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Thromboembolism in total hip and knee arthroplasty patients receiving low molecular weight heparin prophylaxis

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Abstract: Major orthopedic procedures, such as total hip and knee replacements, carry a higher risk of deep vein thrombosis and pulmonary embolism compared to minor surgeries. Pre-existing patient risk factors like obesity, hyperlipidemia, and a history of deep vein thrombosis further contribute to this risk. This study aims to identify the thrombotic risk factors in Libyan patients who received low-molecular-weight heparin and are undergoing post-orthopedic surgery. A retrospective study included 100 patients who underwent total hip or knee replacement at Al-Khadra Medical Center, Tripoli, Libya, between June 2023 and February 2024. Data collected included demographics, medical history, pre-operative coagulation tests, surgical details, and post-operative outcomes. This study of joint replacement patients (74.0% female, 26.0% male; mean age 65.0 ± 9.0 years for females, and 64.0 ± 13.0 years for males) found that total knee replacement comprised 91.0% of procedures, more common in older patients (98.1% of those ≥ 70.0 years vs. 68.8% < 65 years). Total hip replacement was more frequent in younger patients (31.3%, < 65.0). The prevalence of hypertension and diabetes mellitus increased with age, while hyperlipidemia was exclusive to males. All patients received Nadroparin (0.3 ml or 0.6 ml). Hospital stays of 7-10 days were most common for both doses (65.0%), with no significant difference in the length of stay between doses. The prevalence of total hip and knee replacements varied by age and gender. Thus, low-molecular-weight heparin prophylaxis appeared effective, as no deep vein thrombosis was observed in Libyan patients in this study.

Introduction

Thrombosis, the formation of blood clots within blood vessels, is a complex physiological process with potentially serious consequences, including deep vein thrombosis (DVT) and pulmonary embolism (PE) [1]. Pharmacological management of thrombosis involves three primary classes of drugs: anticoagulants, antiplatelet agents, and fibrinolytics [2]. Anticoagulants, warfarin and heparin, disrupt the coagulation cascade, inhibiting the formation of new clots. Antiplatelet drugs, aspirin and Clopidogrel, prevent platelet aggregation, reducing clot formation. Fibrinolytics dissolve existing clots by activating plasminogen. Understanding the mechanisms of action of these drugs is crucial for effective thrombosis management in various clinical settings [3]. Major orthopedic procedures, such as total hip and knee replacements (THR/TKR), carry a higher risk of DVT [4]. This increased risk is attributed to several factors: Longer surgical times, greater tissue trauma, prolonged postoperative immobilization, surgical-induced inflammation, potential hormonal changes affecting coagulation, and the

influence of certain perioperative medications. Pre-existing patient risk factors, such as obesity, hyperlipidemia, and a history of DVT, further elevate the risk [5-7]. Numerous thromboprophylaxis guidelines exist to identify similarities and differences in approach. Regarding the American College of Chest Physicians, anticoagulant prophylaxis is recommended for 28-35 days in THR/TKR patients. Adequate pharmacological options include vitamin K antagonists, low-molecular-weight heparin (LMWH), and fondaparinux [8]. LMWH is the preferred agent with a grade 1B recommendation, followed by fondaparinux, apixaban, dabigatran, rivaroxaban, and low-dose UFH. LMWH is preferred over vitamin K antagonists and aspirin. The guidelines do not recommend routine Doppler ultrasonography screening for asymptomatic patients before hospital discharge [9]. Concerning the American Academy of Orthopedic Surgeons, the guidelines emphasize a balanced approach to thromboprophylaxis, prioritizing efficacy while minimizing bleeding risk. Prophylactic regimens should be individualized based on patient-specific factors. The recommended pharmacological prophylaxis for THR/TKR includes: Aspirin, LMWH, synthetic penta-saccharides, or warfarin [10]. The specific choice of anticoagulant and duration of treatment will depend on the individual patient's risk factors for blood clots and bleeding. Post-discharge, patients should be encouraged to slowly increase their mobility and educated about the symptoms of DVT and PE [11].

Anticoagulant prophylaxis for orthopedic patients undergoing TKR/THR, detailing various LMWH options shown in **Table 1**. It differentiates dosing based on DVT risk as moderate or high. Thus, the recommended dosage of LMWH for the prophylaxis and treatment of DVT in Libyan patients undergoing THR/TKR at Alkhadra Hospital, Tripoli, Libya. For prophylaxis, patients at moderate risk should receive 2,500 - 5,000 units of LMWH administered once daily, while those at high risk (past DVT, vascular diseases, autoimmune disease, obesity, smoker, or alcoholic patient) should be given 3,500 - 5,700 units once daily. If the patient is diagnosed with DVT, treatment begins with a weight-dependent dosing regimen of LMWH, which is recommended for DVT and PE, with administration occurring twice daily. This study aims to identify thrombotic risk factors in post-orthopedic surgery of Libyan patients with THR and TKR, and those receiving LMWH.

Table 1: Guidelines for the use of thromboprophylaxis in Alkhadra Hospital, Tripoli, Libya

Indications	Bemiparin	Daltiparin	Enoxaparin	Tinzaparin	Nadroparin
Prophylaxis of DVT (moderate risk)	2500 unit (0.2 ml)	2500 unit (0.2 ml)	2000 UI (0.2 ml)	50 unit/Kg 3500 UI (0.35 ml) 4500 UI (0.45 ml)	2850 UI (0.3 ml)
Prophylaxis of DVT (high risk)	3500 unit (0.2 ml)	5000 unit (0.2ml)	4000 UI (0.4 ml)	50 unit/Kg 3500 UI (0.35 ml) 4500 UI (0.45 ml)	5700 UI (0.6 ml)
Treatment of DVT	115 unit/Kg	DVT and PE < 46 Kg 7500 UI 46-56 Kg 10,000 UI 57-68 Kg 12,500 UI 69-82 Kg 15,000 UI > 82 Kg 18,000 UI	150 unit/Kg	175 unit/Kg	Weight dependent: 10 UI/100 ml

Specific anticoagulant names and corresponding dosages are provided for each LMWH

Materials and methods

This study is a retrospective observational analysis of 100 patients who were admitted to the inpatient orthopedic unit at Alkhadra Hospital for TKR/THR surgery between June 2023 and February 2024. Ethical approval was received from the Alkhadra Hospital Ethical Committee (124, 21/08/2024). Data were collected from the medical record of each patient by filling a predesigned data collection form which contains; file number, age, gender, weight, height, date of admission, the surgery type, medical history (hypertension, diabetes, heart diseases, disability, or other diseases), thrombosis risk factors (hyperlipidemia, smoking, obesity, pregnant, family history with DVT, DVT in the past), the prescribed medications, physiotherapy, coagulation test before surgery including PTT, INR, or D-Dimer, hospital stay, post-operative screening using venography, Doppler ultrasound or other tests, and efficacy outcomes which includes monitoring for complications such as DVT, PE, vessel wall injury, hemodynamic disruption, and hypercoagulability. In addition, safety outcomes, which encompass assessments of bleeding, patient mobilization, and walking capabilities, as well as clinical status, discharge, and mortality, were recorded.

Statistical analysis: The numerical data were presented as mean ± standard deviation, and the categorical data were presented as absolute frequency and percentage. The categorical variables were compared using the Chi-squared test or Fisher's exact test, where indicated. A $p < 0.05$ is considered significant.

Results

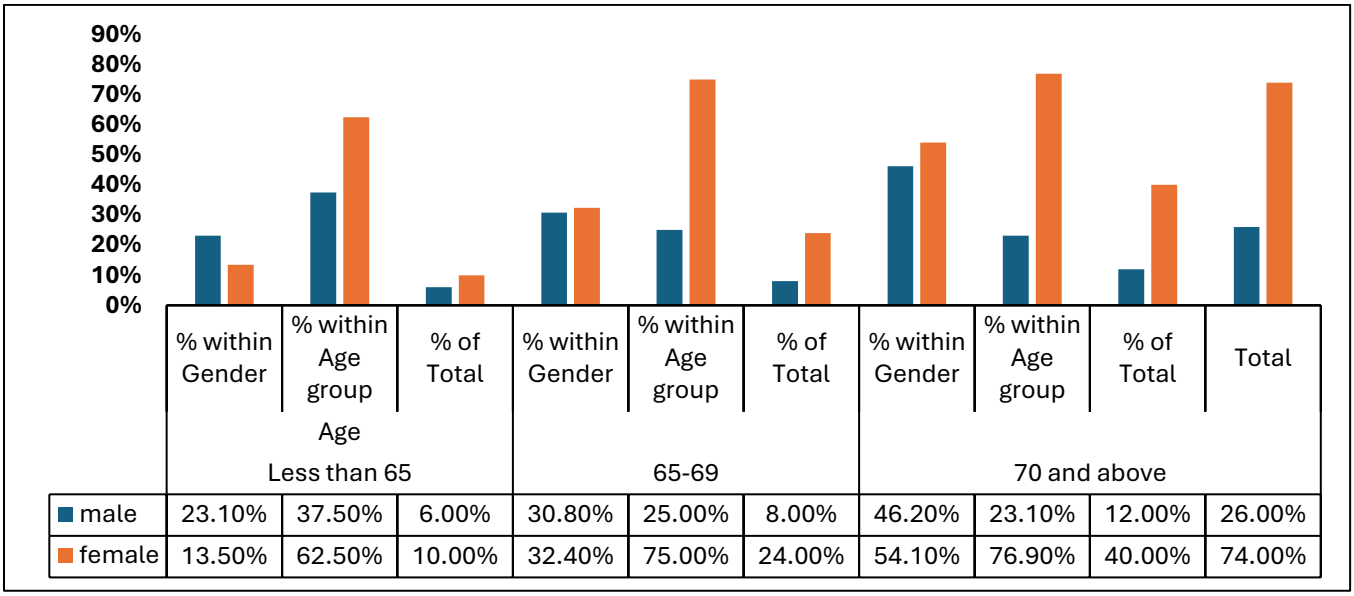
A total of 100 patients (26 males and 74 females) were included who were admitted to the orthopedic department of Alkhadra Hospital for TKR/TR procedures (**Table 1**). Thus, the frequency of patients in the category of surgery (TKR/THR), age group, gender, coagulation risk factors (hypertension, diabetes mellitus, and hyperlipidemia), clotting blood tests (INR, PTT, and D. Dimer), Nadroparin dose, and hospital duration stay. 91 Libyan patients had TKR, while only nine patients had THR.

Table 1: Surgery, coagulation risk factors, clotting test, Nadroparin dose, and hospital stay of the patients

Type of surgery		**Total knee replacement (n=91)**						**Total hip replacement (n=9)**					
Gender		**Male (n)**			**Female (n)**			**Male (n)**			**Female (n)**		
Age in years		≤ 65 (2)	65-69 (6)	≥ 70 (12)	≤ 65 (9)	65-69 (23)	≥ 70 (39)	≤ 65 (4)	65-69 (2)	≥ 70 (0)	≤ 65 (1)	65-69 (1)	≥ 70 (1)
Coagulation risk factors	**Hypertension**	2	5	8	4	7	20	0	0	0	0	0	0
	Diabetes	1	2	4	2	8	15	0	0	0	0	1	1
	Hyperlipidemia	1	0	1	0	0	0	0	0	0	0	0	0
Clotting blood tests	**INR test**	1	2	9	6	15	29	3	1	0	0	0	1
	PTT test	1	2	9	6	15	29	3	1	0	0	0	1
	D. dimer test	0	1	1	0	0	2	0	0	0	0	0	1
Dose Nadroparin	**0.3 ml**	2	6	10	9	21	35	4	2	0	1	1	0
	0.6 ml	0	0	2	0	2	4	0	0	0	0	0	1
Hospital stay period	**≤ 6 days**	0	2	2	1	4	6	1	0	0	0	0	0
	7 - 10 days	2	3	8	6	15	21	2	1	0	1	0	0
	≥ 11 days	0	1	2	1	2	6	1	1	0	0	1	1

Figure 1 shows the percentage of patients for age group and gender: Of the 100 patients admitted to the hospital, 26.0% were male, and 74.0% were female. The mean age for the female patients was 65.0 ± 9.0 (36-88 years), while the mean age of male patients was 64.0 ± 13.0 (33-90 years). The distribution of three distinct age groups:

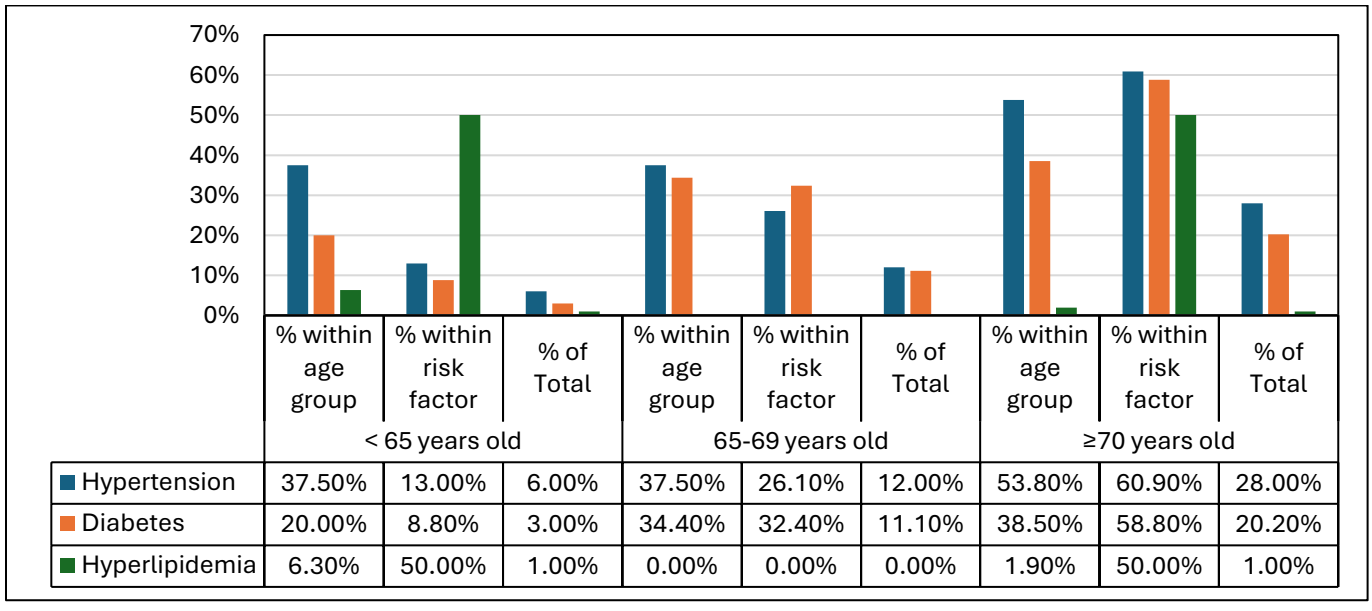
Those < 65 years, those aged 65 to 69 years, and those aged ≥ 70 years, categorized by gender. The displayed percentages represent each demographic's share of the overall population and within the specified age brackets. The age distribution reveals a predominance of older individuals, mainly those aged ≥ 70 years (52.0% of the total patients). Regarding gender, the distribution of males and females varies across the three age groups. In the youngest group (< 65), males are more highly represented (23.1%) than females (13.5%). However, for the middle-aged group (65-69 years), the representation becomes more equal, with males at 30.8% and females at 32.4%. This trend reverses in the oldest age group (> 70), where females have a notably higher representation 54.1% compared to males (46.2%). Despite these observed differences, the p-value of 0.510 suggests that these variations are not significant.



	Age									
	Less than 65			65-69			70 and above			
	% within Gender	% within Age group	% of Total	% within Gender	% within Age group	% of Total	% within Gender	% within Age group	% of Total	Total
male	23.10%	37.50%	6.00%	30.80%	25.00%	8.00%	46.20%	23.10%	12.00%	26.00%
female	13.50%	62.50%	10.00%	32.40%	75.00%	24.00%	54.10%	76.90%	40.00%	74.00%

Figure 1: Patients according to age and gender

With respect to the age group and risk factors, **Figure 2** illustrates the distribution of coagulation risk factors, specifically hypertension, diabetes, and hyperlipidemia, across different age groups and risk categories.

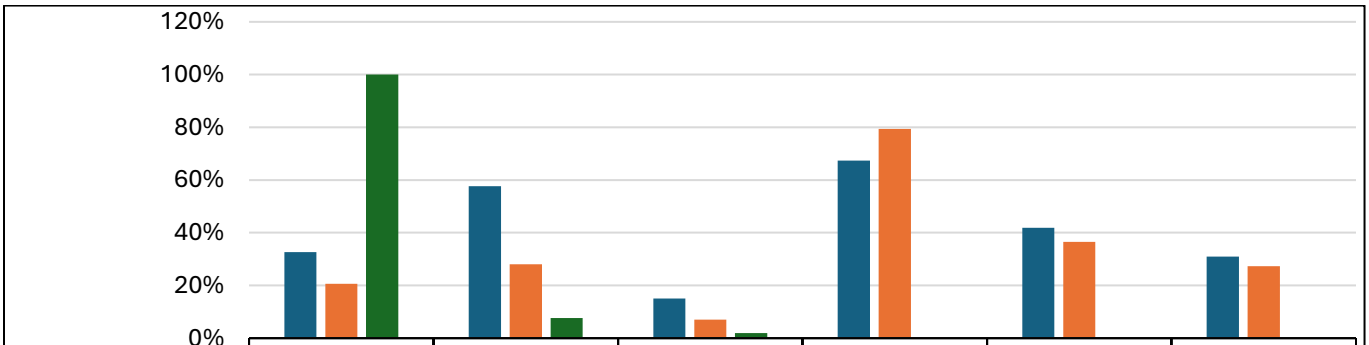


	< 65 years old			65-69 years old			≥70 years old		
	% within age group	% within risk factor	% of Total	% within age group	% within risk factor	% of Total	% within age group	% within risk factor	% of Total
Hypertension	37.50%	13.00%	6.00%	37.50%	26.10%	12.00%	53.80%	60.90%	28.00%
Diabetes	20.00%	8.80%	3.00%	34.40%	32.40%	11.10%	38.50%	58.80%	20.20%
Hyperlipidemia	6.30%	50.00%	1.00%	0.00%	0.00%	0.00%	1.90%	50.00%	1.00%

Figure 2: Libyan patients according to age group and risk factors

The prevalence of hypertension shows a substantial increase with age, rising from 13.0% in individuals younger than 65 years to 60.9% in those aged ≥ 70 years. Similarly, the incidence of diabetes increases significantly with age, escalating from 8.8% in the < 65 age group to 58.8% in the ≥ 70 years. In contrast, the prevalence of hyperlipidemia remains relatively stable at 50.0% across both age groups (< 65 and ≥ 70 years). However, it is important to note that the significant levels for these comparisons (hypertension: p = 0.261; diabetes: p = 0.415; and hyperlipidemia: p = 0.345) are all above the conventional significance level.

About the percentage of patients according to gender and risk factors, **Figure 3** illustrates the prevalence of three coagulation risk factors-hypertension, diabetes, and hyperlipidemia-across different genders.

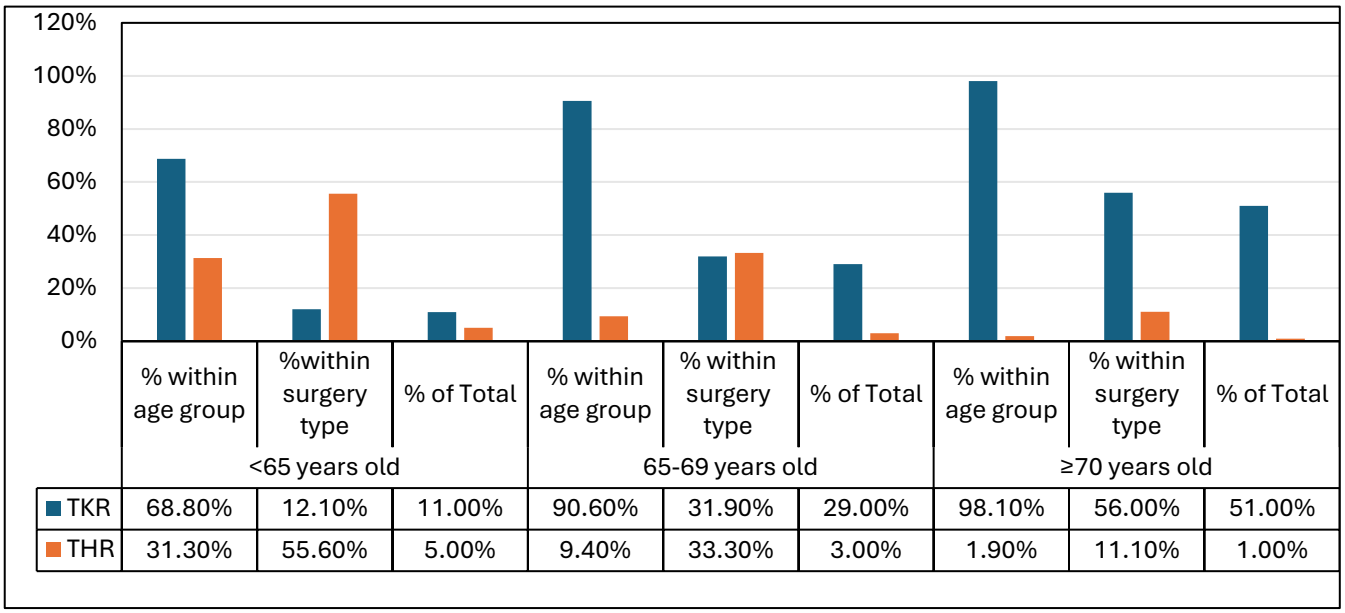


	Male			Female		
	% within risk factor	% within Gender	% of Total	% within risk factor	% within Gender	% of Total
Hypertension	32.60%	57.70%	15.00%	67.40%	41.90%	31.00%
Diabetes	20.60%	28.00%	7.10%	79.40%	36.50%	27.30%
Hyperlipidemia	100.00%	7.70%	2.00%	0.00%	0.00%	0.00%

Figure 3: Patients according to gender group and risk factors

Hypertension is the most prevalent risk factor in the overall population at 46.0%, followed by diabetes at 34.4% and hyperlipidemia at 2.0%. Definitely, hypertension is more common among females (67.4%) than among males (32.6%) (p = 0.164), and diabetes shows a higher prevalence in females (79.4%) compared to males (20.6%) (p = 0.440). Hyperlipidemia is exclusively found in males. This finding is significant (p = 0.016), indicating a strong association between male and hyperlipidemia in this study, with no females in the study sample exhibiting this risk factor. Among males, hypertension is the most common risk factor (57.7%), followed by diabetes (28.0%) and hyperlipidemia (7.7%). Additionally, among females, hypertension is the most prevalent risk factor (41.9%), followed closely by diabetes (36.5%).

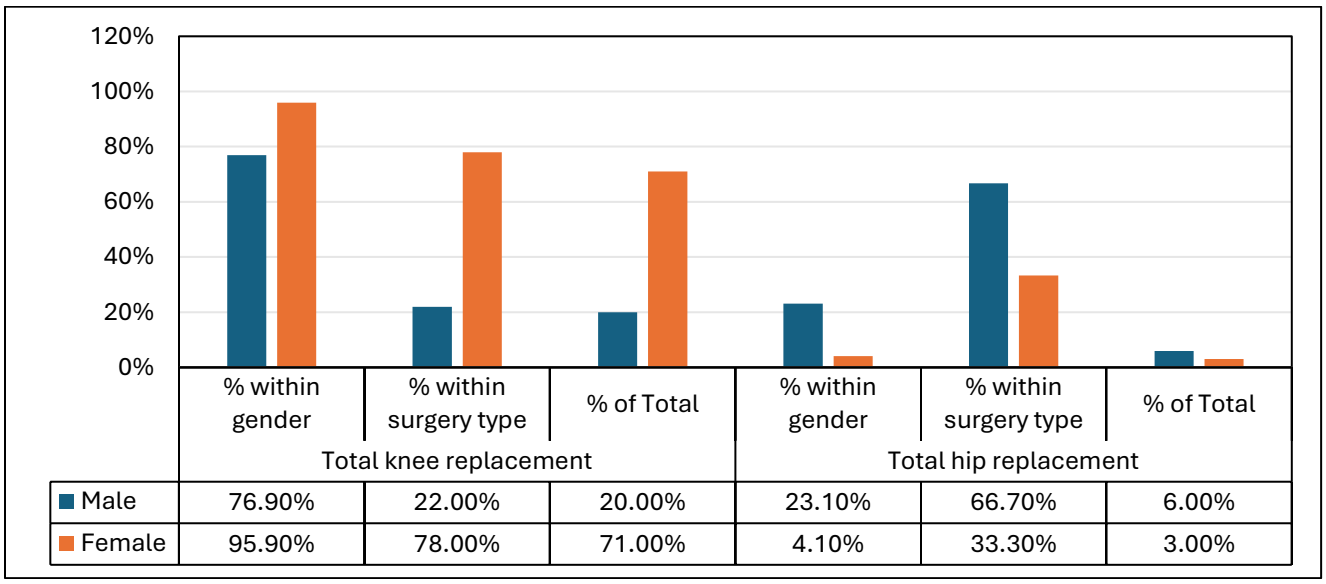
With respect to the percentage of patients in the age group and surgery type, **Figure 4** presents a comparison for the TKR/THR procedures across age groups: < 65 years old, 65-69 years old, and ≥ 70 years old. TKR Dominance: TKR is the dominant procedure across all age groups, particularly in the older age groups. The "% within age group" for TKR increases with age: 68.8% (< 65 years), 90.6% (65-69), and 98.1% (≥ 70 years). THR procedures are more commonly found in the younger age (< 65 years), with 31.3%. The percentage within the age group is much lower than the percentages in the older groups (9.4% and 1.9%). According to the age distribution within procedures, and looking at "percent within surgery type", it can be seen that the majority of TKR procedures are performed on patients aged ≥ 70 (56.0%), followed by the 65-69 age group (31.9%). In contrast, THR procedures are more evenly distributed among the < 65 (55.6%) and 65-69 (33.3%) age groups. A p = 0.002 is highly significant because it is less than the threshold of 0.05.



	% within age group	%within surgery type	% of Total	% within age group	% within surgery type	% of Total	% within age group	% within surgery type	% of Total
	<65 years old			65-69 years old			≥70 years old		
TKR	68.80%	12.10%	11.00%	90.60%	31.90%	29.00%	98.10%	56.00%	51.00%
THR	31.30%	55.60%	5.00%	9.40%	33.30%	3.00%	1.90%	11.10%	1.00%

Figure 4: Patients according to age group and surgery type

The percentage of patients by gender and surgery type is shown in **Figure 5**. The figure depicts the distribution of TKR/THR procedures segmented by gender.

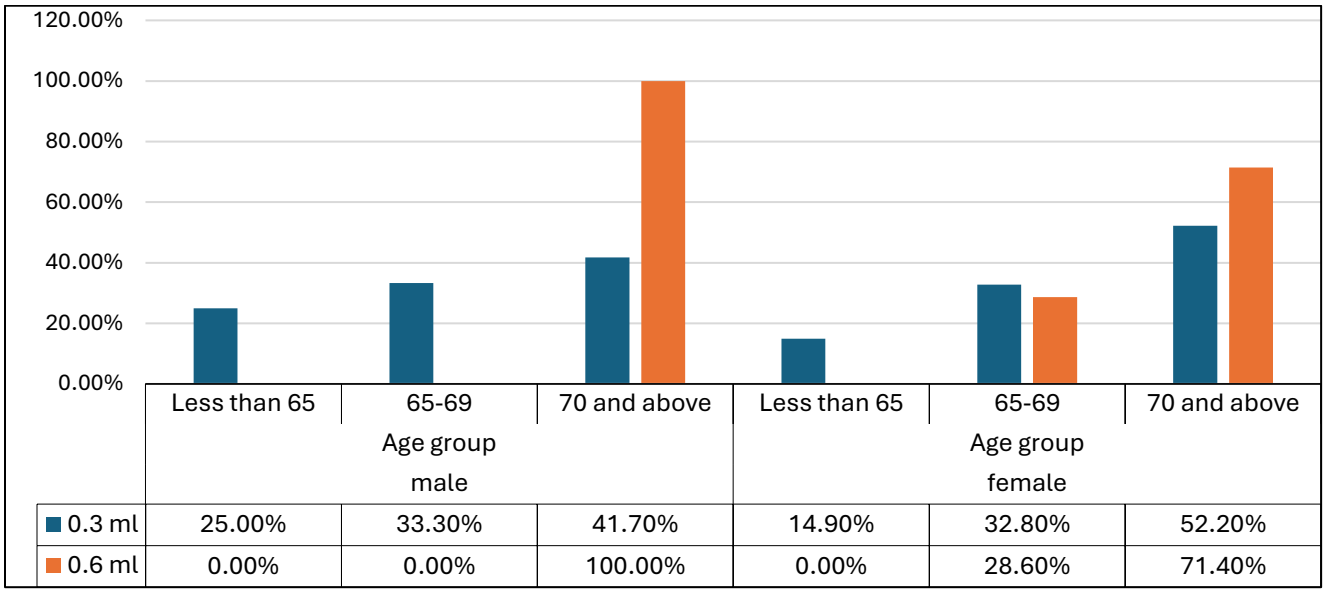


	% within gender	% within surgery type	% of Total	% within gender	% within surgery type	% of Total
	Total knee replacement			Total hip replacement		
Male	76.90%	22.00%	20.00%	23.10%	66.70%	6.00%
Female	95.90%	78.00%	71.00%	4.10%	33.30%	3.00%

Figure 5: Patients according to the gender and surgery type

The overall prevalence rates for these surgical interventions are 91.0% for TKR and 9.0% for THR. Notably, a significantly higher proportion of females, accounting for 78.0%, undergo TKR than males, who represent 22.0% of such procedures. Conversely, the data indicate that males have a higher prevalence of THR, with 66.7% of these procedures performed on men, while females account for 33.3%. The $p = 0.004$ is much lower than the conventional significance threshold of 0.05. This indicates that the observed differences in the distribution of TKR and THR procedures between males and females are highly significant.

Regarding the nadroparin dose, age groups, and gender, **Figure 6** shows the distribution of Nadroparin doses (0.3 ml and 0.6 ml) between age groups and gender.

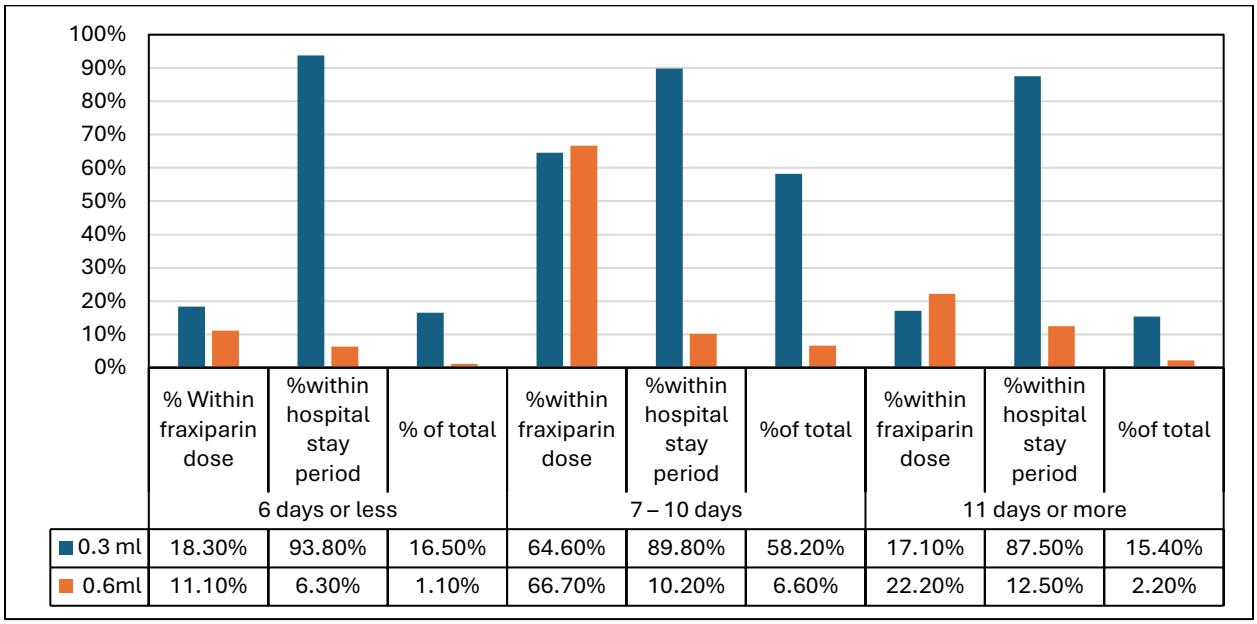


	Less than 65	65-69	70 and above	Less than 65	65-69	70 and above
	Age group male			Age group female		
0.3 ml	25.00%	33.30%	41.70%	14.90%	32.80%	52.20%
0.6 ml	0.00%	0.00%	100.00%	0.00%	28.60%	71.40%

Figure 6: Patients according to nadroparin dose, age group, and gender

In the analysis of male patients, the 0.3 ml dose of nadroparin is administered across all age groups, with a notable increase in prevalence among older populations: 25.0% for < 65 years, 33.3% for those aged 65 to 69 years, and 41.7% for those aged ≥ 70 years. Conversely, the 0.6 ml dose was exclusively prescribed for male patients aged ≥ 70 years, representing 100% of this demographic. For female patients, the 0.3 ml dose follows a similar pattern, being utilized across all age groups with increasing prevalence in older patients: 14.9% for those < 65 years, 32.8% for the 65 to 69-year age group, and 52.2% for individuals aged ≥ 70 years. The 0.6 ml dose was administered in the 65 to 69-year age group (28.6%) and ≥ 70 years (71.4%), but not the youngest patients. The data do not provide sufficient evidence to conclude that gender significantly influences the prescribed dose of nadroparin, as indicated by a p = 0.283, which is not significant.

About the percentage of patients to nadroparin dose and hospital stay period, **Figure 7** presents the distribution of nadroparin doses (0.3 ml and 0.6 ml) among hospital stay periods.



	% Within fraxiparin dose	%within hospital stay period	% of total	%within fraxiparin dose	%within hospital stay period	%of total	%within fraxiparin dose	%within hospital stay period	%of total
	6 days or less			7 – 10 days			11 days or more		
0.3 ml	18.30%	93.80%	16.50%	64.60%	89.80%	58.20%	17.10%	87.50%	15.40%
0.6ml	11.10%	6.30%	1.10%	66.70%	10.20%	6.60%	22.20%	12.50%	2.20%

Figure 7: Patients according to nadroparin dose, hospital stay period

Figure 7 shows the distribution of nadroparin doses (0.3 ml and 0.6 ml) across hospital stay periods, categorized into three groups according to the duration of stay at the hospital: ≤ 6 days, 7-10 days, and ≥ 11 days. For patients receiving the 0.3 ml dose, the highest proportion (64.6%) exhibited hospital stays within 7-10 days, followed by 18.3% in the ≤ 6 days and 17.10% in the ≥ 11 days. For patients receiving the 0.6 ml dose, the majority (66.7%) have hospital stays of 7-10 days, with 22.2% in the ≥ 11 days, and with 11.1% in the ≤ 6 days. The statistical analysis revealed no significant difference in hospital stay duration between the two groups ($p = 0.833$).

Discussion

The current study aims to assess safety and efficacy outcomes, as well as follow-up investigations after orthopedic surgery (TKR/THR). Regarding efficacy, the evaluation of DVT, PE, vessel wall injury, hemodynamic disruption, and hypercoagulability was assessed. In terms of safety, it concentrates on bleeding, mobilization, walking, and clinical status (discharge or death). All 100 Libyan patients were discharged without any recorded fatalities. No potential complications regarding the safety or efficacy have been found. THR/TKR surgeries have become increasingly prevalent and are playing a significant role in Libya. This retrospective study indicates a higher incidence among females patients compared to 26 male patients with the distribution of three age groups: those under 65 years, those aged 65 to 69 years, those 70 years old and above, the highest percentage was recorded in the age group ≥ 70 years old (52.0%), in Line with a study conducted in Japan includes patients undergoing total hip and knee replacements, which reported a markedly higher number of female patients [12]. This strengthens the idea that aging is the primary risk factor for osteoarthritis, which can lead to joint changes and to TKR/THR. Aging-related joint changes, such as joint inflammation, collagen degradation, and reduced water content, are more common in females than in males for several reasons, including hormonal changes [13]. This is because decreased estrogen during menopause leads to loss of bone density, and bone anatomy in terms of size, density, and the females' bones are smaller and less dense than those of males; all these factors make females more susceptible to osteoarthritis [14, 15].

The present study identified modifiable risk factors: Hypertension was the most prevalent, affecting half of all patients, followed by diabetes and hyperlipidemia. This aligns with previous research identifying these conditions as risk THR/TKR due to their association with osteoarthritis [16]. Hellevik et al. [16] reported higher hypertension prevalence in patients < 50 years, but the present study found the highest prevalence in the ≥ 70 age group. Further supporting the link between hypertension and joint replacement, Huang and others [17] indicated that hypertensive patients are more likely to undergo such procedures. They also suggested hypertension as a potential risk factor for DVT following orthopedic surgery. The underlying mechanism connecting hypertension to joint problems may involve vasoconstriction that reduces blood flow to the joints, contributing to bone density loss, potentially leading to osteoarthritis and ultimately necessitating THR/TKR [18]. Consistent with this, research from the Hospital for Special Surgery indicates that diabetic patients undergoing joint replacement face a heightened risk of postoperative hyperglycemia, which can increase susceptibility to infections, delay wound healing, and prolong hospitalization, potentially elevating DVT risk due to extended inactivity [19]. Diabetes has been implicated in venous thromboembolism VTE including DVT. The evidence remains inconclusive as some observational studies suggest an association, but others report no substantial causal link between type 1 or type 2 diabetes and VTE [20]. However, the data reveal a substantial proportion of individuals in all age groups at risk for hypertension, and a considerable number of those aged 65-69 and ≥ 70 at risk for diabetes, indicating a broader public health concern regardless of insignificant age-related variations within this dataset. Hyperlipidemia exhibited the lowest prevalence among male patients, observed in the < 65 and ≥ 70 groups. Despite elevated serum cholesterol in hyperlipidemia being associated with increased thrombotic risk, this study found no evidence

of thrombotic events. This observation aligns with a broader research gap regarding the relationship between hyperlipidemia and osteoarthritis. As highlighted by Garcia-Gil et al. [21], longitudinal studies investigating this potential link are lacking. This underscores the need to explore hyperlipidemia's potential role in osteoarthritis progression and its subsequent impact on joint replacement rate [21]. Regarding gender differences in risk factors, hypertension is more common among females than among males, and diabetes shows a higher prevalence in females compared to males. Hyperlipidemia is exclusively found in males. This finding is significant, indicating a strong association between male and hyperlipidemia, with no females exhibiting this risk factor [22-24].

Regarding surgery type, there is a clear trend of TKR being more common in older patients, suggesting age-related knee joint degeneration as a primary driver for this procedure. While TKR is performed in patients aged 65-69, this highlights the increasing need for knee replacements with advancing age. In contrast, THR is more frequently performed in younger individuals, implying different etiologies for hip joint damage in this population, such as avascular necrosis, resulting from disrupted femoral head blood supply and potentially affecting younger individuals; hip dysplasia, a congenital malformation predisposing to early osteoarthritis and THR; traumatic hip fractures necessitating replacement at any age; and inflammatory arthritis, such as rheumatoid arthritis, which can accelerate hip joint deterioration and require THR in younger patients [25, 26]. This age-related trend aligns with broader population data. Kremers et al. [27] reported increasing THR and TKR prevalence with age in the US at age 80, supporting the observed increase in joint replacement with advancing age. While their study reported much higher overall numbers due to the larger population, the age-related trend is consistent. Rothbauer and others[16], with a 2: 1 female-to-male ratio, highlight the burden of joint replacement [25]. However, Kremers et al. [27] found a gender distribution contrast with higher numbers of females undergoing THR and TKR. The current study found TKR more common in females (78.0%) and THR more common in males (66.7%). This discrepancy suggests potential differences in the studied populations, referral patterns, access to care, or underlying gender-specific predispositions to joint conditions. In orthopedic procedure utilization, the limited sample size of the present study may contribute to this difference [28].

All patients who entered the orthopedic department in this study and underwent TKR/THR surgeries received anticoagulants after surgery to reduce the risk of DVT and PE, which can occur as a result of prolonged bed rest or reduced mobility after surgery. The anticoagulant used was nadroparin for prophylactic purposes. Two distinct dosage regimens were identified: patients classified as moderate risk received 2850 IU, while those deemed high risk received 5700 IU. The involvement of orthopedic specialists provided a valuable clinical context, ensuring appropriate dose selection based on individual patient risk factors and adherence to established clinical guidelines [29]. This highlights the importance of risk stratification in tailoring LMWH therapy for optimal patient outcomes. Risk stratification for thromboembolic events lacks a strong evidence base. Increased risk is linked to prior cancer, thromboembolism, hypercoagulable conditions, spinal cord injury, and multi-trauma. Genetic predisposition may play a role, along with physical examination, and clinical judgment that considers known risk factors alongside the patient's condition, which are crucial for managing thromboembolic risk in patients undergoing THR or TKR. Surgeons in Al-Khadra Hospital identify prior DVT, vascular disease, autoimmune disease, obesity, smoking, and alcohol abuse as key risk factors; three or more of these factors indicate high risk and justified prophylactic nadroparin (5700 UI). However, the presence of high dosage in older patients may suggest a correlation with more severe medical conditions, such as past deep venous thrombosis, vascular diseases, autoimmune disease, obesity, smoker or alcoholic patient, or a need for increased levels of anticoagulation [30]. No cases of DVT or complications have been reported. Conversely, a retrospective study by Gao et al. [31] in patients undergoing THR/TKR investigated the comparative efficacy of two anticoagulants: Nadroparin and fondaparinux sodium. This demonstrated a DVT prevalence of 8.3% in the nadroparin group and 15.0% in the fondaparinux sodium

group. These findings suggest a potential advantage of nadroparin over fondaparinux sodium in DVT prophylaxis after arthroplasty [31]. The absence of reported DVT or other complications in this study, while seemingly positive, warrants careful interpretation. Several factors may contribute to this finding; the study population may have comprised patients with inherently lower baseline risk for DVT. Secondly, a highly homogenous patient cohort could have reduced variability and minimized the influence of potential confounding factors. Critically, the relatively small sample size increases the probability that the observed absence of events is attributable to chance rather than a true reflection of the intervention's efficacy. Therefore, while the lack of reported complications is noteworthy, the findings of Gao et al. [31] are based on a larger sample and direct comparison of anticoagulants. Analysis of hospital stay duration revealed that the majority were hospitalized for 7-10 days, aligning with current international guidelines and the typical duration of nadroparin treatment. No significant association was found between length of stay and patient age, gender, modifiable risk factors, drug dosage, or coagulation-related complications. Prolonged hospitalizations were attributed to post-operative complications, most frequently surgical site infections, followed by wound-related issues such as delayed healing, impaired mobilization, balance difficulties, and patient apprehension regarding ambulation. Strategies to reduce hospital stay duration should focus on optimizing preoperative patient health, implementing enhanced recovery after surgery protocols, and promoting early mobilization through structured physiotherapy interventions [26, 32]. The findings underscore the importance of early identification and management of modifiable risk factors, such as hypertension and diabetes, to reduce the burden of osteoarthritis and the need for joint replacement surgeries.

Conclusion: Age and gender were identified as the most significant factors in the incidence of joint replacements in Libyan patients. This study highlights the potential impact of these comorbidities on postoperative outcomes, emphasizing the importance of preoperative risk assessment and management. TKR was more common in older patients, while THR was more common in younger individuals, suggesting different etiologies for hip and knee joint damage. Prophylactic use of nadroparin for all patients in this study, guided by risk stratification.

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