Original Article

The Autar Deep Venous Thrombosis Risk Assessment Among Orthopedic Surgeries' Patients

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Abstract

Background: Deep venous thromboembolism is a most prevalent problem for orthopedic surgery patients. Nurses have been shown in the literature to play a significant role in reducing the incidence of DVT practicing range of motion exercises increase blood flow to the lower extremities, and early mobilization has been shown to improve outcomes**. Aim of the study:** To assess the Autar DVT risk among orthopedic surgeries' Patients. **Research design:** A descriptive research design. **Setting**: Orthopedic department at Minia University hospitals. **Sample**: (60) randomly selected patients undergoing orthopedic surgery. **Tools**: (I), Patient assessment sheet including demographic& medical data and Autar DVT risk assessment scale. (II), Deep vein thrombosis evaluation sheet. **Results**: Highest percentage were aged from 41 to 50 years old, females, illiterate, not working and from rural area (38.3. 51.7, 75, 86.7 and 86.7%) respectively. Less than half were in obese level of weight (30 < 40 kg) as body mass index (41.7%). Less than half of them experienced a very limited activities (45%). More than half of them had no chronic disease and had no contraceptive drugs (51.9, 16.6, and 50%). **Conclusion**: All of the studied patients were performing orthopedic surgeries due to presence of a lower limb injury and more than half of them were with high risk category. The high risk especially Left limb with p.value (0.027*). There was a positive correlation between demographic data and risk factors of DVT regarding age by years. **Recommendation:** Regularly updating and refreshing the nurses' knowledge and practice are recommended through workshops to assess and minimize the risks of DVT among the patients with orthopedic surgery using Autar scale.

Keywords: Autar, Deep Venous Thrombosis Risks, and Orthopedic Surgery.

Introduction:

Patients having major orthopedic surgery (MOS), such as total hip replacement (THR), total knee replacement (TKR), and hip fracture surgery (HFS), are at an increased risk of deep venous thrombosis (DVT) most commonly the wide veins of the legs or pelvis **(1).**

DVT is more common in orthopedic patients than in the general population, with DVT rates ranging from 40% to 60% in major orthopedic surgeries. In approximately 6% of DVT patients and approximately 12% of pulmonary embolism patients, death occurs within one month of diagnosis [(2)].

Venous thromboembolism (VTE), particularly deep vein thrombosis (DVT) and pulmonary embolism (PE), is a leading cause of morbidity and mortality in the United States. Patients undergoing major orthopedic surgery, especially hip and knee arthroplasty, are at the highest risk of DVT [(3)].

The coagulation cascade is triggered by major surgery or damage to the lower extremities, and the physiologic balance between factors that promote and inhibit coagulation is disrupted, resulting in a hypercoagulable state. Reduced venous flow and compromised endothelial function raise the risk of deep-vein thrombosis and pulmonary embolism in these patients [(4)].

The most common DVT symptoms occur at the clot's location. Swelling, hot, discomfort or tenderness, and skin redness are some of the symptoms. Deep vein thrombosis may also occur without warning [(5)].

The techniques that nursing staff can use to prevent DVT in high-risk patients including mechanical approaches such as programmed ambulation, leg exercises, deep breathing exercise, application of compression stocking or intermittent calf muscle compression, and hydration maintenance and anticoagulant medications, such as warfarin, aspirin and heparin are used in pharmacologic techniques [(6)].

Venous thromboembolism (VTE), also known as deep vein thrombosis, is the third leading cause of death worldwide due to cardiovascular disease. DVT acquired in hospitals poses a significant threat to patient safety. In the medical sector, deep vein thrombosis (DVT) is a recurrent and growing issue. This is particularly true of orthopedics and the aftermath of orthopedic procedures [(7)].

There are two types of prophylaxis methods: pharmacological and mechanical. Prophylaxis should be started as soon as possible after surgery and continued until the risk has passed. Since each patient's risk/benefit ratio for bleeding after pharmacologic prophylaxis is different, The type of thromboprophylaxis should, preferably, be tailored to the level of risk. Perioperative thromboprophylaxis for 28-35 days after discharge from the hospital will lower the risk of DVT and improve outcomes for these patients [(8)].

To prevent DVT, static methods like graduated compression stockings (or elastic stockings or anti-embolism stockings) and dynamical systems like intermittent pneumatic compression and a venous foot pump are utilized (DVT). The most significant advantage of these devices is that they do not result in bleeding [(9)].

Nurses caring for patients at risk for DVT must consider their medical background, family history, current condition, current medications, and physical examination data when treating them. Nurses must evaluate the patient's risk factors and detect and immediately disclose irregular physical examination results in order to adequately advocate for patients and avoid DVT [(10)].

Thromboprophylactic approaches, such as health education, correctly applied basic preventive measures, physical prevention strategies, and adequate antithrombotic medications, should be provided to patients undergoing major orthopaedic surgery. In order to promote patient involvement and adherence, these treatments should ideally be patient-centered [(11)].

Significance of the study

Orthopedic surgeries, such as complete hip replacement , THA (total knee arthroplasty) and whole knee joint surgery are both conducive to the establishment and progression of DVT [(12)]. DVT incidence rates without prophylaxis have been observed to range from 40% to 60% [(13)]

Long-term complications (post thrombotic syndrome) affect 50% of people who have had a DVT, including extremity pain, venous dilation, edema, pigmentation, and venous ulcers [(14)]

The most common cause of pulmonary embolism (PE) is deep venous thrombosis (DVT) Pulmonary embolism (PE) is a potentially fatal illness or complication that is one of most surgeons' worst fears. The embolus that causes the obstruction normally comes from a faraway location and passes through the venous system. Dyspnea, chest pain, and collapse are all signs of PE. Furthermore, the clinical severity of PE varies, ranging from asymptomatic to fatal [(15)]

From the researcher's review of literatures, found that that majority of orthopedic patients return with deep venous thrombosis which can be reduced through mechanical methods such as range of motion ,exercises, and elastic stocking wearing .So, this study will be conducted to reduce venous thromboembolism among orthopedic patients.

Aim of the study:

The current study aimed to assess the Autar risks among the patients with orthopedic surgery

Research question:

what are risks among the patients with orthopedic surgery regarding the Autar scale?

Subject and methods:

Research design:

A descriptive research design used in the study

Setting:

This study was conducted in the Orthopedic department at Minia University hospitals**.**

Subject:

A randomly selected (60) patients admitted to the orthopedic surgery department, at Minia University Hospital during.

Inclusion criteria:

- In general, all patients with Orthopedic surgery (i.e., major and minor).

Study Duration:

- The whole data was collected during 12 month period, beginning in February 2021 ending in January 2022.

Tools of data collection

Three tools was used for data collection of current study:

Tool I: Patient's Assessment sheet:

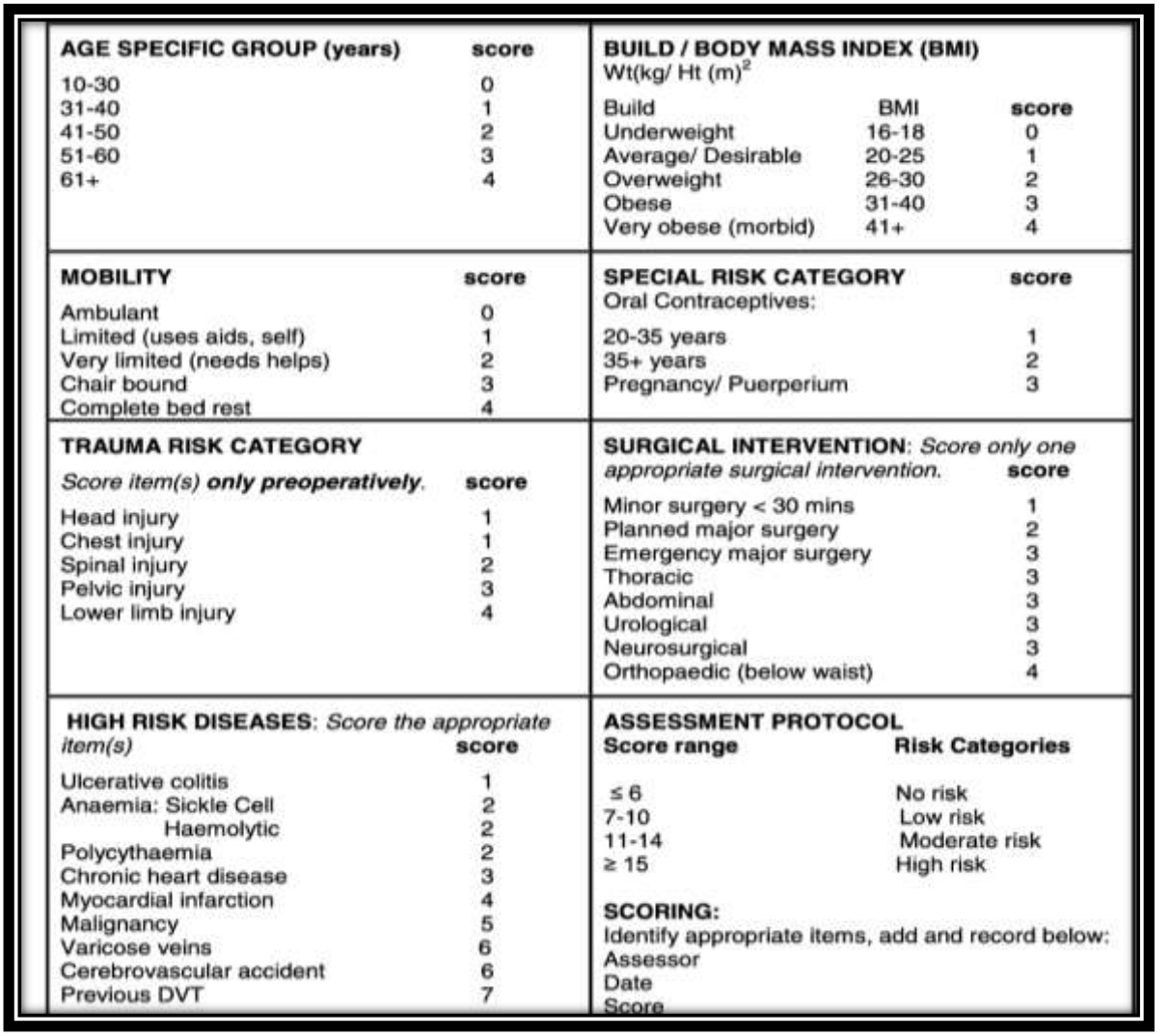
This tool, which comprised of three sections, was designed to assess patients' risk factors for DVT development.

- **Part 1**: **Demographic data of the patient:** Such as age, sex, educational level, marital Status.
- **Part 2: Patient medical sheet:** This part was developed to assess patient BMI and type of surgery.

Part 3: Autar DVT risk assessment scale [(16)]

The Autar DVT scale, which analyses risk quantitatively for nursing assessment and can prevent wrong evaluation due to varied levels of clinician practise, can be used to score the likelihood of getting DVT. Autar developed the scale in 1996, based on Virchow's trade of DVT risk factors: decreased blood flow velocity, damaged arteries, and irregular coagulation.

The Autar DVT scale was created to proactively identify individuals who are at risk of DVT so that the required prophylaxis can be started as soon as possible. The Autar DVT scale has seven subscales (Age specific category, Mobility, Trauma, Build/Body mass index, Special risk factor, High risk disease, Surgical intervention) and was developed using an action research approach based on Virchow's triad of risk factors in the genesis of DVT [(16)]



AGE SPECIFIC GROUP (years)	score
10-30	0
31-40	1
41-50	2
51-60	3
61+	4

BUILD / BODY MASS INDEX (BMI)
Wt(kg/ Ht (m)^2

Build	BMI	score
Underweight	16-18	0
Average/ Desirable	20-25	1
Overweight	26-30	2
Obese	31-40	3
Very obese (morbid)	41+	4

MOBILITY	score
Ambulant	0
Limited (uses aids, self)	1
Very limited (needs helps)	2
Chair bound	3
Complete bed rest	4

SPECIAL RISK CATEGORY Oral Contraceptives:	score
20-35 years	1
35+ years	2
Pregnancy/ Puerperium	3

TRAUMA RISK CATEGORY *Score item(s)* ***only preoperatively.***	score
Head injury	1
Chest injury	1
Spinal injury	2
Pelvic injury	3
Lower limb injury	4

SURGICAL INTERVENTION: *Score only one appropriate surgical intervention.*	score
Minor surgery < 30 mins	1
Planned major surgery	2
Emergency major surgery	3
Thoracic	3
Abdominal	3
Urological	3
Neurosurgical	3
Orthopaedic (below waist)	4

HIGH RISK DISEASES: *Score the appropriate item(s)*	score
Ulcerative colitis	1
Anaemia: Sickle Cell	2
Haemolytic	2
Polycythaemia	2
Chronic heart disease	3
Myocardial infarction	4
Malignancy	5
Varicose veins	6
Cerebrovascular accident	6
Previous DVT	7

ASSESSMENT PROTOCOL

Score range	Risk Categories
≤ 6	No risk
7-10	Low risk
11-14	Moderate risk
≥ 15	High risk

SCORING:
Identify appropriate items, add and record below:
Assessor
Date
Score

Scoring system (16)

Score range	Risk categories
≤6	No risk
7-10	Low risk
11-14	Moderate risk
≥15	High risk

<u>Tool II</u>: Deep vein thrombosis evaluation sheet

The researcher updated this tool to monitor the progression of DVT. It was divided into three sections:

- **Part 1: Symptoms of Deep Vein Thrombosis:** This section was used to evaluate DVT symptoms. It will evaluate the patient in five areas: calf pain, calf discomfort, calf situation, skin colour, and calf muscle warmth.
- **Part 2: Laboratory Tests:** This section is for documenting the patient's laboratory test results to establish coagulation status, such as partial thromboplastin clotting time (PTT) and platelets account.
- **Part 3: Doppler Ultrasound:** This test evaluates the blood supply in the lower limb veins. The presence of DVT is indicated by the Doppler findings. It will only be performed on people who have Deep Vein Thrombosis symptoms.

Validity and reliability:

Content validity of the used tools was done by (5) jury of specialists in the field of medical- surgical nursing and Orthopedic field.

The reliability was tested for tools by using Cronbach's alpha coefficient 0.85 and 0.88.

Ethical considerations:

The study was following the common ethical guidelines of clinical research according to the declaration principles of **Helsinki, [17]**for medical research. Confidentiality and anonymity were guaranteed. Nurses and patients had the freedom to participate and or withdraw from the study whenever they want. No names appeared on any results and a coding system known only to the researcher was developed and used.

Pilot Study:

A pilot study was conducted to test visibility and applicability of the used tools and to estimate the time required for data collection tools. Which applied on (10%) the study subjects (6 patients who were chosen randomly). Some minor modifications based on the result of the pilot study were made to have more applicable tools for data collection. Some statements were omitted, and then the final forms were developed**,** so the total subject did not include the pilot study to ensure the stability of the results.

Data collection methods:

- Official letters were issued to the director of the hospital and to the head of the Orthopedic department as well as the hospital nursing director.

The current study was carried out by creating several data collection tools as well as securing a formal paper agreement one month before to the start of the study. Data was collected on a daily basis (3 to 4 days a week) during the morning or evening shift.

- . Researchers briefed for males and females patients who were scheduled for orthopedic procedures about the study's objective and nature, and then got oral consent from those who agreed to participate. The researcher selected the studied patients randomly by selecting all the patients undergoing orthopedic surgery through small paper blinded selected.
- Then the aims and objectives of the study were explained to each patient individually and only those who gave their consent participated in the study.

Using the instrument (I and II), the researcher began collecting data from the studied patients in 12 months to determine the existence of DVT.

- The researcher assessed the studied patients' demographic and medical data in addition to risk factors, from the patients' folders it took around 10 minutes to fill it.

The study sample's data was collected in an inpatient orthopaedic department during their hospitalization (which spanned from 1 to 5 days) and subsequently at an outpatient clinic for follow-up. Each treatment lasts about 5–10 minutes, depending on the patient's tolerance. It lasted between 15 and 20 minutes.

Statistical analysis:

Data was presented using SPSS program (version 20) in numbers, percentages, mean and standard deviation (SD), Paired T-test, chi square analysis were used for assessment of the inter-relationships among quantitative variables. The level of significant was adopted at $p < 0.05$

Results:

Table (1): Distribution of the studied patients regarding their demographic and medical data (N. =60)

Demographic data	Patients	
	N.=60	%
1. Age in years:		
• 18- 29	3	5
• 30-40	17	28.3
• 41 - 50	23	38.3
• 51 – 65	18	30
2. Sex:		
• Male	29	48.3
• Female	31	51.7
3. Marital status:		
• Single	5	8.3
• Married	51	85
• Divorced	1	1.7
• Widowed	3	5
4. Education level:		
• Illiterate	45	75
• Primary	5	8.3
• Preparatory	2	3.3
• Secondary	8	13.3
5. Occupation:		
• House wife	52	86.7
• Worker	8	13.3
6. Residence:		
• Urban	8	13.3
• Rural	52	86.7
Medical data		
Body mass index		
• Low weight < 20	7	11.7
• Standard level of weight (20 < 26 kg)	8	13.3
• Over weight (26 < 30kg)	17	28.3
• Obese (30 < 40kg)	25	41.7
• Morbid obesity(> 40)	3	5

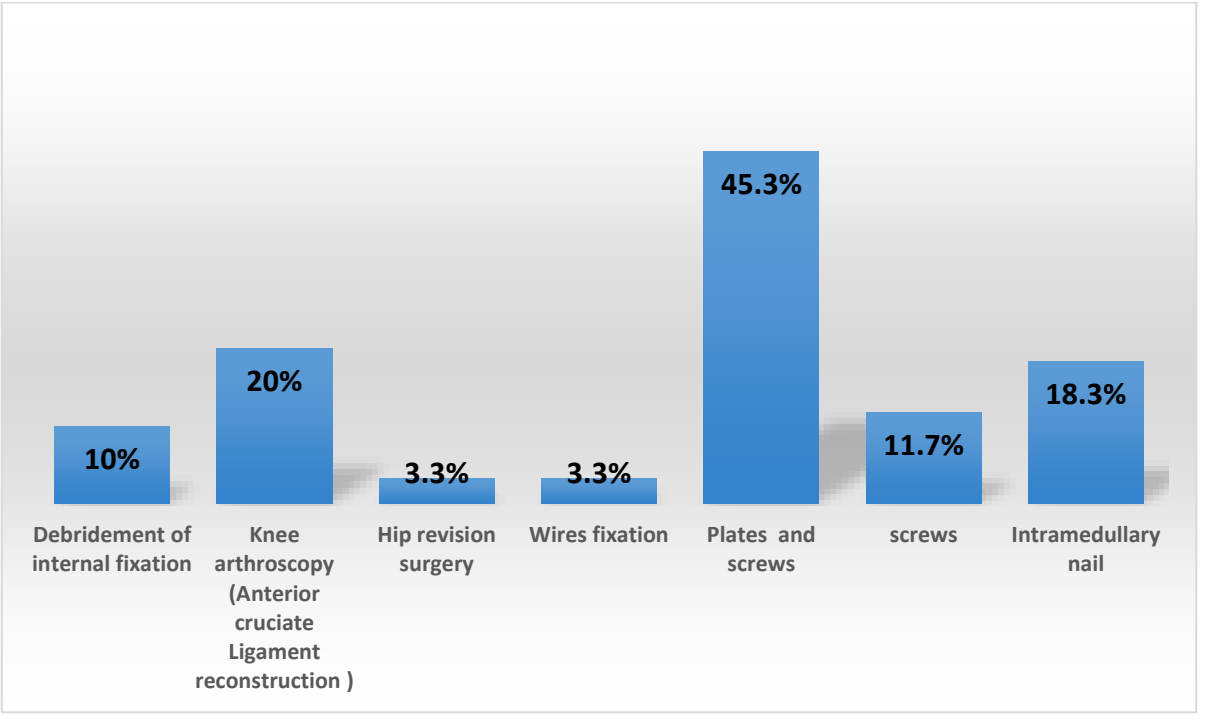


Figure (1): Distribution of studied patients regarding medical data (type of surgery) (n= 60)

Table (2): Distribution of the studied patients regarding Autar risk factors assessment (n= 60)

Items	Patients	
	N.	%
Age		
10-30yrs	10	16.7
31-40yrs	15	25
41-50yrs	19	31.7
51-65yrs	16	26.6
Mobility		
Ambulant	6	10
Limited	21	35
Very limited	27	45
Complete bed rest	6	10
Trauma risk injury		
Head injury	1	1.7
Pelvis injury	1	1.7
Lower limb injury	58	96.6
Special risk factors		
Oral contraceptive		
20-35yrs	6	10
More 35yrs	14	23.3
Pregnancy	10	16.6
No	30	50
High risk disease		
Anemia(sickle anemia)	9	15
Chronic heart disease	10	16.6
Varicose vein	8	13.3
Cerebral vascular disease	1	1.6

Pervious DVT	1	1.6
No	31	51.9
Surgical intervention		
Orthopedic surgery	60	100.0
Risk category		
High risk	36	60
Doppler findings		
Right limb	10	27.8
Left limb	26	72.2

Table (3) : Correlation between demographic data and risk factors for DVT (Regression test).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	11.245	1.849		6.083	.000	7.553	14.937
Age By Years	.120	.020	.601	5.885	**.027***	.079	.161
Male And Female	.337	.402	.074	.837	.406	-.467	1.140

Table (1): showed that, the highest percentage among the studied patients for both study and control groups were aged from 41 to 50 years old, near half of them were females, vast majority of them were married, and most of them were illiterate. Concerning occupation and residence majority of them were not working, and most of them were living in rural area. Regarding the medical data, the table found that less than half of patients were in obese level of weight (30 < 40 kg) as body mass index.

Figure (1): Shows that the highest percentage in the studied patients had diagnosed with tibia fracture.

Table (2): Regarding the risk factors of developing deep venous thrombosis among orthopedic surgical patients; the current study clarify that one third of patients' age in the studied patients was ranging between 41 – 50 years. Regarding the mobility; the present study shows that more than half of them experienced a very limited and limited mobility respectively. Regarding the trauma risk injury, the majority had a lower limb injury. Regarding body mass index the present study revealed that more than one third experienced obesity. Regarding chronic diseases, more than half of them had no chronic disease and no contraceptive drugs. All of the studied patients were performing orthopedic surgeries and more than half of them were with high risk category. Also, the table shows that the high risk of DVT especially Left limb.

Table (3): demonstrates that there was a positive correlation between demographic data and risk factors of DVT regarding age by years with p .value (0.027*). Most common indicators factor (age by years).

Discussion

Deep venous thrombosis (DVT) represents one of the most important causes of morbidity and mortality among patients with orthopedic surgeries. Most cases of venous thromboembolism are caused by it. Without proper prophylaxis, patients having high-risk orthopedic surgeries, such as total hip arthroplasty, total knee arthroplasty, and hip fracture repair surgery, are at a greatly elevated risk [(18)].

The present study aimed to assess the Autar DVT risks among patients undergoing orthopedic surgery.

The present study revealed that the majority of the studied patients in the age range of 41 - 49 years. This result disagreed with **The Mary Pack Arthritis Program, [(19)]** who mentioned in their study, that two thirds of all diagnosed patients undergoing orthopedic surgery were in the age 55 years older.

Moffat et al., [(20)] were in agreement, revealing that "the current study findings demonstrated that the risk of developing DVT had a substantial association with patient age, with the risk increasing with greater age." In

line with this, a Turkish study found that patients' age was a significant factor in increasing the risk of DVT in orthopedic surgery patients."

The current study shows that the highest percentage of the studied patients had diagnosed with tibia fracture. **Boonchoo et al., [21]**were disagreeing with current study results as they revealed that" In terms of surgically treated joints, the right hip was the most common. Finally, about two-thirds of patients had osteoarthritis, which necessitated surgical replacement.

Regarding body mass index the present study revealed that more than one third in of the studied patients experienced over weight and obesity respectively. Obesity is connected with inactivity, elevated intraabdominal pressure, and decreased blood velocity in the legs, as well as proinflammatory and prothrombotic states, according to the study findings. All of these factors are likely to increase the risk of venous thromboembolism, which is defined as deep venous thrombosis (DVT) with or without pulmonary embolism as a consequence. Obesity is linked to a nearly twofold increase in the risk of main DVT." [22]

Furthermore**, Anderson et al., [23]**Obesity as a causal risk factor for deep venous thrombosis" the researchers discovered. These findings show that efforts to reduce obesity and overweight across the board could have a significant impact on DVT prevention."

Regarding the mobility; the present study shows that more than half of the studied patients experienced a very limited and limited mobility respectively. **Hussein et al., [24]** found that the risk of DVT linked with immobility is widely recognized," they said, citing the study findings. Because postoperative immobility is an unavoidable result of surgery, it is difficult to distinguish between the relative contributions of surgery and immobility because they are not strictly independent variables."

Regarding the trauma risk injury; the majority of the studied patients had lower limb injury. **Zhai et al., [11]** who perform a study titled" Venous thromboembolism associated with lower limb fractures after trauma: dilemma and management "Trauma patients have the highest risk of getting DVT among hospitalized patients, with a reported thirteen-fold increased risk of developing DVT than non-trauma patients," according to the study. When compared to minor lower limb trauma patients, major lower limb trauma patients have a six-fold greater risk of developing DVT during admission."

Regarding chronic diseases; More than one quarter in the studied patients had no chronic disease while the highest percentage had chronic heart disease. **Ahmad et al., [25]** who performed a study about heart failure and risk of venous thromboembolism who enforced the current study results as they reported that congestive heart failure, which causes symptoms such as congested lungs, fluid and water retention, and rapid or irregular heartbeats, has recently been identified as an independent risk factor for DVT. In addition, the study found that Asians who were hospitalized with heart failure had a higher risk of DVT.

Chi et al., [26] who performed a study titled" Association of Anemia with Venous Thromboembolism in Acutely Ill Hospitalized Patients" were not agreeing with study findings as the provision of pharmacologic thromboprophylaxis with enoxaparin or betrixaban, an FDA approved direct oral anticoagulant for DVT prevention, lower haemoglobin concentration (anaemia) was related with a two-fold incidence of symptomatic DVT or non-fatal PE, according to study data.

The current study results revealed that signs and symptoms of DVT in calf muscle regarding redness, swelling and absence of signs while in thigh muscle presence of swelling show a statistical significant difference between the two groups.

Mohamed et al., [27] were in the same line with the current study results as they reported that" DVT is known to cause pain and edema in the legs; however, symptoms might be present or absent, unilateral or bilateral, mild or severe in a specific patient. A thrombus that does not restrict the net venous outflow is frequently asymptomatic. The most particular symptom of DVT is edema and swelling."

In this admiration, **Hernández-Gea et al., [28]** reported that; Egyptian patients enrolled in exhibit nearly the same features as compared to the global study. In both the global and Egyptian studies, orthopedic surgical patients make up a slightly higher percentage of high-risk patients than other types of surgeries.

On both the international and Egypt-specific levels, there was substantial room for improvement to achieve a goal of 100% prophylaxis compliance, as only 30-50% of high-risk patients received any preventative care [29]

While, **Danwang et al., [30]**mentioned that; DVT is a leading cause of hospital-related deaths worldwide. However, the proportion of patients at risk of DVT who receive appropriate prophylaxis in Egypt is unknown.

Finally, the present study shows that most common indicators factors of developing DVT in orthopedic surgical patients were age and occupation. Also, there were positive correlations between risk factors for VET and age, marital status and occupation. **Bui et al., [31]** were agreeing with the current study results as they reported that" DVT remains a common complication following orthopedic surgery. Older age, immobility status, and surgical time have been found to be risky factors for the development of postoperative lower-limp DVT in orthopedic patients".

Also, **Zhang et al., [32]** were in the same line as they revealed that" Patients aged more than fifty years who were hospitalized for orthopedic surgery were having a great Risk factors associated with the development of deep vein thrombosis.

Additionally, **Heit et al., [33]** agreeing with the present study results as they revealed that" Risk factors include age, congestive heart failure, immobility, major trauma, obesity, prior DVT, recent surgery, and smoking".

The researcher point of view that, the nurses' performance regarding DVT risks identification, prevention and management which help in early detection and decrease the level of risks among the patients undergoing orthopedic surgery.

Limitation of the study:

- Limitation of privacy during follow up with patients because no anymore places provided in the outpatient clinic for more explanation and evaluate their patients accurately.
- The sample size was small and from the limited setting, leading to restrictive the value of the findings.

• Conclusion:

The present study showed that, the highest percentage among the studied patients were aged from 41 to 49 years old, near half of them were females, vast majority of them were married, and most of them were illiterate. Concerning occupation and residence majority of them were not working, and most of them were living in rural area. Regarding the medical data, the table found that less than half of patients were in obese level of weight (30 < 40 kg) as body mass index. The highest percentage in the studied patients had diagnosed with tibia fracture. Regarding the mobility; the present study shows that more than half of them experienced a very limited and limited mobility respectively. Regarding the trauma risk injury, the majority had a lower limb injury. Regarding chronic diseases, more than half of them had no chronic disease and no contraceptive drugs. All of the studied patients were performing orthopedic surgeries and more than half of them were with high risk category. Also, the table shows that the high risk of DVT especially Left limb. Results illustrated that that there was a positive correlation between demographic data and risk factors of DVT regarding age by years.

Recommendations:

Based on the finding of the present study the following recommendations are suggested:

1. Continuous in service training programs regarding the suggested nursing interventions for detection, prevention and management of DVT among the patients undergoing orthopedic surgery were highly recommended to raise the standards of nursing care given to such group of patients.

2. Nurses should monitor and assess the risk of DVT in orthopaedic surgery patients on a regular basis.
3. A continual educational and training programme for staff nurses, including post-orthopedic surgery discharge instructions and home care, is designed and delivered on a regular basis for patients following orthopaedic surgery.
4. Written Arabic booklets or brochures, as well as posters, with post-orthopedic surgery discharge instructions, should be provided in health-care settings and distributed to orthopaedic surgical patients and their caregivers.
5. The media should be used more effectively to raise public awareness of disease, treatment approaches, and prevention among the general public and their caregivers.
6. Orthopedic surgical patients must be followed for a long time to evaluate long-term outcomes.

7. Reapplication of the study on a larger sample selected from different geographical areas of Egypt is recommended to generalized the study results, taking in to consideration the present limitations.

Declaration of conflicting interests:

The authors declare that there is no conflict of interest

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