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Incidence of Pulmonary thromboembolism and its associated Comorbidities in Ha'il Region, Northern Saudi Arabia

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ABSTRACT

Background: Pulmonary embolism (PE) is a major cause of illness in Saudi Arabia. Therefore, the current study aimed to find out the incidence rates of pulmonary thromboembolism and its associated comorbidities in the Ha'il Region, Northern Saudi Arabia. *Methodology:* In this prospective descriptive study, data referred to 133 patients admitted with suspected pulmonary thromboembolism (PTE) were obtained. For risk assessment, patients confirmed as having PTE were further ascertained as cases and those unconfirmed were categorized as controls. *Results:* PTE was diagnosed in 45/133(33.8%) of the patients. Out of the 45 patients, 26/45(58%) were males and 19/45(42%) were females. The incidence of PE among males was 26/70(37%), and among females was 19/63(30%). The incidence rates of PE among patients with hypertension (HTN), Diabetes Mellitus (DM), Cancer, patients with a history of Deep Vein Thrombosis (DVT), Heart Disease (HD), Chronic Kidney Disease (CKD), other diseases, and immobilization were 17/55(31%), 18/59(31%), ¼(25%), 4/16(25%), 9/24(38%), 9/22(41%), 13/49(27%), and 11/52(21%), in this order. *Conclusion:* Pulmonary thromboembolism is prevalent in Northern Saudi Arabia, and more frequent among males. The most common risk factors associated with PTE in this series of patients were obesity/overweight, cardiovascular diseases, CKD, DM, and immobilization.

Keywords: pulmonary embolism, Thromboembolism, DVT, Obesity, Saudi Arabia

1. INTRODUCTION

Pulmonary thromboembolism (PTE), which is derived from venous thrombi that travel to and occluding the lung arteries. If PTE is misdiagnosed or untreated, it can result in dangerous consequences. In acute cases, PTE can lead to right ventricular dysfunction resulting in arrhythmia, hemodynamic collapse, and shock (Huisman et al., 2018). Pulmonary embolism (EP) and deep vein thrombosis (DVT), together known as venous thromboembolism, which constitutes a major disease burden worldwide (Di Nisio et

al., 2016). It is assumed that PE originated from emobilized fibrin fragments from DVT, which is rarely found in PE's patients (Marongiu et al., 2019).

Acute PE still represents a significant cause of morbidity, which necessitates timely diagnosis and treatment. Patients with PE have fluctuating grades of clinical steadiness. Patients with PE should be assessed from the perspective of different accessible management possibilities non-surgical medical treatment, catheter-based, and surgical embolectomy (Martinez et al., 2020).

The diagnosis of DVT is frequently challenging because of the diversity of diagnostic tests, as well as the inexactitude of clinical evaluation. Though missed-diagnosis can lead to fatal consequences, superfluous treatment can result in serious complications. For that reason, Saudi Arabia has produced clinical practice guidelines to assist healthcare providers to make the most appropriate decision for the diagnosis of patients suspected of DVT. However, up to date the exact incidence rates of pulmonary embolism are inaccessible (Hassen et al., 2019). Therefore, the current study aimed to find out the incidence rates of pulmonary thromboembolism and it's associated Comorbidities in the Ha'il Region, Northern Saudi Arabia.

2. MATERIALS AND METHODS

In this prospective descriptive study, data referred to 133 patients admitted with suspected pulmonary thromboembolism (PTE) (from Feb. 2019 to Feb. 2020) were obtained from the intensive care unit (ICU) at King Khalid Hospital, Hail, Northern Saudi Arabia. For risk assessment, patients confirmed as having PTE were further ascertained as cases and those unconfirmed were categorized as controls. Besides the clinical presentations, the diagnosis of PTE was based on computed tomography (CT) angiography testing, Coagulation testing, and another necessary testing for a particular situation of the distinct patients. Information referring to the underlying comorbidities or risk factors, such as diabetes mellitus (DM), hypertension, heart disease, previous DVT, etc. were also obtained. Body mass index (BMI) was estimated from each patient (BMI=weight/height in m^2).

Data analysis

All obtained data were arranged and entered a computer software Statistical Package for Social Sciences (SPSS) and analyzed. Frequencies, percentages, cross-tabulations, relative risk (RR), and chi-square test were obtained. A P-value of less than 0.05 was considered statistically significant.

Ethical consent

The proposal of the present study was approved by the Research Ethics committee (REC) at the University of Ha'il, Saudi Arabia. Approval number: Nr13675/5/42. All procedures performed in this study were per the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

3. RESULTS

Of the 133 patients admitted for suspected thromboembolism, 70(52.6%) were males, and 63(47.4%) were females, aged 15 to 95 years old with a mean age of 48 years. Pulmonary thromboembolism was diagnosed in 45/133(33.8%) of the patients. Out of the 45 patients, 26/45(58%) were males and 19/45(42%) were females. The incidence of PE among males was 26/70(37%), and among females was 19/63(30%). The relative risk (RR) and the 95% confidence interval (95%CI) of PE and male's sex; RR (95%CI) =1.2316(0.7592 to 1.9979), P-value =0.3988. Most post cases were in aged 40-49 followed by 30-39 & 60+, representing 13/45(29%), and 10/45(22%), respectively. The risk of PE in age <50 years, RR (95%CI) = 1.2292 (0.7552 to 2.0005), P-value =0.4064, as indicated in Table 1, Fig 1.

Table 1. Distribution of the patients by sex, age, and pulmonary thromboembolism diagnosis

Variable	PE (n=45)	No-PE (n=88)	Total (n=133)	RR(95%CI)	P-value
Sex					
Males	26	44	70	1.2316(0.7592 to 1.9979)	0.3988
Females	19	44	63		
Age					
<30 years	4	17	21	<50 years= 1.2292 (0.7552 to 2.0005)	0.4064
30-39	10	15	25		
40-49	13	13	26		
50-59	8	17	25		
60+	10	25	35		

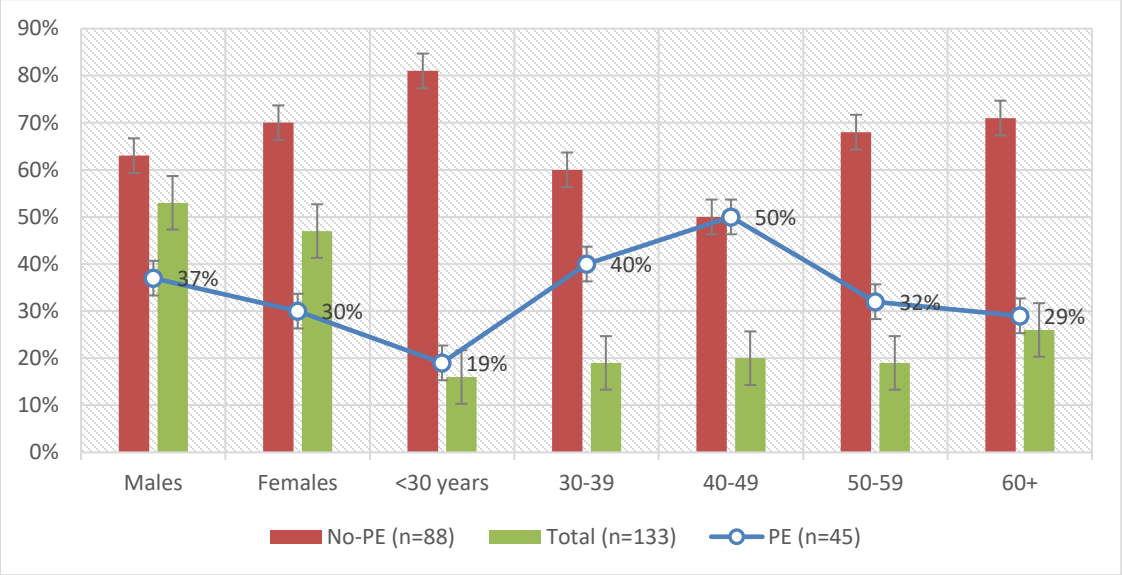

Figure 1. Patients by pulmonary thromboembolism diagnosis within entire sex and age groups

The incidence rates of PE among patients with hypertension (HTN), Diabetes Mellitus (DM), Cancer, patients with a history of Deep Vein Thrombosis (DVT), Heart Disease (HD), Chronic Kidney Disease (CKD), other diseases, and immobilization were 17/55(31%), 18/59(31%), ¼(25%), 4/16(25%), 9/24(38%), 9/22(41%), 13/49(27%), and 11/52(21%), in this order. Most frequent PE patients were observed among DM, hypertension, immobilization, constituting 18/45(40%), 17/45(38%), and 11/45(24%), correspondingly, as indicated in Table 1, Fig 2.

Table 2. Distribution of the patients by pulmonary thromboembolism diagnosis and comorbidities

Variable	PE (n=45)	No-PE (n=88)	Total (n=133)	RR(95%CI)	P-value
Hypertension				0.8610(0.5254 - 1.4112)	0.5528
Yes	17	38	55		
No	28	50	78		
DM					
Yes	18	41	59	0.7684 (0.4736-1.2465)	0.2858
No	27	47	74		
Cancer					
Yes	1	3	4	0.733(0.1320 4.0698)	0.7224
No	44	85	129		
Previous DVT					
Yes	4	12	16	0.7134(0.2948 to 1.7266)	0.4539
No	41	76	117		
Heart Disease					
Yes	9	15	24	1.1354(0.6347 to 2.0311)	0.6687
No	36	73	109		
CKD					
Yes	9	13	22	1.2614(0.7137 to 2.2293)	0.4242
No	36	75	111		
Other diseases					
Yes	13	36	49	0.6964(0.4059 to 1.1949)	0.1890
No	32	52	84		
Immobilization					
Yes	11	41	52	0.5040(0.2811 to 0.9036)	0.0214
No	34	47	81		

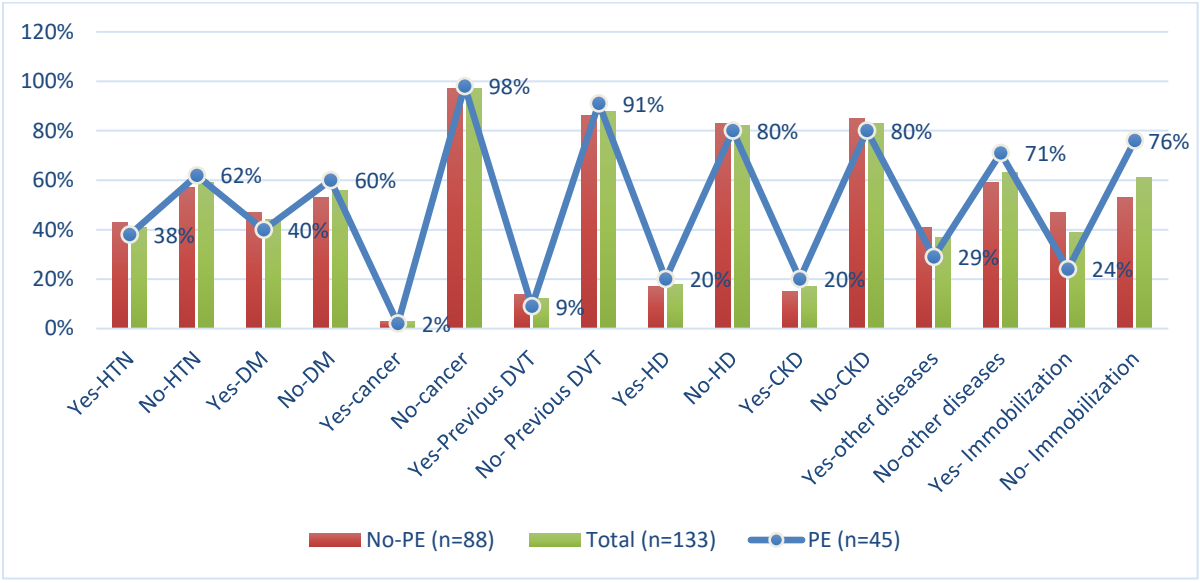

Figure 2. Patients by pulmonary thromboembolism diagnosis and comorbidities

The risk of PE was increasing with an increase in BMI. Weight measurement was available for 63 patients of whom 26/63(41%) were patients with PE, of whom 23/26(88.5%) were overweight or obese. The risk of PE among obese/overweight, the RR (95%CI) =1.2589(0.9790 to 1.6187), P-value =0.0727, as indicated in Table 3, Fig 3.

Table 3. Distribution of the PE by BMI

BMI	PE	No-PE	Total	RR (95%)	P-value
Underweight	0	1	1		
Normal	3	10	13		
Overweight	10	7	17	1.2589(0.9790 to 1.6187)	0.0727
Obese	7	7	14		
Morbid obese	6	12	18		
Total	26	37	63		

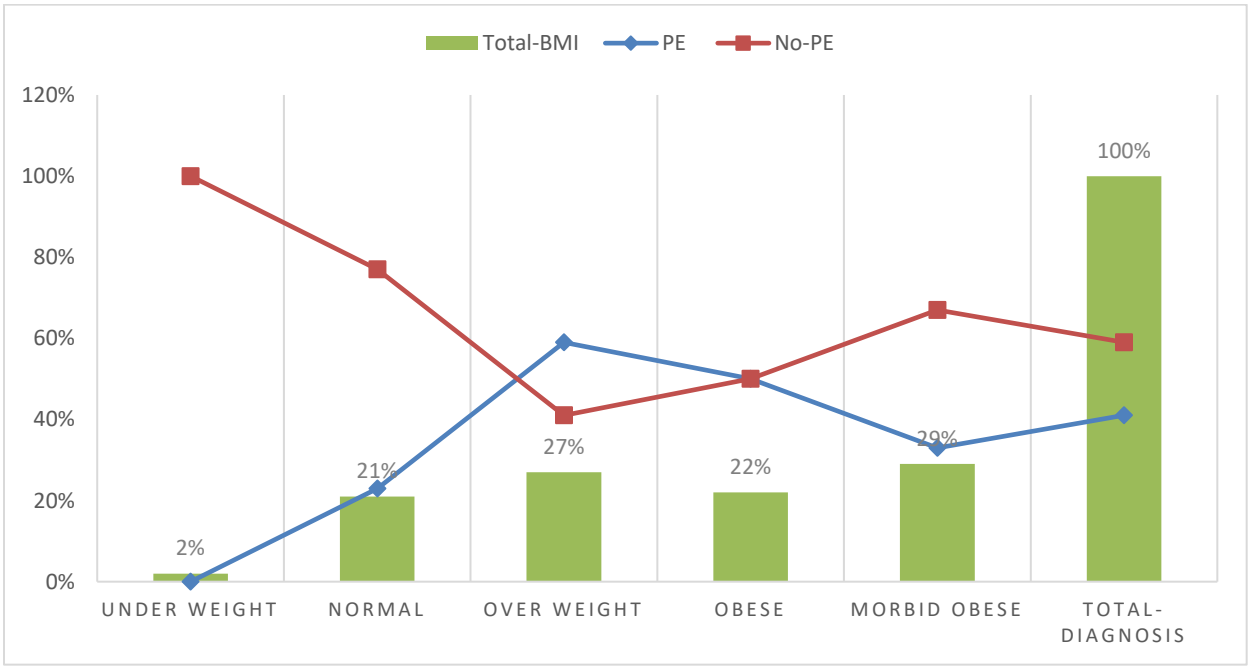

Figure 3. Description of the PE by BMI categories

4. DISCUSSION

Pulmonary embolism is a common health problem in Saudi Arabia. However, the epidemiological data referred to PE are scarce, though the frequencies of patients attending intensive care units are increasing. Therefore, the objective of the present study was to identify the incidence rates of pulmonary thromboembolism and its associated Comorbidities in the Ha'il Region, Northern Saudi Arabia. The findings of the present investigation have shown an overall incidence of pulmonary thromboembolism of 33.8% of the patients presented with symptoms mimicking PE. The incidence rate in males was (58%) more than females (42%). However, variable incidence rates were previously reported in this context, most of them were lower than our findings in this study (Liu et al., 2015; Turetz et al., 2018; Bělohlávek et al., 2013). Most of these studies linked PE to certain medical conditions. Irrespective of measures employed for assessing lung scans in pulmonary embolism, the incidence of silent pulmonary embolism is 40 to 50% in patients with DVT. The lung scan may simply identify pulmonary embolism though is not suitable for predicting early recurrences of thromboembolism during treatment (Meignan et al., 2000). The available reports from Saudi Arabia revealing poor linkage in this regard and mostly dealt with venous deep vein thrombosis, which was reported to occur in up to 40% of the patients (Essam et al., 2011). Although some reports showing that the PE is more frequent among women (Khoury et al., 2020), the adverse outcomes didn't differ between men and women in patients with PE and were not affected by the sex in spite of sex-specific dissimilarities in the prognostic presentation of risk stratification (Keller et al., 2019).

The current study showed a PE incidence of 31% in hypertensive patients. The increased risk of venous thromboembolism in patients with hypertension (Zhang et al., 2012). Similar PE incidence (31%) was revealed for DM. Although several epidemiological studies have demonstrated the increased risk of PE in patients with diabetes mellitus (Stein et al., 2009; Ageno et al., 2008), some studies showing inconsistent findings regarding the association between DM and the occurrence of venous thromboembolism (Heit et al., 2009; Holst et al., 2010). About 25% of the patients in the present study were found with a history of the previous DVT. The increased risk of PE following DVT was previously reported. Diverse pathophysiological underlying mechanisms have been suggested (Monreal et al., 1992; Jin et al., 2018). Heart disease was reported in 38% of the patients presented with PE symptoms. Increased risk of PE and VTE linked to atrial fibrillation was previously established (Enga et al., 2015). The incidence of PE was 41% in patients with CKD. It is well-established that CKD increases the risk of DVT and PE and therefore, oral anticoagulants are frequently used in these patients to reduce the risk of thromboembolism related consequences (Kuo et al., 2017; Jain et al., 2019).

The incidence of PE was 24% in immobilized patients. A previous study has shown that PE occurred in 17% of the immobilized patients, which was less than in patients with a history of VTE (Catella-Chatron et al., 2019).

The incidence of PE was 41% in obese/overweight patients. The findings of the present study showed a significantly increased risk of PE with the increase of BMI. Obesity is strongly associated with an increased risk of diverse cardiovascular events, particularly PE (Movahed et al., 2019).

5. CONCLUSION

Pulmonary thromboembolism is prevalent in Northern Saudi Arabia, and more frequent among males. The most common risk factors associated with PTE in this series of patients were obesity/overweight, cardiovascular diseases, CKD, DM, and immobilization. Further studies are recommended to explore the magnitude of pathophysiological events underlying the elevated risk.

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Conflict of interest

The authors declare that there are no conflicts of interests.

Ethical approval

All procedures performed in studies involving human participants were following the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (ethical approval number: Nr13675/5/42.

Informed consent

Informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Data and materials Availability
All data associated with this study are present in the paper.

Peer-review
External peer-review was done through double-blind method.

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