



## Effect of Valsalva Maneuver on Pain Perception among Adult Patients Undergoing Spinal Procedures

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### Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### ABSTRACT

In a healthcare setting, procedure pain is a common source of discomfort for patients. One of the non-pharmacological approaches for reducing severe pain is the Valsalva Maneuver (VM). VM also significantly minimizes the pain produced by skin puncturing during spinal injection. This study was conducted to assess the effect of Valsalva maneuver on pain perception among adult patients undergoing spinal procedures. A quasi- experimental, with posttest only control group design was adopted for this study. Fifty adult patients who were selected using the convenient sampling

technique and were taught about the VM procedure by blowing into sphygmomanometer tubing and hold the mercury line up to 30 mm Hg for a period of minimum 20 seconds. The numeric rating scale (NRS) was used immediately after the spinal puncture. The results indicates that there is statistically significant reduction in pain among patients who performed VM ( $p=0.001$ ). The study concludes that the VM can be included routine protocol to reduce pain during any procedures.

**Keywords:** Valsalva maneuver; pain perception; spinal procedures; numeric rating scale (NRS).

## 1. INTRODUCTION

Suffering is choice, but pain is unavoidable. It's an all-too-common human experience. Everyone has gone through some form of pain at some point in their lives. Pain, according to Aristotle, is the soul's passion. Pain is the fifth vital sign, according to the American Pain Society. Pain is a substantial issue for many people, causing suffering and lowering quality of life.

The agony from any medical procedure could be worse than the suffering from the sickness itself. Nurses are in a unique position to learn about and implement emerging methods for reducing pain associated with procedures such as IV cannulation and spinal procedures etc. There are a variety of non-pharmacological methods for pain relief, including nursing activities. Such therapies are effective, simple, and safe, and they don't take a long time or require expensive equipment. Furthermore, in the non-pharmacological method, the side effects induced by pharmaceutical interventions are reduced [1].

Spinal anaesthesia is a simple and effective way to anesthetize the lower body. Many people, however, decline it due to a fear of needles and back pain. Infiltration analgesia and the EMLA patch are two treatments that have been utilized to alleviate the pain of needle insertion [2]. Local anaesthetics can cause discomfort during injection, and many anaesthetists are unsure whether infiltration analgesia at the site of spinal puncture offers any benefit over a puncture without analgesia.

The pain felt during a spinal puncture is a combination of physical and psychological factors. Pharmacological interventions, such as the use of local anaesthetics, target just the physical aspect of pain, whereas attention-diverting interventions, such as the use of a squeezing ball, address only the psychological aspect of pain [3,4,5].

The Valsalva Maneuver (VM) is one of the non-pharmacological strategies for reducing pain

associated with any invasive procedure like intravenous cannulation. VM raises intra-thoracic pressure, which is crucial for activation of sinoarotic baroreceptors and thus vagus nerve stimulation. Antinociception is induced by vagal stimulation [6]. Also, VM does not necessitate any expensive equipment. Patients undergoing cannulation find it simple to learn, and it decreases the level of pain during intravenous cannulation, increasing the success rate of venous cannulation. VM also significantly minimizes the pain produced by skin puncturing during spinal injection. Because this maneuver creates a distraction, it is beneficial in alleviating the pain of venipuncture [7,8].

Valsalva Maneuver-Related Physiological Changes is explained as followed: VM is divided into four different phases, each of which is linked to different physiological responses.

**Phase I:** From the starting of straining through the early rise of intrathoracic pressure, the blood pressure is rising, while the heart rate is remaining the same.

**Phase II:** This phase is marked by a reduction in venous return, which leads to a reduction in stroke volume and blood pressure (decreased cardiac output). In an attempt to bring blood pressure back to normal, the baroreceptor reflex is triggered, producing vasoconstriction and tachycardia (due to autonomic stimulation).

**Phase III:** Blood pools in the pulmonary arteries as a result of a further drop in intrathoracic pressure, resulting in a further drop in blood pressure.

**Phase IV:** Due to baroreceptor-mediated bradycardia, this phase is characterized by an increase in blood pressure above normal values and a recovery of heart rate to normal levels (a compensatory mechanism). The autonomic system is responsible for controlling the exaggerated responses and involves the baroreceptors, cardiopulmonary, and chemoreceptor reflexes [1].

Reducing pain during lumbar puncture: A lumbar puncture is used to obtain the cerebrospinal fluid. Due to its action in controlling nociceptive pain, VM has been shown to lessen the skin puncture discomfort associated with needle insertion [9]. One of the nonpharmacological approaches for reducing the pain of spinal puncture has been described as VM. The process is based on an increase in intrathoracic pressure, which causes baroreceptor activation. Antinociception is thought to be induced by activation of either the cardiopulmonary baroreceptor reflex arc or the sinoaortic baroreceptor reflex arc.

Valsalva maneuvers during venous cannulation have been shown to reduce venipuncture pain in adults according to a study by Agrawal et al., [10]. A quasi-experimental study was conducted to determine the effect of the Valsalva maneuver on pain severity during needle insertion into the arteriovenous fistula in hemodialysis patients with 35 samples. In terms of subjective pain due to needle insertion before intervention, the study found that 14.3%, 71.4%, and 14.3% of the investigated units had mild, moderate, and severe pain, respectively. Mild, moderate, and severe pain was experienced by 42.9%, 45.7%, and 11.4%, respectively, after intervention. According to Wilcoxon test results, the subjective pain intensity caused by needle insertion was reduced significantly [11]. Hence, this study was conducted to assess the effect of Valsalva maneuver on pain perception among adult patients undergoing spinal procedures.

## 2. MATERIALS AND METHODS

A quasi- experimental, with posttest only control group design was adopted for this study. Fifty adult patients who undergo routine surgical procedure like lumbar puncture were selected using the convenient sampling technique. Extensive review on the effect of Valsalva maneuver (VM) on pain was done by the researchers prior to the study. As it is noninvasive and earlier studies described that baroreceptor activation provokes nociception, no harm certificate and ethical clearance was taken from the institutional ethical board.

The patients of the study group were taught about the procedure and demonstration of the procedure (blowing into sphygmomanometer tubing and hold the mercury line up to 30 mm Hg for a period of minimum 20 seconds) by the patients was ensured prior to the spinal procedure. The numeric rating scale (NRS) was used to assess the pain perception which is caused by skin puncturing in spinal injection. All patients were premedicated with 10 mg diazepam orally one hour before the procedure. The pain intensity was assessed immediately after the spinal puncture. Heart rate and blood pressure also were monitored before, during and 3 minutes after the procedure. After completion of the data collected from the study group, next 25 patients who underwent the spinal procedure were selected as control group and those patients underwent the routine protocol.

The data was split into two sections for analysis.

- 1) The use of descriptive statistics: The socio demographic and clinical data of the participants were analyzed using frequencies and percentages distribution. The level of pain was assessed using the mean and standard deviation.
- 2) Inferential statistics: The effectiveness of the Valsalva technique on pain level was determined using an independent “t” test, and the relationship of pain level with chosen socio-demographic characteristics was determined using a Chi-square test.

## 3. RESULTS AND DISCUSSION

In this study, the patients in the study group (60%) falls in the category of 45-50 years of age and in control group (40%) were more than 50 years of age. Most of the patients (52%) of adults in study group and (60%) in control group did not underwent any formal education. Maximum of the adults (80%) in study and (84%) in control group were employed. 56% of patients in study and (60%) in control group were having less than 10,000 rupees as monthly family income. The study results indicated that both the groups were similar in terms of socio-demographic variables.

**Table 1. Distribution of pain perception (NRS) by the patients after the procedure**

Severity of pain (NRS)	Study group		Control group	
	No.	%	No.	%
Mild (1 -3)	17	68	2	8
Moderate (4-6)	6	24	15	60
Severe (7 -10)	2	8	8	32

**Table 2. Effectiveness of valsalva maneuver in reducing pain**

Group	Mean	SD	't' value	'p' value
Study Group	1.76	1.234	13.81	0.001
Control Group	4.97	2.019		

The Table 1 depicts the distribution of pain perception by the patients after the spinal procedures. It shows that the patients in the study group who followed the VM, had less pain as compared to the control group. The similar findings were reported in few studies which was done during venipuncture and spinal procedures show that VM had significantly reduced the pain intensity among the patients [12,13].

A comparison study was conducted on 70 hemodialysis patients. They were collected from two Isfahan hospitals, Amin Medical Center and Hazrat-e Zahra-e Marziye Hospital, employing easy sampling. The participants were then divided into two groups, one receiving the valsalva movement and the other receiving ice massage. An interview questionnaire was used to obtain data. The Abbey pain scale as well as a numerical pain rating was used to assess the level of pain. After the intervention, there was no significant change in objective pain assessment between the two groups ( $P=0.73$ ), according to the test results. This study also found that patients in the Valsalva maneuver group reported less pain than those in the ice massage group ( $p=0.04$ ). When compared to ice massage, the Valsalva maneuver lowers greater objective pain [13].

The Table 2 shows the effectiveness of the VM in reducing pain among adult patients. It indicates that there is statistically significant reduction in pain among patients who performed VM during the spinal procedure ( $p=0.001$ ) according to the NRS of pain. Similar findings were reported in the study by Mohammadi, Sussan Soltani; Pajand, Amin Ghasemi; Shoeibi, Gita [9] on efficacy of the Valsalva Maneuver on needle projection pain and hemodynamic responses during spinal puncture concluded that Valsalva maneuver can reduce the skin puncture pain related with spinal needle projection<sup>8</sup>.

A study conducted by Kadyan R et al., [14] also concluded that Valsalva maneuver is effective technique in reducing pain associated with IV cannulation. Sundaran J et al., [15] reported comparable findings, stating that there had been a considerable decrease in the ( $p=0.05$ ) amount of pain after doing the valsalva maneuver. As a

result, the valsalva maneuver appears to be effective method for lowering the amount of pain in patients. According to the findings, the valsalva maneuver had a substantial impact in reducing pain in patients undergoing lumbar puncture like spinal procedures. Hence, this VM can be included in the pain reduction protocol among hospitalised patients.

#### 4. CONCLUSION

The findings of the study concludes that the VM can be used as routine procedure while performing the painful procedures to the patients to reduce pain as it is non – invasive and non – pharmacological technique.

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#### CONSENT

The informed consent was obtained from the patients before the data collection.

#### ETHICAL APPROVAL

Ethical clearance was taken from the institutional ethical board.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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