

Effect of Shotblocker on Venipuncture Pain among Blood Donors: A Randomized Controlled Trial

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ABSTRACT

Background: Blood donation is process obtaining, analyzing, preparing, and preserving blood and its many components essential for life-saving that enhances health and lowers mortality rates. Despite the fact that giving blood is frequently demonstrated to be a voluntary service, certain studies highlight a number of factors that affect blood donations such as Gender, past donor experiences including syncopal reactions, venipuncture pain, anxiety, and donor satisfaction, all have an impact on the decision to donate blood. In addition, one of the main reasons donors reject to donate blood is pain associated with venipuncture.

Aim: Evaluate the effectiveness of shotblocker on pain during venipuncture in adult blood donors compared to control group.

Methods: A randomized control trial (one control group and one study groups) conducted on 50 blood donors were selected randomly by simple random sampling at mean blood bank center during 2023. Data were collected by using visual analogue scale (VAS). Descriptive and inferential statistics were used in data analysis.

Results: Showed that there are statistically significant differences between (shotblocker and control groups) regarding pain score with venipuncture among blood donors. The study concluded that shotblocker have an effect in reducing pain resulting from venipuncture procedure for adult blood donors compared with control group.

Conclusion: The study concluded that shotblocker has an effect in reducing pain resulting from venipuncture procedure for adult blood donors compared with control group. Also, concluded there is no significant statistical difference between shotblocker and demographic characteristic regarding pain resulting from venipuncture procedure in adult blood donors. The researcher recommends to conduct future studies to apply shotblocker in one group, so the effect of each technique can be assessed in each blood donors. This will help to reduce the bias regarding the subjectivity of pain sensation among study groups. In other hand, it is recommended to use shotblocker before the needle insertion among blood donors to reduce the pain.

Keywords: shotblocker, venipuncture, blood donation.

INTRODUCTION

Blood donation is a process obtaining, analyzing, preparing, and preserving blood and its many components essential for life-saving that enhances health and lowers mortality rates¹. In addition, it is necessary for the therapeutic intervention of the patient's condition, which makes it an essential part of the health care system in any country². Furthermore, required for additional health care services are the management of emergency patients and a variety of surgical procedures³. According to the world health organization stated that the total number of blood donations obtained worldwide is about 118.54 million. 16% of the world's population lives in high-income countries, which account for 40% of these collections¹. Despite the fact that giving blood is frequently demonstrated to be a voluntary service, certain studies highlight a number of factors that affect blood donations such as gender, past donor experiences including syncopal reactions, venipuncture pain, anxiety, and donor satisfaction, all have an impact on the decision to donate blood⁴. In addition, one of the main reasons donors hesitate to donate blood is pain associated with venipuncture⁵.

Blood donation is one of the most frequent reasons for venipuncture, which is also one of the most frequent invasive medical procedures in general⁶. Venipuncture-related complications can include pain, development of hematomas, nerve damage, arterial puncture, petechiae, allergies, phobia, infections, fainting, hemorrhaging, and thromboembolism⁷. Venipuncture often performed by nurses, which cause pain to patients. Also, other studies reported blood donors who undergo venipuncture frequently feel stress and extreme pain⁸. Pain is an uncomfortable emotion and a physical sensation that might indicate either real or potential tissue injury and Pain not only results from disease itself but may also be derived from invasive diagnosis and treatment interventions⁹. Pain caused by venipuncture become problematic causing high levels of anxiety and emotional consequences including needle-related phobia^{10,11}. Therefore, it is essential to control pain throughout medical procedure and it is the primary responsibility of nurses to use the most effective methods to manage pain¹². Both pharmacological and non-pharmacological techniques are used to control the pain caused by the insertion of the needle into the vein¹⁰.

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However, studies have shown that pharmacological approaches to pain management have disadvantages, including the potential for side effects¹³, additional it need more time to effect and consider expensive¹², and being less suitable for use in healthcare settings where pace is required, such as in blood bank centers¹. According to a study of literature, different non-pharmacological techniques are employed to treat pain associated with venipuncture¹⁰. One of these non-pharmacological therapeutic methods is the application of Shot Blocker is a tiny, flat, u-shaped piece of plastic that is 2mm thick, measures roughly 70mm by 50mm at its widest points, and has rounded nubs (**Figure 1**) to stimulate the skin around the injection site. Shotblocker are an efficient way to reduce the pain brought on by the vascular access needle.

In Iraq non-pharmacological methods are not routinely used to control pain associated with venipuncture¹³. In addition, no studies were assess effectiveness of shot blocker on pain during venipuncture among blood donors, also there are no studies identified the best effective method for control of pain related to venipuncture, and there are limited number of studies have been conducted on healthy people¹⁴. Based on these gaps, the study aimed to evaluate the effectiveness of shotblocker on pain during venipuncture in adult blood donors and to find out the associated between demographics and level of pain in shot blocker on pain during venipuncture in adult blood donors.

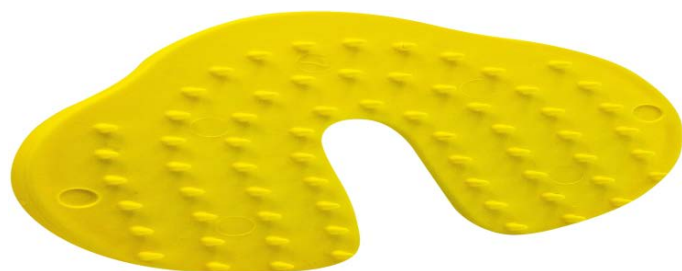


Figure 1: Shotblocker

METHODOLOGY

A Randomized control trial study design was done to assess the effective of shotblocker to reduce venipuncture during blood donation procedure. Cold spray is the independent variable in this study and the dependent variable is pain during venipuncture. Adult blood donors in the main blood bank in Diyala Health Directorate in Iraq. A simple randomization sampling method was used to assign the study sample in two groups: shotblocker and a control group. Use simple random sampling in this study to ensure that each participant has an equal chance of being assigned to any group, the possibility of comparison between the groups of the study and the control group, as well as to generalize the results of the study to population¹⁵.

A sealed envelope contained two colors (white and yellow) and was given to each client to choose one color. The clients were allocated to groups based on their colors; white= control, yellow =shotblocker. Indeed, two groups were allocated randomly. This study was conducted as an open-label (unblinded) study because clients were aware of the applied intervention (shotblocker). Subjects were eligible for inclusion whom male and female adult blood donors (18 years and above), Volunteering to participate in the study and giving a written consent form, Read and write, had no sign of (pain, hematoma, necrosis, scar, incision or infection) on the skin around the venipuncture site, and had no analgesic drug for the last six hours. Clients were excluded if they refused participation, significantly impaired vision, altered mental state, suffered from skin disease associated with cold intolerance (e.g., Raynaud’s disease), had vision problems, sensory-motor deficit,

diabetes, peripheral vascular disease, neuropathy, and wound, burn, scar tissue on the skin around the venipuncture site.

The minimum sample size for each group would be 50 as it was calculated based on the confidence level of 80% and a 5 % margin of error. Therefore, the total sample for two groups is (100) participants. In this study, 105 clients agreed to participate as a study sample. Among them, 3 clients were excluded as they failure to venipuncture. Also, 2 were excluded as they declined to participate because of refusing the intervention. At the end, a total of 100 clients were included in the data analysis. Official permissions were obtained before collecting the study data. Visual Analogue Scale (VAS), this scale is used to evaluate the intensity of pain experienced by the individuals during the procedure. The wide use of VAS in the literature indicates how this tool is crucial to assess intensity of pain, which its validity and reliability have been confirmed (16). VAS assesses pain in a score of 1-100 as "none" (0-4mm), "mild" (5-44mm), "moderate" (45-74 mm), or "severe" (75-100 mm). A ruler is used to measure the distance between the anchor (0mm) and the client’s mark on VAS. Demographics include age, gender, level of education, marital status, occupation, times donated blood Previously, Body Mass Index (BMI), and chronic diseases (hypertension or cardiovascular diseases). This study was conducted at Main Blood Bank in Diyala Health Directorate in Iraq. The data collection started from January 3, 2023, till February 10, 2023. For all clients, VAS was used to measure the severity of pain immediately after venipuncture. For the control group, no procedures were done before venipuncture. For shotblocker immediately before venipuncture, clean venipuncture site with antiseptic solution, place shotblocker firmly over the site by the left hand and apply the venipuncture by the right hand through the opening of shotblocker. immediately after venipuncture assess the severity of venipuncture pain by ask donors to mark point on line of VAS (0-100 mm) indicate their pain status.

RESULTS

Table 1: Sample Distribution Based on Demographic Data of nursing staff

Characteristic	%	F
Age		
M ± SD	34.3509 ± 9.23769	
Gender		
Male	98.8	48
Female	1.2	2
Educational level		
Reads and Writes	14.0	7
Primary	33.9	17
Intermediate	11.1	5
Secondary	12.3	7
Bachelor's	14.0	7
Diploma	11.7	6
Master ‘s or Ph.D.	2.9	1
Marital status		
Unmarried	25.1	12
Married	74.3	37
Widower	.6	1
Occupation		
Unemployed	3.5	2
Free business	51.5	25
Employee	44.4	22
Retired	.6	1
Times Donated Blood		
Previously		
Not once	19.9	10
Once	18.1	9
Twice	11.1	6
More than twice	50.9	25

Chronic Disease		
Hypertensive	4.1	2
Heart Disease	.6	1
There is none of that	95.3	47
Body mass index		
M ± SD	28.8245± 4.57515	
Total	100.0	50

f. = Number of frequencies, %=Percentage, M = Mean, SD= Standard Deviation.

In Table 1 the results show that the mean of blood donors age in this study was 34.3509 years with a SD of 9.23769. Most of participant were male (98.8 %). Table 1 also shows (33.9 %) were primary educational level, followed by 14 % were reads and writes also same percent were Bachelor's degree. Marital status reveals the most of study participants (74.3 %) were married, followed by (25.1 %) were unmarried and only (0.6%) was Widower. More than half of participants (51.5 %) were free business, followed by 44.4% were employees. Furthermore, table 1 shows more than half of sample (50.9 %) were previously donated blood more than twice and (19.9 %) were don't donated blood previously. According to table 1, the study presents that most of study sample (95.3 %) weren't suffer from chronic disease. Also, the mean of blood donors of Body Mass Index (BMI) was 28.8245 with a SD of 4.57515.

Table 2: Difference between shotblocker group and Control group regarding Pain Score

Pain score					
Group	N	Mean Rank	Sum of Ranks	Sig	Mann-Whitney U
Shotblocker	50	40.35	2340.50	.000	629.500
Control	50	79.35	4919.50		

Sig = Significance, N= The number of participants.

Table 2 shows significant difference between cold spray and control groups regarding pain score respectively with venipuncture among blood donors. The results also show there is significant differences (p=.000) between cold spray and control groups regarding pain score with venipuncture among blood donors.

Table 3: Correlation between Times Donated Blood Previously, Body Mass Index and Age with pain score

Pain score			
Characteristics	N	Pearson Correlation	Sig.
Times Donated Blood Previously	50	.060	.435
Body Mass Index	50	.081	.294
Age	50	-.045-	.562

Sig = Significance, N= The number of participants.

Table 3 show that there is no significant relationship (P = .435) between times of donated blood previously and pain score and no significant correlation (p= .294) between body mass index and pain score with venipuncture respectively among blood donors in this study. The results shows that there is a significant correlation (p= .562) between age and pain score with venipuncture respectively among blood donors in this study.

Table 4: Difference among Educational Level, Gender, Marital status, Occupation, and Chronic Disease with Pain Score

Pain score				
Characteristics	N	Mean of Square	Sig.	F
Educational level	50	317.699	.637	.716
Gender	50	37.628	.994	62
Marital status	50	835.233	835.233	1.923
Occupation	50	839.569	.125	1.944
Chronic disease	50	317.532	.488	.721

Sig = Significance, N= The number of participants.

Table 4 shows that there is no significant difference between educational level and pain score with venipuncture respectively among blood donors in this study. The results also show that there is no significant difference (P = .060) between educational level and pain score. shows that there is a significant difference between gender and pain score with venipuncture respectively among blood donors in this study. The results also show that there is no significant difference (P = .426) between gender and pain score. shows that there is a significant difference between occupation and pain score with venipuncture respectively among blood donors in this study. The results also show that there is no significant difference (P = .422) between occupation and pain score. shows that there is a significant difference between chronic disease and pain score with venipuncture respectively among blood donors in this study. The results also show that there is no significant difference (P = .462) between marital status and pain score.

DISCUSSION

This chapter periodically explores and describes the finding of this research in relation to its goals, with input from literature and related studies. The data analysis finding showed the distribution of the sample according to demographic characteristics, which revealed that the mean age was 34.3 years. In the literature, study conducted to determined effect of buzzy on pain and satisfaction with phlebotomy in blood donors, founded that mean of age in experimental group was 34.40 years and 36.26 years in Placebo Control Group and 35.83 years' nonintervention control group¹⁷. Another study conducted to determine effective technique of ethyl chloride spray to reduce venipuncture pain, the means of age for this study was 36.45 in group A, 32.91 in group B and 39.15 in group C¹³. According to the researcher 's opinion, Middle-aged adult donors are generally healthier, more accepting of blood donation procedures, and especially more tolerant of the discomfort associated with those procedures.

The majority of study sample was male (98.8 %). study in Italy, stated that (64.6%) of blood donor's participant were male to examine the reasons for blood donation and how they vary based on the amount of donations and the gender of the donors¹⁸. The difference in numbers could be explained by the fact that males typically have higher iron levels than women, making them less likely to have their donation requests declined due to low hemoglobin levels. In this study, the results show that (33.9 %) of blood donors were primary educational level, followed by 14 % were reads and writes. In the contrast to previous evidence, the study conducted in Greece, the results show (4.8%) of blood donor's participant had a primary school education and (40.3%) had a university degree. Another study conducted by to describe demographic characteristic and cardiovascular risk factors of blood donors; the majority of study sample were highly educated¹⁹. The educational level does not effect on the decision of donating blood supported by²⁰.

In this study, the results show that most of study participants (74.3 %) were married, and this finding is similar to a study in Iran that conducted to assess the relationships between Iranian blood donors with Hepatitis C virus (HCV) confirmation and the viremic rate and demographic variables, also results found most of study participants (76.89) was married²¹. This could be explained that married people have more relatives that may need to blood transfusion as a result of surgery or disease. Regarding occupation, the result show more than half of participants (51.5 %) was free business and this result consists with study conducted in Nigeria to evaluate the blood donation pattern and blood donor characteristics, about 44.3 % of blood donor's participants was unemployed. unemployed do has more available time so more likely to donate blood²². This result also shows more than half of sample (50.9 %) were previously donated blood more than twice and this finding consisted with study conducted to assess how applying hand massage during the venipuncture technique affected the patient's discomfort, anxiety, and vital signs, also finding of this study show that (96.9 %) of study sample had prior venipuncture experience²³. People typically donated blood because it feels good to assist others, and altruism and volunteering have been associated with beneficial health effects, such as a reduce blood viscosity, decreases oxidative stress and significant lower cholesterol levels.

The demographic results also show that most of study sample (95.3 %) were not suffer from chronic disease. Other study in America _ New York reported that (21 %) of study participants suffer from hypertensive. Iraqi culture does not allow people who suffer from chronic diseases to donate blood and encourage healthy young people to donate in emergency cases. In this study the mean of blood donors of BMI was (28.8)²⁴. study conducted to compared between Valsalva maneuver and (EMLA) cream to relieve venipuncture pain, the result shows the mean of BMI in EMLA group was (28), (27) in Valsalva group, and (27) in control group [20]. This indicated that the blood donors were overweight and the evidence recommended overweight people to regular blood donation to lower Body Mass Index²⁵.

Also, the results in table (2) show there is significant differences ($p=.000$) between cold spray and control groups regarding pain score with venipuncture among blood donors, which indicates that the use of cold spray is effective to reduce venipuncture pain among blood donors compares to control group. In study in turkey conducted to evaluate effective use of cold spray to reduce venipuncture pain among young blood donors, which funded that use cold spray is effective method to reduce venipuncture pain¹⁴. Another study conducted to determine effectiveness and safety of cold spray on venipuncture pain among adult patient in emergency department, was found the cold spray is effective to reduce venipuncture pain comparing with a placebo spray and no complications or major adverse effects associated with using cold spray²⁶.

In this study, the results show there is no significant correlation between times of donated blood previously and pain score with venipuncture ($P = .435$), This finding supported by¹⁷, also the results in current study show that there is no significant correlation between body mass index and pain score with venipuncture ($P = .294$). This finding consists study conducted in Turkey to evaluate efficacy of shotblocker to reduce venipuncture pain with short peripheral intravenous catheter which also found no statistically significant difference in pain with body mass index²⁷. In this study, the results show that there is no significant correlation between age and pain score with venipuncture ($P = .562$). This finding similar to study conducted in iraq to evaluate of nurses' knowledge and attitudes toward pain management at baghdad teaching hospitals which also found no statistically significant correlation

between age and venipuncture pain²⁰. In this study, the finding also show that there is no significant difference between educational level and pain score with venipuncture ($P = .412$). This finding consisted with study conducted to determine the patient population at risk for a greater pain score based on their level of education, also found there is no statistically significant difference in postoperative perception of pain with educational level of study participant's²⁷.

In this study, the result show there is no significant correlation between gender and pain score with venipuncture ($P = .994$), and this finding is similar to a study conducted on 97 individuals to determine the effect use of hand massage on pain, anxiety, and vital signs before venipuncture procedure²³. Also, in the current study, result reveal that there is no significant difference ($P = .915$) between marital status and pain score with venipuncture similar to study conducted by²⁰. In this study the result show that there is no significant difference between chronic disease and pain score with venipuncture ($P = .900$), this finding consisted with study conducted to evaluate the efficiency of ethyl chloride vapocoolant spray, topical EMLA cream, and placebo in reducing pain in arteriovenous fistula patients receiving long-term hemodialysis induced by venipuncture²⁹. Finally, the current results reveal that no significant difference between occupation and pain score with venipuncture ($P = .272$). This finding consisted with study conducted in Iran to evaluate efficacy of topical lavender on needle insertion pain in hemodialysis³⁰.

CONCLUSION

Venipuncture is routinely nursing intervention used in main blood bank centers that cause pain in blood donors . furthermore, it is the primary responsibility of nurses to use the most effective methods to manage pain. Both pharmacological and non-pharmacological techniques are used to control the pain caused by venipuncture. This study concluded that use of shotblocker is effective to reduce venipuncture pain among blood donors. Also, concluded there is no significant statistical difference between shotblocker and demographic characteristic regarding pain resulting from venipuncture procedure in adult blood donors.

RECOMMENDATIONS

The researcher recommends to conduct future studies to apply cold spray in one group, so the effect of cold spray can be assessed in each blood donors. This will help to reduce the bias regarding the subjectivity of pain sensation among study groups. On other hand, it is recommended to use shotblocker before the needle insertion among blood donors to reduce the pain. However, the shotblocker is not available in Iraq. Therefore, Ministry of health in Iraq can import this cheap device to be used in blood bank centers. Applying shotblocker before the venipuncture can reduce the pain among blood donors.

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Competing Interest: None

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