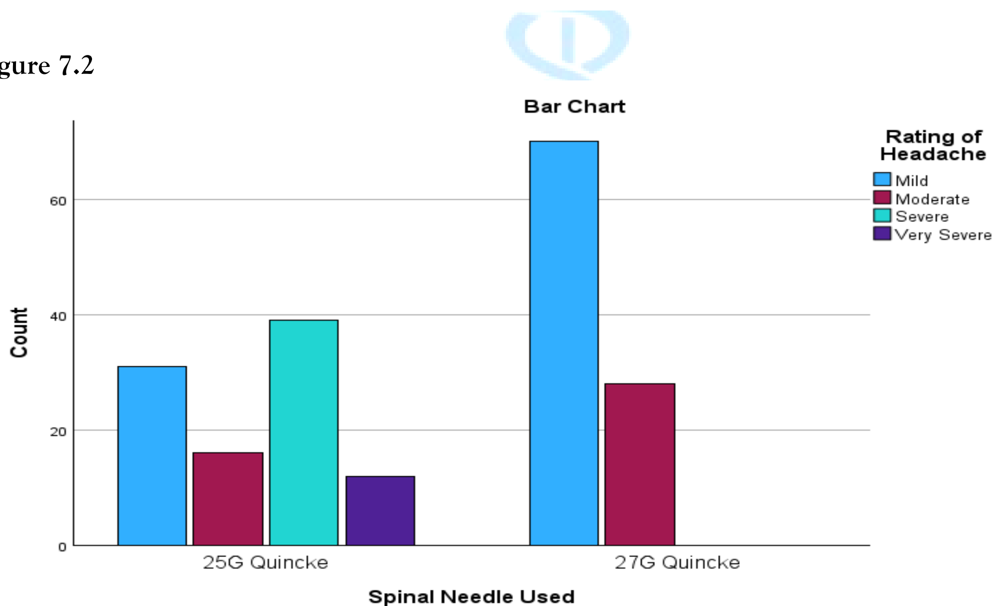
Table 7.2

Spinal Needle Used * Rating of Headache Crosstabulation

Count

		Rating of Headache				
		Mild	Moderate	Severe	Very Severe	Total
Spinal Needle Used	25G Quincke	31	16	39	12	98
	27G Quincke	70	28	0	0	98
Total		101	44	39	12	196

Figure 7.2



The severity of Post-Dural Puncture Headache (PDPH) is statistically significantly related to the gauge of used spinal needle ($\chi^2 = 31.070$, df = 1, $p < 0.001$). The proportion of severe and very severe headaches was significantly higher among patients in the 25G Quincke group but none of the patients in the 27G Quincke group had severe and very severe PDPH. The opposite was the case since the intensity of headaches was mostly mild to moderate among participants who had anaesthesia with a 27G Quincke needle. Since a sufficient sample size is used and there are no anticipated cell count of below 5, such results are statistically sound and valid and confirm that 27G Quincke spinal needle is

much better in terms of reducing the severity of PDPH.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	31.070[a]	1	.000	.000	.000	
Continuity Correction[b]	29.497	1	.000			
Likelihood Ratio	31.952	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	30.911[c]	1	.000	.000	.000	.000
N of Valid Cases	196					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 47.50.
b. Computed only for a 2x2 table
c. The standardized statistic is 5.560.

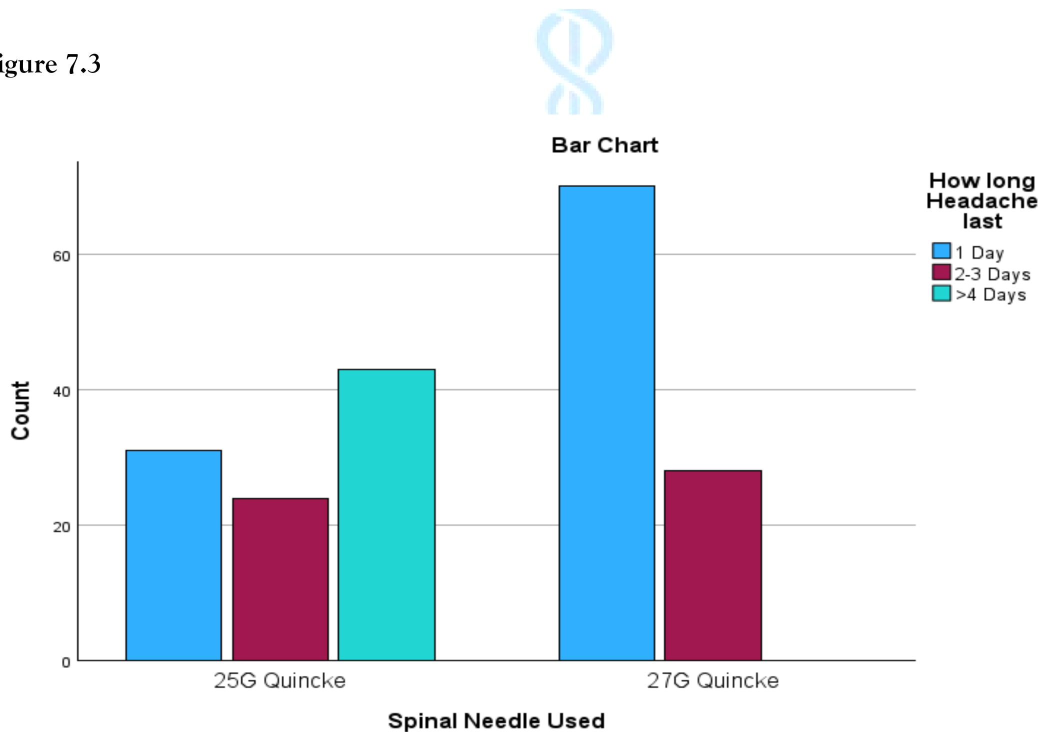
Table 7.3

Spinal Needle Used * How long Headache last Crosstabulation

Count

		How long Headache last			Total
		1 Day	2-3 Days	>4 Days	
Spinal Needle Used	25G Quincke	31	24	43	98
	27G Quincke	70	28	0	98
Total		101	52	43	196

Figure 7.3



The association between the gauge of spinal needle employed and the length of Post-Dural Puncture Headache (PDPH) is statistically highly significant ($\chi^2 = 58.367$, df = 2, $p < 0.001$). There was significantly more headache time in patients undergoing spinal anaesthesia with a 25G

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Quincke needle, which was more than 4 days in 43.9%. Conversely, all patients in the 27G Quincke group denounced headache to be more than 4 days; most patients had headache on one day with few on 2-3 days. These findings prove that the 27G Quincke spinal needle is better in the reduction of the length of PDPH with sufficient sample size and highly significant statistical tests.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	58.367[a]	2	.000	.000		
Likelihood Ratio	75.377	2	.000	.000		
Fisher-Freeman-Halton Exact Test	71.010			.000		
Linear-by-Linear Association	52.743[b]	1	.000	.000	.000	.000
N of Valid Cases	196					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.50.
b. The standardized statistic is -7.262.

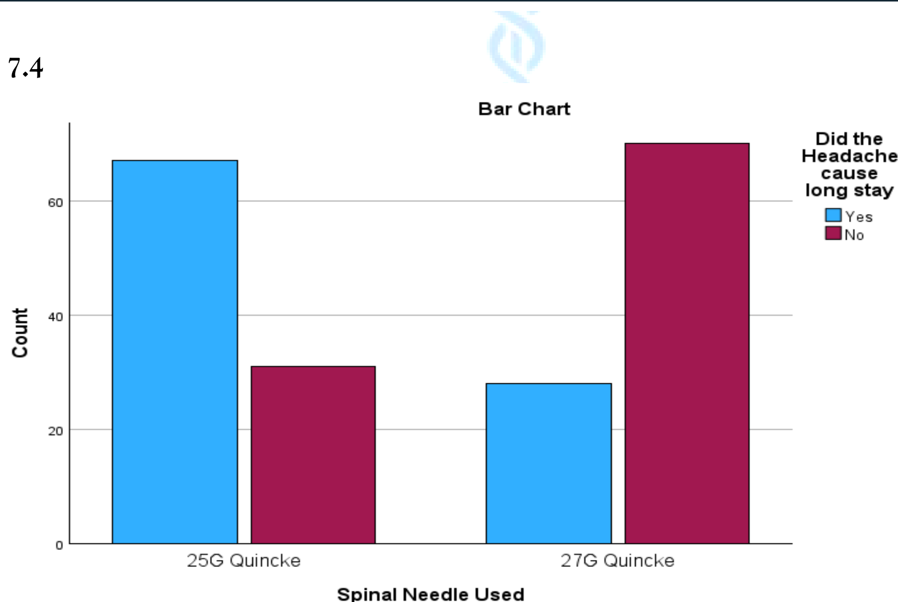
Table 7.4

Spinal Needle Used * Did the Headache cause long stay Crosstabulation

Count

		Did the Headache cause long stay		
		Yes	No	Total
Spinal Needle Used	25G Quincke	67	31	98
	27G Quincke	28	70	98
Total		95	101	196

Figure 7.4



The statistically significant association between spinal needle gauge used and the long time hospital stay as a result of PDPH is statistically highly significant ($\chi^2 = 31.070$, df = 1, $p < 0.001$). There was significantly greater percentage of patients in the 25G Quincke group who had protracted or extended hospitalization due to headache than the 27G Quincke group. On the other hand, patients who underwent spinal anaesthesia by using a 27G Quincke needle did

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

not have to spend longer time at the hospital. Having sufficient sample size and no anticipated cell frequency less than 5, the results are statistically valid and verify the conclusion that 27G Quincke spinal needle is better in terms of avoiding long hospitalization related to PDPH.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	31.070[a]	1	.000	.000	.000	
Continuity Correction[b]	29.497	1	.000			
Likelihood Ratio	31.952	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	30.911[c]	1	.000	.000	.000	.000
N of Valid Cases	196					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 47.50.

b. Computed only for a 2x2 table

c. The standardized statistic is 5.560.

DISCUSSION

The results of the current research have made it clear that the gauge of Quincke spinal needle exerts a significant impact on the incidence, intensity, duration, and the general outcome of Post-Dural Puncture Headache (PDPH) in obstetric patients who undergo spinal anaesthesia. PDPH was considerably higher in the group of patients in whom a 25G Quincke needle was applied, compared to patients who were subjected to spinal anaesthesia with a 27G Quincke needle. The percentage of headache developed by a significantly higher percentage of women in the 25G group but did not manifest in most patients of the 27G group. This high contrast with a significant chi-square value under 0.001 proves that the finer 27G needle is less traumatic to the dural and leads to less leakage of cerebrospinal fluid, which drastically decreases the possibility of PDPH.

The occurrence of headache was well below in 27G group not only, but the severity of the headache was much milder in such patients. A significant percentage of women in the 25G group reported severe and very severe headache which had a detrimental impact on their comfort and day-to-day functional activities but none of the patients in the 27G group reported severe and very severe PDPH. The intensity of headache was mostly mild to moderate in the ones anaesthetised by use of a 27G needle. This is a strong indication that a smaller dural puncture made by the 27G needle will restrict the amount of CSF lost and the intracranial hypotension and therefore limit the severity of the symptoms.

Another significant area of difference was that of duration of PDPH where there was a definite difference between the two types of needles. A significant percentage of patients experienced headache in the 25G Quincke group which lasted beyond four days greatly prolonging the sufferings and postponing the healing process. Contrastingly, none of the patients in the 27G group said that they had headache beyond four days and most only had one to three days of headache. This is because this shorter period of symptom duration is clinically significant

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

because it facilitates ambulation earlier, increased maternal infant interaction, enhanced placid breastfeeding, and faster postpartum recovery.
There was also another clinically significant result of this study, which consisted of the effect of PDPH on hospital stay. The 25G needle caused a headache that also caused prolonged hospital stay to a high number of patients, but the majority of women under the 27G needle did not need the extended stay and were discharged sooner. This is not only the indicator of improved clinical outcomes but also signifies the economic and logistic advantages of using 27G needles, lowered hospital load, decreased treatment demands, fewer treatments, and enhanced efficiency of healthcare.
In all analyses, the chi-square values were always high and p-values were always less than 0.001, which proves that these differences were not by coincidence. In addition, the expected frequencies of cells were not there, and statistical validity and reliability of the findings were not problematic. Combined, the research is highly suggestive that 27G Quincke spinal needle is a clinically better method than the 25G Quincke needle because it does not only decrease the occurrence, severity, and time period of PDPH but also prevents the necessity of the extended hospitalization. According to the above findings, the 27G Quincke needle could be regarded as a safer and more effective tool in performing spinal anaesthesia in obstetric practice, which leads to increased maternal outcomes and improved overall postoperative recovery.

CONCLUSION

According to the stated goals of the introduction with the help of the literature published previously and the results of the current research, it should be concluded that the gauge of Quincke spinal needle is the determining factor of the incidence, severity, duration, and clinical outcomes of the Post-Dural Puncture Headache in obstetric patients subject to spinal anaesthesia. In line with the literature, which indicates that finer needles produce less dural trauma and decrease cerebrospinal leakage, the outcome of this study clearly showed that the 27G Quincke needle is far much better than the 25G needle in terms of reducing the occurrence of PDPH to mild forms, decreasing duration of PDPH, and decreasing hospital stay. All statistical results were highly significant with $p < 0.001$, which proved that all higher differences were robust and clinically significant. Thus, incorporating the values of evidence based on current studies and results of the present research, it may be stated that the 27G Quincke spinal needle is a better, less risky, and safer option in the practice of obstetric anaesthesia to improve the comfort and recovery of the maternal patient, as well as the overall result of the postoperative period.

RECOMMENDATIONS

Following the results of the study, it is proposed to recommend the following measures to help improve the anesthetic practice and increase patient outcomes:

- The use of 27-G Quincke spinal needles during elective Caesarean Sections should be embraced in the hospitals to minimize the rate of PDPH and achieve quicker recoveries.
- The ideal approach would be to focus training sessions on the safe insertion of a needle and the anatomical accuracy to reduce dural harm and enhance the success rates.
- An effective system to monitor postoperative cases of PDPH and other complications should be put in place in order to detect and manage the condition in good time.
- The preoperative education of patients on spinal anesthesia should incorporate the idea of early reporting of adverse effects like headache or impaired vision so that it can be dealt with timeously.
- Future studies are needed to assess the cost-efficiency and efficiency of smaller-gauge needles in larger, multicenter studies to provide clinical validation on a wider basis.

RESEARCH LIMITATIONS

Although the study offers useful information regarding the spinal needle gauge and the postoperative outcomes, it has a number of limitations that need to be mentioned:

- The study was restricted to patients undergoing elective Caesarean Surgery and

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

as such, the study cannot be generalized to any other surgical population.

- The research was done in only one tertiary care hospital and this may not give a reflection of differences in practice amongst different hospitals.
- The number and duration of the samples were small, and bigger multicentre studies would be able to give more holistic conclusions.
- The subjective bias of self-reporting questionnaires was used in the evaluation of satisfaction. There was a comparison of two needle gauges (25-G and 27-G), the rest of the needle type and designs should have been included to give a comprehensive picture of the risk factors of PDPH.

REFERENCES

Vallejo, M. C., Mandell, G. L., Sabo, D. P., & Ramanathan, S. (2000). Postdural puncture headache: A randomized comparison of five spinal needles in obstetric patients. *Regional Anesthesia and Pain Medicine, 25*(3), 261–267. Europe PMC

Shah, A., Bhatia, P. K., & Tulsiani, K. L. (2002). Post-dural puncture headache in cesarean section—A comparative study using 25G Quincke and 27G Quincke needle. *Indian Journal of Anaesthesia, 46*(5), 373–377. healthcare-bulletin.co.uk

Butt, Z., Ali, M., Nazeer, T., Hussain, R., & Tahir, A. (2018). The frequency of post-dural puncture headache: Comparison of 25G Quincke spinal needle with 22G Whitacre. *Pakistan Journal of Medical & Health Sciences, 12*(4), 1727–1730. pjmhsonline.com

Devalla, A. R., Ninave, S. S., & Singam, A. P. (2021). To compare the incidence of PDPH using 25G Quincke and 25G Whitacre spinal needles in LSCS. *Journal of Evolution of Medical and Dental Sciences, 10*(13), 1001–1006. academia.edu

Jha, A., et al. (2022). Incidence and severity of postdural puncture headache following subarachnoid block with 25G cutting vs 25G non-cutting needles. *Journal of Clinical and Diagnostic Research, 16*(9), UC06–UC10. jcdr.net

Weji, B. G., Obsa, M. S., Melese, K. G., & Azeze, G. A. (2020). Incidence and risk factors of postdural puncture headache: Prospective cohort study. *Perioperative Medicine, 9*(1), 32. BioMed Central

Kim, J. E., Kim, S. H., Han, R. J. W., Kang, M. H., & Kim, J. H. (2021). Postdural puncture headache related to procedure: Incidence and risk factors after neuraxial anesthesia. *Pain Medicine, 22*(6), 1420–1425. OUP Academic

Biswal, D., Mishra, J., Sahu, B. P., Jena, S., & Nayak, S. R. (2023). Postdural puncture headache incidence with 25G and 27G Quincke needles after spinal anesthesia for elective cesarean section. *Asian Journal of Medical Sciences, 14*(2), 1–6. academia.edu

Choudhury, M., Virdi, J., & Kumar, M. (2019). Effect of spinal needle size and tip design on PDPH: A systematic look. *Karnataka Anaesthesia Journal, 5*(2), 37–42. karnatakaanesthesiajournal.in

A comparative trial: 27G Quincke vs 27G Whitacre in parturients—randomized controlled study (2025). *Journal of Chemical and Health Research, 5*(2025), Article 9979. jchr.org

Srivastava, V., et al. (2016). Incidence of PDPH in cesarean section: 25G Quincke vs 25G pencil-point. *International Journal of Contemporary Medical Research, 3*(12), 3512–3516. ijcmr.com

Shah, A., Bhatia, P. K., & Tulsiani, K. L. (2002). PDPH in cesarean section: 25G Quincke vs 27G Quincke vs 27G Whitacre. *Indian Journal of Anaesthesia, 46*(5), 373–377. ijlbpr.com

Bohara, C., Maharjan, R., Regmi, S., & Regmi, P. (2021). Comparison of PDPH using 25G Quincke vs 25G Whitacre in obstetric patients. *Nepalese Medical Journal* (preprint PDF). ResearchGate

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Imphal randomized, double-blind RCT (2019–2021): 25G cutting vs 25G non-cutting in lower abdominal surgery—findings applicable to obstetric PDPH risk. *Journal of Clinical and Diagnostic Research, 16*(9), UC06–UC10. jcdr.net

Observational cohort in cesarean deliveries identifying modifiable PDPH risks including needle size and attempts (2022). *Annals of Medicine and Surgery, 82*, 104–111. ScienceDirect

Study comparing 25G Quincke vs 25G Whitacre during C-section with outcomes on PDPH and attempts (2024). *Wolaita Sodo & KNE Open.* kneopen.com

Multiple-risk-factor analysis of PDPH in cesarean spinal anesthesia with Quincke needle (2024). *The Open Anesthesia Journal, 18*, e25896458339013. The Open Anesthesia Journal

Magnitude of PDPH and associated factors in obstetric mothers under spinal anesthesia for CS: Prospective study (2023). *ResearchGate preprint PDF*, 1–9. ResearchGate

Classic comparison of 25G Whitacre vs 25G Quincke—tip design and PDPH independent of diameter (1993). *Regional Anesthesia, 18*(3), 166–171.