# Effects of Nursing Guidance About Venipuncture Versus Ordinary Syringe, A Comparative Study On Rates of Phlebotomy Hematoma

Anaam Mohammed Hassan[1], Ghada Thabet Mohammed[2], Gehan Refat Hefnawy[3], Shaymaa Sayed Khalil[4].

[1]*Fellow of medical surgical nursing, Assiut University hospitals, Assiut University, Egypt.* anaam.mohamed@aun.edu.eg

[2]*Assistant consultant of medical surgical nursing, Assiut University Hospitals, Egypt.* ghada_thabet@aun.edu.eg

[3]*Assistant professor of Community Health Nursing, College of Nursing, Jouf University, Saudi Arabia.* gehan.hefnawy@ju.edu.sa

[4]*Assistant professor of Medical Surgical, Faculty of Nursing, Assiut University, Egypt.* shaymaa@aun.edu.eg

**Abstracts:** Objective: To assess the effects of nursing guidance about Venipuncture versus ordinary syringe, a Comparative Study on Rates of phlebotomy hematoma. Background: In order to reducing the incidence of phlebotomy hematoma, nurses should receive comprehensive training regarding appropriate blood sampling Study design and methods: Pre-posttest, comparative study design using a quasi-experimental design for both groups. Setting: The surgery departments at Assiut University Hospital. Subjects: There were 40 nurses in total coverage, and 100 randomly selected patients underwent blood sample. The nurses and patients were split into two equal groups. Tools: (I): Patients' assessment (personnel and clinical data), (II): Easy hematoma degree classification and (III) Nurses' awareness questionnaire (demographic characteristics, knowledge, and observation checklist). Results: A statistically significant difference the venipuncture and ordinary syringe groups regarding the rates of phlebotomy hematoma (wound quality of life and wound healing) with a significant correlation between them. Moreover, a statistically significant difference between nurses' knowledge and practice of applying the nursing guidance pre- and post-test. Conclusion: The nursing guidance had a beneficial impact on nurses' knowledge and practice, and it improved the rates of phlebotomy hematoma occurrence among patients who underwent venipuncture compared to the other group using an ordinary syringe Implications for research, policy, and practice: Enhance nurses' knowledge and practice, offer ongoing education and in-service training program to the surgery departments. Apply venipuncture to blood sampling to reduce the risk of phlebotomy hematomas.

**Keywords:** Nursing Guidance, Ordinary Syringe, Phlebotomy Hematoma and Venipuncture.

## 1. INTRODUCTION

The process of venipuncture involves inserting a needle into a vein to collect blood. It is regarded as an invasive method that causes the patient to experience pain, anguish, and maybe unavoidable extreme reactions [1]. Additionally, venous blood sampling is an essential method that has an impact on laboratory results. It involves multiple distinct procedures, each of which is prone to error, such as patient preparation, blood specimen collection, and handling [2]. One of the main goals of venipuncture for blood collection is to succeed on the first attempt with the least amount of tension and discomfort [3].

Venipuncture affects the veins, subcutaneous tissue, and skin by puncturing them, which causes skin friction and drying during disinfection. Venipuncture can result in problems such infection, nerve injury, artery puncture, and hematoma formation even when only a tiny amount of blood is extracted. The most frequent of these complications is hematoma development. Some research indicate that the incidence rate ranges between 25% and 75% [4].

The term "hematoma" describes a blood leak at the venipuncture site. A hematoma is present if a blue or purple discoloration appears where the venipuncture was done. This site darkening could appear right away or soon after the venipuncture is performed. Hematomas can occur as a result of poor technique or procedures, such as when a needle is placed in a small vein where it may pass through the vein, when the tourniquet is still on when the needle

is removed, when insufficient pressure is applied after venipuncture, when the vein is searched blindly, or when a patient is receiving anticoagulant therapy [5]. As their skin is thinner and has less fat to protect the blood vessels from injury older adults may also bruise more easily [6].

The Vacutainer system produces blood specimens of higher quality at a cost equivalent to that of the syringe method, but it requires the user to be competent in its usage. It is quicker, simpler, and more versatile to use [7].

Ordinary syringe system is widely available, does not require special training, is generally accessible, inexpensive, and comes in a variety of gauges and lengths of needles. It can be safer for patients who have small or difficult veins, blood drawing can be easier. However, its disadvantage includes the requirement for blood transfer, which increases the risk of blood splashing or needle stick injuries, as well as the difficulty in drawing large or numerous blood samples [8].

Enhancing health care team outcomes depends on the providers who must be familiar with the patient's medical background and any current ailments. Any healthcare professional who has a conversation with a patient, whether it's a nurse or a doctor, should let them know that a blood draw is going to happen, explain why, and answer any questions they might have to help them feel more at ease about an often traumatic and difficult procedure. If the patient is taking any blood thinners or other medications that could result in unintended side effects, pharmacists should be consulted. A certified phlebotomist should be consulted for complex instances with challenging entry points to veins [9].

Phlebotomy problems may occur, thus medical professionals should only use this procedure when absolutely required. To ensure perfect sterility during the treatment, the whole healthcare team, including nurses, doctors, lab technicians, and phlebotomists, shares equal responsibility [10].

**Objective**

Assess Effects of Nursing guidance about Venipuncture versus ordinary syringe on Rates of phlebotomy hematoma

**Hypotheses**

To fulfill the aim of the study, the following hypotheses formulated:

Hypotheses 0: No difference in rates of phlebotomy hematoma between Venipuncture group and ordinary syringe group after the application of nursing instruction.

Hypotheses 1: After the deployment of nursing guidance, nurses' understanding and practice of venipuncture versus ordinary syringe at Assiut University Hospitals will improve.

Hypotheses 2: Rates of phlebotomy hematoma among the Venipuncture group, following the implementation of nursing direction, will be smaller than the conventional, ordinary syringe group.

## 2. MATERIEL AND METHODS

### 2.1. Research Design

A comparative, quasi-experimental (pre-posttest) research design for the two groups.

### 2.2. Setting

Surgical departments at Assiut Main University Hospital were the site of the study.

### 2.3. Subjects

A convenience sample of nurses who worked in surgical wards (N=40) and were subjected to the nursing management protocol.

The patients: 100 adult patients who were admitted to the aforementioned settings and undergoing surgery made up the convenience sample for this research. Two equal groups of individuals were randomly assigned: one group (50) underwent blood extraction using a vacuum tube, and the other group (50) underwent blood extraction using a standard syringe device.

Sample size:Using the European Patent Institute (EPI) information, programme version 7 (Epi info -7), the sample size was determined with a 95% confidence level, a 50% percentile, and a 10% error rate.).

Inclusion Criteria

The patients, who participated in this study, were selected according to the following criteria:

- Patients aged from 18- 65 years old.
- Both sexes (male and female).
- Patients diagnosed undergoing surgery
- Able to communicate verbally.
- Absence of skin lesions on the investigated site (antebrachial area) .

Exclusion criteria:

- History of vascular complications
- Patients who are receiving blood thinning drugs

### 2.4. Tools of the Study

**Tool 1: Patients' Assessment Sheet**; a tool created by the researchers and translated into Arabic, is divided into two sections:

**Part I**: Demographic characteristics: this developed by the researcher and included; age and gender.

**Part II**: Patients' Clinical Data: This section of the tool contained details about a patient's past medical history and main problems, such as:

Type of venipuncture. (Syringe system or vacuum tube)

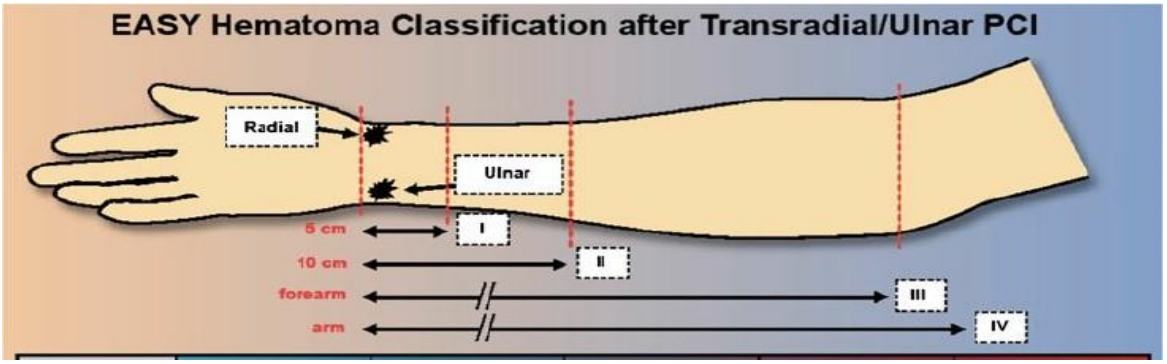
- Previous medical history & co-morbidities:
- Chronic disease history as well as (Musculoskeletal, Pulmonary, Gastrointestinal, cancer, Circulatory, Cerebrovascular)
- Present clinical data, including:
- Vital signs (body temperature, Pulse, Blood Pressure)

• BMI (Underweight less 18.5 lbs, Normal range 18.5–24.9 lbs, Overweight 25–29.9 lbs, Obese 30 or more lbs, Obese class I 30.0-34.9 lbs, Obese class II 35.0- 39.9 lbs, Obese class III 40 or more lbs)

**Tool 2: Easy hematoma degree classification**, adopted from Rajpali, [11]

This aimed to assess the onset of hematoma after venipuncture and its degrees.

According to their size, forearm hematomas can be divided into four categories: grade 1 hematomas are less than 5 cm, grade 2 hematomas are less than 10 cm, grade 3 hematomas extend distally to the elbow, and grade 4 hematomas extend proximally to the elbow. [11]




Trans radial Site Assessment [11]

**Tool III: Nurses Awareness Assessment sheet**

This study tool, which was created by the researchers and translated into Arabic, consists of two parts:

**Part (1):** Demographic characteristics

Age, gender, educational attainment, place of employment, and other demographic factors were incorporated in the researcher's development of this category.

**Part (2):** Nurses Knowledge Questionnaire and Skills observation checklist

This section consists of a questionnaire that the investigator created after reviewing appropriate literature in order to gauge nurses' knowledge of the phlebotomy procedure, gauge baseline knowledge and skills of nurses regarding the procedure, and guarantee the study subject's compliance with the nursing care protocol. There were inquiries on the following:

- Knowledge and skills related to preparations before phlebotomy procedure.
- Knowledge and skills related to instruction during phlebotomy procedure.
- Knowledge and skills related to instructions after phlebotomy procedure.

The nurse's knowledge was scored using the following system: each accurate response received one point, while no response or not knowing received a point.

Using the following scoring scale, the overall knowledge score was determined: bad knowledge = 50%, reasonable knowledge = 50–75%, and strong knowledge = 75% and above.

**Tool IV: Nursing guidance for phlebotomy procedure**

The researchers created it after evaluating relevant literature and taking into account the demands and needs of nurses. It was written in a simplified form of Arabic and accompanied by colored images and photographs. There were two sections to it.

1. Theoretical part; included illustration about both types of blood extraction included in the study , Vacutainer tube and ordinary syringe system, their advantages, disadvantages, nursing instructions before, during and after the procedure according to WHO guidelines on drawing blood.

2. Practical part; includes the illustrations for best practices in phlebotomy, using both types of blood extraction included in the study, Vacutainer tube and ordinary syringe system.

Content validity and reliability: To ensure the content validity, completeness, and clarity of the items as well as the appropriate translation, the validity of the present study's instruments was examined by five professional professors in the fields of nursing and medicine. The items were consequently modified, corrected, and clarified.

The Cronbach's alpha test was used to gauge the tools' dependability. It showed that the reliability of tools I and II is r=0.75., indicating reliable tools.

Pilot Study:

10% of the subjects were involved in the pilot trial (4 nurses and 10 patients).

Because the data collection methods were not changed, subjects from the pilot study were included in the real study sample.

Method: Administrative approval was obtained by submitting a formal letter to the head of the nursing department, the surgical department, and the general directors of Assiut Main University Hospital.

**Ethical Consideration**

The study followed the principles of Helsinki (1996) declaration for medical research. The proposal of the current research was approved from the ethical committee in the faculty of nursing, Assiut University. There was no risk for study subject during application of the research. Informed consent obtained from the patients who are willing to participate in the study after explaining the nature and purpose of the study. Nurses & patients had the right to refuse to participate and/or withdraw from the study without any rational and at any time to maintain anonymity.

**Procedures of the study:** The study was carried out in four phases that followed one another: assessment, planning, implementation, and evaluation.

**Phase A the assessment**

- From May 2022 to July 2022, data were gathered. Researchers visited 30 nurses in surgical wards to collect data in order to establish a line of contact, explain the goal of the study, and complete a tool (II). There were 12 sessions total, one session every week (1 session/week), with 4 nurses present at various times during each session in accordance with their work schedules. The session could be detected for roughly 30 minutes.

- The researchers conducted interviews with each participant in the study prior to phlebotomy in order to establish a line of contact, explain the goal of the study, and collect data (I and II). These go on for three months till the completed product was the chosen sample.

**Phase B Planning**

- Based on nurse's assessment, Nursing guidance for phlebotomy procedure was formulated based on the guidelines of the WHO, relevant literatures.

- The information was arranged to better suit a workable learning progression (from simple to complex) for nurses.

**Phase C Implementation**

For nurses;

- The participant nurses received a nursing guideline.

- The material of the nursing guidance was tailored to the needs and comprehension levels of the nurses and was based on recent national and international literature.

- Three sessions were held to discuss the nursing guidance's content with the nurses: one theoretical session and two practical sessions. Following phlebotomy, the researcher was questioned and patients in the surgical unit were monitored to determine if hematomas occurred.

- Depending on the nurses' availability, a variable number of nurses attended each session (4-5nurses). Each session lasted between 30 and 40 minutes.

- The researchers clarified the knowledge regarding the two types of phlebotomy, Vacutainer and conventional syringe system, utilizing PowerPoint and colored brochures to convey the theoretical portion. They made an example of. Using a training Manichean and the rescuers' own laptop to play instructional movies, they demonstrated the practical aspect. putting the nurses in a real situation by using real tools for both types of phlebotomy procedures.

**For the patients**

- Before implementing the nursing program on the patients, the researchers evaluated the patients' personal and clinical data (Tool I) and examined the formation of hematomas (Tool II) to establish baseline data (pre-test). It took around 30 minutes, twice a week, with about 3–4 people per day.

**Phase D evaluation**

**For the nurses**

- After implementing the nursing program, the researchers assess the nurses' performance (as a post-test) using the aforementioned instrument (III). This procedure took place after 12 weeks and took about an hour to complete.

- Each nurse who participated in the study, as well as the head nurses, received a copy of the final, colored printout.

**For the patients**

- During their weekly visits to the outpatient clinic, both groups were evaluated using Tool II immediately following the procedure and after being discharged. The evaluation took place over the course of around 20 minutes.

**Statistical planning**

- The gathered information was tallied and statistically examined to assess the differences between the groups

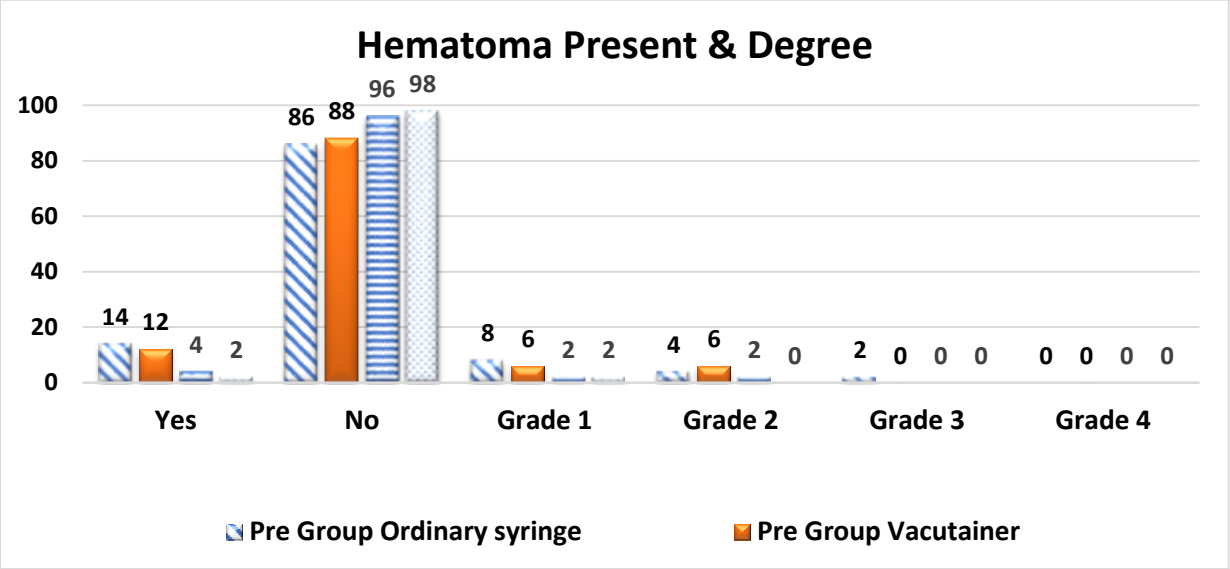
under the study using frequencies and percentages, mean ± SD using (SPSS) version (26). T-test, Chi-square tests, One-way ANOVA test and Pearson correlation test used in the relationship between variables. The significant P. value equal < (0.05).

## 3. RESULTS AND DISCUSSIONS

### 3.1. Table 1: shows the distribution of the participating groups related to Socio & Medical data of Patients (n=100)

| Items | Ordinary syringe Group | | Vacutainer Group | | F-test | P-value |
|---|---|---|---|---|---|---|
| | No. (n=50) | % | No. (n=50) | % | | |
| **Age:** | | | | | 0.316 | 0.576 |
| 20 to < 35 | 10 | 20.0 | 9 | 18.0 | | |
| 35 to < 50 | 27 | 54.0 | 30 | 60.0 | | |
| ≥ 50 | 13 | 26.0 | 11 | 22.0 | | |
| **Mean ± SD** | **43.2±9.7** | | **42.6±9.4** | | | |
| **Range** | **22 - 56** | | **20 - 57** | | | |
| **Sex** | | | | | 0.157 | 0.693 |
| Male | 29 | 58.0 | 22 | 44.0 | | |
| Female | 21 | 42.0 | 28 | 56.0 | | |
| **BMI kg/ m$^2$ (WHO classifications)** | | | | | 0.118 | 0.732 |
| Underweight <18.5 | 9 | 18.0 | 9 | 18.0 | | |
| Normal rang 18.5-24.9 | 14 | 28.0 | 12 | 24.0 | | |
| Overweight 25.0-29.9 | 12 | 24.0 | 13 | 26.0 | | |
| Obese ≥ 30 | 9 | 18.0 | 12 | 24.0 | | |
| Obese class I 30.0 – 34.9 | 6 | 12.0 | 4 | 8.0 | | |
| Obese class II 35.0 – 39.9 | 0 | 0.0 | 0 | 0.0 | | |
| Obese class III ≥ 40 | 0 | 0.0 | 0 | 0.0 | | |
| **Body temperature C** | | | | | 1.320 | 0.253 |
| Normal | 42 | 84.0 | 44 | 88.0 | | |
| Abnormal | 8 | 16.0 | 6 | 12.0 | | |
| **Pulse b/m** | | | | | - | - |
| Normal | 50 | 100.0 | 50 | 100.0 | | |
| Abnormal | 0 | 0.0 | 0 | 0.0 | | |
| **Maximum BP mmhg** | | | | | 2.561 | 0.113 |
| Normal | 40 | 80.0 | 43 | 86.0 | | |
| Abnormal | 10 | 20.0 | 7 | 14.0 | | |
| **Minimum BP mmhg** | | | | | 2.561 | 0.113 |
| Normal | 40 | 80.0 | 43 | 86.0 | | |
| Abnormal | 10 | 20.0 | 7 | 14.0 | | |
| **Comorbidities** | | | | | 0.001 | 0.972 |
| Musculoskeletal | 15 | 30.0 | 14 | 28.0 | | |
| Pulmonary | 18 | 36.0 | 20 | 40.0 | | |
| Gastrointestinal | 12 | 24.0 | 10 | 20.0 | | |
| Cancer | 2 | 4.0 | 3 | 6.0 | | |
| Circulatory | 3 | 6.0 | 3 | 6.0 | | |
| Cerebrovascular | 0 | 0.0 | 0 | 0.0 | | |

T-test using an independent sample * Statistically significant differences (p 0.05)




**3.2.** Figure 1: Distribution of Pre & Post groups related to hematoma of patients (n=100)

**3.3. Table 2: Relationship between Hematoma occurrence among both groups and their Demographic characteristics pre and post-test**

| Items | Pre - test | | | | Post – test | | | |
|---|---|---|---|---|---|---|---|---|
| | Ordinary syringe | | Vacutainer | | Ordinary syringe | | Vacutainer | |
| | F-test | P-value | F-test | P-value | F-test | P-value | F-test | P-value |
| **Age** | 2.444 | 0.125 | 0.256 | 0.609 | 4.2s12 | 0.046 | 0.004 | 0.950 |
| **Sex** | 0.002 | 0.961 | 0.304 | 0.584 | 1.493 | 0.228 | 0.782 | 0.381 |
| **BMI kg/ m$^2$** | 0.021 | 0.886 | 3.569 | 0.065 | 0.097 | 0.756 | 0.972 | 0.329 |
| **Body temperature** | 4.595 | 0.037 | 2.997 | 0.090 | 0.384 | 0.538 | 0.134 | 0.716 |
| **Maximum BP** | 0.160 | 0.691 | 0.039 | 0.845 | 1.152 | 0.288 | 0.160 | 0.691 |
| **Minimum BP** | 0.160 | 0.691 | 0.039 | 0.845 | 1.152 | 0.288 | 0.160 | 0.691 |
| **Comorbidities** | 2.987 | 0.090 | 5.385 | 0.025 | 1.091 | 0.302 | 1.234 | 0.272 |

One way ANOVA * Statistical significant differences ($p < 0.05$)

BMI=Body Mass index

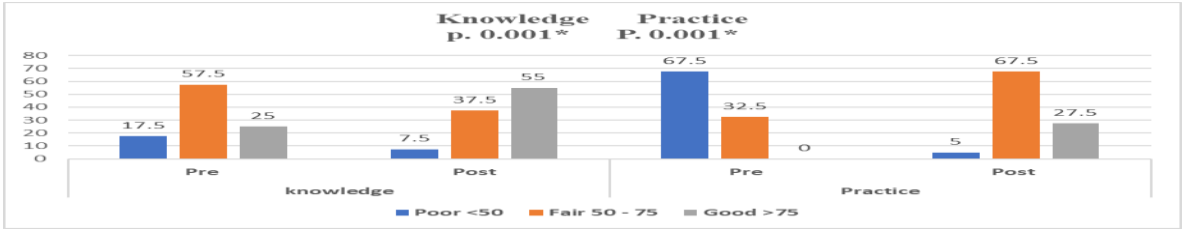
This table shows that there is no statistical distinction between the sociodemographic and medical statistics of the groups using regular syringes and vacutainers.

**Table 3: studied nurses' distribution of the demographic data of the (n.= 40)**

| Items | Group | |
|---|---|---|
| | No. (n=40) | % |
| **Age:** | | |
| 20 to < 25 | 24 | 60.0 |
| 26 to < 35 | 16 | 40.0 |

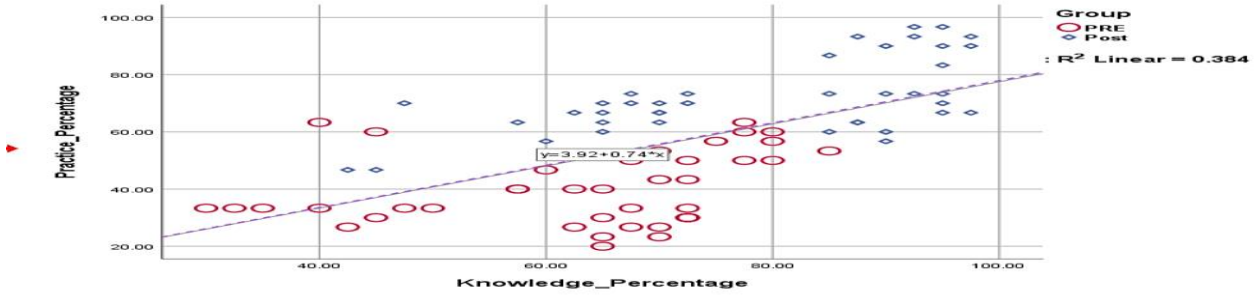
| | | |
|---|---|---|
| 36 to < 45 | 0 | 0.0 |
| **Mean ± SD** | **26.9 ± 5.2** | |
| **Range** | **21.0 – 39.0** | |
| **Gender** | | |
| Male | 6 | 15.0 |
| Female | 34 | 85.0 |
| **Education level** | | |
| Intermediate Diploma of Nursing | 27 | 67.5 |
| Nursing technical institute | 9 | 22.5 |
| Bachelor of Nursing | 4 | 10.0 |
| **Years of experience:** | | |
| 1 to < 3 Years | 0 | 0.0 |
| 3 to < 5 Years | 24 | 60.0 |
| 5 to < 10 Years | 16 | 40.0 |
| > 10 Years | 0 | 0.0 |
| **Mean ± SD** | **5.5 ± 2.1** | |
| **Range** | **3.0 – 9.0** | |
| **Have a train?** | | |
| Yes | 0 | 0.0 |
| No | 40 | 100.0 |

This table shows that more than 50% of nurses between the ages of 20 and 25 (60.0%). Vast majority of them were female with percentage (85.0%). Most of them (67.5%) had intermediate diploma of nursing. Greater than half of nurses had 3 to < 5 years of experiences (60.0%). All of nurses hadn't any previous training with percentage (100.0%).




**3.4. Figure 2:** relation between knowledge and practice of the participated nurses pre and post implementation of the nursing guidance.

Figure 2 shows that there is very highly statistical difference between nurses studied nurses related to their knowledge and practice per and post-test with a significant improvement of their level after application of the nursing guidance with p-value
0.0001)




**3.5. Figure 3:** A comparison of nurses' knowledge and practice before and after using the nursing advice.

This figure shows that a positive association between the knowledge and practice of the participated nurses in the pre- and post-groups with p-value (0.0001) and Pearson correlation with (0.593 and 0.616 respectively).

### 3.6. Discussion

Regarding the demographics of the nurses who were the subject of this study, the findings showed that the average age of the nurses was (26.9 ± 5.2), that all of the nurses were female, that they all had an intermediate Diploma in Nursing, and that their years of experience ranged from three to five. According to the researcher, nurses with less experience might need the most additional training programs to make up for their lack of experience. It was noted that no venipuncture technique training programs are provided to all nurses.

This agrees with Osman,[12] findings, according to which the majority of practicing nurses were females with nursing degrees who had never been trained in venipuncture. However, Ayalew et al.,[13] found that the three-thirds of the nurses had experience ranging from 5 to 10 years. This may be because the administration chose older nurses who could more effectively handle responsibilities that were mostly in the surgical sector.

The current study indicated that, previous to the implementation of nursing guidance, the majority of nurses lacked enough understanding about and experience with venipuncture. The lack of Arabic language resources available to freshly graduated nurses for continuing education and performance updates, in the researchers' perspective, may be the source of low knowledge and performance levels. This performance area is essential for providing the best care possible to those patients and for lowering the risk of phlebotomy hematoma formation during venipuncture and standard syringe use.

More than half of the nurses' performance improved in the current study once the nursing guidance was implemented. Given that more than half of nurses are single and have free time to learn, this may have something to do with the nurses' strong desire to learn new things. Butts & Rich, [14] explained that organizations must set criteria to direct practitioners in providing safe and effective care.

This findings is consistent with that of Amer [15], who found that nurses' knowledge levels did not rise in step with their decline in years of experience.

Regarding the demographic details of the patients who were the subject of the study, In general, the present investigation discovered no statistically significant difference between the two groups' demographic information. This was necessary to guarantee the two groups could be compared and to show that the randomization of the two groups had been successful. According to Boonchoo et al., [16] the study's findings, the patients in both groups had mean ages of (43.2±9.7 and 42.6±9.4) years, respectively. This age group consists of young people who lead active professional lives, and the prevalence of chronic diseases has little impact on our findings.

The researcher claimed that researcher, the key conclusion of this study was that, when compared to samples taken by direct vein puncture, all of the results of the tested individuals, who were 18 years or older, showed excellent conformity and were within clinically acceptable ranges.

This is consistent with the Loving et al.,[17] study, which showed that younger patients had a lower percentage of hematoma development locations than older patients did. Elsner, [18] said that as patients' age, their skin's moisture and flexibility alter.

However, this is not consistent with Wang et al., [19] who stated that the majority of patients who require blood analysis were older than average—66.98 ± 14.56 years—which may be a risk factor for the formation of hematomas.

According to the current study, the majority of patients were men with normal temperatures and pulse rates. Numerous hormone levels are affected by fever. Hypoglycemia brought on by fever raises insulin levels, which is followed by an increase in glucagon levels [20 ].

Additionally, fever raises cortisol levels, which may interfere with their regular diurnal cycle and alter blood vessel walls [21]. The body's reaction to a temperature increase causes the level of pulse rate to increase [22]. Blood is forced from the skin's outer layer to the interior of the body, where it is easier to retain the heat in, as a result of constricted blood vessels [23].

The concentration of a variety of blood components is influenced by the patient's gender [24]. The majority of distinctions become noticeable only after sexual maturity and are represented in different normal values for males and females. For instance, males often have larger RBC, Hgb, and Hct values than females do [25]. That factors affect the blood vessels wall resistance to rupture.

According to the current study, after applying nursing guidance, there were significantly more patients with phlebotomy

hematoma in the group using regular syringes than in the group using venipuncture. This difference was statistically significant between the two groups.

According to the researchers' explanation, venipuncture needles are more likely to trigger a rupture in the punctured vein than ordinary syringes with smaller size needles. According to Zhao & Bi [26], who detailed their study, improper use of an ordinary syringe caused blood leakage that resulted in a hematoma, and the latter resulted in the development of a brachial artery or vein pseudoaneurysm that could only be treated surgically.

This was additionally supported by Binvel et al. [27] study, "Comparison of a closed system and an open system for blood collection in feline donors," which demonstrated that alternatives to traditional syringes with venipuncture improved the quality of care and patient satisfaction while reducing phlebotomy hematoma and cost. This is because there is a larger frequency of problems than with venous whole-blood phlebotomy [28].

However, Galena [29],revealed that only one incidence was observed in their investigation following venipuncture, hematoma is a reasonably common consequence.

The current study showed that, compared to the traditional syringe group, the venipuncture group had a decrease in phlebotomy hematomas among the patients studied. This can be explained by the fact that nursing educational programs and raising nurses' levels of practice and knowledge had a significant impact on the standard of care provided to patients.

The correct tightness of the tourniquet, the vein choice, the needle size, the sharpness of the needle's bevel, and the phlebotomy entrance technique are all thought to affect the hematoma and contusion rates [30]. The researcher therefore believes that in order to prevent the development of hematomas following phlebotomy, nurses should refresh their skills and knowledge about the competent blood collecting procedure.

After the completion of the current study, Horowitz [31], findings revealed an improvement in the patient's level of satisfaction with the blood sample procedures following training of the staff nurses in the novel venipuncture technique.

According to Srikanth and Lotfollahzadeh's [32] research from 2021, venipuncture patients reported higher levels of patient satisfaction and less phlebotomy hematoma degree creation than syringe users. While, in contrary, Yildirim & Yildiz, [33] found that the presence of the negative pressure that generates a high pain at the injection site led to the patient with a venipuncture device having low satisfaction and a high pain level compared to traditional blood collection methods.

The current study found no difference throughout the ages, sexes, or hemodynamic state of the groups receiving venipuncture vs those receiving regular syringes in terms of demographic characteristics.

The results of the current study showed that, compared to the elderly group, the adult patient population of patients between the ages of 18 and 55 showed a considerable improvement in the degree of hematoma following the application of nursing guidance. Because collagen and vascularity decline with age, the healing of wounds may take longer to complete.

Age-related alterations, according to Uitto, [34] had an effect on diseases associated with old age as well as diminished skin flexibility and collagen.

In this context, Kalish et al [35], reported that the patient's sex and age may be non-modifiable factors in the hematoma formation. In this regard, Newman et al.36, came to the conclusion that women experience contusions and hematomas more frequently than men. According to the research conducted by Hemelaar [25], there does not seem to be a clear association between age and hematoma occurrence

Regarding this, Rahim-Williams et al., [37] reported that venipuncture had no appreciable impact on the patients' vital signs.

Blood sample collection is an invasive procedure, thus the person may become anxious about it. Companies place off going to the hospital for healthcare services due to their fear of providing blood, needle phobia, and the sensation of discomfort, which prevents them from receiving a diagnosis and treatment [38].

Another study by Hosseinabadi et al., [39] found that venipuncture in adult patients had no effect on vital signs when massage was performed to the puncture spots in comparison to the control and placebo groups ($p>0.05$).

According to the literature review, it is challenging to pinpoint the physiological changes that painful treatments trigger in a

brief period of time since the altered values soon return to their pre-adjusted levels, and physiological adaptation sets in almost immediately [40].

Finally, the results of the current study demonstrated that, following the implementation of nursing guidance, nurses' knowledge and practice regarding the formation of phlebotomy hematomas were greatly improved. After using the nursing guidance, the current study's findings improve patient satisfaction by lowering the rates of phlebotomy hematoma formation.

In this regard, Cloete, [41] came to the conclusion that people's increased nursing awareness (knowledge and practice) results in a reduction in method errors.

Incorporating the outcomes of the Hambleton et al., [42] analysis, it is possible to draw the conclusion that the venipuncture procedure yields accurate laboratory results while minimizing blood loss and discomfort, and there was no hemolysis seen in the matched samples. These findings are helpful to patients who must have numerous consecutive blood samples drawn for testing because they are in line with earlier studies by Lippi et al., [43].

According to the study, the method of venipuncture did not seem to increase the frequency of hematoma. However, venipuncture was the most popular approach in some earlier research for treating adult patients. The most frequent hematomas require more attention in terms of how to prevent/reduce them [44 ].

## CONCLUSIONS

After the implementation of nursing guidance, nurses` knowledge and practice concerning venipuncture and ordinary syringe technique improved.

• Hematoma rates among the patients with venipuncture were lesser than ordinary syringe with a positive-correlation the nursing guidance applications.

Implications for research, policy, and practice

Use the venipuncture technique for all blood samples to ensure minimal hematoma formation.

• Replication of this study on a larger probability sample from different geographical areas.

## REFERENCES

[1] Pan T, Francisco D, Yen C, Wang S, Shiue Y. Vein pattern locating technology for cannulation: a review of the low-cost vein finder prototypes utilizing near infrared (NIR) light to improve peripheral subcutaneous vein selection for phlebotomy. Sensors. 2019; 19:3573.

[2] Cai Q, Zhou Y, Yang D. Nurses' knowledge on phlebotomy in tertiary hospitals in China: a cross-sectional multicentric survey. Biochem Med. 2018; 28:1–13.

[3] Sheils S, Mason S, Gullick J. Acceptability of external jugular venepuncture for patients with liver disease and difficult venous access. Br J Nurs. 2020; 29:S27–S34.

[4] Keiko K, Chizuko K, Masaru M. Venipuncture-Induced Hematomas Alter Skin Barrier Function in the Elderly Patients, SAGE Journals 2018. Available from: https://doi.org/10.1177/2377960818782050.

[5] Cornes M, Ibarz M, Ivanov H, Grankvist K. Blood sampling guidelines with focus on patient safety and identification - a review. Diagnosis (Berl). 2019; 6(1):33-37..

[6] Jacquelyn C, Why You Can Get a Bruise After a Blood Draw, 2018. Available from: https://www.healthline.com/health/bruising-after-blood-draw.

[7] VeRonika D, Matthew D, Elizabeth A, Show-Hong D, Robert H. Assessing Phlebotomy Device Preference and Specimen Quality in an Oncology Outpatient Clinic. The Journal of Applied Laboratory Medicine. 2022; 7(2): 532–540. Available from: https://doi.org/10.1093/jalm/jfab109.

[8] World Health Organization, Best Practices for Injections and Related Procedures Toolkit.2010.

[9] Padaro E, Kueviakoe I, Agbétiafa K, Magnang H, Mawussi K, Layibo Y, Vovor A. Therapeutic phlebotomy during major sickle cell disease in Togo. Med Sante Trop. 2019; 29(1):106-107.

[10] Kishan K. Srikanth, Saran L. Phlebotomy, The National Center for Biotechnology Information . StatPearls Publishing; 2022 Jan.

[11] Rajpali S. Transradial Site Assessment: Review of Nursing Skill, Journal of pioneering medical science. 2022.

[12] Osman T. The Effectiveness of Educational Program on Nurses knowledge and practice Regarding Wound Care in Kosti Teaching Hospital Kosti city-Sudan (Doctoral dissertation). 2019:38.

[13] Ayalew F, Kibwana S, Shawula S, Misganaw E, Abosse Z, Van Roosmalen J, Mariam D. Understanding job satisfaction and motivation among nurses in public health facilities of Ethiopia: a cross-sectional study. BMC nursing. 2019; 18(1): 1-13..

[14] Butts J, Rich L. Philosophies and theories for advanced nursing practice. Jones & Bartlett Learning. 2021; 18(1):1-13.

[15] Amer R, Nursing students' knowledge and practices related to sharp object injury and management at a university in the Western Cape Province (Doctoral dissertation, Cape Peninsula University of Technology.2019: 45-60.

[16] Boonchoo K, Leelataweewud P, Yanpiset K, Jirarattanasopha V. Simplify pulpectomy in primary molars with a single-file reciprocating system: a randomized controlled clinical trial. Clinical oral investigations. 2019:1-7.

[17] Loving V, Johnston B, Reddy D, Welk L, Lawther H, Klein C, Morris M. Antithrombotic therapy and hematoma risk during image-guided core-needle breast biopsy. Radiology. 2021; 306(1): 79-86..

[18] Elsner P. Skin elasticity. In Bioengineering of the skin: methods and instrumentation. 2020; 53-63. CRC Press..

[19] Wang L, Zhang X, Qin Y, Wang F, Cui M, Shi Y, Chen Y. A comparative study on coagulation and hematologic laboratory techniques for blood sampling using the push-pull method from a CVC versus venipuncture. The Journal of Vascular Access. 2022: 112-129.

[20] Szekely M, Petervari E, Balasko M.Thermoregulation, energy balance, regulatory peptides: recent developments. Frontiers in Bioscience-Scholar. 2010; 2(3): 1009-1046.

[21] Schimmer B, Parker K. Adrenocorticotropic hormone; adrenocortical steroids and their synthetic analogs; inhibitors of the synthesis and actions of adrenocortical hormones. Goodman & Gilmans the pharmacological basis of therapeutics, 11th ed. New York: McGraw Hill. 2016: 1587-612..

[22] Linek N, Volkmer T, Shipley J, Twining C, Zúñiga D, Wikelski M, Partecke J. A songbird adjusts its heart rate and body temperature in response to season and fluctuating daily conditions. Philosophical Transactions of the Royal Society B.2021; 376(1830): 202: 213..

[23]Wen X, Sun S, Wu P. Dynamic wrinkling of a hydrogel–elastomer hybrid microtube enables blood vessel-like hydraulic pressure sensing and flow regulation. Materials Horizons. 2020; 7(8): 2150-2157.

[24] de Marcos Carpio I, Sanghani-Kerai A, Solano M, Blunn G, Jifcovici A, Fitzpatrick N. Clinical Cohort Study in Canine Patients, to Determine the Average Platelet and White Blood Cell Number and Its Correlation with Patient's Age, Weight, Breed and Gender: 92 Cases (2019–2020). Veterinary Sciences. 2021; 8(11): 262.

[25]Hemelaar A. Age, growth and other population characteristics of Bufo bufo from different latitudes and altitudes. Journal of Herpetology. 2018:369-388.

[26] 26. Zhao G, Bi L. Microsurgical Repair of Peripheral Vascular Injury. In Microsurgical Orthopedics. 2019: 347-361. Springer, Dordrecht

[27] Binvel M, Fairbrother J, Lévesque V, Blais M. Comparison of a closed system and an open system for blood collection in feline donors. Journal of feline medicine and surgery. 2020; 22(12): 1121-1128.

[28]Newman B. Arm complications after manual whole blood donation and their impact. Transfusion medicine reviews. 2021; 27(1): 44-49.

[29]Galena H. Complications occurring from diagnostic venipuncture. J Fam Pract 2022; 34(5): 582-584.

[30]Ranasinghe J, Harrison F. Bruising following blood donations, its management and the response and subsequent return rates of affected donors Transfusion Med. 2021; 10 (2): 113-116..

[31]Horowitz H. Venipuncture-induced nerve injury: a review J of Neuropathic Pain & Symptom Palliation. 2018; 1 (2): 109-114.

[32]Srikanth K, Lotfollahzadeh, S. Phlebotomy In StatPearls, Publishing. 2021: 66-78.

[33]Yildirim D, Yildiz C. The effect of acupressure on vital signs, acute pain, stress and satisfaction during venipuncture: Single-blind, randomized controlled study. European Journal of Integrative Medicine.2021; 44:101343.

[34]Uitto J. Connective tissue biochemistry of the aging dermis: age-related alterations in collagen and elastin. Dermatologic clinics. 2016; 4(3): 433-446.

[35]Kalish J, Eslami M, Gillespie D, Schermerhorn M, Rybin D, Doros G, Vascular Study Group of New England. Routine use of ultrasound guidance in femoral arterial access for peripheral vascular intervention decreases groin hematoma rates. Journal of vascular surgery. 2015; 61(5): 1231-1238.

[36]Newman S, Pichette D, Pichette E, Dzaka B. Adverse effects in blood donors after whole blood donation: a study of 1000 blood donors interviewed 3 weeks after whole blood donation Transfusion,. 2018; 43 (4): 598-603.

[37]Rahim-Williams J, Riley A, Williams R. A quantitative review of ethnic group differences in experimental pain response: do biology, psychology, and culture matter? Pain Med. 2020; 13 (4): 522-540.

[38]Wang Z, Kain M. Auricular acupuncture: a potential treatment for anxiety Anesth. Analg. 2021; 92 (2): 548-553.

[39]Hosseinabadi S, Biranvand Y, Pournia K, Anbari M. (2015), The effect of acupressure on pain and anxiety caused by venipuncture J. Infus. Nurs. 2015; 38 (6): 397-405.

[40]Inangil G, Inangil M. The effect of acupressure (GB30) on intramuscular injection pain and satisfaction: single-blind, randomised controlled study J. Clin. Nurs. 2020; 29 (7–8):1094-1101.

[41]Cloete L. Reducing medication errors in nursing practice. Cancer Nursing Practice. 2015; 14(1).

[42]Hambleton V, Gómez A, Andreu, F. Venipuncture versus peripheral catheter: do infusions alter laboratory results?. Journal of Emergency Nursing. 2019; 40(1): 20-26.

[43]Lippi G, Plebani M, Di Somma S, Cervellin, G. Hemolyzed specimens: a major challenge for emergency departments and clinical laboratories. Critical reviews in clinical laboratory sciences. 2020; 48(3): 143-153.

[44]Yamada K, Yamada I, Katsuda T, Hida M. Cubital fossa venipuncture sites based on anatomical variations and relationships of cutaneous veins and nerves, Clin Anat. 2018; 21 (8):307-313.

DOI: https://doi.org/10.15379/ijmst.v10i2.3146