Knowledge levels of obstetricians and gynecologists on deep vein thrombosis

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ABSTRACT

Objectives: The aim of this study was to evaluate the level of knowledge of obstetricians and gynecologists about deep vein thrombosis (DVT) in pregnancy.

Methods: A cross-sectional questionnaire comprising 12 items was administered to obstetricians and gynecologists employed at a tertiary care hospital between January 2024 and March 2024. Following a reliability analysis, a DVT questionnaire scale was developed, which was subsequently evaluated across three sub-dimensions: (1) General Disease Knowledge (F1), (2) Medical Treatment Knowledge (General) (F2), and (3) Anticoagulant Knowledge Level (F3).

Results: A total of 163 participants were evaluated in the study, with a mean age of 32.33±5.75 years. Among these individuals, 107 (65.6%) were female and 56 (34.3%) were male. Additionally, 72 (44.2%) of the participants were classified as resident physicians. The scores for the sub-dimensions of the DVT scale were as follows: 2.25±1.03 for (F1), 1.33±0.72 for (F2), and 2.53±1.09 for (F3). Notably, (F3) of the resident physicians was found to be significantly lower than that of the specialist/faculty member group, with a P-value of less than 0.017.

Conclusions: The study demonstrated that the knowledge levels of obstetricians and gynecologists fell below the established proficiency threshold. This deficiency is believed to stem from inadequate understanding of the differentiation between superficial and deep vein thrombosis, the management of anticoagulant therapy during pregnancy, and post-thrombotic syndrome. Enhancing awareness in these areas may improve patient outcomes, reduce reliance on cardiovascular surgery consultations, and alleviate clinical workload.

Keywords: Deep vein thrombosis, obstetrics and gynecology, anticoagulants, knowledge assessment, healthcare surveys

Deep vein thrombosis (DVT) involves the formation of clots within deep veins, most frequently affecting the lower limbs, and poses serious health risks due to its potential to cause pulmonary embolism (PE) and post-thrombotic syndrome (PTS) [1]. Both conditions contribute to significant patient morbidity and mortality, highlighting the need for early recognition and treatment [2]. While DVT is more commonly associated with cardiovascular care, it is also a pertinent issue in obstetrics and gynecology

due to patient exposure to unique risk factors. For instance, pregnancy increases blood clot risks through physiological changes, while treatments like oral contraceptives, hormone replacement therapies, and certain surgical procedures further elevate the likelihood of venous thromboembolism (VTE) [3]. Given these considerations, it is essential for obstetricians and gynecologists to have a thorough understanding of DVT risk factors, diagnostic approaches, and effective treatment protocols. By examining these areas within a specialty that frequently encounters patients with heightened clotting risks, this research strives to enhance patient safety and improve clinical outcomes through more informed DVT awareness and practices [4, 5]. This study aims to assess the current knowledge levels among obstetrics and gynecology specialists and residents concerning DVT management, identifying key gaps that could benefit from targeted educational interventions.

METHODS

Ethical Approval and Methodology

This study was designed as a prospective survey utilizing a two-point Likert-type scale to assess gynecologists' knowledge of DVT. Responses were categorized as correct or incorrect. Ethical approval for the study was obtained from the ethics committee on January 15, 2024 (Ethics Approval No: 2024/00345). A structured questionnaire comprising 12 questions was administered to participants concerning DVT. The study was conducted between January 20, 2024, and March 15, 2024. The questionnaire items were categorized into three domains: general knowledge about DVT, general medical treatment information, and anticoagulant treatment information. The questions were developed in collaboration with cardiovascular surgeons and obstetricians, adhering to the national vascular guidelines published in 2021. The questionnaire was distributed online to obstetricians and gynecologists employed at a tertiary care hospital via Google Forms (Google LLC, Mountain View, CA, USA). The specific questions included in the survey are presented in Table 1.

Data Collection Tools

In this study, a structured, prospective question-

naire was utilized to evaluate the knowledge levels of obstetricians and gynecologists regarding DVT. The questionnaire comprises two principal components: demographic information and an assessment of knowledge pertaining to DVT.

Scale Development

The DVT scale questionnaire consists of 12 questions in total. As a result of the KR-20 reliability analysis, since the item distinctiveness indices (biserial) of the 1st and 3rd questions were below 20%, they were removed from the scale, and their reliability was examined again. The KR-20 coefficient was obtained as 0.586. The scale is of low reliability but can be used as a prototype. The results of the reliability analysis for the DVT scale are given in Table 2. The first-level multifactorial structure of the DVT questionnaire, which consists of 3 sub-dimensions and a total of 10 items, was tested by confirmatory factor analysis (CFA) using the RSP library on the R Project. Since the data did not satisfy the assumption of multiple normality, the construct validity of the model fit was tested with the diagonal-weighted least squares (DWLS) estimation technique. The results of CFA are presented in Fig. 1. As a result of the goodness of fit values obtained (χ^2= 26.641, df=32, P=0.735, RMSEA= 0, CFI=1, SRMR=0.053, χ^2/df=0.833), it was shown that the proposed three-factor model was well compatible with the data and was acceptable. It was found that the three-factor structure for the DVT questionnaire was confirmed. In the DVT questionnaire, the F1 dimension includes questions about general disease knowledge, the F2 dimension includes questions in the medical treatment knowledge (general) category, and the F3 dimension includes questions about anticoagulant treatment knowledge. The questionnaire does not have an overall score and is evaluated on three dimensions. The F1 dimension consists of Q2, Q4, Q5 and Q6 items and a score of 0-4 is obtained from this section. The F2 dimension consists of Q7 and Q8 items, and a score of 0-2 is obtained from this section. The F3 dimension consists of Q9, Q10, Q11 and Q12 items, and a score of 0-4 is obtained from this section. In the survey evaluation, the limit for the level of proficiency was set at 75% of the total score (>3 points for F1, 1.5> points for F2 and >3 points for F3, respectively).

**Table 1. Questions asked to participants and their numbers**

Question number	Questions
1	Pregnancy is a known risk factor for DVT.
2	Elevated D-dimer levels are a definitive diagnostic criterion for DVT.
3	DVT is a rare cause of pulmonary embolism.
4	The most common chronic complication of DVT is post-thrombotic syndrome.
5	DVT involvement is most frequently observed at the iliac vein level.
6	Thrombosis of the great saphenous and small saphenous veins is considered within the scope of DVT.
7	In cases of pregnancy-induced DVT, anticoagulant therapy should be planned for life.
8	Antiplatelet drugs are preferred in the standard treatment of DVT.
9	Apixaban, dabigatran, edoxaban, and rivaroxaban are new-generation anticoagulant drugs that can be used in the treatment of DVT during pregnancy.
10	Both heparin and low-molecular-weight heparins can be used in the treatment of DVT in pregnant women.
11	Warfarin, a vitamin K antagonist, is an anticoagulant drug that can be used in the treatment of DVT during pregnancy.
12	For patients receiving low-molecular-weight heparin treatment for DVT, INR tests should be performed regularly to evaluate treatment efficacy.

DVT=Deep Vein Thrombosis, INR=International Normalized Ratio

Table 2. Reliability analysis results for DVT questionnaire

Item	Item Difficulty	Biserial
Q2	0.767	0.631
Q4	0.822	0.539
Q5	0.644	0.617
Q6	0.325	0.603
Q7	0.779	0.643
Q8	0.546	0.675
Q9	0.374	0.712
Q10	0.779	0.331
Q11	0.755	0.574
Q12	0.626	0.719
Number of participants	163	
Number of items	10	
KR-20	0.586	

DVT=Deep Vein Thrombosis, KR=Kuder Richarson coefficient
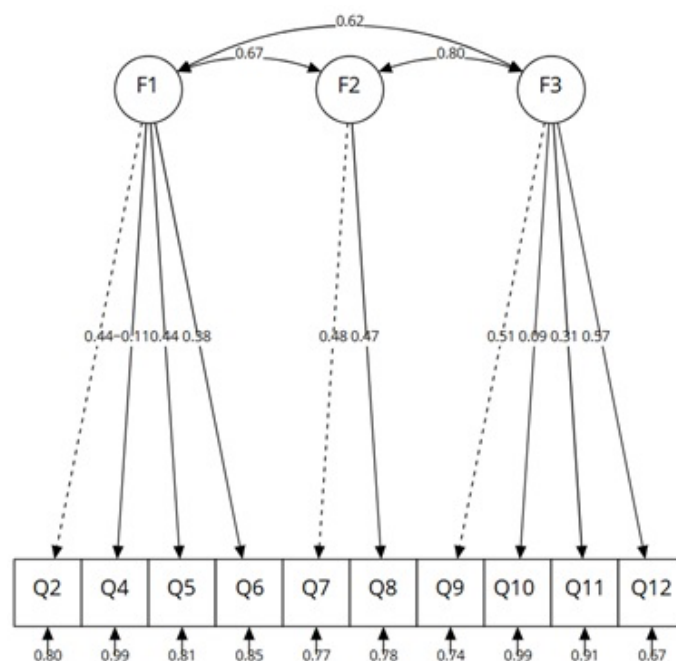
Fig. 1. Confirmatory factor analysis graph of the DVT survey.

Statistical Analysis

The internal consistency and reliability of the DVT questionnaire were evaluated using the KR-20 coefficient. To assess construct validity, CFA was performed utilizing the DWLS estimation technique. The assumption of normality was assessed through kurtosis and skewness coefficients; data were considered to conform to a normal distribution if the kurtosis and skewness coefficients were within the range of ±3. Two independent sample t-tests and one-way analysis of variance (ANOVA) were employed to compare normally distributed survey scores across different groups. The relationship between age, which was normally distributed, and the questionnaire scores was examined using the Pearson correlation coefficient. The analysis findings were obtained using R software (R Core Team, 2024), with results derived from the RSP package included in the R software. The results of the analysis are presented as mean ± standard deviation, median (minimum–maximum), and frequency (percentage). A significance level of $P<0.05$ was established.

RESULTS

A total of 163 physicians participated in the study. Among the participants, 107 (65.6%) were female and 56 (34.4%) were male, with a mean age of 32.33±5.75 years. The median duration of employment at the institution was determined to be 3 years. Of the participants, 81 (49.7%) were specialist physicians, 72 (44.2%) were resident physicians, and 10 (6.1%) were faculty members. Descriptive statistics of the demographic data are presented in Table 3. The question q6 posed to the participants had the lowest response rate at 32.52%. The five questions with the lowest response rates were Q6 (32.52%), Q9 (37.42%), Q4 (51.53%), Q8 (54.60%), and Q12 (62.58%), respectively. The twelve questions included in the questionnaire and their corresponding accuracy rates are illustrated in Fig. 2. Upon examining the mean scores of the participants across the sub-dimensions of the DVT questionnaire scale, the mean score for the general disease knowledge dimension was 2.25, the mean score for the medical treatment information (general) dimension was 1.33, and the mean score for the anticoagulant treatment information dimension was 2.53. No statistically significant relationship was found between the

DVT questionnaire sub-dimension scores and the demographic characteristics of the participants ($P>0.05$) (Table 4). No statistically significant relationship was identified between the medical treatment general knowledge dimension score and other demographic characteristics of the participants ($P>0.05$) (Table 5). Additionally, a statistically significant difference was found in the mean scores of the anticoagulant treatment knowledge dimension according to the titles of the participants ($P=0.017$), with resident physicians scoring lower than specialists or faculty members. No statistically significant relationship was noted between the anticoagulant knowledge dimension score and other demographic characteristics of the participants ($P>0.05$) (Table 5).

DISCUSSION

The primary objective of this study was to systematically evaluate the knowledge levels of obstetricians

Table 3. Descriptive statistics on demographic characteristics

	Data (n=163)
Age (years)	32.33±5.75
Gender	
Male	56 (34.4%)
Female	107 (65.6%)
Occupation	
Resident physicians	72 (44.2%)
Specialist	91 (55.8%)
Titles of participants	
Resident physicians	72 (44.2%)
Faculty members	10 (6.1%)
Specialist	81 (49.7%)
Duration of employment in the institution	
0-1 years	34 (20.9%)
1-2 years	31 (19%)
2-3 years	38 (23.3%)
>3 years	60 (36.8%)

Data are shown as mean± standard deviation or n (%)
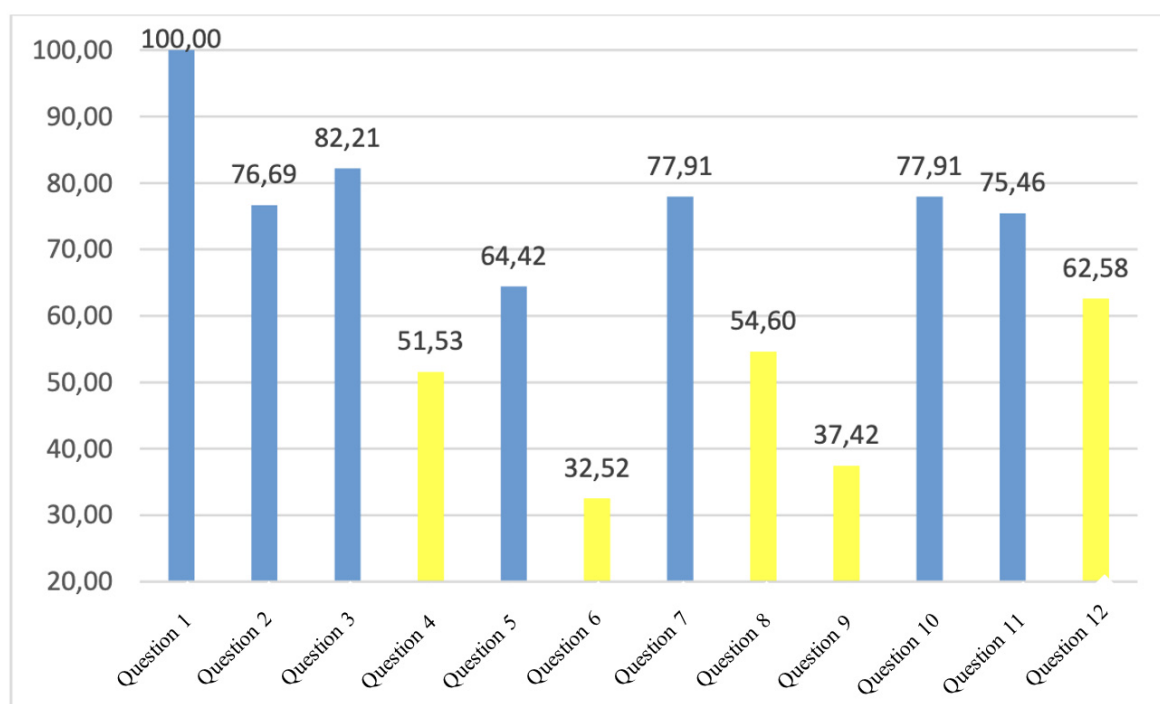
Fig. 2. Score distribution of questions in the study.

and gynecologists regarding DVT, with a specific focus on noncardiovascular specialties that frequently encounter DVT cases. This research addresses a critical gap in the extant literature by rigorously assessing knowledge related to the diagnosis, risk factors, and management protocols of DVT within a domain where awareness is paramount yet often insufficiently addressed. The findings of the study revealed several encouraging insights: participants demonstrated a comprehensive understanding of prevalent risk factors and essential treatment modalities, particularly for high-risk populations, including pregnant women, and exhibited significant proficiency in recognizing general diagnostic criteria. In addition, this study is important because it is the first survey conducted on DVT to healthcare professionals in our country. These

findings provide a robust foundation, indicating that with targeted educational interventions, these healthcare professionals can further augment their competencies in the effective management of DVT-related complications.

When the average scores of the DVT scale, which consists of three sub-dimensions, were examined in the study, it was seen that all three sub-dimensions were below the determined proficiency level. When the results of the sub-dimension of general disease knowledge were considered, it was thought that the insufficiency here was due to superficial vein thrombosis (Q4) and postthrombotic syndrome (Q6). Our investigation elucidated considerable deficiencies in the comprehension of the differentiation between superficial vein thrombosis (SVT) and DVT. While SVT

Table 4. Descriptive statistics of DVT questionnaire subdimension scores

	n=163	
General information	2.25±1.03	2 (0-4)
Medical treatment general information	1.33±0.72	1 (0-2)
Anticoagulant information	2.53±1.09	3 (0-4)

Data are shown as mean± standard deviation or median (minimum-maximum). DVT=Deep Vein Thrombosis

Table 5. Investigation of the relationship between the sub-dimensions of the DVT questionnaire and demographic characteristics

	General information	Medical treatment general information	Anticoagulant information
Gender			
Male	2.3±1.03	1.41±0.68	2.52±1.14
Female	2.22±1.04	1.28±0.74	2.54±1.07
Test stat.	0.464	1.100	-0.134
P^t value	0.643	0.273	0.893
Occupation			
Resident physicians	2.26±1.02	1.29±0.76	2.31±1.15
Specialist	2.24±1.05	1.35±0.69	2.71±1.01
Test stat.	0.135	-0.528	-2.412
P^t value	0.892	0.598	**0.017**
Duration of employment in the institution			
0-1 years	2.5±1.13	1.26±0.71	2.5±1.19
1-2 years	2.39±0.95	1.26±0.73	2.55±1.12
2-3 years	2.24±1	1.37±0.79	2.63±1.13
>3 years	2.05±1.02	1.37±0.69	2.48±1.02
Test stat.	1.617	0.279	0.155
P^t value	0.187	0.841	0.926
Age			
r	-0.062	-0.005	0.106
P value	0.432	0.946	0.180

Data are shown as mean± standard deviation. DVT=Deep Vein Thrombosis
^{t}Independent sample t test, ^{k}One way variance test, ^{r}Pearson correlation coefficient

is not as acutely life-threatening as DVT, it can nonetheless lead to significant morbidity and typically necessitates a shorter therapeutic regimen. Therefore, the precise distinction between SVT and DVT is of paramount clinical significance to avert unnecessary interventions and to alleviate the burden of consultations [6]. The research conducted by Turton *et al*. [7] in the United Kingdom and Ireland underscored that accurate differentiation between SVT and DVT can substantially diminish clinical workload and optimize treatment management. Their findings indicated that the mismanagement of SVT could exacerbate clinical burdens, particularly in high-demand settings such as metropolitan hospitals, where precise differentiation is critical to prevent unwarranted consultations. Fur-

thermore, our study identified substantial gaps in knowledge regarding the administration of novel oral anticoagulants (NOACs) during pregnancy. It is well-documented that NOACs are generally contraindicated in pregnant populations due to safety concerns, potential teratogenic effects, and their restricted use within this demographic.

The FRONTLINE survey conducted by Kakkar *et al*. [8] elucidated the limited utilization of NOACs in patients with cancer and underscored the associated risks of their use during pregnancy due to potential teratogenic effects. There exists a consensus within the medical community that low-molecular-weight heparin (LMWH) represents the safest therapeutic option for the management of DVT during pregnancy. Our study

corroborated these findings, revealing that the restricted application of NOACs during pregnancy contributes to a pervasive lack of knowledge regarding their use. This highlights the imperative for enhanced educational initiatives concerning NOACs and the necessity for updates to clinical guidelines of their administration in pregnant populations. Furthermore, we identified a significant deficiency in awareness regarding PTS, a chronic complication that can result in permanent damage and markedly diminish quality of life if not addressed promptly. Consequently, early diagnosis and intervention for PTS are of paramount importance.

The National Venous and Arterial Disease Guidelines (2021) elucidated that PTS possesses the potential to induce chronic morbidity, and that early therapeutic intervention may substantially mitigate this risk. The existing body of literature indicates that PTS is more prevalent among patients situated in intensive care units and within high-risk populations, with a failure to initiate timely treatment potentially culminating in severe adverse outcomes [9]. Cook *et al*. [10] accentuated that PTS constitutes a prevalent complication in intensive care settings, which may result in lifelong morbidity if not addressed with alacrity. The findings of the present study corroborate this perspective, underscoring the imperative for heightened awareness of PTS and the necessity for comprehensive educational initiatives aimed at healthcare professionals regarding this condition.

In the evaluation made specifically for the sub-dimension of medical treatment knowledge (general), it was determined that the potential cause of the detected insufficiency was the question about the antiplatelet (Q8). Furthermore, our investigation identified pervasive misconceptions regarding the application of antiplatelet therapy in the management of deep vein thrombosis (DVT). In the study conducted by Kakkar *et al*. [8], it was observed that the utilization of antiplatelet agents, such as aspirin, for the management of DVT is not supported by a robust evidence-based framework, particularly in Eastern Europe, where the prevalence of inappropriate treatment practices is notable. Furthermore, Cook *et al*. [10] emphasized that antiplatelet therapy does not constitute an effective strategy for the management of DVT. Our research corroborated these assertions, concluding that antiplatelet therapy is ineffective in the treatment of DVT, thereby underscoring the imperative for the

adoption of appropriate therapeutic interventions. There exists a significant necessity to address the existing knowledge gaps pertaining to antiplatelet therapy and to enhance the educational initiatives aimed at physicians regarding this critical issue.

The reason for the low level of anticoagulant treatment knowledge, which is the third sub-dimension of the scale, was evaluated as the question about INR (Q12). Knowledge deficiencies were observed in this study regarding the necessity of monitoring INR in patients treated with LMWH. While the effects of LMWH on INR are limited, regular monitoring of INR during treatment is important to prevent complications. In the study by Kakkar *et al*. [8] it was emphasized that INR monitoring should be performed alongside LMWH treatment, especially in high-risk groups. Similarly, in this study, it was found that INR monitoring was not adequately performed in patients receiving LMWH, indicating a lack of awareness. This underscores the importance of INR monitoring in preventing complications. Future educational programs should focus on raising awareness about this issue. In addition, in our study, it was observed that the level of anticoagulant therapy knowledge of resident physicians was found to be significantly lower than that of specialist/academic physicians.

The association between iliac vein involvement and the risk of pulmonary embolism was misinterpreted in our study. The research conducted by Cook *et al*. [10] indicated that the risk of pulmonary embolism is markedly elevated in patients exhibiting iliac vein involvement, thereby necessitating meticulous monitoring of these individuals. This study identified a significant gap in knowledge regarding the correlation between iliac vein involvement and the risk of pulmonary embolism, highlighting the imperative for more rigorous management of such cases. It is essential for physicians to be thoroughly informed about the increased risk of pulmonary embolism in patients with iliac vein involvement, as this factor is pivotal in the effective management of these clinical scenarios. Based on the findings of our study, information sessions were conducted for obstetricians and gynecologists. In comparison to the study by Zhao *et al*. [11], which evaluated nurses' knowledge of DVT, both studies underscored the necessity of addressing knowledge deficiencies related to DVT.

In a study conducted by Alyousef *et al*. [12] in

Saudi Arabia, it was noted that knowledge gaps regarding DVT increased healthcare costs, and such information sessions could improve patient outcomes.

This study demonstrates that obstetricians and gynecologists exhibit significant knowledge deficiencies concerning DVT indicating a pressing need for the implementation of educational programs to address these gaps. Future research should focus on evaluating the impact of such educational initiatives on clinical outcomes.

This study makes significant contributions to the existing literature by highlighting the knowledge deficiencies of obstetricians and gynecologists regarding DVT and emphasizing the areas requiring improvement. The findings indicate that the implementation of appropriate treatment practices could diminish the necessity for cardiovascular surgery consultations. A key conclusion of the study is the imperative for training and awareness programs, particularly in high-demand healthcare settings such as urban hospitals.

Our study shows some similarities and differences compared to other studies in the literature. In the study by Kakkar et al. [8] it was emphasized that antiplatelet therapy has no place in DVT management and that evidence-based treatment methods such as LMWH should be preferred. This finding aligns with our study, where antiplatelet therapies were misunderstood in the management of DVT. While antiplatelet therapies are known to be ineffective in DVT treatment, our study observed that the knowledge level regarding these therapies was low. Additionally, in the study by Cook et al. [10] it was stated that early treatment and appropriate anticoagulation are vital in DVT management, which is also consistent with our findings. It is known that incorrect treatment practices in DVT increase morbidity and mortality risks.

In the study by Zhao et al. [11] it was stated that if PTS is not treated early, it can lead to permanent damage and significantly impact quality of life. Similarly, this study found that the importance of post-thrombotic syndrome was not sufficiently understood. In our study, it was emphasized that post-thrombotic syndrome should be addressed as a permanent complication and that early treatment can prevent the development of this syndrome. The National Venous and Arterial Disease Guidelines (2021) also suggest that more attention should be given to PTS in DVT treatment [9].

Among the risk factors for DVT during pregnancy are the use of oral contraceptives, immobility, and genetic factors. In the study by Atilgan et al. [13] which evaluates the incidence of DVT based on age and gender in the Central Anatolia region in light of regional factors, the effects of age and gender on DVT development were examined. It was particularly noted that DVT incidence increases in older individuals and that post-menopausal women have a DVT incidence similar to men. This study is consistent with our findings, as it was observed that obstetricians and gynecologists tend to misjudge the risk of DVT during pregnancy and have a lack of knowledge about new oral anticoagulants. Our study also highlighted the need to prefer treatment methods such as LMWH during pregnancy. In the study by Kakkar et al. [8] it was stated that the risk of pulmonary embolism is higher in patients with iliac vein involvement. Similarly, in the study by Cook et al. [10] it was noted that the risk of pulmonary embolism is higher in patients with iliac vein thrombosis, and this can lead to fatal outcomes. In this study, it was found that the risk of pulmonary embolism in patients with iliac vein involvement is not sufficiently known. Although this relationship is clearly stated in the literature, our study observed that physicians do not have enough knowledge about it. This indicates that patients with iliac vein thrombosis should be closely monitored.

This study makes a significant contribution to the existing body of knowledge by revealing that obstetricians and gynecologists possess a limited understanding of deep vein thrombosis (DVT). It suggests the implementation of educational programs to address these knowledge gaps. Similarly, Zhao et al. [11] emphasized the importance of training programs in DVT management. These findings are consistent with our study's results, indicating that physicians in high-demand settings, such as urban hospitals, require additional training to manage thrombosis cases more effectively.

The findings of this study are largely consistent with the literature and show that the knowledge deficiencies of obstetricians and gynecologists in DVT management need to be addressed. The literature indicates that early diagnosis and treatment of DVT are crucial for preventing complications.

These studies can serve as a foundation for future awareness initiatives and educational programs in major healthcare institutions, such as urban hospitals. As highlighted by Cayley et al. [14], the appropriate implemen-

tation of DVT prophylaxis can significantly mitigate the risk of both fatal and non-fatal complications.

Limitations

This study has several limitations. Firstly, it relied on a self-reported questionnaire format, which may be subject to response bias and may not fully capture the actual clinical knowledge or decision-making practices of participants. Additionally, the study was conducted primarily in urban, high-volume centers, potentially limiting the generalizability of findings to rural or lower-volume healthcare settings. The study also focused on knowledge levels rather than clinical practice outcomes, leaving the impact of knowledge gaps on patient outcomes unmeasured. Future research could address these limitations by incorporating broader sample populations and evaluating how knowledge levels directly influence clinical practices and patient outcomes.

CONCLUSION

This study sought to evaluate the knowledge levels of obstetricians and gynecologists regarding DVT, particularly within high-demand healthcare settings such as tertiary centers. The results identified significant knowledge deficiencies, especially in differentiating between superficial and deep vein thrombosis, the application of anticoagulants during pregnancy, and the management of post-thrombotic syndrome. Addressing these gaps through targeted educational initiatives could improve patient outcomes, reduce the reliance on cardiovascular surgery consultations, and ease the clinical burden in high-volume centers. This study highlights the imperative of enhancing awareness and providing adequate training for healthcare professionals in DVT management.

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