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THE ASSESSMENT OF MEDICAL STUDENTS' KNOWLEDGE OF VENOUS THROMBOEMBOLISM AND ITS ASSOCIATION WITH PREGNANCY IN SAUDI ARABIA

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Abstract
Background: In recent years investigations looked at pregnant women in Enugu, Nigeria, and Jeddah, Saudi Arabia, to see how much they knew about venous thromboembolism (VTE). Research showed a lack of understanding of VTE. In Enugu, 40% had heard of VTE, 30% had looked up information online while pregnant, and 20% were unaware of any symptoms. Adult Saudi women were aware of VTE in pregnancy but were unaware of risk factors and complications. VTE, which involves clot migration and puts expectant mothers at risk, frequently results in ICU admissions. The study aimed to assess pregnancy related VTE awareness among medical students in Saudi Arabia.
Methods: The study design was cross-sectional research on Saudi adult females, including medical students up to the fifth year. The study contained medical students from the first to fifth year and sixth-year Saudi interns, with 2023's final quarter enrolling pregnant women from various Saudi provinces. This research highlights insufficient VTE awareness, particularly among pregnant women and medical students, advocating for enhanced awareness initiatives and education.
Results: As regard the knowledge and awareness score about VTE during pregnancy, there were (66.9%) out of 498 participants exhibited a moderate level of knowledge on this critical health concern, which is an encouraging finding. However, there was a significant proportion (9.6%) with a low level of knowledge. Notably, the high level of knowledge observed in 23.5% of the participants. Regarding the relation between knowledge level and sociodemographic characteristics, there was a statistically significant relation to gender (p value=0.001), age (p value=0.001), social status (p value=0.0001), region of residence (p value=0.0001). It also shows statistically insignificant relation to nationality.
Conclusion: the study highlighted a concerning gap in awareness and knowledge regarding venous thromboembolism (VTE) in pregnant women among medical students in Saudi Arabia. While approximately 66.9% of participants demonstrated a moderate level of understanding, a significant number—9.6%—displayed low awareness, emphasizing the need for improved education and training on this critical health issue. The findings reveal that many individuals struggle to identify risk factors and symptoms associated with VTE, which could lead to serious health consequences for both mothers and their infants.

Keywords: pregnancy, knowledge level, venous thromboembolism, medical students, pulmonary embolism, deep vein thrombosis

Introduction:

The blood clot that moves from the body and causes occlusion or blockage is called venous thromboembolism or (VTE) [1]. Venous thromboembolism (VTE) has a lot of risk factors, and one of them is pregnancy. The

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physiological changes that occur during pregnancy are considered a risk factor for venous thromboembolism because they induce a pro-thrombotic state [2]. (VTE) is one of the most common causes of ICU admission in pregnant women besides postpartum hemorrhage and hypertensive disorder of pregnancy [3]. Also, it is one of the causes of cardiac arrest among patients admitted for delivery besides the hemorrhage and amniotic fluid embolism (AFE) [4]. Because of that, VTE is a leading cause of mortality during pregnancy [5]. One more important thing is that there are some difficulties in the differentiation between thromboembolism and physiological symptoms of pregnancy [6]. Deep vein thrombosis and pulmonary emboli are at least five times more likely to occur during pregnancy alone, and the puerperium, which is when the risk is highest, is when many women develop or already have extra risk factors for venous thrombosis [7].
According to a 2022 study, vein thromboembolism (VTE) has yearly incidence rates between 39 and 115 per 100,000 people and is regarded as the third most common acute cardiovascular condition globally, while DVT has annual incidence rates between 53 and 162 per 100,000 people [6].
VTE during pregnancy resulted in the identification of 215 patients, of which 183 required systemic thrombolysis, 19 catheter-directed thrombolysis, and 13 mechanical thrombectomy. Systemic thrombolysis had a 4.40% maternal complication rate and a 1.65% fetal complication rate. The maternal complication rate for catheter-directed thrombolysis was 14.75 percent, and the fetal complication rate was 5.2 percent [8].
In March 2023 Studies were published on knowledge and awareness of venous thromboembolism among pregnant women in the Enugu metropolis, Nigeria. Generally, there is insufficient knowledge and awareness of VTE among pregnant women [9].
Less than 40.0% of the surveyed reported having heard of venous thromboembolism. Most of them—approximately 30%—got their knowledge regarding the risk of pregnancy-related VTE on the Internet rather than from healthcare professionals. Over 20% of those surveyed reported being unaware of any illness signs [10].
Adult Saudi women from Jeddah are aware of VTE during puerperium and pregnancy, but they have substantial gaps in their awareness of the risk factors and potential pulmonary complications [11].
Due to insignificant numbers related to our topic, especially in Saudi Arabia. The majority of previously published research in Saudi Arabia has focused on the importance of physicians following VTE screening and prevention recommendations in obstetric cases with the support of the Saudi Center for Evidence-Based Healthcare (EBHC) [12]. A study was carried out in Saudi Arabia to assess the knowledge of VTE among at-risk pregnant and postpartum women. Their research revealed that the women had inadequate knowledge and insufficient awareness of VTE. To provide safe and better patient care, the authors suggested more initiatives to raise VTE risk awareness. Despite the significance of VTE regarding pregnant women, there is generally a lack of public awareness. Therefore, we designed this study to assess the level of awareness of VTE among pregnant women. This study aimed to assess the awareness level of pregnant women and its link to venous thromboembolism among medical students in Saudi Arabia.

Materials and Methods:

Study design:

The research study is a cross-sectional study that included adult females living in Saudi Arabia from Augst 2023 – September 2024.

Study setting: Participants, recruitment, and sampling procedure:
The population of the study was made up of medical students from the first to the fifth year, as well as the sixth-year and interns in Saudi Arabia.

Inclusion and Exclusion Criteria:
This study includes all medical students in Saudi Arabia and medical students studying in other countries, and non-medical students was excluded.

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Sample size:
Using Raosoft to calculate, the sample size is 384, with a confidence level of 95% and a marginal error of 5%.

Method for data collection and instrument (Data collection Technique and tools):

There were 10 questions regarding this part and the participants were asked regarding their knowledge level. Each question has 3 choices, and one of them is the correct answer. A correct answer was given a 1 score, whereas a 0 score was given for a wrong answer. The original Bloom's cut-off points, 80% - 100%, 60% - 79%, and less than 59%, were used to classify the questions into 3 levels. The scores varied from 1 to 10 points and were classified into 3 levels as follows: High level: 8-10 scores. Moderate level: 6-7 scores. Low level: less than 6.
There were 19 questions regarding this part and the participants were asked regarding their opinion.
Each question has 5 choices, and one of them is the correct answer. A correct answer was given a 1 score, whereas a 0 score was given for a wrong answer. The original Bloom's cut-off points, 80% - 100%, 60% - 79%, and less than 59%, were used to classify the questions into 3 levels. The scores varied from 1 to 19 points and were classified into 3 levels as follows: High level: 17-19 scores. Moderate level: 12-16 scores. Low level: less than 12.

Analyzes and entry method:
Data collection was done electronically using the Microsoft Windows Excel application (2016). The Statistical Package of Social-Science Software (SPSS) application, version 20, was then used to import the data. to undergo statistical evaluation.

Results:
Table (1) displays various demographic parameters of a group of people with a total number of (498). The provided data presents a comprehensive overview of the sociodemographic characteristics of the study participants, which can offer valuable insights into the population under investigation. The sample size of 498 individuals suggests a substantial representation, allowing for more robust statistical analyses and generalizability of the findings. The age distribution reveals that most of the participants (67.4%) are between 22 and 25 years old, with a significant proportion (19.3%) being 21 years or younger. This age range is typically associated with the undergraduate or early postgraduate stages of medical education, suggesting the sample may be representative of the target population. The gender distribution shows a predominance of female participants (69.3%), which is not uncommon in the field of medicine, where the proportion of women has been steadily increasing in recent decades. The high percentage of single individuals (95.8%) is also consistent with the expected marital status of the study population, which is largely composed of young adults in the early stages of their medical training. The academic performance of the participants, as measured by their Grade Point Average (GPA), indicates a diverse range of achievements, with a significant proportion (50.6%) excelling with a GPA above 4.5 out of 5. This suggests the sample may encompass a wide spectrum of academic abilities, potentially allowing for the exploration of correlations between demographic factors and academic success. Furthermore, the distribution of academic years reveals a strong representation of interns (45.2%), with smaller proportions of students in earlier and later stages of their medical education. This composition can provide insights into the differences in knowledge, perceptions, and experiences across the various stages of medical training. The nationality distribution shows a predominance of Saudi participants (84.9%), with a smaller proportion of non-Saudi individuals (15.1%). This breakdown may reflect the broader demographics of the medical education system or the specific institution where the study was conducted. Finally, the data indicates that most participants (97.6%) have learned about venous thromboembolism during their medical education or training, suggesting a strong emphasis on this important clinical topic within the curriculum. Overall, the provided data offers a detailed snapshot of the sociodemographic characteristics of the study participants, which can serve as a valuable foundation for further analyses and the interpretation of the study's findings in the context of the target population.

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Table (1): Sociodemographic characteristics of participants (n=498)

Parameter		**No.**	**Percent (%)**
Age	21 years or less	96	19.3
	22 to 23	177	35.5
	24 to 25	159	31.9
	more than 25	66	13.3
Gender	Female	345	69.3
	Male	153	30.7
Social status	Single	477	95.8
	Married	21	4.2
Grade Point Average (GPA)	>4.5 out of 5	252	50.6
	3.75-4.5 out of 5	156	31.3
	2.5-3.75 out of 5	36	7.2
	>3.5 out of 4	33	6.6
	3.5-3 out of 4	6	1.2
	3-2.5 out of 4	15	3.0
Academic year	Intern	225	45.2
	First year	12	2.4
	Second year	6	1.2
	Third year	81	16.3
	Fourth year	33	6.6
	Fifth year	78	15.7
	Sixth year	63	12.7
Nationality	Non-Saudi	75	15.1
	Saudi	423	84.9
Region	The Northern Region	15	3.0
	The Southern Region	39	7.8
	The Central Region	126	25.3
	The Eastern Region	75	15.1
	The Western Region	243	48.8
Have you learned about venous thromboembolism during your medical education or training?	No	12	2.4
	Yes	486	97.6

As shown in figure 1, The overwhelming majority of respondents (486 out of a total of 498) indicating that they have learned about VTE during their medical education or training is a positive sign, reflecting the healthcare community's commitment to addressing this significant health concern. VTE, a condition characterized by the formation of blood clots in the deep veins, poses a substantial risk to pregnant women, with increased incidence and the potential for severe complications if left untreated. The low percentage of respondents (12 out of 498) who have not been exposed to VTE-related education is a concern that merits further investigation. Ensuring comprehensive and consistent training on VTE recognition, prevention, and management across all healthcare disciplines is essential to providing the highest level of care for pregnant women and reducing the burden of this condition within the Saudi population. Continuous efforts to enhance awareness, strengthen clinical guidelines, and foster interdisciplinary collaboration can contribute to improving maternal health outcomes and reducing the risk of VTE-related complications during pregnancy.

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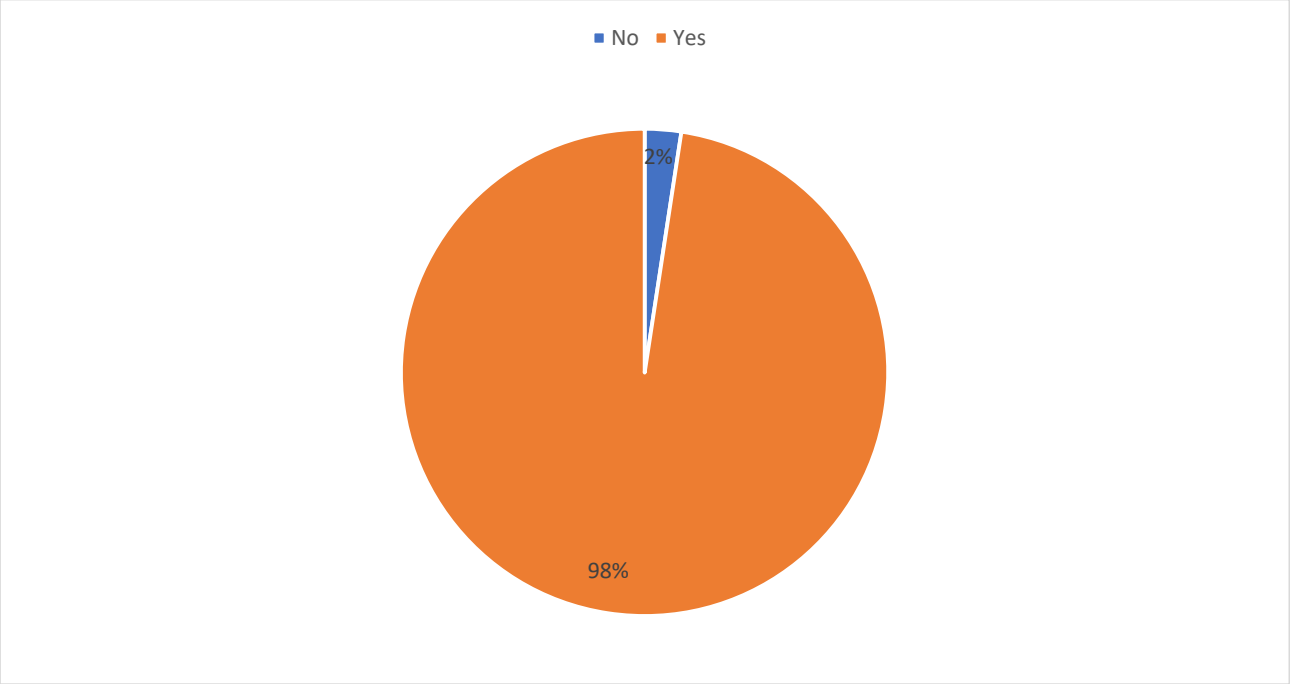
Figure (1): Illustrates whether participants learned about VTE during medical education or training.



As illustrated in table (2), it is evident that the surveyed population, comprising 498 individuals, exhibits a strong understanding and awareness regarding venous thromboembolism (VTE) in the context of pregnant women and its association with various obstetric procedures. The majority of the respondents (74.7%) reported being "very familiar" with the term "venous thromboembolism," and a significant proportion (94%) acknowledged the risk of VTE during or after obstetric procedures. The data further reveals that the participants possess a comprehensive knowledge of the obstetric procedures linked to an increased risk of VTE, with the majority recognizing cesarean section (74.1%), vaginal delivery (43.9%), and assisted vaginal delivery (32.5%) as high-risk procedures. Additionally, a significant number of respondents (45.8%) indicated a "high" understanding of the signs and symptoms of VTE, while 74.7% reported knowing how to lower the risk of blood clots during childbirth. Regarding the implementation of prophylactic measures, the data suggests a generally positive attitude, with 63.8% of the respondents either "likely" or "very likely" to recommend such measures when pregnant women undergo obstetric procedures. However, it is worth noting that a notable proportion (27.7%) remained "neutral" on this matter, potentially indicating a need for further education and guidelines to promote the consistent adoption of VTE prophylaxis. Interestingly, the data reveals that a significant percentage of respondents (19.3%) had encountered patients who developed VTE during their clinical rotations after obstetric procedures, and the majority of these individuals (64.8%) reported that this experience enhanced their understanding and awareness of the relationship between VTE and obstetric interventions. The survey results also shed light on the sources used by the respondents to stay updated on VTE and its management, with online resources (63.8%), lectures or presentations (63.8%), and textbooks (42.2%) being the most commonly utilized channels. This information highlights the importance of maintaining accessible and comprehensive educational materials on this topic. Lastly, the data overwhelmingly indicates a perceived need for increased education and training on VTE and its association with obstetric procedures in medical school curricula, with 83.1% of the respondents supporting this recommendation. This finding underscores the importance of incorporating this critical subject matter into the core curriculum to ensure that future healthcare professionals are well-equipped to recognize, manage, and prevent VTE in the context of obstetric care.

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http://magellanes.com/

Table (2): Parameters related to knowledge regarding VTE in pregnant women (n=498).

Parameter		No.	Percent (%)
Are you familiar with the term "venous thromboembolism"?	Not at all	24	4.8
	Somewhat	27	5.4
	Moderately	75	15.1
	Very familiar	372	74.7
Did you know that venous thromboembolism can happen during or after obstetric procedures?	No	30	6.0
	Yes	468	94.0
Which of the following obstetric procedures are associated with an increased risk of venous thromboembolism? Please select all that apply *	Cesarean section	369	74.1
	Vaginal delivery	219	43.9
	Assisted vaginal delivery (forceps or vacuum extraction)	162	32.5
	Preterm labor induction	144	28.9
	Intrauterine device (IUD) insertion	195	39.1
	None of the above.	9	1.8
How well do you understand the signs and symptoms of venous thromboembolism?	Very low	21	4.2
	Low	15	3.0
	Moderate	174	34.9
	High	228	45.8
	Very high	60	12.0
Do you know how to lower the risk of blood clots during childbirth?	No	126	25.3
	Yes	372	74.7
When pregnant women undergo obstetric procedures, how likely are you to recommend prophylactic measures for venous thromboembolism?	Likely	165	33.1
	Very likely	153	30.7
	Neutral	138	27.7
	Unlikely	27	5.4
	Very unlikely	15	3.0
Have you ever had a patient who developed venous thromboembolism during your clinical rotations after an obstetric procedure?	No	402	80.7
	Yes	96	19.3
If you answered yes, did this experience enhance your understanding and awareness of venous thromboembolism and its relationship with obstetric procedures? (n=162)	No	57	35.2
	Yes	105	64.8
What sources do you use to stay updated on venous thromboembolism and its management? (Select all that apply) *	Textbooks	210	42.2
	Journals	141	28.3
	Online resources (websites, medical forums, etc.)	318	63.8
	Lectures or presentations	318	63.8
	Clinical guidelines	210	42.2
	Other	24	4.8
Is there a need for increased education and training on venous thromboembolism and its association with obstetric procedures in medical school curricula?	No	84	16.9
	Yes	414	83.1

*Results may overlap

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As shown in figure (2), The findings presented in the figure provide valuable insights into the risk factors for venous thromboembolism (VTE) in pregnant women within the Saudi population. The most prominent risk factor identified is a history of VTE in a first-degree relative, with 405 respondents endorsing this as a significant contributor to VTE risk during pregnancy. This underscores the importance of considering familial predisposition and genetic factors when assessing an individual's susceptibility to VTE, as the presence of a positive family history can significantly increase the likelihood of developing this potentially life-threatening condition. In contrast, factors such as multiple previous uncomplicated pregnancies (51 respondents), normal body weight (12 respondents), and young maternal age (30 respondents) appear to have a relatively lower impact on VTE risk in this population. These findings suggest that healthcare providers should prioritize screening for and addressing a personal or family history of VTE when developing comprehensive thromboprophylaxis strategies for pregnant women in Saudi Arabia. Furthermore, these results highlight the need for continued research and awareness initiatives to better understand the unique risk factors and disease burden associated with VTE in this specific geographic and cultural context. By leveraging this knowledge, healthcare professionals can implement targeted interventions and optimize the management of VTE in pregnant women, ultimately improving maternal health outcomes and reducing the associated morbidity and mortality within the Saudi population.

Figure (2): Illustrates the risk factors for VTE in pregnancy according to participants.

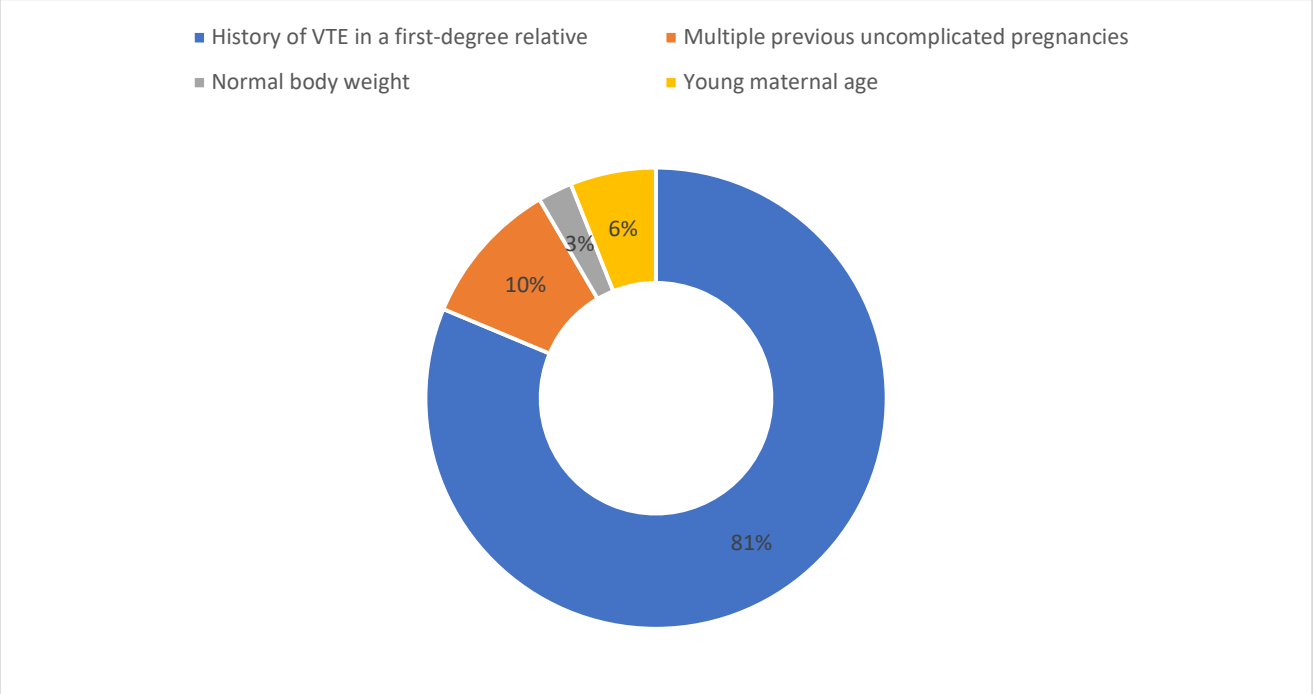

Table (3) reveals participants' awareness regarding venous thromboembolism (VTE) in pregnant women. The data highlights several important aspects of VTE, including risk factors, incidence, timing of occurrence, prevention methods, symptoms, diagnostic techniques, and potential complications. The majority of participants (81.3%) recognized a history of VTE in a first-degree relative as a risk factor for VTE in pregnancy, indicating a good overall understanding of the importance of genetic predisposition. However, the relatively low awareness of other risk factors, such as multiple previous uncomplicated pregnancies (10.2%), normal body weight (2.4%), and young maternal age (6.0%), suggests a need for further education in these areas. Regarding the incidence of VTE in pregnant women without any risk factors, the data shows a concerning lack of consensus, with responses ranging from less than 1% to more than 15%. This discrepancy suggests that healthcare professionals may benefit from more comprehensive training on the epidemiology of VTE in pregnancy. The data also reveals a strong understanding of the trimester-specific risk of VTE, with most participants (56.0%) correctly identifying the third

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http://magellanes.com/

trimester as the period with the highest risk. This knowledge is crucial for targeted preventive measures and vigilant monitoring during this critical stage of pregnancy. The participants' responses regarding preventive strategies demonstrate a good grasp of the recommended method, with 68.7% identifying the administration of low molecular weight heparin as the preferred approach. However, the significant proportion of participants (22.9%) who selected regular aspirin consumption, which is not a recommended prophylactic measure, suggests the need for further clarification on evidence-based VTE prevention guidelines. The data also highlights the participants' awareness of common VTE symptoms, with 84.9% recognizing leg swelling and pain as key indicators. This awareness is essential for timely diagnosis and management of VTE during pregnancy. Notably, most participants (96.4%) correctly identified that pregnant women with a previous VTE are at high risk for developing VTE in subsequent pregnancies. This level of understanding is crucial for appropriate risk stratification and implementation of tailored preventive strategies. The data further indicates that healthcare professionals have a strong grasp of the appropriate diagnostic imaging techniques, with 86.7% correctly identifying Doppler ultrasound as the commonly used method for VTE diagnosis during pregnancy. Finally, the participants' responses on the potential complications of VTE during pregnancy demonstrate a mixed understanding, with more than half (55.4%) incorrectly identifying gestational diabetes as a potential complication. This finding suggests a need to further reinforce the specific complications associated with VTE, such as placental abruption, postpartum hemorrhage, and preterm birth. Overall, the data reveals a relatively comprehensive awareness of VTE in pregnant women among the participants, with some areas requiring additional education and clarification to ensure a more consistent and evidence-based understanding of this important clinical issue.

Table (3): participants' awareness regarding VTE in pregnant women (n=498).

Parameter		**No.**	**Percent (%)**
Which of the following is a risk factor for venous thromboembolism (VTE) in pregnancy?	History of VTE in a first-degree relative	405	81.3
	Multiple previous uncomplicated pregnancies	51	10.2
	Normal body weight	12	2.4
	Young maternal age	30	6.0
What percentage of pregnant women without any risk factors develop VTE?	Less than 1%	153	30.7
	Approximately 5%	234	47.0
	About 10%	60	12.0
	More than 15%	51	10.2
Which trimester of pregnancy carries the highest risk for developing VTE?	First trimester	24	4.8
	Second trimester	33	6.6
	Third trimester	279	56.0
	Risk remains consistent throughout pregnancy	162	32.5
Which of the following is a recommended method for preventing VTE in pregnant women?	Administration of low molecular weight heparin	342	68.7
	Avoidance of physical activity	30	6.0
	Prolonged bed rest	12	2.4
	Regular consumption of aspirin	114	22.9
Which of the following is a common symptom of VTE during pregnancy?	Decreased fetal movement	21	4.2
	Leg swelling and pain	423	84.9
	Elevated blood pressure	39	7.8

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	Excessive fetal movement	15	3.0
True or False: Pregnant women who have had a previous VTE are automatically considered high-risk for developing VTE in subsequent pregnancies.	False	18	3.6
	True	480	96.4
Which of the following imaging techniques is commonly used to diagnose VTE during pregnancy?	Computed tomography (CT) scan	18	3.6
	Doppler ultrasound	432	86.7
	Magnetic resonance imaging (MRI)	36	7.2
	X-ray	12	2.4
Which of the following is NOT a potential complication of VTE during pregnancy?	Gestational diabetes	276	55.4
	Placental abruption	42	8.4
	Postpartum hemorrhage	33	6.6
	Preterm birth	147	29.5
How can medical education contribute to improving awareness about VTE among medical students?	Incorporating VTE-related topics in the curriculum	54	10.8
	Organizing workshops or seminars on VTE	27	5.4
	Providing clinical exposure to VTE cases	51	10.2
	All of the above	366	73.5

The data presented in Table (4) provides valuable insights into the knowledge and awareness levels about Venous Thromboembolism (VTE) during pregnancy among the study participants. The results indicate that most of the respondents (66.9%) exhibited a moderate level of knowledge on this critical health concern, which is an encouraging finding. However, the presence of a significant proportion (9.6%) with a low level of knowledge highlights the need for continued efforts to enhance awareness and education within this population. Notably, the high level of knowledge observed in 23.5% of the participants suggests that targeted interventions and knowledge-sharing initiatives have been somewhat effective, but there remains room for improvement to ensure comprehensive understanding of VTE and its implications during pregnancy. These findings underscore the importance of ongoing initiatives to equip healthcare professionals and expectant mothers with the necessary information and resources to proactively manage the risks associated with VTE, ultimately leading to improved maternal health outcomes.

Table (4): Shows knowledge and awareness about VTE during pregnancy score results.

	Frequency	Percent
High level of knowledge	117	23.5
Moderate level of knowledge	333	66.9
Low level of knowledge	48	9.6
Total	498	100.0

Table (5) shows that the knowledge level regarding VTE in pregnant women has statistically significant relation to gender (p value=0.001), age (p value=0.001), social status (p value=0.0001), region of residence (p value=0.0001). It also shows statistically insignificant relation to nationality.

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Table (5): Relation between knowledge level and sociodemographic characteristics.

Parameters		**Knowledge level**		**Total (N=498)**	**P value***
		High level of knowledge	Moderate or low level		
Gender	Female	96	249	345	0.001
		82.1%	65.4%	69.3%	
	Male	21	132	153	
		17.9%	34.6%	30.7%	
Age	21 years or less	18	78	96	0.001
		15.4%	20.5%	19.3%	
	22 to 23	60	117	177	
		51.3%	30.7%	35.5%	
	24 to 25	30	129	159	
		25.6%	33.9%	31.9%	
	more than 25	9	57	66	
		7.7%	15.0%	13.3%	
Social status	Single	105	372	477	0.0001
		89.7%	97.6%	95.8%	
	Married	12	9	21	
		10.3%	2.4%	4.2%	
GPA (Grade Point Average)	>3.5 out of 4	6	27	33	N/A
		5.1%	7.1%	6.6%	
	>4.5 out of 5	48	204	252	
		41.0%	53.5%	50.6%	
	2.5-3.75 out of 5	6	30	36	
		5.1%	7.9%	7.2%	
	3-2.5 out of 4	0	15	15	
		0.0%	3.9%	3.0%	
	3.5-3 out of 4	6	0	6	
		5.1%	0.0%	1.2%	
	3.75-4.5 out of 5	51	105	156	
		43.6%	27.6%	31.3%	
Academic year	First year	0	12	12	N/A
		0.0%	3.1%	2.4%	
	Second year	0	6	6	
		0.0%	1.6%	1.2%	
	Third year	18	63	81	
		15.4%	16.5%	16.3%	
	Fourth year	12	21	33	
		10.3%	5.5%	6.6%	
	Fifth year	15	63	78	
		12.8%	16.5%	15.7%	
	Sixth year	21	42	63	
		17.9%	11.0%	12.7%	
	Intern	51	174	225	
		43.6%	45.7%	45.2%	
Nationality	Non-Saudi	21	54	75	0.318
		17.9%	14.2%	15.1%	

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http://magellanes.com/

	Saudi	96	327	423	
		82.1%	85.8%	84.9%	
Region of residence	The Northern Region	9	6	15	0.0001
		7.7%	1.6%	3.0%	
	The Southern Region	15	24	39	
		12.8%	6.3%	7.8%	
	The Central Region	33	93	126	
		28.2%	24.4%	25.3%	
	The Eastern Region	21	54	75	
		17.9%	14.2%	15.1%	
	The Western Region	39	204	243	
		33.3%	53.5%	48.8%	

*P value was considered significant if ≤ 0.05.

Discussion:

Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is a significant factor contributing to the global disease burden. It impacts thousands of people across the globe and is a major reason for annual hospital admissions [13]. The worldwide annual incidence of VTE ranges from one to two cases per 1,000 adults. Various risk factors are linked to thrombosis, such as advanced age, obesity, smoking, previous thrombotic events, surgical procedures, hospitalization, varicose veins, thrombophilia, the use of oral contraceptives, and pregnancy [14]. The risk of developing VTE during pregnancy is at least five times higher compared to nonpregnant women of the same age, with the relative risk during the postpartum period potentially increasing to as much as 60 times. VTE is characterized by either DVT or PE. The heightened risk of thrombosis in pregnant women is associated with physiological changes that affect homeostasis. Throughout a typical pregnancy, levels of clotting factors such as fibrinogen, VII, VIII, von Willebrand factor, IX, X, and XII rise, creating a state of hyper-coagulation that elevates the risk of thrombosis in this population [15]. This hyper-coagulation state during pregnancy serves a protective function against excessive bleeding that can occur during miscarriage and childbirth [16].Thus, we aimed in this study to assess the pregnancy related VTE awareness among medical students in Saudi Arabia.

As regard the knowledge and awareness score about VTE during pregnancy, we have found that (66.9%) out of 498 participants exhibited a moderate level of knowledge on this critical health concern, which is an encouraging finding. However, there was a significant proportion (9.6%) with a low level of knowledge. Notably, the high level of knowledge observed in 23.5% of the participants. Moreover, the majority recognizing cesarean section (74.1%), vaginal delivery (43.9%), and assisted vaginal delivery (32.5%) as high-risk procedures. Additionally, a significant number of respondents (45.8%) indicated a "high" understanding of the signs and symptoms of VTE. The participants' responses regarding preventive strategies demonstrate a good grasp of the recommended method, with 68.7% identifying the administration of low molecular weight heparin as the preferred approach. On the other hand, A study by Gupta et al. (2021) [17] conducted at a medical college in Delhi found that only 38% of the medical students could accurately identify the symptoms of VTE, with knowledge scores averaging 12.5 out of 25. Conversely, a study by Mehta and Sharma (2022) [18] in Maharashtra revealed that 45% of participants were aware of the risk factors associated with pregnancy-related VTE, but only 30% could correctly outline appropriate prophylactic measures. Moreover, a study conducted by Vujicic et al. (2022) [19] surveyed 200 medical students across various institutions in the United States and found that only 42% could correctly identify the classic symptoms of VTE, such as leg swelling and chest pain. Additionally, only 37% of students were aware of the appropriate prophylactic measures for at-risk pregnant patients. Another study by Ellis et al. (2021) [20] assessed the knowledge of 150 medical students and reported that 55% were familiar with the risk factors associated with pregnancy-related VTE, while only 25% could accurately define the term "prophylaxis" in the context of managing VTE during pregnancy. Additionally, a survey by Thompson and Lee (2020) [21] which targeted final-year medical students across several London medical schools found low levels of awareness.

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This study found that merely 20% of the students could accurately name the signs and symptoms of VTE, while 15% had comprehensive knowledge of prophylactic measures with heparin. Furthermore, only 10% were familiar with the guidelines for management of VTE in the context of pregnancy. Furthermore, a study conducted by Alshaikh et al. (2021) [22] found that only 42% of medical students could identify the common symptoms of VTE in pregnant women, and only 38% were aware of the recommended prophylaxis with low molecular weight heparin. Moreover, the study reported that overall awareness scores averaged 55%, indicating a significant gap in knowledge. In another study by AlMansoori et al. (2022) [23], the findings revealed that awareness regarding VTE management during pregnancy was found to be particularly inadequate. Only 30% of the participants correctly answered questions related to the management protocol of VTE in pregnant women, and the average score for their knowledge about prophylactic measures was 26%. In a notable study by Yilmaz et al. (2022) [24], a cross-sectional questionnaire was distributed to 400 medical students across various Turkish medical faculties. The results indicated that only 45% of the participants could correctly identify the common symptoms of pregnancy-related VTE, while a mere 30% had adequate knowledge about the prophylactic use of heparin during pregnancy to prevent thromboembolic events. Moreover, when assessing management strategies, only 25% were aware of the current guidelines for treating VTE in pregnant patients. Additionally, a subsequent investigation by Demir et al. (2023) [25] further corroborated these findings with a focus on the impact of formal training on knowledge retention. In their study involving 350 medical students, only 40% demonstrated an understanding of the risk factors associated with pregnancy-related VTE, and only 32% were familiar with the appropriate dosage of heparin for pregnant patients in prophylactic settings.

Conclusion:

In conclusion, this study highlights a moderate level of awareness regarding venous thromboembolism (VTE) among medical students in Saudi Arabia, with 66.9% demonstrating adequate knowledge of this critical health issue during pregnancy. Despite this encouraging finding, nearly 10% of participants displayed a low level of understanding, underscoring a need for increased educational initiatives targeting VTE awareness among healthcare professionals and pregnant women alike. The findings reveal significant gaps in knowledge regarding risk factors, symptoms, and prophylactic measures, which may contribute to the high morbidity and mortality associated with VTE in this population. Therefore, to enhance patient safety and outcomes, it is imperative to implement more robust awareness campaigns and educational programs within medical curricula and public health initiatives, ensuring that medical students and their future patients are better informed about the risks and management of VTE during pregnancy.

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Ethics approval consideration:

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only. Institutional research ethics board approval was acquired before conducting any study-related procedures.

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Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

Written informed consent was obtained from all individual participants included in the study.

Data and materials availability

All data associated with this study are present in the paper.

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