RELATIONSHIP BETWEEN SITTING DURATION AND BODY MASS INDEX TO DEEP-VEIN THROMBOSIS RISK ON EMPLOYEE

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ABSTRACT

BACKGROUND
Deep vein thrombosis (DVT) is a condition where a blood clot forms in the deep venous circulation system, especially in the femoral and popliteal vein. This disease has various factors, including obesity and a sedentary lifestyle such as sitting for long period of time. Employees who spend most of their time sitting at work are at risk of developing this condition. Previous studies showed different results, thus further research is needed.

METHODS
An analytic observational study with a cross-sectional method conducted on 90 employees at Bank BTN Head Office Jakarta from October to November 2021. Data were collected by interview using the OSPAQ questionnaire to assess sitting duration, Wells criteria to assess DVT risk, and calculation of body mass index (BMI). Sample was done by simple random sampling technique and analysis using chi-square.

RESULT
There are more male respondents (60%) than female respondents (36%). It was found that 4.4% of employees have a thin BMI, 52.2% of employees have a normal BMI, and 43.3% of employees have a fat BMI. The respondents’ average sitting duration was 2.6 hours/day without interruption. There was no relationship between sitting duration (p=0.903) and the risk of DVT. There was a relationship between BMI (p=0.008) and the risk of DVT.

CONCLUSIONS
A body mass index above normal is a risk for deep vein thrombosis, but long sitting duration is not related significantly with this disease.

KEYWORDS : Sitting Duration, Body Mass Index, Deep Vein Thrombosis, Employee

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Hubungan Durasi Duduk Dan Indeks Massa Tubuh Terhadap Risiko Deep-Vein Thrombosis Karyawan

LATAR BELAKANG

METODE

HASIL
Responden laki-laki (60%) lebih banyak dari responden perempuan (36%). Didapatkan 4.4 % karyawan memiliki IMT kurus, 52.2% karyawan memiliki IMT normal, dan 43.3% karyawan memiliki IMT gemuk. Rerata durasi duduk responden yaitu 2.6 jam/jam hari tanpa interupsi. Tidak terdapat hubungan antara durasi duduk (p=0.903) dengan risiko deep vein thrombosis. Terdapat hubungan antara indeks massa tubuh (p=0.008) dengan risiko deep vein thrombosis.

KESIMPULAN
Indeks massa tubuh di atas normal merupakan risiko terjadinya deep vein thrombosis, namun durasi duduk yang lama tidak berhubungan secara bermakna dengan penyakit ini.

KATA KUNCI: Durasi Duduk, Indeks Massa Tubuh, Deep Vein Thrombosis, Karyawan.
prolonged sitting in front of a computer while working for an average of 12 hours per day.\(^{(13)}\) However, Johannesen et al.'s study in Denmark on a population aged 20-65 years stated that there was no relationship between sitting duration and risk of DVT.\(^{(14)}\) Body mass index is also closely related to the risk of DVT. The study by Evan et al. proved that for a group of respondents with a high genetic score, a lower body mass index was associated with a reduced risk of venous thromboembolism with a hazard ratio (HR) of 0.79.\(^{(7,15)}\) A study by J Klovaite et al. conducted in Denmark on a population aged 20 – 100 found an association between obesity and DVT.\(^{(16)}\) Due to the many contradictions in the results of previous studies, this study was conducted to assess the relationship between sitting duration and body mass index to the risk of deep vein thrombosis, especially in employees whose majority have long sitting duration at work.

**METHODS**

This study uses a cross-sectional method conducted at the Bank BTN Head Office Jakarta in October-November 2021. The target population of this study are employees in 2 divisions, namely the retail funding & services division and the corporate strategic & performance division. The sample selection method was simple random sampling because the employees in both divisions worked in sitting positions and had the same working hours. Therefore, the sample size of this research is 90 people with the following criteria: employees who are still actively working at the Bank BTN Jakarta Head Office, aged <65 years, who are willing to sign an informed consent and work at least 8 hours/day. In addition, for those who have cancer or are on cancer treatment such as taking tamoxifen, history of undergoing surgery for leg and spine fractures in the last 12 weeks, history of bed rest in the previous three days, being pregnant, history of suffering from varicose veins, using hormonal contraception and hormonal therapy, history of suffering from heart failure, inflammatory bowel disease (ulcerative colitis and Crohn's disease), chronic liver disease (chronic hepatitis, cirrhosis, and liver cancer with onset of 6 months), stroke, chronic obstructive pulmonary disease, systemic lupus erythematosus, hypothyroidism, and diabetes mellitus, taking oral anticoagulant and antiplatelet drugs such as aspirin, clopidogrel, warfarin, fraxiparin, and enoxaparin were not included in this study.

To assess the risk of DVT, the Wells Criteria adaptation questionnaire was used. This questionnaire is available in English, so it will be tested for validity and reliability. The validity test was carried out on 30 respondents with the r table value of 0.3610 and the calculated r-value between 0.397 and 0.694. The reliability was tested using the Cronbach alpha test and obtained a Cronbach alpha of 0.680. It can be concluded that the questionnaire is reliable and valid to use.

The OSPAQ questionnaire assessed the duration of sitting at work in the last seven days. The results of this questionnaire were obtained by multiplying the percentage of activity for each domain (sitting, standing, walking, and doing strenuous activities) by the number of hours worked per day and then converted into minutes. The final result of this questionnaire is the duration of each domain in hours/day or minutes/day.\(^{(17)}\) Measurement of body mass index by measuring weight and height. Body weight was measured using a Camry digital scale with an accuracy of 0.1 kg. Height was measured using a General Care microtoise.

This research was started after obtaining ethical approval from the Research Ethics Commission of the Medical Faculty, Universitas Trisakti and permission from the Head of Bank BTN Jakarta Head Office. The data analysis used in this research is the univariate and bivariate analysis. Univariate analysis used descriptive analytics to describe the percentage and frequency of the results obtained for each variable studied. The bivariate analysis used in this study was the chi-square test with a significance level of p<0.05.

**RESULT**

As shown in table 1, the results of this study indicate that more respondents are male (60%). Most respondents were between 25-35 years old (58.9%). Based on the body mass index, as many as 39 (43.3%) of the respondents belonged to the obese category (52.2%). Respondents with a duration of sitting without interruption of 3 hours/day are 40%. The average duration of the respondent's sitting is 2.6 hours/day without
interruption. Respondents who have a risk of likely suffering from DVT are 13 people (14.4%). Sitting is 2.6 hours/day without interruption. Respondents who have a risk of likely suffering from DVT are 13 people (14.4%).

Table 2 shows the bivariate analysis results between BMI and duration of sitting and the risk of DVT. The body mass index initially used a 3x2 table (skinny, normal, obese BMI), but because it did not meet the Chi-Square test requirements, the cells were combined to form a 2x2 table (skinny and normal BMI, obese). As a result, respondents in the obese BMI category were 10 (25.6%), and in the thin-normal category were 3 (5.9%), including those at risk of DVT. The statistical test results got a p-value=0.008 (<0.05), so it can be concluded that there is a significant relationship between BMI and the risk of DVT.

A total of 8 people (14.8%) of respondents with short sitting duration and five respondents (13.9%) with long sitting duration were at risk of suffering from DVT. Based on the results of the Chi-Square test, p-value=0.903 (>0.05), it can be interpreted that there is no significant relationship between sitting duration and the risk of DVT.

DISCUSSION

Sitting for a long time is a risk factor for the formation of thrombus and embolism in the veins. Sitting for a long time can compress the veins and cause endothelial damage, decreasing blood flow by 1.4 times and by two times when a person sits motionless with the legs do not touch the floor. Silent position for a long time will cause stress on the feet, which increases oxidative stress and is followed by endothelial dysfunction.

Deep vein thrombosis occurs when a person sits for at least 8 hours and at least 3 hours without interruption. After 3 hours of sitting without interruption, blood flow disturbance will occur. Decreased blood flow will cause hypoxia, activate blood clotting factors, and cause a hypercoagulable state that triggers thrombus formation.

Table 1. Distribution of subject characteristics

<table>
<thead>
<tr>
<th>Characteristic (n = 90)</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>54</td>
<td>60</td>
</tr>
<tr>
<td>Female</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late adolescence (17-25 years)</td>
<td>16</td>
<td>17.8</td>
</tr>
<tr>
<td>Early adulthood (25-35 years)</td>
<td>53</td>
<td>58.9</td>
</tr>
<tr>
<td>Late adulthood (36-45 years)</td>
<td>14</td>
<td>15.6</td>
</tr>
<tr>
<td>Early elderly (46-55 years)</td>
<td>5</td>
<td>5.6</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skinny (≤18.4 kg/m²)</td>
<td>4</td>
<td>4.4</td>
</tr>
<tr>
<td>Normal (18.5-25.0 kg/m²)</td>
<td>47</td>
<td>52.2</td>
</tr>
<tr>
<td>Obese (≥25.1 kg/m²)</td>
<td>39</td>
<td>43.3</td>
</tr>
<tr>
<td>Sitting duration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not long (&lt;3 hours)</td>
<td>54</td>
<td>60</td>
</tr>
<tr>
<td>Long (≥3 hours)</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Risk of deep vein thrombosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlikely (score ≤1)</td>
<td>77</td>
<td>85.6</td>
</tr>
<tr>
<td>Likely (score &gt;1)</td>
<td>13</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Table 2. Relationship between body mass index and body duration to the risk of deep vein thrombosis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unlikely (n = 77)</th>
<th>Likely (n = 13)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skinny and normal</td>
<td>48</td>
<td>94.1</td>
<td>3</td>
</tr>
<tr>
<td>Obese</td>
<td>29</td>
<td>74.4</td>
<td>10</td>
</tr>
<tr>
<td>Sitting duration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not long</td>
<td>46</td>
<td>85.2</td>
<td>8</td>
</tr>
<tr>
<td>Long</td>
<td>31</td>
<td>86.1</td>
<td>5</td>
</tr>
</tbody>
</table>

*p-Chi-Square test*
the coagulation pathway, thereby increasing the risk of DVT.\(^{(24)}\)

El-Menyar et al.\(^{(25)}\) stated that obese patients have a higher risk for abnormal coagulation factors, recurrent venous thromboembolism (VTE), and distal DVT. Previous studies have shown that the risk of VTE is increased by 2x in obese patients compared to non-obese patients despite adjustments for sex, age, and components of the metabolic syndrome. Yang G et al.\(^{(26)}\) mentions several studies that state obesity is a moderate risk factor for the incidence of VTE. Still, if there are other risk factors, such as genetic and environmental factors, obesity will be a high-risk factor.

However, the results of this study contradicted the retrospective study by Samuel et al.\(^{(27)}\), which examined overweight and obese hospitalized patients; they did not find an increase in the incidence of VTE with an increase in obesity rates. This was because the patients in the study received thromboprophylaxis such as heparin, which prevented developing a prothrombic state. Likewise, the study’s results by Tajik F et al.\(^{(28)}\) stated that body mass index was not an important risk factor for VTE because there were other more decisive factors such as race and hyperlipidemia.

The results of this study prove that body mass index has a significant relationship with the incidence of DVT. Thus body mass index needs to be considered in terms of education and prevention of DVT.

This study has several limitations; namely, it cannot exclude respondents with a genetic predisposition to suffer from DVT due to limited tools and resources. In addition, complaints of DVT are still subjective without a physical examination or supporting examinations such as venous ultrasound.

CONCLUSIONS

Based on the results of this study, it can be concluded that there is no significant relationship between sitting duration and DVT risk in employees, and there is a significant relationship between BMI and DVT risk in employees. Thus, it is necessary to monitor the nutritional status of employees so that there is no increase in cardiovascular risk, including deep vein thrombosis.
Future researchers are expected to exclude other risk factors such as genetic factors and use more objective measurement methods in diagnosing and determining the risk of DVT.

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AUTHORS’ CONTRIBUTION

SF contributes in data collection, analysis and draft manuscript preparation. SF and WM, both contribute in interpretation of results. WM reviewed and made revision of the manuscript. SF and WM approved the final version of the manuscript.

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The funding of this study was personal funds.

CONFLICT OF INTEREST

There is no conflict of interest.

REFERENCE