- *Basic Research*

Valsalva Maneuver: Reducing Procedural Pain and Anxiety for Patients Undergoing Peripheral Intravenous Cannulation

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Abstract

Introduction: Peripheral intravenous cannulation is one of the most prevalent invasive procedures used to treat diseases and it is often painful and distressing for the patients. In patients undergoing IV cannulation the valsalva maneuver is helpful in minimizing pain and anxiety **Aim**: Evaluate the effectiveness of valsalva maneuver on procedural pain and anxiety for patients undergoing peripheral venous cannulation. **Methods**: A quasi-experimental research design was utilized to conduct this study on 100 patients undergoing peripheral intravenous cannulation at the Medical Research Institute in Alexandria Hospital. **Tools**: Three tools were used in this study to collect data. Tool I: Structured Interview sheet, Tool II: Visual Analogue Pain Scale (VAS): and Tool III Visual Analogue scale for anxiety (VAS-A) **Results:** There was a statistically significant reduction in pain severity and anxiety level total mean scores in the study group after application of valsalva maneuver than the control group. Also, there was a significant association between pain level and a total mean score of anxiety. **Conclusion**: Valsalva Maneuver can be applied during peripheral intravenous cannulation as an effective nursing intervention in decreasing pain and anxiety **Recommendations:** Valsalva Maneuver should be incorporated in nursing intervention protocols during performing the peripheral intravenous cannulation for reducing pain and anxiety levels.

Keywords: Valsalva Maneuver, Procedural Pain, Anxiety, Peripheral Intravenous Cannulation.

Introduction

Pain is difficult to describe due to the complexities of its anatomical and physiological fundamentals, the uniqueness of its perception, and its culture and social events attached to it. The international association for the study of pain (IASP) termed pain as "An unpleasant, subjective, sensory and emotional experience associated with actual or potential tissue damage". In nursing care settings procedural pain is a major cause of patient discomfort **(Raja et al., 2020)**. Peripheral intravenous cannulation (PIVC) is still the most commonly used invasive nursing technique in inpatients and approximately 70% of patients require

PIVC during hospitalization. Even though intravenous cannulation is a common therapeutic procedure, it carries significant hazards and can induce a patient's pain. **(Alexandrou et al ., 2018, & Blanco et al., 2019).**

Procedural pain of peripheral intravenous cannulation is sometimes underestimated. Previous venous cannulation experiences may result in the avoidance or postponement of necessary medical care. Fear of this procedure may provoke an autonomic nervous response, resulting in vasoconstriction and subsequent venous access difficulties **(Mendonça, et al., 2020).** Most patients are afraid of the pain of intravenous cannulation. The extent to which a patient fears intravenous cannulation is determined by their character, sex, culture etc. Previous intravenous cannulation exposure may lead to evading or delaying required medical treatment. Cannula insertion is often difficult for those who are afraid of needles or have had terrible experiences with needles (**Anjana, 2015).**

Pain alleviation is considered a fundamental human right, and a number of pharmaceutical and non-pharmacological methods were used to decrease pain and anxiety during PIVC. Nurses can utilize diversional therapy, music therapy, parental presence, topical anesthetic, hypnosis, and ice compresses as alternative strategies for alleviating PIVC-related discomforts **(Ali et al.,2016 & Caddye, 2020)**. There have been studies on how to alleviate the pain associated with PIVC. **Karaman, et al ., 2016** has investigated the effects of lavender oil on PIVC-associated pain and anxiety. In addition, **Lozano, et al., 2021** explored the feasibility and potential efficacy of local anesthetics on pain intensity during PIVC insertion. Furthermore, **Basak et al., 2020** found the distraction-based relief of pain related to peripheral intravenous catheterization in adults. In some clinical studies, the Valsalva Maneuver (VM) performed during PIVC was found to effectively minimize the frequency and intensity of venipuncture pain and anxiety in patients.

Valsalva Maneuver is one of the easiest techniques to be learned and practice. This technique is safe, effective, self- induced by the patient, evidence base, inexpensive and free from side effects. It is done by attempting a relatively powerful exhale against a sealed airway **(Ravneet et al .,2015 and Alan et al.,2021).** During Valsalva maneuver the thoracic cage contract, compressing the lungs and increasing intrathoracic pressure causing compression of vessels in the chest and, as a result, baroreceptor activation. Antinociception is induced when the cardiopulmonary baroreceptor reflex is activated. Baroreceptors in the cardiopulmonary (CP) system are hypothesized to influence baroreflex regulation of sympathetic nerve activity. Increased intrathoracic pressure promotes loading of CP baroreceptors, which causes regulation of baroreflex controlling nerve activity and antinociception. The sympathetic nervous system is activated and controlled by Valsalva bar receptors, which reduces pain perception **(Vijay et al.,2013 & Kadyan, 2017).**

Valsalva Maneuver seems to be a non-pharmacological strategy that is simple to perform for patients undergoing cannulation and minimizes the pain intensity thereby eventually raising the achievement level of venous cannulation. This technique creates a distraction; thus, it is beneficial for alleviating the pain of venipuncture **(Sharma &George, 2018)**. It is necessary to impose some form of non-pharmacological therapy, such as the Valsalva maneuver to decrease the pain and anxiety throughout venipuncture in hospitalized patients **(Babaei et al., 2017)**.

Significance of the Study:

Procedural pain during PIVC is a significant cause of concern for caring patients, and it is exacerbated by factors such as anxiety and previous cannulation. Many studies have attempted to overcome this problem in a number of methods, including the use of pharmaceutical agents, which are usually costly and have associated health risks.

As the literature review revealed limited studies assessing valsalva maneuver during peripheral venous cannulation in Egypt, a lack of data necessitates the design of this study. For these reasons, there was an urgent need to conduct this study on the valsalva maneuver, which is affordable and simple to conduct, is one of the pain-relieving treatments used by nurses. It is also hoped that this effort will generate attention and motivation for further studies on this topic.

Aim of the Study: This study aimed to evaluate the effectiveness of valsalva maneuver on procedural pain and anxiety level for patients undergoing peripheral venous cannulation.

Research hypothesis:

$H_{1:}$ Patients undergoing peripheral venous cannulation, who perform valsalva maneuver will have less pain, than those who do not practice it.

$H_{2:}$ Patients undergoing peripheral venous cannulation, who perform valsalva maneuver will have less anxiety, than those who do not practice it.

Operational Definitions

Valsalva maneuver:

Valsalva maneuver is a technique that involves forcing exhalation against a sealed glottis and holding it for at least 20 seconds.

Peripheral Intravenous cannulation*:*

A 20G intravenous cannula is inserted into a peripheral vein.

Subjects and Methods:

Research Design: A quasi-experimental research design was used to conduct this study.

Settings: The present study was conducted at surgical departments at the Medical Research Institute in Alexandria. The surgical departments consist of two floors, each floor contains five rooms, and each room has four beds.

Subjects:

- A purposive sample of 100 patients, in the above- mentioned settings were recruited in the study. They were randomly assigned into two equal study and control groups (50patients each). ***Control group (G1);*** received hospital conventional treatment only, while the ***study group(G2) ;*** performed valsalva maneuver.
- The **Epi- info-7 program** was used to calculate the minimum sample size based on the following criteria, the population size of 650, the prevalence rate of 50%, confidence coefficient of 95%, and acceptable error of 10%. The minimum sample size required is 100 patients.
- **Inclusion criteria:** Adult patients aged from21-60 years, patients who were getting cannulated on the arm and agree to take part in the study.
- **Exclusion criteria:** Patient had heart disease, respiratory disease, neurological disease, glaucoma, having skin problems in the arm, lung cancer, chronic pain, anxiety disorders, hearing problems, long usage of analgesia, or neuropathy of peripheral nerves, and those who are difficult to cannulate.

Tools:

In this study, three tools were used to gather data.

Tool I: Structured Interview sheet the researcher was created, this tool after reviewing the relevant literature **(Kadyan, 2017&Tapar et al., 2018).** It was composed of three parts:

Part I: Patient's demographic data such as; age, gender, residence area, marital status, educational level and occupation.

Part II: Data about cannulation such as; cannulation site, previous cannulation exposure, number of cannulation attempts.

Part III: Physical assessment sheet: physiological parameters (vital signs) such as respiratory rate, pulse, and blood pressure.

Tool II: Visual Analogue Pain Scale (VAS):

- This tool was created by **(Melzack and Katz , 1994)**. It was a self-report instrument used to assess and evaluate pain severity and how pain feels right now. It was adopted and converted into the Arabic language. It is made up of a horizontal line that is used to measure the subjective patient's pain.
- It consists of a ten- point numerical rating scale that matches the level of pain with zero indicating no pain and ten indicating the worst degree of pain. Between these two extremes values, terms such as mild, moderate, severe, and intolerable are allocated.
- The patient was instructed to choose a number from ten point's numerical continuum that corresponded to pain perceived which has been classified as no pain (0), mild pain (1-3), moderate pain (4-6), severe pain (7-9) and the worst extreme pain (10).

Tool III: Visual Analogue Scale for Anxiety (VAS-A)

- It was developed by **(Hornblow& Kidson,1976)**. It was used to measure current anxiety level at this moment.

- It's a plain and uncomplicated self-rating scale. It is comprised of a 10-centimeter horizontal line with the words “not at all anxious” and “very anxious” at the left and right extremes correspondingly, and the following written instructions. “Please put a cross on the line shown below to indicate how feels right now. A mark at the extreme left end would indicate that the patient is feeling not at all anxious. A mark at the extreme right end would indicate that the patient is feeling the most anxious could ever imagine. A mark near the center would indicate that the patient feels moderately anxious.
- Anxiety levels were categorized as no anxiety (0), mild anxiety (1-3), moderate anxiety (4-6) and severe anxiety (7-10).

Method:

- A written endorsement from the Ethics Committee of Faculty of Nursing, Alexandria University was acquired.
- After clarifying the study's aim, an endorsed letter from the Faculty of Nursing, Alexandria University was offered to the managers and head of the departments of the selected hospital settings to take their agreement for conducting the study.
- **Tools validity**: Tool I was created by the researcher and translated into Arabic, and tools II and III were adapted. Five specialists in the area of Medical-Surgical Nursing, Faculty of Nursing at Alexandria University, tested the tools to ensure the applicability, and clarity of its items. The jury's comments and recommendations were taken into account, and necessary changes, corrections, and clarifications were made to the items.
- The Cronbach's Alpha statistical test was used to assess the tool's reliability. The tool I, II, and III were found to be internally reliable, with Cronbach's Alpha values of 0.90, 0.84, and 0.80, correspondingly, indicating high tool reliability.
- A pilot study: Before to data collection phase, a pilot study on ten patients was conducted to confirm the clearness, feasibility, and appropriateness of the tools and determine any obstacles that may be faced during the data collection process; correspondingly, necessary modifications were made. The subjects of the pilot study were not included in the study.

- Data were gathered over a period of four months, from the beginning of December 2020 to the end of March 2021.
- Patients who met inclusion criteria were randomly selected using the purposive sampling method and distributed into two equal groups (control group and study group). (50patients each) as following**:**
    - Group one (control group): received hospital conventional treatment only.
    - Group two (study group): performed valsalva maneuver.

- Data were collected by the researcher initially from the control group and then from the study group to prevent any influence on the practices of patients in the control group.

For the study group:

- Each patient in the study group was interviewed individually before the PIVC for approximately 30 minutes. The researchers introduced themselves to the patient and clarified the purpose of the study. During the interview, collect data from the patient using tools I and III.
- The researchers seemed to implement the intervention and educate the subjects on how to performed valsalva maneuver.
- The patient was instructed to sit comfortably on the bed and to close his eyes and keep them closed (if possible) until the finish of the technique. For the relaxation training, the researchers demonstrated each action of the VM technique and then inquired the patient to re-demonstrate it, as follows:
- The patients were taught to take deep breath and inhale deeply through the nose Exhale slowly via the lips, bringing the navel in toward the spine as the patient exhales. Repeated the deep breathing cycle 3-5 times (as patient tolerance).
- The researchers told the patient to lie down in a supine position with the tourniquet were wrapped around the forearm.
- The patients were instructed to cover their nose and mouth as tightly as possible with their hands while attempting maximum expiration. The respondent was asked to perform the valsalva technique for 16–20 seconds without pausing, with a maximum of 5 seconds of expiration. The nurse inserted the PIVCs after a 5-second wait. During PIVCs insertion, the patient maintained maximal expiration from16 or 20 seconds.
- The patient was then instructed to trim the technique by breathing deeply and note how much quieter and relaxed he/she felt.
- Each patient was evaluated after immediately PIVC using all study tools (Tools I part III, II & III to determine the effect of VM on pain and anxiety levels which took approximately 15–20 min.

For the control group:

The patients in the control group received routine care. Each patient was interviewed for around 15 minutes to collect data from them using a tool I. After PIVC insertion the patient was evaluated using tools I, II&III.

Ethical consideration:

- Verbal consent was taken from each patient to share in the study after clarification of the goal of the study.
- The privacy of study participants was asserted
- Confidentiality of the collected data was assured.

- Participation in the study was voluntary and the right to withdraw from the study at any moment was emphasized.

Statistical Analysis:

- The Statistical Package for the Social Sciences (SPSS) software version 25.0 was used for all statistical analyses. Continuous variables with a normal distribution are described using the mean and standard deviation, while categorical data is represented using frequency (percent). The Chi-square or Fisher's exact test, as well as independent t-tests, were utilized to investigate categorical and continuous data. The Kolmogorov-Smirnov test was used to determine the normal distribution of data. In addition, a one-way ANOVA test was utilized. The significance of the observed results was estimated to be less than 0.5 %.

Results:

Table (1) Percentage distribution of study and control groups in relation to their demographic characteristics (n=100)

Demographic Characteristics		Control (n=50)		Study (n=50)		χ^2 Test	P value
		No	%	No	%		
Age (Years)	< 40	25	50.0	28	56.0	0.452 t=1.20	0.858 0.234
	40 <50	16	32.0	15	30.0		
	50 < 60	9	18.0	7	14.0		
	Range **Mean ±SD**	20-55 37.54±10.31		21-55 37.12±9.5			
Gender	Male	27	54.0	31	62.0	0.657	0.418
	Female	23	46.0	19	38.0		
Marital status	Single	11	22.0	12	24.0	FE1.22	0.760
	Married	35	70.0	31	62.0		
	Widow	3	6.0	5	10.0		
	Divorced	1	2.0	2	4.0		
Level of education	Uneducated	8	16.0	11	22.0	0.982	0.837
	Primary education	10	20.0	8	16.0		
	Secondary education	22	44.0	23	46.0		
	Higher education	10	20.0	8	16.0		
Residance	Urban	14	28.0	17	34.0	0.364	0.688
	Rural	36	72.0	33	66.0		
Occupation	Manual	16	32.0	15	30.0	□□□□□	1.000
	Professional	5	10.0	6	12.0		
	Not working	29	58.0	29	58.0		

Table (1) revealed that half of the patients in the control group (50.0%) and more than half of the study groups (56%) were less than 40 years old with average means of 37.54±10.31and 37.12±9.5 respectively. More than half of the control group (54.0%) and the study group (62.0%) were males. The majority of patients in the control group (70.0%)

and in the study group (62.0%) were married, and less than half of the control group (44.0%) and study group (46.0%) had secondary educated. Around two- thirds of the studied patients in the control group (72%) and (66%) in the study group are from a rural area. More than half (58.0%) of patients in the control and study groups were not working and housewives. The differences in characteristics were not statistically significant.

Table (2) Percentage distribution of the study and control groups according to their data of cannulation.

Data of cannulation.		Control (n=50)		Study (n=50)		χ 2 Test	P value
		No	%	No	%		
Canulation site	Dorsum the of hand	27	54.0	24	48.0	0.698	0.781
	Inner surface of forarm	16	32.0	20	40.0		
	Outer surafce of forarm	7	14.0	12	12.0		
Number of cannulation attempts	Frist	42	84.0	36	72.0	FE2.35	0.342
	Second	7	14.0	11	22.0		
	More than two	1	2.0	3	6.0		
Previous cannulation	Yes	41	82.0	43	86.0	0.289	0.585
	No	9	18.0	7	14.0		
Previous cannulation experience	Mild pain	4	8.0	6	12.0	2.08	0.576
	Modrate pain	12	24.0	17	34.0		
	Sevre pain	25	50.0	20	40.0		
	No prior experince	9	18.0	7	14.0		

χ^2: Chi square test, MC: Monte Carlo

Table (2) illustrates that more than half had cannulation in the dorsum of the hand, (54.0%) in the control group and nearly half (48.0%) in the study group. The majority of the studied patient (84.0%) in the control group and (72.0%) in the study group were first time exposed to cannulation, and (82.0%) of the control group and (86.0%) from the control group had previous cannulation experience.

Table (3) Difference in pain level between patients of both study and control group post intervention (n= 100).

Pain level	Control (n=50)		Study (n=50)		χ 2 Test	P value
	No	%	No	%		
No pain	10	20.0	17	28.0	10.34	0.014*
Mild pain	16	32.0	24	48.0		
Moderate pain	20	40.0	7	14.0		
Severe pain	4	8.0	2	2.0		
Mean ±SD	3.64±2.43		2.14±2.15		*t*=3.26	0.002*

Table (3) showed that 40.0% of patients were had moderate pain followed by 32.0% of them had mild pain while 20.0% had no pain and 8.0% of them had severe pain in the control

group as compared to the study group it was found that 48.0% of them had mild pain followed by 28.0% had no pain while 14.0% of them had moderate pain and 2.0% of them had severe pain. There were significant differences between them at p (0.014). Moreover there were significant differences between the mean pain score of the control and study group.

Table (4) Difference in anxiety level between patients of both study and control group pre/ post intervention (n= 100).

Anxiety level	Control(n=50)				Study(n=50)				Test of sig.(p_1)	Test of sig.(p_2)
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
No anxiety	0	0.0	0	0.0	0	0.0	4	8.0	χ^2= 3.24 (0.198)	χ^2=8.19 (0.03)*
Mild anxiety	18	36.0	20	40.0	12	24.0	28	50.0		
Moderate	23	46.0	25	50.0	32	64.0	16	38.0		
Sever anxiety	9	18.0	5	10.0	6	12.0	2	4.0		
Mean ±SD	4.42±1.59		4.54±1.45		4.54±1.45		4.22±1.32		t=0.393 (0.695)	t=2.72 0.008*

χ^2: Chi square test, MC: Monte Carlo t: Student –t test
p_1: p value for comparing between study and control pre p_2: p value for comparing between study and control post

Table (4) revealed that around half 46.0%of the control group and more than half 64.0%of the study group had moderate anxiety before implementing VM with no statistically significant difference between the two groups. However, after implementing VM the anxiety level was decreased in study group, but not in control group with a statistically significant difference between the two groups. Furthermore, there were significant differences in the mean anxiety score of the control and study groups.

Table (5) Comparison between mean and standard deviation of physiological parameter between patients of both control and study groups pre/post the intervention (n= 100).

physiological parameter	Control (n=50)		Study (n=50)		Test of sig.(p_1)	Test of sig.(p_2)
	Pre	Post	Pre	Post		
Respiratory rate	16.82±2.70	17.90±2.52	16.50±1.61	16.64±1.52	t=0.719 (0.474)	t= 3.02 (0.003*)
Pulse rate	80.32±10.79	79.06±11.66	78.00±8.23	74.12±5.17	t=1.20 (0.230)	t=2.73 (0.007*)
Systolic	122.80±8.81	123.20±8.67	121.0±8.14	120.00±8.57	t=1.06 (0.29)	t=1.85 (0.067)
Diastolic	84.00±5.71	82.80±6.40153	83.40±4.78	80.30±6.57	t=0.56 (0.571)	t=1.92 (0.057)

p_1: p value for comparing between study and control pre p_2: p value for comparing between study and control post

Table (5) shows that there were no statistically significant differences in the respiratory rate, heart rate, and systolic and diastolic blood pressure mean scores of patients in the study and control groups prior to implementing the VM. Moreover, there were significant differences between respiratory rates, heart rate mean scores of control and study groups.

Table (6) Relation between the studied groups' in pain severity and demographic characteristics

Socio-demographic characteristics	Pain severity															
	Control (n=50)								Study (n=50)							
	No pain		Mild		Moderate		Severe		No pain		Mild		Moderate		Severe	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Age (years)																
< 40	7	14.0	11	22.0	6	12.0	1	2	13	26.0	13	26.0	2	4.0	0	0.0
40 <50	2	4.0	5	10.0	9	18.0	0	0.0	4	8.0	9	18.0	1	2.0	1	2.0
50 < 60	1	2.0	0	0.0	5	10.0	3	6.0	0	0.0	2	4.0	4	8.0	1	2.0
$\chi 2(^{FE}p)$	14.88(0.01*)								15.35(0.005*)							
Gander																
Male	7	14.0	12	24.0	8	18.0	0	0.0	14	28.0	16	32.0	0	0.0	1	2.0
Female	3	6.0	4	8.0	12	24.0	4	8.0	3	6.0	8	16.0	7	14.0	1	2.0
$\chi 2(^{FE}p)$	9.67(0.015*)								14.72(0.001*)							
Marital status																
Single	1	2.0	1	2.0	2	4.0	2	4.0	4	8.0	6	12.0	2	4.0	0	0.0
Married	7	14.0	7	17.0	17	34.0	2	4.0	12	24.0	14	28.0	3	6.0	2	4.0
Widow	1	2.0	1	2.0	1	2.0	0	0.0	1	2.0	2	4.0	2	4.0	0	0.0
Divorced	1	2.0	1	2.0	0	0.0	0	0.0	0	0.0	2	4.0	0	0.0	0	0.0
$\chi 2(^{FE}p)$	11.10(0.17)								6.73(0.72)							
Level of education																
Uneducated	2	4.0	4	8.0	1	2.0	1	2.0	5	10.0	5	10.0	0	0.0	1	2.0
Primary school	3	6.0	2	4.0	4	8.0	1	2.0	4	8.0	2	4.0	2	4.0	0	0.0
Secondary school	5	10.0	6	12.0	10	20.0	1	2.0	7	14.0	10	20.0	5	10.0	1	2.0
Higher	0	0.0	4	8.0	5	10.0	1	2.0	1	2.0	7	14.0	0	0.0	0	0.0
$\chi 2(^{FE}p)$	8.18(0.49)								15.73(0.023*)							

Residance																
Urban	3	6.0	3	6.0	7	14.0	1	2.0	4	8.0	9	18.0	3	6.0	1	2.0
Rural	7	14.0	13	26.0	13	26.0	3	6.0	13	26.0	5	10.0	4	8.0	1	2.0
$\chi 2(^{FE}p)$	1.35(0.82)								1.85(0.63)							
Occupation:																
Manual	1	2.0	4	8.0	8	16	2	4.0	8	16.0	7	14.0	1	2.0	0	0.0
Professional	3	6.0	0	0.0	2	4.0	1	2.0	3	6.0	2	4.0	0	0.0	0	0.0
not working	6	12.0	12	24.0	10	20.0	1	2.0	6	12.0	15	30.0	6	12.0	2	4.0
$\chi 2(^{FE}p)$	9.69 (0.143)								7.68 (0.266)							
Canulation site																
Dorsum of the hand	2	4.0	8	16.0	13	26.0	4	8.0	6	12.(	12	24.0	4	8.0	2	4.0
Inner surface of arm	6	12.0	8	16.0	2	.0	0	0.0	10	20.(	10	20.0	0	0.0	0	0.0
Outer surface of forarm	2	4.0	0	0.0	5	10.0	0	0.0	1	2.0	2	4.0	3	6.0	0	0.0
$\chi 2(^{FE}p)$	16.68(0.003)*								11.61(0.035*)							
Number of cannulation attempts																
Frist	5	10.0	13	26.0	20	40.0	4	8.0	7	14.0	21	42.0	6	12.0	2	4.0
Second	4	8.0	3	6.0	0	0.0	0	0.0	8	16.0	2	4.0	1	2.0	0	0.0
More than two	1	2.0	0	0.0	0	0.0	0	0.0	2	4.0	1	2.0	0	0.0	0	0.0
Previous cannulation																
Yes	8	16.0	13	26.0	17	34.0	3	6.0	12	24.0	24	48.0	6	12.0	1	2.0
NO	2	4.0	3	6.0	3	6.0	1	2.0	5	10.0	0	0.0	1	2.0	1	2.0
$\chi 2(^{FE}p)$	0.84(0.95)								10.19 (0.009*)							

Table (6) describe that there was a significant relation between the level of pain and demographic characteristics such as age, gender, cannulation site and the number of cannulation attempt in control and study groups.

Table (7) Relation between pain severity and anxiety level among patients of both control and study groups.

Pain severity	Level of Anxiety			
	Control (n=50)		Study (n=50)	
	Mean±SD	Test of sig.(p)	Mean±SD	Test of sig.(p)
No pain	4.00±1.49	F:5.002 (0.004*)	3.00±1.54	F:6.715 (0.001*)
Mild pain	4.93±1.52		3.33±1.65	
Moderate pain	5.15±1.38		5.42±1.33	
Severe pain	7.25±0.95		6.50±0.70	

F: ANOVA test

Table (7) Illustrates that there was a statistical relation between pain severity and anxiety among subjects undergoing peripheral intravenous cannulation in control and study groups P= (0.004 and 0.001), respectively.

Discussion:

In the healthcare setting, procedure pain is a significant source of discomfort for patients. During any nursing procedure, it is critical to pay close attention to pain. So healthcare providers should emphasize the role of effective pain managing strategies. The insert of PIVCs is required for many therapeutic interventions during hospital stays. Because pain relief measures are a fundamental human right, it is the nurse's responsibility to use the best approach to pain management **(Feo & Kitson., 2016)**. Valsalva maneuver should be an important part of the PIVCs procedure because it helps to minimize pain intensity and anxiety accompanying with PIVCs and helps to maintain quality care. This technique can be applied to nursing education and nursing practice to enhance the quality of nursing care. So the objective of the study is to evaluate the effectiveness of valsalva maneuver on procedural pain and anxiety level for patients undergoing PIVCs.

The current study revealed that there was a significant lowering in pain means scores of the study group post applying VM when compared to the control group. These results have been confirmed with other studies, such as the study conducted by **(James ,2019)** Which examines the effect of VM on the perception of pain during PIVCs on sixty patients in a selected hospital in the city of Kerala, India. The result showed that the control group's mean pain score was considerably greater than the experimental group's pain score. The Valsalva maneuver was demonstrated to be beneficial in controlling pain.

The current findings are consistent with those of **(Sharma and George ,2018)** who found that adults in the experimental group had decreased mean post-test pain scores than those in the control group. Another study by **(Sundaran etal ., 2016)** found that the use of Valsalva maneuver minimizes pain intensity related to peripheral intravenous cannulation in cancer patients with statistically significant differences in pain mean score. Furthermore, (**Kumar et al., 2016)** concurred with the current findings, as they reported that valsalva maneuver was significantly lesser pain in the study group than that in the control group. This finding was also confirmed by (**Akdas et al., 2014**) who studied the efficacy of the VM during venipuncture and concluded that VM was beneficial in decreasing pain during venipuncture. The most likely explanation for the usefulness of VM is that it elevates tension in the lungs that stimulates baroreceptors resulting in antinociception and relief of pain. The Valsalva maneuver is likely to be accepted because it is a modest, non-invasive method, easily understandable and applied, doesn't harm, is inexpensive and is a non-pharmacological approach for decreasing pain.

McGowan, (2014) stated that (IV) cannulation is a widespread carried out procedure done in the hospital context. This practice, yet essential, often causes patients substantial distress and anxiety, particularly those patients who undergo numerous, potentially painful and incredibly hard cannulations. The current study revealed that there was statistically significant decreases in anxiety mean scores of the study group post-application of VM when compared to the control group. This may be related to anxiety easily controlled by this technique resulting in relaxation and decreased muscular tension due to the effect of deep breathing holding effect. In this respect studies by **(Gideon,et al.,2019)** reported a significant decrease in anxiety mean scores of the subjects undergoing peripheral intravenous cannulation using standard care and the valsalva technique. These findings were inconsistent with **(Tapar etal..,2018)** who found that patient's anxiety scores after PVC were no significant differences between the group and valsalva groups.

Physiological responses are factors that can be used to monitor and assess pain. Differences in the level of oxygen saturation, pulse rate, and respiratory rate may be noticed as an effect of the pain (**Koç & Gözen, 2015 ; Mutlu & Balcı, 2015).** In relation to the physiological changes, the current study revealed that the study group's mean respiratory rate and pulse rate were significantly lower than the control groups. This is in agreement with (**Mohamedi , Pajand and Shoeibi , 2011)** who conducted a study to see the efficacy of VM on needle projection pain and hemodynamic responses during spinal puncture and they reported that hat the mean heart rate (HR) from pre-spinal to the third minute after VM was statistically different between the study groups. Similarly with (**Babaei etal .,2017)** found the heart rate in the study group decreased after cannulation. Whereas other hemodynamic parameters did not show significant variance. This study is in disagreement with **(Akdas et al., 2014)** who matched the effects of emla treatment and the VM on the pain that was felt during

venipuncture, and they found that there were no significant variations in heart rate values during and oxygen saturation during the technique.

The present study revealed that there was a statistical relation between severity of pain and anxiety among subjects undergoing peripheral intravenous cannulation in the control group and study group. This study is in agreement with (**Gideon etal., 2019)** who reflected that there was a positive correlation between the intensity of pain and anxiety among subjects undergoing peripheral intravenous cannulation in standard care and Valsalva maneuver. Also with **(Dawood et al.,2021)** who reveals that, there was statistically significant relation between patient's pain scores and mean score of the Pain Anxiety Symptom pre-intervention, It was also discovered that there was a statistically significant relation between patients' pain scores and the mean score of the Pain Anxiety Symptom after guided visualization application.

The present study showed a significant relation between pain severity and age with pain severity decreasing with younger age. In accordance with (**Lautenbacher et al.,2005)** who carried out a study to determine the effect of age on the sensitivity of pain in younger and elderly adults. Who claim that older adults suffer from more pain than younger adults. It comes to the conclusion that pain perception differs according to age. Also, this result was contradicted with **(Ravneet, Preksha and Rupinderjeet, .,2015)** who found no significant difference in age and pain level post-application of VM.
In relation to gender it was found that significant relation between gender and pain severity as it increased with females. A study carried out by **(Hussain, et al ., 2013)** on the effect of sex on pain intensity stated that women subjects experience greater pain than male subjects. This result is supported by **(Kadyan ,2017)**, who confirmed that there is a significant association between gender and pain rating and females felt more pain than males because many females had pain scores higher than the median. This finding is consistent with the findings of **(Gideon et al., 2019),** who discovered a significant difference in the intensity of pain among subjects undergoing PIVCs based on gender.

In the present study previous cannulation recorded a significant relation with pain severity. This result comes in line with **(Bijttebier and Vertomme., 1998)** who investigated the effect of past experience on pain during venipuncture and stated that patient that has negative past experience feels more pain while those who have balanced past experience has no influence on pain perception. In relation to the site of cannulation, it was found that significant relation between the site of cannulation and pain severity as it increased in the dorsum of the hade site. This is similar to the findings by **(Goudra ,2014),** who stated that inserting cannulation on the antecubital space creates less pain than any other site. So, it concluded that pain during venipuncture was based on the cannulation site. This result is

also corresponding with **(Sharma and George, 2019**) who found a significant association between the location of the cannula and the level of pain.
The results of this study revealed a statistically significant improvement in pain and anxiety levels after applied VM, which pointed to, the hypothesis of the current study was fulfilled and accepted that, the VM had a positive outcome on pain and anxiety levels among patients undergoing peripheral venous cannulation.

Conclusion

Based on the findings of the study, it can be concluded that the VM in the study group significantly improved than the control group in terms of reducing pain intensity, anxiety, and physiological parameters.

Recommendations

- Valsalva maneuver is a technique that is inexpensive, beneficial, and easy to perform during the hospital stays. Thus the nurses should incorporate such techniques for patients undergoing PIVCs.
- In-service education programs for nurses and students to endorse the non-pharmacological approach for pain relief during IV cannulation.
- Patients undergoing PIVCs should be educated on the VM to aid in the relief of pain and anxiety.
- Replication of the current study under different circumstances to confirm its results.

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الملخص العربى

مناورة فالسالفا: تقليل الألم الإجرائي ومستوى القلق لدى المرضى الذين يخضعون لإدخال يخضعون لإدخال الكانيولا في الاوردة الطرفية

المقدمة: تركيب الكانيولا فى الاوردة الطرفيه هى اكثر الطرق استخداما فى العناية الطبية والتى تسبب الالم والقلق لدى المرضى عند تركيبها. وبالتالي، يجب دمج مناورة فالسالفا في تدريب موظفي الرعاية الصحية لأنها طريقة آمنة وفعالة في تقليل الألم والقلق لدى هؤلاء المرضى من حيث التكلفة وسهلة التعلم.

الهدف من الدراسة تأثير مناورة فالسالفا على شدة الألم الإجرائي و مستوى القلق لدى المرضى الذين يخضعون لإدخال الكانيولا في الاوردة الطرفية.

افتراضات البحث:
افتراضية 1: المرضى الذين يخضعون لإدخال الكانيولا في الاوردة الطرفية ، والذين يقومون بمناورة فالسالفا التنفس يشعرون بالالم اقل شدة ، من أولئك الذين لا يمارسونها.
افتراضية 2:المرضى الذين يخضعون لإدخال الكانيولا في الاوردة الطرفية ، والذين يقومون بمناورة فالسالفا التنفس سيكون لديهم قلق أقل من أولئك الذين لا يمارسونها.

منهجية البحث : : تم استخدام تصميم بحثي تجريبي لاجراء هذه الدراسة على 100 مريضا الذين يخضعون لإدخال الكانيولا في الاوردة الطرفية فى اقسام الجراحة بالمعهد العالى للبحوث الطبية بالإسكندرية.

أدوات البحث: تم استخدام ثلاث أدوات في هذه الدراسة لجمع البيانات.
- **الأداة الاولى :** استمارة المقابلة الشخصية الخاصة بالبيانات الاجتماعية والديموغرافية للمريض و ادخال الكانيولا.
- **الأداة الثانية** : مقياس الألم البصري التناظري **(VAS)**
- **الأداة الثالثة:** مقياس مستوى القلق التناظرى **(VAS-A)**

النتائج: لقد اسفرت نتائج البحث عن الاتى: كان هناك انخفاض ذو دلالة إحصائية في درجات شدة الألم ومستوى القلق الكلي في مجموعة الدراسة بعد تطبيق مناورة فالسالفا من مجموعة الضابطة. أيضا ، كان هناك ارتباط كبير بين مستوى الألم والمتوسط الكلي لدرجة القلق .وعلاوة على ذلك وجد علاقة بين مستوى الألم والبيانات الاجتماعية والديموغرافية والسريرية.

الخلاصة: كانت مناورة فالسالفا في مجموعة الدراسة أفضل بكثير من المجموعة الضابطة فيما يتعلق بانخفاض شدة آلام والقلق لدى المرضى، وتحسن العلامات الفسيولوجية.

التوصيات: يجب دمج مناورة فالسالفا في بروتوكولات التدخل التمريضي أثناء إجراء إدخال الكانيولا ، وايضا تنفيذ برنامج تدريبى للممرضات, وموظفي و مقدمى الرعاية الصحية.