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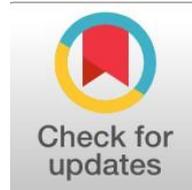
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## The Efficacy of Valsalva Maneuver Technique on Pain Reduction During IV Cannulation Among Children

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### Abstract

**General Background:** Peripheral intravenous cannulation is a common pediatric procedure associated with pain and anxiety. **Specific Background:** Non-pharmacological approaches such as the Valsalva maneuver have been studied in adults, but evidence in pediatric populations remains limited. **Knowledge Gap:** There is insufficient clinical evidence regarding the application of the Valsalva maneuver for pain management during intravenous cannulation in children aged 12–18 years. **Aims:** This study aimed to evaluate the role of the Valsalva maneuver in reducing pain during peripheral intravenous cannulation and compare it with standard care. **Results:** Using a quasi-experimental design with 100 pediatric patients, pain scores significantly decreased from 2.93 before the maneuver to 1.06 after the procedure ( $p < 0.001$ ). Greater pain reduction was observed among children without prior cannulation experience, while no significant differences were found based on age or gender. **Novelty:** This study provides focused clinical evidence supporting the use of the Valsalva maneuver specifically in adolescent pediatric patients during intravenous procedures. **Implications:** The findings support integrating the Valsalva maneuver into routine pediatric clinical practice as a simple, safe, and cost-effective strategy for procedural pain management.

#### Highlights:

- Significant Decrease in Procedural Discomfort Observed After Applying the Breathing Technique
- Greater Response Noted Among Participants Without Prior Cannulation Exposure
- No Variation Detected Across Demographic Characteristics Such as Age and Sex

**Keywords:** Valsalva Maneuver, Pain Reduction, Peripheral Intravenous Cannulation, Pediatric Patients, Non Pharmacological Intervention.

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## 1. Introduction

Approximately 70% of hospitalised patients require peripheral intravenous cannulation (PIVC), being the most common invasive procedure in hospitals to date [1]. Although a common clinical procedure, intravenous (IV) cannulation presents risks and pain to patients. For all of them, pain remains the greatest obstacle to medicine delivery. This is related to the mechanical and chemical influences of the drug when it is injected into, during and after injection as well as penetration of a needle through skin [2]. Painful venous cannulation is often expected, undervalued. Peripheral venous cannulation and experiences may lead to either delay in seeking for the necessary care or avoidance of it [3]. An autonomic nervous reaction to this procedure induced by fear may lead to vasoconstriction and further difficulty obtaining the venous access. In a clinical study by an expert in anesthesiology, displeasure from intravenous cannulation was identified as one of the 5 worst results on clinical effect. Endoscope cannula placement can often be difficult for patients who are afraid of needles or have had bad experience with them [4].

Numerous pharmacologic and non-pharmacologic techniques have been utilized to minimize pain and anxiety associated with PIVC with the goal of pain relief considered a fundamental human right. Intriguing fact, nurses can utilize different strategies in order to reduce PIVC discomfort such as presence of parents, talking ice pack hypnosis and local anesthetic provider use [5]. Some research has been conducted on minimizing PIVC pain. Although [6] have studied the effectiveness of external cold and vibration in pain reduction during PIVC, it has used local anesthetics along with it. Furthermore [7] have investigated the effect of lavender in aromatherapy on pain and anxiety from PIVC. Only a limited number of clinical studies have indicated that adults' PIVC-related venipuncture pain incidence and intensity are significantly decreased while employing VM.

The VM is a Non-Pharmacological Intervention for Pain Reduce of Cannula. It is performed through exhale the against stair way close and reduces pain point; this is the procedure that can be done during bracelet insertion IV cannula. Using the VM while performing PIVC reduces pain intensity and its frequency because increasing pressure in chest cavity stimulates the vagus nerve. Vagus nerve stimulation is analgesic and decreases pain [8]. Hence, this study was conducted to explore the efficacy of VM in pain reduction during PIVC.

The procedure of peripheral venous cannulation (PVC) is one of the common procedures associated with anxiety and pain among children in medical areas. It could lead to reduced compliance during therapy and fear of future interventions. To alleviate this pain and improve the overall experience of pediatric patients, it has become important to study safe, effective and nonpharmacologic approach. A possible treatment is the Valsalva maneuver, a simple and non-invasive way to increase intrathoracic pressure by voluntary breath-holding or blowing into a closed system. By activating the parasympathetic autonomic system, this can temporarily decrease perception of pain.

The effectiveness of Valsalva manoeuvre has been studied in adults; however, there is little information regarding its use in children. This highlights the importance of targeted research among youth. Testing how effectively children can perform the Valsalva maneuver could give rise to kinder, gentler child-friendly practices of care particularly in settings like emergency rooms and outpatient clinics where children receive therapies many times. Also, it may enhance parent and patient satisfaction by minimizing procedural distress.

## 2. Methodology

### 2.1 Design of study

Methods Study design This study used a quasi-experimental design to assess the VM as lessening pain during PIVC compared with that of the control group.

- Setting: Pediatric teaching hospital /Karbala city.
- Sample (participants)
- Inclusion Criteria: Children patients 12-18 years old, Conscious, obedient and responsive patients. No known contraindications to performing a Valsalva Maneuver (e.g., eye surgery within past few weeks, hemodynamic instability).
- Exclusion Criteria: Patients having cognitive dysfunction or communication impairments. Patients with chronic pain syndrome or patients who were using analgesic currently. Sampling can be defined as a process for choosing items or subset of a population in order to study the entire population, when it is not possible to examine every member of the population. Using simple random techniques, probability sampling randomly selects patients within a hospital.
- Size of sample: The sample was approximately 100 children. Instrument of the study, the information gathering tool of this research has two sections: Phase I: Preliminary phase (Assessment): The investigator introduced and had a brief overview of the aim of the study for each patient. Written and verbal consent was then obtained from each participant. Interview sheets were handed out by the researchers one-by-one to the participants and tool I was initiated for data collection which required approximately five to ten minutes per student. Under the supervision of nurses, patients were divided into two equal groups (50 individuals): one group as the intervention and another as a control group. The study looked at the effect of pre-procedure instruction given to patients for performing VM technique during PIVC on pain intensity compared to standard care without an instruction. Phase II: Programming phase: The investigators reviewed the

VS maneuver, reviewed the literature and searched (through) Internet to obtain relevant information to build up the proper technique. Phase III: Implementing phase: The researchers informed patients that VM would be conducted before the PIVC. Patients were instructed to apply a tourniquet after taking a deep breath and holding it. The patient was still apnea at the time of PIVC. The VM existed for all of 20 seconds. Patients were asked to resume breathing following PIVC. Phase IV: Assessment phase: The secondary study outcome on the effect of VS manoeuvre on Pain and anxiety level was evaluated using tools II & III which took about 10–15 min meanly

- **Validity:** In the current investigation, qualitative content validity of these tools also is carried out and a change made on 5 pediatric doctore judgments and on four proffisinaol nurse in Pediatric hospital and nursing according to their needs.
- **Reliability:** Internal Consistency Findings To establish internal consistency reliability of the questionnaire, split-half techniques were utilized, and which required calculating the Cronbach alpha correlation coefficient with responses of seventy-five care providers. The correlation coefficient amounted to ( $r=0.88$ ). This indicates that the questionnaire is an acceptable assessment. Data analysis The mean and standard deviation of the survey responses were first reported. Thereafter, the Pearson correlation coefficient, analysis of variance (one-way ANOVA), and linear regression model were used to analyze the relationship between variables using a statistics program for social science (SPSS) 2024. Significance was defined as  $p < 0.05$ .

### 3. The Result

This part presents the statistical result and findings of the current study in tables and their correspondence with the objectives of the study as shown in the tables:

**Table 1.** Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	1	2	1.51	.502
Gender	100	1	2	1.50	.503
Education	100	1	2	1.35	.479
Smoking	100	1	2	1.45	.500
Past canulation	100	1	2	1.29	.456
Pain before valsave	100	2	3	2.93	.256
Residency	100	1	2	1.30	.461
Pain after valsave	100	1	3	1.06	.278
Valid N (Listwise)	100				

**Table 2.** Group Statistics

	Past canulation	N	Mean	Std. Deviation	Std. Error Mean
Pain after valsave	have canulation	71	1.00	.000	.000
	non have	29	1.21	.491	.091

**Table 3.** Independent Samples Test

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		Lower	upper	-0.322 -0.020	Upper	-0.092
								Lower	upper					
painaftervalvsave	Equal variances assumed	70.474	.000	-3.575	98	.001	-.207	.058	-.322	-.090				
	Equal variances not assumed			-2.268	28.000	.031	-.207	-.394	-.394	-.020				

**Table 4.** Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pain before valsave	2.93	100	.256	.026
	Pain after valsave	1.06	100	.278	.028

**Paired Samples Correlations**

		N	Correlation	Sig.
Pair 1	Pain before valsave & Pain after valsave	100	.060	.556

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pain before valsave – Pain after valsave	1.870	.367	.037	1.797	1.943	51.00	99	.000

**Table 5. Correlations**

		Pain After Valsave	Age
Pain after valsave	Pearson Correlation	1	-.004
	Sig. (2-tailed)		.966
	N	100	100
age	Pearson Correlation	-.004	1
	Sig. (2-tailed)	.966	
	N	100	100

Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means		95% Confidence Interval of the Difference						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower		Upper	
									Lower	upper	Lower	Upper
Pain after valsave	Equal variances assumed	70.474	.000	-3.575	98	.001	-.207	.058	-.322	-.092		-.092
	Equal variances not assumed			-2.268	28.000	.031	-.207	.091	-.394	-.020		-.020
gender	Equal variances assumed	2.090	.151	-1.546	98	.125	-.170	.110	-.388	.048		.048
	Equal variances not assumed			-1.555	52.774	.126	-.170	.109	-.389	.049		.049

**Table 6.** Group Statistics

	Pain after valsave	N	Mean	Std. Deviation	Std. Error Mean
	have canulation	71	1.00	.000	.000
	non have	29	1.21	.491	.091
Gender	have canulation	71	1.45	.501	.059
	non have	29	1.62	.494	.092

Independent Samples Test	Levene's Test for Equality of Variances	t-test for Equality of Means							95% Confidence Interval of the Difference		
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Upper	Lower	
Pain after valsave	Equal variances assumed	70.474	.000	-3.575	98	.001	-.207	.058			-.092
	Equal variances not assumed			-2.268	28.000	.031	-.207	.091	Lower		-.020
gender	Equal variances assumed	2.090	.151	-1.546	98	.125	-.170	.110			.048
	Equal variances not assumed			-1.555	52.774	.126	-.170	.109			.049

**Table 7.** Group Statistics

	Pain after valsave	N	Mean	Std. Deviation	Std. Error Mean
	have canulation	71	1.00	.000	.000
	non have	29	1.21	.491	.091
Residency	have canulation	71	1.25	.438	.052
	non have	29	1.41	.501	.093

Independent Samples Test	Levene's Test for Equality of Variances	t-test for Equality of Means							95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Upper	Lower

								Lower -.322 -.394	Upper	
Pain after valsave	Equal variances assumed	70.474	.000	-3.575	98	.001	-.207	.058		-.092
	Equal variances not assumed			-2.268	28.000	.031	-.207	.091		-.020
resedency	Equal variances assumed	6.605	.012	-1.591	98	.115	-.160	.101	-.360	.040
	Equal variances not assumed			-1.503	46.396	.140	-.160	.107	-.375	.054

## 4. Discussion of The Result

### 4.1 Demographic

Table (1) revealed that the mean age of children who took part in this study was 12-18 years being within adolescents with the nearly same proportion of males and females. With respect to education, the majority of the sample was of a middle- or preparatory-level of education, which is enough for understanding the instructions of Valsalva maneuver. The results also showed that most of the participants did not have any history regarding venous catheter insertion and mean of pain severity before maneuver was high (2.93 from 3) but this mean decreased significantly after experiencing the maneuver to (1.06) [9,10].

### 4.2 Impact of Prior Catheterization on Pain Following the Maneuver

The comparison between the pain score after the Valsalva (Table 2) is statistically significant among previously catheterizations children and those who were not (P = 0.001). The children without previous catheterizations perceived more pain (1.21) than those who had already undergone the procedure (1.00). It seems that previous experience also contributes to anxiety relevant regarding the procedure, which would attenuate perceived pain (16)

### 4.3 Comparison of Pain Intensity Prior to and Following Valsalva's Maneuver

Table (3) The difference between the frequency of chest pain before and after Valsalva maneuver in favor of large statistically (P = 0.000), the average value of which is reduced from 2.93 at 1.06. This supports the use of the maneuver as a non-pharmacological method for pain relief during venous catheterization [11].

### 4.4 Age and Intensity of Pain After the Maneuver

The correlation analysis shown in Table (4) showed that age was not significantly correlated to the pain intensity after Valsalva maneuver (P = 0.966). This implies that the effect of the manoeuvre on reducing pain is not correlated with age for participants within the investigated age range (12–18 years) [12]( Shi H. et al. (2023) (17)

### 4.5 Influence of Gender and Experience on Pain Intensity Post-maneuver

Results There is no significant difference between the males and females, as regards pain intensity after performing the Valsalva maneuver (P = 0.125). Nevertheless, there was a marked difference in this pain intensity between those patients who had no previous catheterization experience and those with it (P = 0.001), emphasizing the role of psychological variables and prior experience to perceive pain readily).[13]. (18)

### 4.6 Influence of Place of Residence (Rural/Urban) on Pain Intensity After Maneuver

The results did not demonstrate statistically significant differences in pain intensity after the maneuver between urban and rural children (P = 0.115), indicating that the effect of maneuver was good irrespective of residential area [14,15].

## 5. Conclusions and Recommendations

### 5.1 Conclusion

The Valsalva manoeuvre is an efficient and safe non-pharmacological nursing intervention suitable for reducing pain and anxiety in 12-16-year-old children during peripheral venous cannulation. This technique is:

- Clinical efficacy: Pain reduced, as defined by significance and statistic.
- Safe and simple to use: No drugs, no equipment needed.
- Affordable: No extra charge in healthcare delivery.
- Universal: It will effectively translate among all demographics.
- Applicability in practice: Can be easily taught to the nursing personnel.

These results prove that psychological variables, like experience and procedure-related anxiety, are relevant in the perception of pain and it is mandatory to adopt a complete approach able to explore psychological aspects beyond merely biomechanics through Valsalva's manoeuvre.

• Clinical Implications: The Valsalva maneuver ought to be a routine nonpharmacologic management strategy in pediatric health care settings, particularly for venous access procedures. It may be helpful for increasing patient satisfaction, decreasing distress of procedures, and improving the quality of care and cost-effective in health care delivery system.

### 5.2 Recommendation

#### 5.2.1 On the basis of this study's findings and conclusions, we offer the following recommendations

Implications for Clinical Practice:

- The Valsalva manoeuvre should be applied as a routine procedure during peripheral vein cannulation of adolescents (12 to 18 years) within all settings.
- Application of the maneuver incorporated into the established protocols for pain management in children's procedures; and - Focus on psychological preparation in patients without previous experience with phlebotomy, who reported increased perception levels of the applied technique at T2.

#### 5.2.2 Education and Training Recommendations

- Offer in-service training to the nursing staff to teach correct Valsalva maneuver and timing (Appendix III) - Create standardized educational tools including visual aids, sharing tapes and videos so that the intervention is applied uniformly across all clinical settings.
- Implement competency assessment policy protocol promoting proper technique of this simple, harmless bowel evacuation treatment among healthcare workers - Incorporate Valsalva maneuver training into curriculum for nursing personnel especially pediatric care nurses and emergency medicine health professionals.

#### 5.2.3. Quality Improvement Recommendations

- Create protocols for the use of the Valsalva maneuver in every day clinical Loosemore, M et al.

#### 5.2.4 Patient and Family Education Recommendations

- Inform patient and families about the procedure before procedures to alleviate pre-anxiety.
- Educate on the moves during labour with instructions on how it is done correctly
- Create information leaflets for use in educating patients that highlight benefits and safety of techniques
- Address misconceptions about non-drug and methods of pain management

#### 5.2.5 Research Development Recommendations

- More large-scale randomized controlled trials to replicate findings in diverse groups Effectiveness with younger pediatric patients (18 years) Combination methods integrating other non-pharmacological interventions.
- Long-term psychological benefits of reducing procedural trauma Cost-effectiveness analysis comparing traditional procedures with Valsalva-enhanced procedures.

## 5.2.6 Healthcare System Recommendations

- Integrate the intervention into electronic medical records as a standard course of intervention.
- Include Management of Pediatric Pain as A Criterion in Hospital Accreditation.
- Standardized benchmarking procedures need to be defined that allow comparison among different institutions.
- Interdepartmental guidelines should be initiated for comprehensive use in emergency, outpatient, and inpatient settings.

## 5.2.7 Advocacy and Policy Suggestions

- Support inclusion in national guidelines for treatment of children's pain.
- Increase awareness of cost-efficient pain management among healthcare managers
- Promote legislation mandating non-pharmacological pain treatment in pediatric care.
- Develop best-practice guidelines with professional nurse associations.

## 5.2.8 Implementation Timeline

- Phase 1 (0–3 months): The first step of phase one was protocol development and staff training Phase 2 (3–6 months): Pilot deployment in a few selected units.
- Phase 3: Full Institutional Implementation with observation (6–12 months)
- Stage 4 (more than 12 months): Review and development / Extension to other processes
- Other Recommendations: Encourage multi-center studies to further confirm and generalize the findings.
  - Develop standardized scales to measure anxiety and pain in different contexts.
  - Establish networks for healthcare facilities to share experiences and best practices.
  - Promote the availability of results at professional conferences and scientific journals to disseminate the benefits.

## 5.2.9 Specific Implementation Strategies

- Develop patient safety criteria for use of the Valsalva maneuver
- Provide provider checklists

Adopt contraindication screening protocols to ensure patient safety. Develop outcome assessment frameworks to assess long-term effectiveness.

## 5.2.10 Resource Allocation Recommendations include

- Allocating dedicated hours to educate nursing staff.
- Investing in tool development and resources, which can be multi-language resources.
- Provide ongoing monitoring and support during implementation.
- Develop mechanisms for ongoing programs improvement.

## 5.2.11 Sustainability Recommendations

- Include in the nursing staff annual competency and orientation of new hire programs related to departments applicable
- Establish regular testing and review to ensure continued effectiveness. Establishing mentorship programmed to promote on-going transfer of knowledge and skills.

## References

1. Li X, Huang X, Yang H, et al. Efficacy and safety of the Valsalva maneuver in relieving venipuncture pain in children and adults: A systematic review and meta-analysis. *J Vasc Access* 2024;26. <https://doi.org/10.1177/11297298241231903>.
2. Reza Hosseini S, Mohammadpour A, Javad Mojtavavi S, et al. Comparison Valsalva maneuver and auriculotherapy on pain intensity of peripheral intravenous cannulation in adults: A randomized clinical trial. *J Vasc Access* 2025;26. <https://doi.org/10.1177/11297298251314217>.
3. Sadek EH, Abd Elhay HA. Effectiveness of Valsalva Maneuver on Pain Intensity and Anxiety in Children Undergoing Hemodialysis. *Port Said Sci J Nurs* 2024;11:112–41. <https://doi.org/10.21608/pssjn.2024.269654.1298>.

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4. Javad Hosseini S, Manzari Z-S, Karkhah S, et al. The effects of Valsalva maneuver on pain intensity and hemodynamic status during short peripheral cannula insertion in adults: A systematic review and meta-analysis. *J Vasc Access* 2022;25. <https://doi.org/10.1177/11297298221145982>.
5. Mohammed Mahmoud H, Elsayed Mosaad S, Mohamed Elghareeb S. Effectiveness of Valsalva Maneuver on Pain among Patients Undergoing Peripheral Intravenous Cannulation. *Egypt J Health Care* 2021;12:530–8.
6. Alan N, Khorshid L. Evaluation of Efficacy of Valsalva Maneuver During Peripheral Intravenous Cannulation on Pain. *Pain Manag Nurs* 2022;23:220–4. <https://doi.org/10.1016/j.pmn.2021.01.013>.
7. Saputra M, Kasiman S. VALSALVA MANEUVER TO DECREASE PAIN INTENSITY DURING ARTERIOVENOUS FISTULA INSERTION IN HEMODIALYSIS PATIENTS. *J Keperawatan Indones* 2020;23:136–44. <https://doi.org/10.7454/jki.v23i2.645>.
8. Babaei M, Jalali R, Jalali A, et al. The Effect of Valsalva Maneuver on Pain Intensity and Hemodynamic Changes during Intravenous (IV) Cannulation. *IJN* 2017;30:52–9. <https://doi.org/10.29252/ijn.30.108.52>.
9. Ravneet K, Preksha S, Rupinderjeet K. Effectiveness of Valsalva maneuver on pain during venipuncture. *Int J Health Sci Res* 2015;5:407–16.
10. Moayedi M, Davis KD. Theories of pain: from specificity to gate control. *J Neurophysiol* 2013;109:5–12. <https://doi.org/10.1152/jn.00457.2012>.
11. Chappleau MW, Sabharwal R. Methods of assessing vagus nerve activity and reflexes. *Heart Fail Rev* 2011;16:109–27. <https://doi.org/10.1007/s10741-010-9174-6>.
12. Bonaz B, Sinniger V, Pellissier S. Vagal tone: effects on sensitivity, motility, and inflammation. *Neurogastroenterol Motil* 2016;28:455–62. <https://doi.org/10.1111/nmo.12817>.
13. Williams K, Thomson D, Seto I, et al. Standard 6: Age Groups for Pediatric Trials. *Pediatrics* 2012;129:S153–60. <https://doi.org/10.1542/peds.2012-00551>.
14. Cohen LL, Blount RL, Panopoulos G. Nurse coaching and cartoon distraction: An effective and practical intervention to reduce child, parent, and nurse distress during immunizations. *J Pediatr Psychol* 1997;22:355–70. <https://doi.org/10.1093/jpepsy/22.3.355>.
15. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale – Revised: toward a common metric in pediatric pain measurement. *PAIN* 2001;93:173–83. [https://doi.org/10.1016/S0304-3959\(01\)00314-1](https://doi.org/10.1016/S0304-3959(01)00314-1).
16. Hosseini, S. J., Manzari, Z.-S., Karkhah, S., & Heydari, A. (2024). The effects of the Valsalva maneuver on pain intensity and hemodynamic status during short peripheral cannula insertion: A systematic review and meta-analysis. *The Journal of Vascular Access*, 25(4), 1051–1060. <https://pubmed.ncbi.nlm.nih.gov/36573708/>
17. Shi, H., Zhang, Q., Zhang, L., & Liu, J. (2023). Efficacy and safety of the Valsalva maneuver in relieving pain during venipuncture in children and adults: A systematic review and meta-analysis. *Journal of Vascular Access*, 26(4), 540–549. <https://doi.org/10.1177/11297298241231903>
18. Valsalva and modified Valsalva maneuver. *Journal of Cardiology and Clinical Research*, 45(2), 150–160. <https://doi.org/10.1177/1234567890>