Nursing Assessment of Pain and Ecchymosis among Cardiac Patients who Receive Subcutaneous Anticoagulant Injection

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Abstract:

Background: "Pain and ecchymosis at the injection site are common side effects of subcutaneous Enoxaparin injections and may discourage patients from continuing the treatment. Using a correct and safe injection technique is an effective and straightforward way to manage these issues. **Aim of the study:** assess pain and ecchymosis among cardiac patients who receive subcutaneous anticoagulant injection .**Research design:** a descriptive correlation research design was utilized. **Subjects:** A purposive sample of adult patients (n=60) .**Setting:** This research was carried out in cardiac department at the Minia University cardiothoracic Hospital. **Data collection tools**: One tool and two scales were used to collect data , the first tool was a structured interview assessment sheet, the second was Numerical Pain Rating Scale , and the third was Ecchymosis Formation Scale **Results:** Clarify that Mean +SD of pain level in 1st &3rd day (two times per day) was (3.78335±0.8445&3.925 ±0.89395) respectively and Mean +SD of ecchymosis extent in 2nd &3rd day was (2.8500+0.9356 &2.5333±1.0116) respectively following the subcutaneous injection administered by the hospital staff .**Conclusion:** The pain level on the third day was slightly higher than on the first day and the ecchymosis extent was higher on the second day compared to the third day, after SC injection administered by hospital staff **Recommendation:** replication of study on large probability sample .

Keywords:, Subcutenous injection , Pain , Ecchymosis.

Introduction:

Globally, cardiovascular diseases (CVDs) remain the major cause of death. There are currently more than 500 million people with CVDs, which caused around 20.5 million deaths in 2021, accounting for almost one-third of all fatalities worldwide and an increase above the 121 million deaths from CVD that were previously estimated (**Di Cesare,etal., 2024).** Numerous risk factors influence cardiovascular disorders. Obesity, smoking, high blood pressure, high cholesterol, and physical inactivity are major causes. Arterial narrowing brought on by these disorders may increase the risk of heart attacks and strokes (**Martin, etal., 2025).** Enoxaparin sodium, a low molecular weight heparin that is injected, and frequently used to treat and prevent diseases like acute coronary syndrome that are brought on by blockages in blood vessels. It has the potential to cause problems because it is a high-risk medicine (**Kullathum et al., 2023**). Enoxaparin functions as an anticoagulant when administered subcutaneously, however it can also have adverse effects like discomfort and bruises at the injection site. Patients may be deterred from pursuing the treatment by these side effects (**Aghakhani et al., 2023**).

Pain caused by subcutaneous enoxaparin injections is a common concern among hospitalized patients, often leading to fear of injury, anxiety, and reduced trust in healthcare professionals (**Taghlili et al., 2021**). To address this, research has investigated various methods to lessen pain, such as warming the injection to body temperature, administering the drug slowly, and applying cold compresses prior to injection. Recognizing the factors that affect pain intensity and adopting evidence-based practices can enhance patient comfort and support adherence to anticoagulant treatment (**Shi et al., 2025**). Additionally, using correct injection techniques is crucial for maximizing therapeutic effectiveness while

reducing local adverse effects associated with enoxaparin (**Mikhael et al., 2024**).

Bruising can occur when blood leaks into the subcutaneous tissue due to trauma to blood vessels or increased vessel fragility (**Varghese, 2022**). Typically, bruising reaches its maximum size around 48 hours after injection and begins to fade after approximately 72 hours (**Ebrahimi et al., 2019**). It is essential for nurses to have a thorough understanding of the medication, including its purpose, precautions, possible complications, correct administration techniques, and appropriate nursing interventions. This knowledge ensure patient safety and maximizes the therapeutic benefits of the medication (**Kullathum et al., 2023**)

Nurses play a vital role in the safe administration of subcutaneous (SC) injections and in promoting patient well-being throughout the procedure. Proper site selection—commonly the abdomen, upper arm, or thigh—is crucial to ensure optimal drug absorption and minimize discomfort. Adhering to established protocols, nurses perform hand hygiene, prepare the injection site, and use the correct needle angle (either 45 or 90 degrees) to reduce the risk of complications like infection or tissue injury. Key responsibilities also include monitoring for adverse effects, providing patient education on self-injection when appropriate, and strictly following safety standards. Through accurate technique and a patient-centered approach, nurses help maximize the effectiveness of treatment while minimizing potential risks associated with SC injections. (**Mathias, etal.,2024).**

Significance of the Study

The safe and precise administration of medication is one of the most important duties of nurses.

This involves using proper techniques and having a thorough understanding of the medications being given, including their potential side effects (**Wang et al., 2020**). Subcutaneous anticoagulant injections are commonly associated with local negative consequences such as pain, swelling, and ecchymosis at the injection site. Research has shown that pain affects approximately 28.35% to 88.9% of patients, while ecchymosis occurs in about 40% to 88% of cases (**Mahmoud et al., 2023**). Pain at the SC injection site is a frequent concern for patients undergoing anticoagulant therapy, and its intensity can be influenced by factors like injection technique, drug formulation, and individual patient sensitivity (**Zhi et al., 2025**).

Injection site pain can have a significant effect on patients, often resulting in reduced adherence to treatment due to the discomfort experienced during and after administration (**Shi et al., 2025**). For individuals undergoing long-term anticoagulant therapy, this pain may also exacerbate anxiety and emotional distress. Similarly, ecchymosis (bruising) can produce both physical and psychological effects. Patients may experience tenderness, swelling, and difficulty performing everyday tasks, while visible bruising may lead to emotional discomfort and self-consciousness, particularly with ongoing therapy. In more severe cases, extensive bruising may limit the availability of suitable injection sites and compromise medication absorption (**Cevheroglu & Buyukylimaz, 2023**). Studies have shown that improper injection techniques contribute to pain in over 90% of patients and are a major factor in the development of bruising. These findings underscore the critical need for comprehensive education and training in the proper administration of low molecular weight heparin (LMWH) to enhance patient outcomes and minimize complications (**Wong et al., 2024**).

Aim of the study

The study aims to assesse pain and ecchymosis among cardiac patients who receive subcutaneous anticoagulant injection .

Research question:-

- How does the incidence of ecchymosis vary among cardiac patients after SC anticoagulant injection administered by hospital staff ?

- How dose pain level vary among cardiac patients after SC anticoagulant injection administered by hospital staff ?

-What are the relationships between pain and ecchymosis and SC anticoagulant injection administered by hospital staff among cardiac patient?

Subjects and Methods:

Research Design:

The research design used was a descriptive correlation study.

Setting:

This research was carried out in cardiac department at Minia University cardiothoracic Hospital at Minia Governorate-Egypt.

Study Duration:

Data collected from July 2023 to April 2024

Subjects:

A purposive sample of both male and female adult patients. The following sample size formula, which is determined using **Isaac and Michael's (1995)** approach, is calculated as

N= n x 30 / 100 in which:

N = Sample size

n = Total number of 200 adult patients admitted to cardiac department received subcutaneous Enoxaparin sodium 80 mg during the period 2020:2021.

N = 200x 30 / 100 = 60 Patient

So the study sample was (60 patient)

Inclusion Criteria: -

- Patients in their adult years, ages 18 to 60.
- Newly admitted patients to the cardiac department.
- Patients who received subcutaneous Enoxaparin sodium (80 mg) for three consecutive days at 12-hour intervals, as per physician's orders.
- Patients who are conscious and able to communicate effectively.

Exclusion Criteria

- Patients with cognitive impairments or those unable to self-report pain.
- Patients diagnosed with liver disease.
- Patients with a history of heparin-induced thrombocytopenia.
- Presence of contraindications on the abdominal area (e.g., skin lesions or burns).
- Diabetic patients who administer insulin in the abdominal region.
- Patients who decline to take part in the study.

Tools of Gathering Data

One tool and two scales to collect pertinent data prepared by the researcher after the literature review.

First Tool: Structured interview assessment sheet :

It was collected at the first interview and addressed two main parts

- **Part one**: Covers patients' sociodemographic characteristics, such as patient's age, gender, education, residence, and marital status.
- **Part two**: Covers patients' medical data such as patient's diagnosis , past medical history ,past pain tolerance regarding SC injection previous exposure to SC injection at abdomen related to any health problems, and body mass index (BMI).

Second Tool: Numerical Pain Rating Scale(NPRS): The Numerical Pain Rating Scale (NPRS), as standardized by McCaffery (1989), was utilized to evaluate patients' perceived pain levels. Participants in the study selected a whole number from 0 to 10 that best represented the intensity of their pain. This scale is typically presented as a horizontal line or bar, providing a simple and effective format for pain assessment.

The scoring system :

Higher scores indicated more intense pain. The scoring system went from 0 to 10. 0 meant there was no pain, 1 to 3 meant there was light pain, 4 to 6 meant there was considerable pain, 7 to 8 meant there was severe pain, and 9 to 10 meant there was agonizing pain. Over the course of three days, pain levels were measured twice a day after each subcutaneous enoxaparin injection.

Third Tool: Ecchymosis Formation Scale: adopted from **(Andersen,et al., 2015).** This scale was used to measure the extent of ecchymosis. The researcher assessed ecchymosis twice: first at 48 hours and again at 72 hours following the routine subcutaneous injection in the hospital. A transparent millimeter ruler was used to accurately measure the size of the bruising. The measurements ranged from no ecchymosis to marked ecchymosis, reflecting the severity of bruising.

Scoring system: Ecchymosis was classified into four groups based on their surface area:

*No: Ecchymosis, which has a diameter of less than 2 cm.

*Ecchymosis is tiny (diameter more than 2 cm).

*Ecchymosis is large (diameter more than 5 cm).

*Marked ecchymosis (diameter more than 10 cm).

Validity and Reliability:

Content validity of the study tools was evaluated by reviewing the items to ensure they accurately measured the intended constructs. This assessment was conducted by a committee of five

experts from the Medical-Surgical Nursing academic staff at the Faculty of Nursing, Minia University. Each expert confirmed that the research tools were reliable, relevant to the study objectives, and did not require any modifications.

To make sure the study tools were consistent, reliability testing was done. To find out how successfully each tool's components measured the desired construct, internal consistency was evaluated. When reliability was established using Cronbach's alpha, the results showed that the first tool, pain scale, and ecchymosis scale in the control group were 0.955, 0.756, and 0.773, respectively, whereas in the study group, the pain scale and ecchymosis scale were 0.786 and 0.790, respectively.

Pilot study

10% of the research sample (6 patients) participated in a pilot study to evaluate the viability, objectivity, and application of the data collection instruments and scales. The results of the pilot research indicated that no changes to the instruments were required.

Ethical Consideration

- The study was officially approved by the Minia University faculty dean, the director of the cardiac department, the director of the cardiothoracic hospital, and the faculty's ethical committee.
- All participants gave their oral informed consent after being fully informed about the nature, goals, methods, and possible advantages of the study. Participants were guaranteed that their information would not be utilized in any future studies without gaining prior agreement, and participation was completely optional.
- Each assessment sheet was coded and participant names were left off in order to preserve confidentiality and anonymity. Additionally, participants were made aware of their freedom to leave the study at any moment and without explanation.

Field Work: It was execution in the three phases:

1-Preparatory Phase

Using books, papers, periodicals, and magazines, a thorough examination of recent local and worldwide literature pertaining to different research aspects was carried out. The number of patients admitted to Minia University Cardiothoracic Hospital's cardiac department was used to evaluate the research setting. After obtaining official permission from hospital authorities to proceed with the proposed study, the researcher began data collection from patients who met the inclusion criteria. Additionally, the researcher prepared the study tools and scales, ensuring their validity and reliability before use.

2. Implementation phase:

The researcher conducted this phase over three days per week, covering both morning and evening shifts in the cardiac department. On the first day of each patient's admission to the cardiac department, the researcher reviewed the patient's medical files to complete the first assessment tool and conducted interviews to gather the necessary information for each item in the tool.

3-Evaluation Phase:

The study sample was assessed as the following

The researcher assessed pain levels following subcutaneous injections administered by the hospital staff using the first scale (NPRS) twice daily for three consecutive days—once during the morning shift and once during the evening shift. Additionally, ecchymosis was evaluated using the second scale (Ecchymosis Formation Scale) at two time points: first at 48 hours and then at 72 hours after the subcutaneous injection. A transparent millimeter ruler was used to measure the extent of ecchymosis during these assessments.

- **IV. Statistical design:**

Statistical analysis of data

The gathered information was methodically arranged, tallied, classified, and then examined. The Statistical Package for Social Sciences (SPSS) version 22, which contains a number of significance tests frequently used in statistical literature, was used to enter the data. Quantitative variables were summarized using descriptive statistics like mean and standard deviation, whereas qualitative data were summarized using frequencies and percentages. To determine the kind and degree of correlations between two numerical variables, correlation analysis was used. Positive or negative relationships are indicated by the correlation coefficient (rho), which can be interpreted as follows: a weak correlation is indicated by a value below 0.25, a fair correlation is indicated by a value between 0.25 and 0.49, a moderate correlation is indicated by a value between 0.50 and 0.74, and a

strong correlation is indicated by a value above 0.74.

Limitations of the study

There was a shortage of Enoxaparin sodium in the hospital pharmacy for five months during the study period due to delays in importing the medication.

Results:

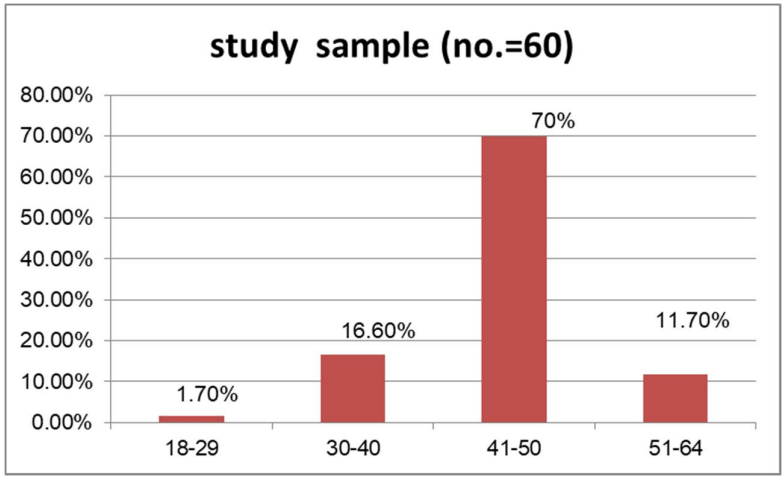


Figure (1): Distribution of patients' age (n=60)

Figure (1) shows that the mean average age of study sample was (41.2 ± 9.15years).

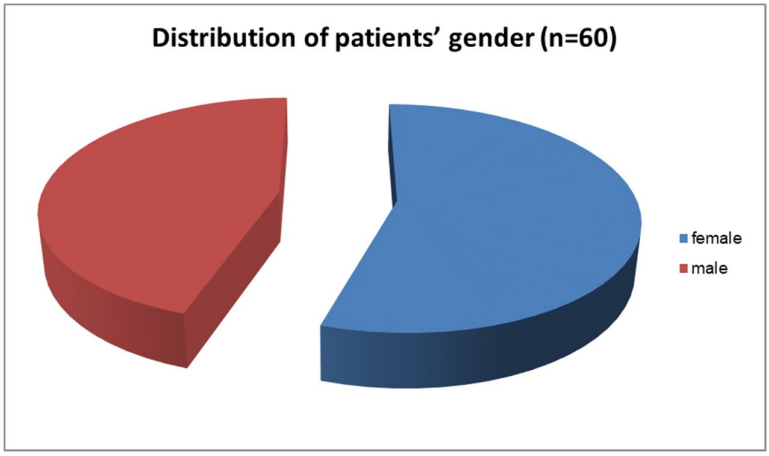


Figure (2): Distribution of patients' gender (n=60)

Figure (2) displays that more than half (55.0 %) of study was females.

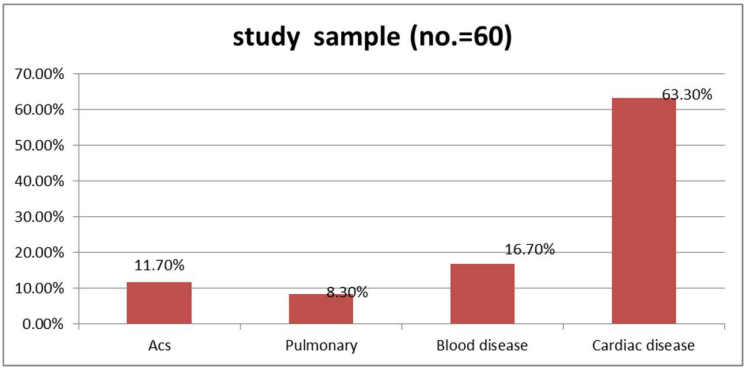


Figure (3): Distribution of medical diagnosis of study group(no=60)

Figure (3) displays that the highest percentage (63.30%) of study group their diagnosis was cardiac disease and lowest percentage (8.30%) their diagnosis was pulmonary disease

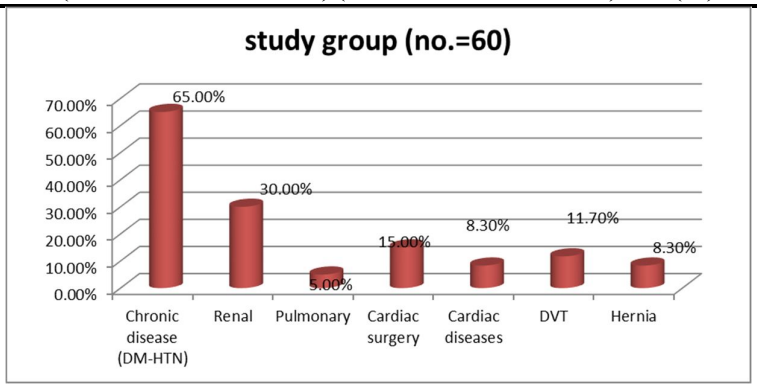
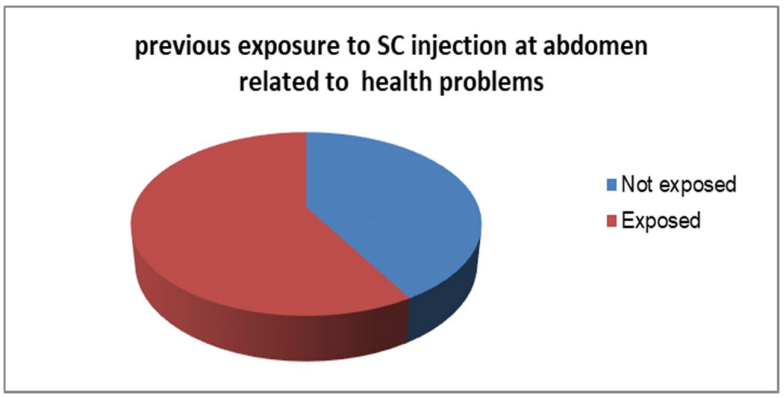


Figure (4): Distribution of past medical history of study group(no=60)

Figure (4) shows that the highest percentage (65.0%) of study group had past history of chronic diseases (DM&HTN) while the lowest percentage (8.3%) of them had past history of hernia surgery.



igure (5) Distribution of previous exposure to SC injection at abdomen related to any health problems (n=60)

Figure (5) shows that more than half of study sample (58.4%) had previous exposure to SC injection at abdomen related to any health problems

Table (1): Distribution of numerical pain level post SC injection through there days (n=600)

Numerical Pain Rating Scale	study sample (no.=60)			
	1st day (1st injection		1st day (2nd injection)	
	No.	%	No.	%
▪ (0)=No pain	0	0.0	0	0.0
▪ (1:3)= Mild pain	5	8.4	5	8.4
▪ (4:6)=Moderate pain	15	25.0	13	21.6
▪ (7:8)=Severe pain	30	50.0	30	50.0
▪ (9:10)=Unbearable pain	10	16.6	12	20.0
Mean +SD (T-test)	3.78335±0.8445			
▪	2nd day (1st injection)		2nd day (2nd injection)	
▪ (0)=No pain	0	0.0	0	0.0
▪ (1:3)= Mild pain	5	8.3	5	8.2
▪ (4:6)=Moderate pain	14	23.4	14	23.4
▪ (7:8)=Severe pain	26	43.3	27	45.0
▪ (9:10)=Unbearable pain	15	25.0	14	23.4
Mean +SD (T-test)	3.84165±1.784			
▪	3rd day (1st injection)		3rd day (2nd injection)	
▪ (0)=No pain	0	0.0	0	0.0
▪ (1:3)= Mild pain	5	8.3	5	8.3
▪ (4:6)=Moderate pain	11	18.3	11	18.3
▪ (7:8)=Severe pain	27	45.0	28	46.7
▪ (9:10)=Unbearable pain	17	28.4	16	26.7
Mean +SD (T-test)	3.925 ±0.89395			

Table 1 shows that the mean ± SD of pain levels on the 1st and 3rd days after subcutaneous injection administered by hospital staff (assessed twice daily) were 3.78 ± 0.84 and 3.93 ± 0.89, respectively.

Table (2): Distribution of ecchymosis extent through second and third day (n=60)

Ecchymosis Extent	Study sample (no.=60)	
	2nd day	
	No.	%
*No: Ecchymosis, which has a diameter of less than 2 cm.	2	3.3
*Ecchymosis is tiny (diameter more than 2 cm).	10	16.6
*Ecchymosis is large (diameter more than 5 cm).	28	46.7
*Marked ecchymosis (diameter more than 10 cm).	20	3.4
Mean +SD (T-test)	2.8500±0.9356	
	3rd day	
*No: Ecchymosis, which has a diameter of less than 2 cm.	10	16.7
*Ecchymosis is tiny (diameter more than 2 cm).	12	20.0
*Ecchymosis is large (diameter more than 5 cm).	25	41.7
*Marked ecchymosis (diameter more than 10 cm).	15	21.6
Mean +SD (T-test)	2.5333±1.0116	

Table (2) reflects that, The mean ± SD of ecchymosis extent on the 2nd and 3rd days after subcutaneous injection administered by hospital staff were 2.85 ± 0.94 and 2.53 ± 1.01, respectively

Table (3)): Relation between socio-demographic data and pain level (n=60)

Socio-demographic Data	Pain level Study sample (n=60)					
	1st day		2nd day		3rd day	
	1st time	2nd time	1st time	2nd time	1st time	2nd time
	Mean +SD	Mean +SD	Mean +SD	Mean +SD	Mean +SD	Mean +SD
Age / Years						
18>30	3.00+1.15	3.00+1.15	3.00+1.15	3.00+1.15	3.00+1.15	3.00+1.15
≤30>40	3.82+.79	3.82+.79	3.82+.79	3.82+.79	3.82+.79	3.82+.79
≤40>50	5.00+.00	3.00+.00	5.00+.00	5.00+.00	5.00+.00	5.00+.00
≤51>64	3.50+.70	5.50+.70	3.50+.70	3.50+.70	3.50+.70	3.50+.70
Anova test (p-value)	3.67(.01*)	3.67(.01*)	3.67(.01*)	3.67(.01*)	3.67(.01*)	3.67(.01*)
Sex						
Female	5.00+.79	6.00+.90	5.84+.87	5.90+.84	6.06+.96	6.03+.95
Male	3.66+1.00	3.62+.83	3.62+.79	3.70+.86	3.77+.80	3.77+.80
T test (p-value)	2. 98(.04*)	3.73(.03*)	2.98(.04*)	2.77(.04*)	3.88(.03*)	3.88(.03*)
Level of Education						
Illiterate	3.82+.92	3.89+.90	3.69+.86	3.78+.89	3.91+.83	3.89+.82
Primary school	3.91+.90	3.58+.79	4.08+.51	4.08+.51	4.08+1.16	3.91+1.16
Secondary school or diploma	4.00+.00	4.00+1.41	3.00+1.41	3.00+1.41	3.50+.70	4.00+.70
University graduate	------	------	------	------	------	------
Anova test (p-value)	075(.92NS)	.603(.55NS)	1.913(.15NS)	1.567(.21NS)	402(.67NS)	.441(.64NS)
Residence						
Rural	3.91+.90	3.85+.88	3.72+.74	3.78+.74	4.06+.76	2.00+.77
Urban	3.61+.86	3.76+.92	3.84+1.14	3.92+1.18	3.46+1.19	2.07+.79
T test (p-value)	1.065(.29NS)	1.29(.77NS)	.465(.64NS)	.505(.61NS)	2.206(.03NS)	.376(.709NS)
Marital Status						
Single	2.75+.500	3.50+1.00	3.00+1.15	4.00+.00	4.00+1.41	4.00+1.41
Married	3.94+.88	3.86+.77	3.76+.78	3.80+1.22	3.94+.88	3.92+.86
Divorced	3.66+.57	4.33+.57	4.66+.57	3.85+.78	4.00+1.00	4.00+1.00
Widow	4.00+1.41	3.00+1.41	3.50+.70	3.71+1.11	3.50+.70	3.50+.70
Anova test (p-value)	2.39(.078NS)	1.12(.34NS)	2.520(.06NS)	.065(.97NS)	162(.92NS)	.160(.92NS)

*. p is statistical significant at the 0.05 or less **. p is highly statistical significant at the 0.005 level or les

Table (3) shows that there is no statistical relation between study sample's socio demographic data and pain level through the three days except age and sex (p-value= <.05)

Discussion

In order to reduce pain and bruises, improve nursing care quality, and increase patient satisfaction, nurses must use safe and appropriate injection procedures due to the possible negative effects at the subcutaneous injection site of enoxaparin (Wang et al., 2020).

In relation to the study sample's age. According to the current study, the average age of the study sample was 41.2 ± 9.15 years.According to the researcher, this is because in Egyptian populations, the risk of cardiovascular illness rises with study sample age group. This result is consistent with that of **Omran and Alan (2022)**, who studied at the Cardiac Care Unit of Benha University Hospital and found that over half of their sample was between the ages of 40 and 50. The mean ages of the patients in the experimental and control groups, however, were 60.74 ± 5.52 and 60.3 ± 5.59 years, respectively, according to **Aghakhani et al. (2022).** The results of the current study are also at odds with the mean patient age of 54.66 ± 8.60 years reported by **Taghlili et al. (2021)**.

Regarding the patient's gender the research revealed that women made up over half of the group. According to the researcher's data, females are more likely to acquire plaque since their hearts and blood vessels are smaller. This finding is consistent with **Betai et al. (2024)**, who pointed out that each gender's hormonal variations in estrogen, progesterone, and testosterone have a distinct impact on cardiovascular illnesses. Likewise, **Díaz-González et al. (2022)** discovered that women made up over half of their study participants. Additionally, the bulk of the study samples were female, according to **Rupam et al. (2018)** and **Çit and Senturan (2018). Cevheroğlu**, on the other hand, **Buyukyilmaz (2023)** discovered that over half of their study sample was male.

Regarding to patient's past medical history, the present results showed that, the highest percentage of study group had past history of chronic diseases (DM&HTN) while the lowest percentage of them had past history of hernia surgery. According to the researcher, the risk of cardiovascular disease (CVD) is greatly increased by metabolic and behavioral risk factors, including poor diet, tobacco use, inactivity, and alcohol use. This is consistent with **Isik and Oztunç's (2022)** findings, which showed that the majority of their sample had at least one chronic illness, with diabetes mellitus and hypertension being the most prevalent. However, the findings of **Mahmoud et al. (2023)**, who discovered that only one-third of their sample had a history of diabetes mellitus, are different from those of the current study

This study found that more than half of the participants had previous exposure to subcutaneous (SC) injections in the abdomen related to various health conditions. From the researcher's perspective, this may be due to some patients being hospitalized for other diseases requiring SC anticoagulant therapy. However, this finding contrasts **with Hafez et al. (2023)**, who reported that more than three-quarters of participants in group II and all participants in group I had prior SC injection exposure within the past year. Similarly, the current result is not supported by **Inangil and Şendir (2020)**, who found that nearly half of their sample had experience with heparin injections.

Regarding the pain level and ecchymosis extent after the subcutaneous injection administered by the hospital staff, the current study reflected that,the mean pain level on the third day was slightly higher than on the first day , Based on the researcher's interpretation, pain perception increased slightly over time, which may be attributed to cumulative tissue irritation or individual variations in response to repeated injections. Additionally, the mean extent of ecchymosis was greater on the second day compared to the third day, suggesting that the tissue impact was more pronounced shortly after the injection but began to diminish as time progressed. This difference likely reflects the body's natural healing process, where subcutaneous bleeding is gradually reabsorbed, resulting in a reduction of bruising.

According to the researcher, a defined checklist for subcutaneous (SC) injections was not regularly followed by the cardiac department's nursing personnel. The results of this study are in contrast to those of **Mahmoud et al. (2023),** who found that manual pressure application is superior to standard methods in minimizing pain and bruising after SC injections. In a similar, **Aghakhani et al. (2022)** discovered that when enoxaparin injections were given over 30 seconds as opposed to 10 seconds, the severity of pain as well as the frequency and size of bruises were dramatically reduced. Additionally, **Sarani et al. (2020)** showed that administering SC enoxaparin using a 30-second injection approach reduced arm and abdominal pain.

The current results are inconsistent with **Mohammady and Sadeghi (2020),** who concluded that applying cold for 3 to 5 minutes before or after

subcutaneous heparin administration can reduce pain and hematoma formation. The researcher suggests that cold application causes vasoconstriction, which minimizes bleeding and limits the spread of bruising. Additionally, it helps reduce swelling and inflammation, thereby improving patient comfort and decreasing pain perception at the injection site.

Regarding, Relation between socio-demographic data and pain level ,the current study showed that there is no statically relation between all patients' socio-demographic data and pain level except age and sex (p-value= <.05). From the researcher's viewpoint, older adults may experience more pain than younger individuals due to declines in the strength and resilience of muscles, bones, and other tissues. Additionally, females tend to have a more intense natural response to painful stimuli, potentially due to greater nerve density, which may cause them to perceive pain more intensely than males. This finding aligns with **Dadaeen et al. (2017)**, who concluded that there was no significant correlation between pain intensity and age. Similarly, the present study supports the findings of **Vishakha and Kalra (2021)**, who reported no significant association between injection site pain intensity or bruising extent and socio-demographic variables or clinical profiles.

Conclusion

Following a subcutaneous injection administered by hospital staff, the mean degree of ecchymosis was larger on the second day than the third day, and the mean level of pain was marginally higher on the third day than on the first.

Recommendations

The researcher proposed the following in light of the current research's findings:

- Conduct frequent and continuous in-service training sessions on the standardized checklist for subcutaneous (SC) injections.
- Implement standardized protocols for SC injection to ensure consistency and safety.
- Utilize non-pharmacological methods, such as cold application, distraction techniques, and proper positioning, to reduce pain and ecchymosis.
- Conduct regular workshops and competency evaluations for nursing staff to reinforce proper SC injection techniques.
- Establish a reward and accountability system to promote adherence to SC injection protocols
- Educate patients and caregivers on correct injection techniques, suitable injection sites, and the use of cold application at home to minimize pain and bruising.
- Encourage further research exploring additional strategies to reduce pain intensity and ecchymosis extent in patients receiving SC enoxaparin.

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