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Association between walking time spent and high sensitivity C-reactive protein level among obese women☆

Azlina Daud*, **Siti Sarah Hasanah Abu Bakar Sedek**, **Siti Zuhaidah Shahadan**

Kulliyyah of Nursing, International Islamic University Malaysia, Pahang Darul Makmur, Malaysia

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KEYWORDS
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Abstract
Objective: This study aims to assess the association between the walking time spent and high sensitivity C-reactive protein (hs-CRP) level to determine the risk for cardiovascular disease (CVD) among obese women.
Methods: Cross-sectional study was conducted in Kuantan, Pahang. The purposive sampling method was chosen. 76 obese women aged 18 years old and above were included in the study. Data were collected by using the set of the self-reported questionnaire consisted of socio-demographic and the walking time for the past 7 days. The sample blood test was taken to check for hs-CRP level.
Results: Walking time spent in minutes was found to be significantly inverse associated with the hs-CRP level ($p = 0.040$) among obese women.
Conclusion: The increase in walking time spent can help reduce the hs-CRP level, therefore reduce the risk for CVD.

Introduction

Over recent years, rates for obesity have rocketed, in most parts of the world, to epidemic proportions. Worldwide obesity has shown a marked increase over the past four decades World Health Organisation (WHO),[1] whereas rates of obesity in Asian countries have been the lowest worldwide.[2] However, Asian countries have experienced alarming rates in recent years.[2] In Asia, Malaysia has the highest obesity rate, with 14%, followed by Thailand, with 8.8%.[2] The number of obese women has surpassed the number of obese men.[2] This has been supported by the findings of the National Health and Morbidity Survey (NHMS)[3] the rate of obesity among women being significantly higher (60.2%) than that of men (only 38.2%). Obesity is greatly influenced by various factors, including hereditary, environmental and

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* Corresponding author.
E-mail address: damia@iium.edu.my (A. Daud).

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behavioral factors, as well as aging and pregnancy.[4] Factors that contribute to obesity are not solely related to an uncontrolled diet or lack of exercise in daily life, as it is often thought. However, dietary factors and limited physical activity greatly influence the energy balance equation, and they are also the main modifiable factors.[3,5] However, gender is strongly associated with obesity, with research showing an increased likelihood among women.[5,6] One reason why woman have a strong association with the increase in obesity is that women undergo the process of pregnancy, where they gain weight during the child bearing period.[7] Another reason is the increased storage of fat in women, who rely on fat more than men for the reproduction purpose.[4]

Obesity is often referred to as an excessive accumulation of fat in the body, and this condition may interfere with the maintenance of the maximum state of health.[8] They added that obesity is the result of too much adipose tissue, which stimulates the release of an inflammatory mediator and stimulates the liver to synthesize and secrete C-reactive protein. The inflammatory state is one of the risk factors from the development of obesity, which can cause or worsen insulin resistance in adipose tissue.[9] In addition, inflammation is an embedded mechanism which also contributes to the development of cardiovascular diseases such as atherosclerosis, metabolic syndrome and diabetes mellitus.[8] According to Blüher,[9] adipose tissue plays an important role in the relationship between obesity and inflammation which later will affect the normal functioning of the cardiovascular system. Moreover, obesity can trigger the inflammatory response, which is characterized by the increase of inflammatory markers, mainly C-reactive protein (CRP).[10,11] Hence, this inflammation will contribute to the development of cardiovascular disease (CVD).[8]

Walking particularly helps the community to gain the greatest health condition and is one of the physical activities that lessen the risk of CVD, such as heart attacks, hypertension and weight loss.[12] Walking is also believed to lessen the hs-CRP level among obese women. It has been proven, in previous studies, that physical activity significantly decreases the hs-CRP level.[13,14] Most studies of the relationship between physical activity and hs-CRP level have been carried out on different classes of the population; however, the association between physical activity, specifically walking, and hs-CRP level among obese women has been reported in a few.[12,15] Therefore, this study sought to evaluate the association between walking time spent and hs-CRP level among obese women, to determine the risk of CVD.

Method

This is a cross-sectional study of women obesity class I and class II from Kuantan, Pahang. Non-probability sampling was applied to recruit the participants. The sample size was calculated based on the prevalence of obesity among class I and class II adults in Kuantan, Pahang. In the NHMS,[3] the prevalence of obesity among class I and class II adults in Pahang was 25% and 5.2%, respectively. Using the Epi Info sample size calculator, a total of 123 participants were needed to represent 80% of the total distribution of obese class I and II adults in Pahang, with a 10% drop-out rate. However, only 61% (76) of the participants completed the data collection procedures. Approval from the Institutional Research Committee Board was obtained before data collection.

The data collection period was between February 2018 and April 2018. Advertisement for participation was done through health screening activities, flyers, and social media networks. All interested participants were invited to screening, which was held at a health clinic in Kuantan. Height and weight were measured to determine the BMI. The research instrument used to measure weight was the Tanita Digital Weighing Scale (Tanita HD319, Japan), to the nearest 0.1 kilograms, and standing height was measured, without shoes, using a SECA Portable Stadiometer (SECA 213 Germany), to the nearest 0.1 centimeters. All interested participants who self-reported any chronic disease or endocrine disorder, pregnant and lactating women, and those taking any medication for a chronic disease, were excluded from this study. With participants' agreement, written informed consent was obtained. The researcher provided all information with regard to the study. After obtaining informed consent, participants answered the questionnaire, which consisted of-of two parts. Part A collected socio-demographic data, including age, body weight, height, BMI, race, marital status, educational level and employment status, which defined the characteristics of the study participants. Part B was the walking time assessment, relating to the time spent on daily walking activity over the previous seven days. The first question of part B was about the walking time spent for at least a ten-minute session, and the second question related to walking time spent in minutes for each day. After completion of the questionnaires, a blood sample, for hs-CRP, was taken by a registered nurse.

The cut-off points quoted by the Malaysian Clinical Practice Guideline (CPG) for obesity were used to define obesity classes. Obesity class I was defined as a BMI between 27.5 and 34.9 kg/m^2.[16] However, there are no standard cut-off points for hs-CRP stated in the Malaysian CPG. Therefore, a cut-off point for elevated hs-CRP was adopted based on the universal cut-off point, which is at or more than 3 mg/L, which indicates inflammation.[17]

Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 21. Normality determination was done using the Shapiro–Wilk test. Descriptive measures (frequency, percentage) for demographic data, walking time in minutes per day and CVD risk were calculated. Mean, standard deviation, median and interquartile range have been used to present the data, including data on the hs-CRP level and walking time in minutes. A non-normal distribution was found in this study, therefore, to identify the association between walking time spent for at least a ten-minute session for each day and hs-CRP level, the Kruskal–Wallis test was used. To identify the association between walking time spent in minutes for each day and hs-CRP level, a Spearman correlation test was used.

Table 1 Socio-demographic data and the walking time of study participants ($n = 76$).

Variables	Mean (SD)	Frequency, *n*	Percentage, %
Age (years)	28.33 (±10.23)		
18–27		52	68.4
28–37		11	14.5
38–47		8	
10.5			
48–57		3	3.9
58–67		2	2.6
≥68		0	0
Ethnicity			
Malay		74	97.4
Non-Malay		2	2.6
Marital status			
Never married		56	73.7
Married		18	23.7
Widow		2	3.6
Educational level			
Never School		0	0
Primary School		1	1.3
Secondary School		17	22.4
Certification/Diploma		9	11.8
Bachelors		47	61.8
Masters/PhD		2	2.6
Occupation			
Government/Private		21	27.6
Self-employed		4	5.3
Housewife		2	2.6
Retired		1	1.3
Student		46	60.5
Others		2	2.6
Working time system			
Regular		31	40.8
Extended hours		6	7.9
Shift hours		6	7.9
Others		33	43.4
Walking time spent (minutes)	46.3 (±41.9)		

Table 2 The risk of CVD of study participants ($n = 76$).

hs-CRP level	Risk of CVD	Frequency, *n*	Percentage, %
<1 mg/L	Low	22	29
1–3 mg/L	Moderate	17	22
>3 mg/L	High	37	49

Table 3 The relationship between walking time (in minutes) in a day and hs-CRP level ($n = 76$).

Variables	hs-CRP level	
	Spearman correlation, *r*	*p*-Value
Walking time (in minutes)	0.236	0.040

Results

Socio-demographic data, anthropometric measurements and walking time of the participants

Table 1 shows the demographic background and the anthropometric measurements of the study participants. The mean age of the participants was 28.33 years old (standard deviation (SD) = 10.23). The majority of the participants were Malay (97.4%) and certificate holders (61.8%). The majority of the participants were single (73.7%) and students (60.5%). As for anthropometric measurements, the average body weight of the participants was 76.61 kilograms (kg) (SD = 10.81), and the average height was 1.55 meters (m) (SD = 0.57). Based on the weight and height data, the mean body mass index (BMI) of the participants was 31.69 kg/m^2 (SD = 3.77). The findings also revealed that the participants of this study spent an average of 46.3 min/day (SD = 41.9) walking.

The hs-CRP level and the risk of CVD

The findings showed that the average level of hs-CRP among the study participants was 6.26 mg/L (SD = 6.88). In addition, based on the universal cut-off point, which is at or more than 3 mg/L, which indicates inflammation (Yousuf et al.[17]), the hs-CRP level data indicated that 49% of the participants had a high risk of CVD (Table 2).

The relationship between walking time spent (in minutes) in a day and hs-CRP level

The relationships between the variables were analyzed and tested using the Spearman correlation test. The findings showed that there was a significant but weak negative association between walking time spent and the hs-CRP level ($r = -0.236$, $p < 0.05$) (Table 3). The result indicates that as walking time (in minutes) increased, the hs-CRP level decreased.

Discussion

In this study of obese women in Kuantan, Pahang, it was found that most of the participants were physically active in terms of walking activity, with an average of 46.3 min/day. However, the present findings contradict a previous study by Teh et al.,[18] who identified women as a group least active physically and showed levels of physical activity, particularly in walking, among Malaysian women to be lower than those of women in other Asian countries. Lusk et al.[19] reported that they found only 39% of obese women spent time on brisk walking with 9 min/day. However, this walking time spent is below the recommendation by the American Heart Association (AHA),[20] where the minimum daily walking at least 30 minutes a day.

The findings of the present study found that most of the obese women had a high hs-CRP level (>3 mg/L), and this high level is associated with an increased CVD risk. This is consistent with the findings from a few previous studies. Blaha et al.[21] and Choi et al.[22] found that a group of obese women had a high hs-CRP level compared with a normal weight group. Moreover, there was a greater correlation between anthropometric measures of obesity and hs-CRP level among obese women.[21] Consequently, the high level of hs-CRP will cause a high risk of developing CVD.[17]

The present study found an inverse association between walking time spent (in minutes) and hs-CRP level. This finding is supported by an intervention study of treadmill walking and hs-CRP level involving 584 participants.[12] They found a lower hs-CRP level when walking time increased. Moreover, the current findings are similar to a review by Morettini et al.,[15] which found that walking activity was associated with a significant reduction in hs-CRP. They added that individuals who usually walk more have a lower hs-CRP concentration. In contrast, the study by Tuite[23] found that self-reported physical activity, such as walking, was not correlated with changes in hs-CRP level.

The overall results of the present study provide convincing evidence on the association between walking time and hs-CRP level. This study can make an important contribution to guiding the community, especially to women in terms of awareness of preventing and reducing the prevalence of obesity. Furthermore, it emphasizes the importance of encouraging the community, especially obese women, to be physically active and to spend more time on simple activities like walking.

Conflict of interests

The authors declare no conflict of interest.

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