VENOUS THROMBOEMBOLISM AWARENESS AMONG MEDICAL STUDENTS – INTERVENTION NEEDED

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ABSTRACT

Objectives: Venous thromboembolism (VTE) is one of the most common causes of death associated with cardiovascular diseases. Despite the relatively high incidence rate, awareness and access to information about VTE risk factors as well as knowledge concerning effective prevention possibilities remain limited, including among health care professionals. The aim of the study was to assess the knowledge and awareness concerning venous thromboembolism among students of the Medical University of Silesia.

Material and methods: The study was performed on a group of 400 medical students from the Medical University of Silesia in Katowice from years 3 to 6, recruiting 100 people from each of the clinical years. The study was conducted based on a survey which included 27 questions concerning knowledge of the definition of venous thromboembolism, pathogenesis, epidemiology, risk factors, symptoms and diagnostics related to this group of patients.

Results: The proper definition of venous thromboembolism was indicated by 60% of the respondents and the proper components of Virchow's triad, which underlies the pathogenesis of deep vein thrombosis, were defined by 69%. The further question answers revealed that although the study programme includes venous thromboembolism, the knowledge of the students in the field of epidemiology, symptomatology and risk factors of this affliction is still limited.

Conclusions: According to the results of the study, it is advisable to take action, including educative effort, to increase the awareness of the future medical staff about problems related to VTE.

Key words: deep venous thrombosis, education, symptoms, venous thromboembolism.

INTRODUCTION

Venous thromboembolism (VTE), which manifests itself as deep vein thrombosis (DVT) and/or pulmonary embolism (PE), still remains a significant problem of today's medicine. Despite increasing knowledge within this area, VTE is one of the most underestimated issues of 21st century medicine. The estimated VTE incidence rate is 1-2/1000 people per year in the world's population. In Poland, the estimated incidence of VTE is 5700 people annually [1].

Despite development of diagnostic methods, most cases of DVT remain unrecognized. It applies to both proximal DVT (popliteal vein, femoral vein, iliac vein and inferior vena cava), which is diagnosed only in 50% of cases, and distal DVT, which is symptomatic and is diagnosed only in 20% of the subjects suffering from this disease [2]. The potential cause of this situation is frequent absence of the symptoms or the presence of non-specific symptoms which patients disregard and which are hard for doctors to clarify. In many cases pulmonary embolism, which is a result of migration of a thrombus from the lower limb and pelvis venous system, is the first diagnosed symptom of this disease. It is crucial because it can result in a fatal embolism of the pulmonary artery. Embolic changes in image explorations of pulmonary arteries can affect up to 50% of patients with proximal DVT [2].

In terms of epidemiology, knowledge about symptoms of disease, potential risk factors and ways of proper anti-thrombotic prophylaxis are crucial.

Based on different diagnostic methods in this scope, clinical effectiveness of anti-thrombotic prophylaxis in various situations is unquestioned. It is advisable to assess every patient individually regarding risk factors and efficacy of preventive procedures. VTE is a cause of in-hospital deaths which could mostly be prevented [3]. Prevalence of VTE increases during hospitalization and presence of other risk factors of this disease [4]. Among hospitalized patients, 78% of those admitted to hospitals have more than 1 VTE risk factor and 20% of them have at least 3 risk factors at once [4]. In the USA, pulmonary embolism is a cause of 200 000 deaths per year [5]. In the USA and Europe VTE leads to more deaths than AIDS, breast cancer, prostate cancer and car accidents combined [6].

Venous thromboembolism is one of the most underrated diseases among both patients and medical staff because of the common lack of symptoms, non-specific symptoms and inadequate awareness of this issue [7-9]. Actions that lead to increased awareness of prevalence of this problem, its consequences, diagnostics and prevention should be carried out both in hospital and in outpatient treatment [8]. Awareness about VT's occurrence should be raised among patients as well [9].

Education about prevalence, consequences, prophylaxis possibilities and treatment of VTE is part of medical faculties' curriculum at medical universities in Poland. Future doctors' task is to acquire knowledge about the pathophysiological basis as well as proper procedures in the group of predisposed patients. In this paper an attempt has been made to assess medical students' awareness about VTE from different clinical years.

MATERIAL AND METHODS

The study was performed on a group of 400 medical students from the Medical University of Silesia in Katowice from years 3 to 6, recruiting 100 people from each of the clinical years. The study was conducted based on a survey which included 27 questions concerning knowledge of the definition of venous thromboembolism, pathogenesis and epidemiology of this affliction. In the questionnaire questions regarding risk factors, symptoms and diagnostics related to this group of patients were asked. 77% of interviewees were women and 23% were men, aged 21-28 years old. Respondents based their answers on the knowledge acquired at the university during studies.

The survey was anonymous and it was conducted between 15 October 2016 and 28 February 2017. The aim of the authors of the research tool was its clarity and preservation of an appropriate number of categorized questions, giving an opportunity to choose one answer and closed questions. Results were edited taking information about the study year of interviewees into consideration and statistically evaluated.

RESULTS

The proper definition of venous thromboembolism as an affliction manifesting as deep vein thrombosis (DVT) and/or pulmonary embolism (PE) was pointed out by 60% of interviewees and an alarmingly low rate of correct answers among 100 consecutive students of the 6th year (25%) (Fig. 1).

According to the majority of students (52%) venous thromboembolism is only the 5th cause of death due to vascular problems. The correct answer, venous thromboembolism being the 3rd cause of death due to cardiovascular diseases (after coronary heart disease and cerebrovascular events), was given by only 50% and the most (55%) by students of the 5th year of studies and the least by students of the 4th and 6th year – 38% and 40% of correct answers respectively. Proper components of Virchow's triad, which underlies the pathogenesis of deep vein thrombosis, were defined by 69% and the best result was achieved by students of the 5th year of studies (Fig. 2).

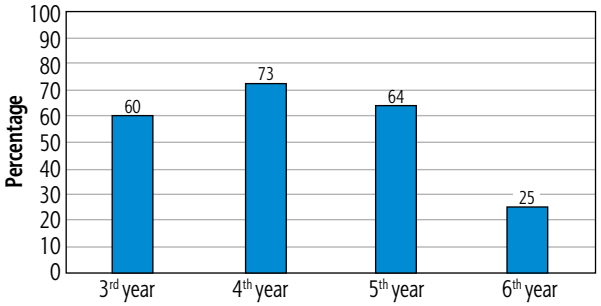

Fig. 1. Percentage of correct answers for definition of venous thromboembolism as a condition including deep vein thrombosis and/or pulmonary embolism

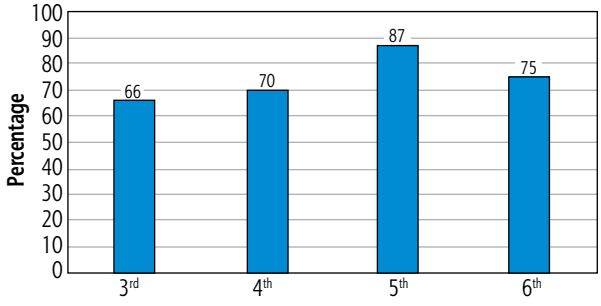

Fig. 2. Percentage of correct answers for Virchows' triad components

Deep veins of lower limbs as the most frequent place of deep vein thrombosis and potential thrombotic material formation was indicated by 85% of respondents. Asked about the incidence of thrombosis in the population, less than half of respondents pointed out the correct answer, with a significantly higher rate of the proper answers chosen by students of the 6th year of the university (Fig. 3).

Referring to the question about symptomatology of venous thromboembolism, 3.75% of respondents responded that venous thromboembolism is always symptomatic. 26% of students claim that in most cases pulmonary embolism is the first manifestation of venous thromboembolism (from 10% of students of the 4th year to 40% of the 5th year). The answer that venous thromboembolism could often be non-symptomatic and this is the reason why it is so hard to identify was chosen by 13.75% of the respondents only. The statement that deep vein thrombosis often causes pain of lower limbs and swelling, and such symptoms suggest that it may be deep vein thrombosis (so you could and should do more tests), was chosen by 52.75% of respondents (the least by students of the 4th year, 41%, and the most by students of the 6th year, 70%).

When we asked the students about symptoms which can occur in patients with deep venous thrombosis, swelling of the lower limbs was indicated by 6.25% of respondents (the most from the 3rd year – 9%), tenderness and pain was indicated by 1.75%, and positive Homans' symptom was chosen by 2%. 87.5% of interviewees claim that all of the symptoms may suggest occurrence of deep vein thrombosis (including most of the 4th and 6th years).

The next question referred to the problem of specific symptoms of the venous thromboembolism – 61.25% of respondents were aware that, unfortunately, there are no specific symptoms of this disease (including most future physicians of the 6th year – 80%). When we asked about the possible risk factors for development of venous thromboembolism (multi-organ injury, long-term immobilization, obesity, venous thromboembolism in the interview, heart failure, stroke, cancers or all of them) the correct answer, indicating all of them, was given by only 17% of students (Fig. 4).

The twentieth question of the questionnaire was "what tests would you recommend to identify deep vein thrombosis, when there is a patient with swollen lower limbs after long-term immobilization during travel?". There were the following answers available: D-dimer assessment in urine, D-dimer assessment in serum, ultrasound compression test, ascending venography, and US duplex Doppler examination, or a combination of them. The correct answer (ultrasound compression test or duplex Doppler examination) was indicated by 30% of respondents (30% of 3rd year students, 14% of 4th year students, 24% of 5th year students, and the most, 50%, of 6th year students).

Responding to the question "what is the first test you will do to identify or exclude the pulmonary embolism?",

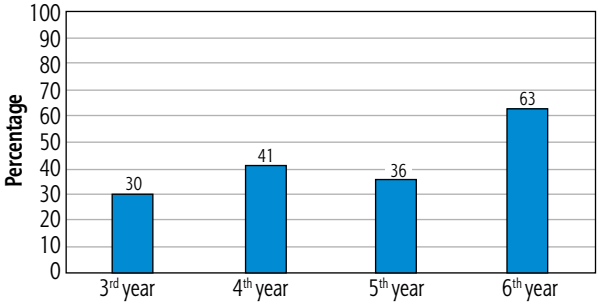

Fig. 3. Percentage of correct answers for incidence rate of DVT in the population

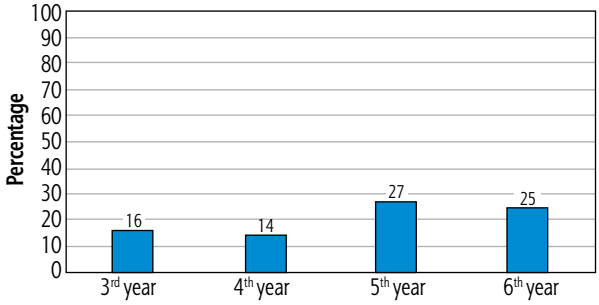

Fig. 4. Percentage of correct answers for risk factors of venous thromboembolism

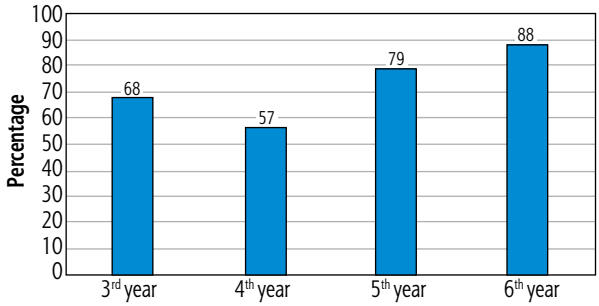

Fig. 5. Percentage of correct answers for first-choice diagnostic method in confirming/excluding PE (angio-CT)

66% of students from the Medical University of Silesia indicated the correct answer, which was angio-CT, and 6th year students got the best result (Fig. 5).

Asked about pharmacological treatment of deep vein thrombosis, antiplatelet drugs were indicated by 71.5% of the respondents (the most, 75%, by 6th year students, and the least, 67%, by 3rd year students). The rest of the interviewees stated that anticoagulation treatment should be used. In the question where the respondents were asked to select an inappropriate method of VTE prophylaxis (which was the use of acetylsalicylic acid for primary thromboprophylaxis), the correct answer was chosen by

29% of students only. The proposed VTE prophylaxis methods in this question included: early mobilization, graduated elastic stockings, intermittent pneumatic compression and anticoagulant use. Correct answers were indicated by 80% of 6th year students, 55% of 5th year students, 20% of 4th year students and 17% of 3rd year students. Concerning the question involving the problem of venous thromboembolism during long immobilization during long distance air flights, 35% of respondents were aware of the risk factors and that some methods of VTE prophylaxis should be implemented during long haul flights if needed (correct answers were stated by 40% of 3rd year students, in 39% of 5th year students and in 33% of 6th year students).

Answering the question concerning the level of the current and obtained knowledge (information) about VTE on a scale from 1 to 10, respondents stated it at the average level of 3.8 (4.09 in 3rd year, 3.4 in 4th, 4.7 in 5th and 3 in 6th year students). Students of every clinical year stated that they were not taught enough about diagnosis and treatment of deep vein thrombosis. 76% of respondents claim that lecturers and classes during medical studies do not pay enough attention and devote insufficient time to deep vein thrombosis and pulmonary embolism (60% in 3rd year, 64% in 4th year, 83% in 5th year and 83% in 6th year students).

DISCUSSION

The lack of proper awareness concerning the disease as well as the lack of knowledge concerning the proper approach to VTE prophylaxis and treatment are definitively two important factors significantly related to the still very high mortality and morbidity rate in this group of patients [10]. Several other factors responsible for the poor clinical implementation of the proposed VTE prophylaxis and treatment guidelines are also identified including: physician-related factors (lack of familiarity with the guidelines, lack of agreement with the guidelines, lack of outcome expectancy, concerns about bleeding risk, difficulty of use of oral anticoagulation, lack of self-efficacy – inability to follow the guidelines), environmental factors (lack of time, lack of staff, poor reimbursement and increased practice costs, lack of reminder system) as well as guideline-related factors (confusing disagreement between the guidelines, guidelines are not easy or inconvenient to use, difficulties in adding new behaviour instead of changing an existing one, some of the guidelines are cumbersome) [11].

Taking into account the conditions mentioned above, the discrepancy between the guideline recommendations and the real world clinical approach to the problem of venous thromboembolism in the hospital as well as ambulatory settings is also potentially related to the proper health care provider education. In the study, both the questionnaire answers and student knowledge self-assessment suggest the need of medical high school education improvement in the VTE field. VTE-related subjects are part of the medical education and training at the medical faculty along the study course from the very early part of the clinical education. This subject is presented and discussed with students during the courses of physiology, pathology, pharmacology, internal medicine, surgery and vascular surgery.

In the performed study, we realized the lack of the proper students' knowledge concerning VTE symptomatology and pathogenesis in all the examined years of the medical faculty training, including in the 6th (last) year students. Among 100 consecutive 6th year students asked, 25% of the respondents could not specify Virchow's triad elements and only 25% of them knew the proper VTE definition (based on the presence of DVT and/or of PE). Several problems with the identification of VTE and DVT symptoms were also identified among the respondents – the lack of knowledge concerning the often asymptomatic disease course as well as the limited understanding of the low specificity of potentially VTE-related symptoms should be especially emphasized. In this context the relatively low rate of correct answers to the question about proper DVT diagnostics in the symptomatic patient should be pointed out: only 29.5% of students identified ultrasound venous the compression test as well as venous duplex Doppler US as the screening diagnostic method in DVT patients (30% of 3rd year, and 14%, 24%, 50% in years 4-6 respectively). Also in the PE field, the insufficient knowledge concerning angio-CT as the diagnostic method of choice to confirm the clinical suspicion should be mentioned (this method was indicated by 68%, 57%, 79% and 88% of the students from the medical faculty, in the 3rd, 4th, 5th and 6th year respectively).

In the performed study, apart from the problems with the proper identification of the VTE risk factors, there are also problems related to the VTE prophylaxis rules. Only 29% of the students identified aspirin as the inappropriate way of pharmacological thromboprophylaxis. The proper methods of VTE prophylaxis were specified by 17% of students of the 3rd year of the medical study, by 20% in the 4th year and by 55% and 80% in the 5th and 6th year respectively. According to the presented results and students' self-assessment, in the programme of the medical faculty more attention should be paid to the education in the field of venous thromboembolism. This, in turn, can potentially improve and ensure safe and high quality medical care in the potential VTE patient population.

Continuous education in this field should be continued not only during the medical study but also afterwards and should concern all health care providers. In the VTE START study, based on a population of 258 556 hospitalized patients, 68 278 patients (26.4%) were determined to be at risk of venous thromboembolism in various hospital departments. The rates of patients who received the appropriate type, dose, and duration of thromboprophy-

laxis in critical care, medical and surgical patient wards were 10.5%, 9.8%, and 17.9% respectively. Among the patients at risk, 36.8% received no thromboprophylaxis. The study publication was summarized with the conclusion concerning the need for physicians and health systems to improve awareness and implementation of recommended thromboprophylaxis [12].

According to the ENDORSE study based on a population of 68 183 hospitalized patients in 32 countries, the proper VTE prophylaxis was used in 59% of the surgical patients at VTE risk and only in 40% of the medical patients at risk of VTE development (assessed according to risk factor presence) [13]. Tang *et al.* explored how the medical staff of intensive care units in China comprehend and practice VTE prophylaxis. In the questioned group of 1861 physicians and nurses, 36.5% of physicians and 22.2% of nurses were aware of the VTE guidelines, and 19.0% of physicians and 9.5% of nurses comprehended the latest ACCP Guideline edition (9th Edition – 2012) – 37.6% of the medical staff chose the VTE prophylaxis method based on the related guidelines [14].

One of the most significant problems related to the difficulties in the VTE prophylaxis and treatment guidelines implementation is the lack of proper VTE awareness among the medical staff. It concerns both risk factor evaluation with proper VTE risk stratification and diagnostic awareness in the potential DVT/PE patients. VTE can often be prevented, but in many cases the course of the disease can be potentially unpredictable, with very few clinical symptoms suggesting the disease occurrence [15-17]. Many VTE cases are still not diagnosed clinically and detected during the autopsy – this observation concerns especially the medical patient group but it can also happen in surgical patients at risk of VTE development [18]. The incidence of VTE increases during hospitalization as well as in the cases of coincidence of significant VTE risk factors [19].

The current VTE prophylaxis and treatment measures, including new medical therapies based on direct oral anticoagulants, significantly simplify both prophylaxis and treatment of this disease [20-23]. Despite the progress in the therapy, a significant proportion of VTE patients remain undiagnosed due to the asymptomatic or barely symptomatic disease course. This concerns both proximal and (especially) distal DVT as well as the number of PE cases. In term of the often asymptomatic VTE course, knowledge concerning risk factors as well as risk stratification has important value [24, 25].

Education as well as activities focusing on an increase of the awareness concerning venous thromboembolism can be addressed to the patient community, which seems to be much less informed about the disease risk consequences and symptoms. In a study published in 2017 by Almodaimegh *et al.* the Saudi Arabia in-hospital patients' awareness of VTE and their perceptions of thromboprophylaxis were evaluated. Among the 174 patients studied, only 32% were familiar with the risk and possibility of DVT occurrence, while for PE the rate was even lower, 15%. Only 5% of the patients with knowledge of DVT identified leg swelling as a potential DVT symptom [26].

In the general (non-hospital) population the knowledge and awareness of VTE also seems to be very low and significantly lower than the knowledge concerning other cardiovascular diseases such as stroke or heart infarction. In a study assessing the global public VTE awareness, 800 respondents from 9 countries were questioned [27]. The rates of respondents who were aware of thrombosis, DVT and PE were 68%, 44% and 54%, and this was significantly lower than the proportion that were aware of other thrombotic disorders, such as heart attack and stroke (88% and 85% respectively). In the same study, the awareness of cancer, hospitalization and surgery as the risk factors turned out to be very low (16%, 25% and 36% respectively) and only 45% of the respondents were aware that blood clots are preventable.

Looking for the possibility to improve this situation, in the AVTERS study, Tomkowski and co-workers focus on the efficacy of the public awareness campaign on the incidence of symptomatic objectively confirmed deep vein thrombosis [27]. In this controlled study a campaign to raise public awareness of DVT was performed during one year in an urban population of 100 000 and compared with the control group in terms of the symptomatic DVT referrals and confirmations by general practitioners by compression ultrasound. The one year incidence of diagnosed DVT was 36/100 000 in the population that underwent education and 14/100 000 in the control (without the educative approach). Of course, for the wider implementation of such an approach, the significant costs should be taken into consideration. As this is probably not possible at this moment as a worldwide strategy, at least medical staff and all medical health care providers should be aware and sufficiently educated in the field of risk factor assessment, prophylaxis as well as diagnostics and treatment of DVT and/or PE. This education should remain an important part of the pre- and post-graduate training as well as part of the continuous education in most of the medical specialties.

The present study demonstrates the lack of sufficient awareness of VTE, DVT, and PE as well as the lack of sufficient knowledge concerning the pathogenesis, risk factors, and diagnostics among medical students, including the last year of medical faculty student group. Based on our study results, action towards an increase of medical high school students' awareness as well as action towards more practical education in this field in the medical faculty of the medical university should be proposed.

CONCLUSIONS

Although the study programme includes venous thromboembolism, the knowledge of students in the field

of epidemiology, symptomatology and risk factors of this affliction is still limited. According to the results of the study, it is advisable to take action, including educative effort, which should lead to increased awareness of the future medical staff about problems related to VTE.

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The authors declare no conflict of interest.

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