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Association between pain intensity and obesity in patients with chronic non-specific low back pain

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Low back pain and obesity are major public health problems; however, the relationship between body composition and the intensity of low back pain is unknown. The purpose of this study was to investigate the relationship between different anthropometric measures of obesity (weight, body mass index, waist circumference, hip circumference, and waist-hip ratio) and chronic non-specific low back pain (CNLBP). One hundred thirty-two patients suffering from CNLBP participated in the current study. They were suffering from continuous or recurrent localized low back pain for at least three months. Height and weight were measured using a recalibrated stadiometer. Waist circumference and hip circumference were measured using flexible measuring tape. In addition, body mass index, waist-hip ratio was calculated and intensity of pain was rated using visual analog scale (VAS). The intensity of pain was not associated with any of the selected anthropometric measures where *P* value >0.05 regarding all anthropometeric measures*.* Weight, body mass index, waist circumference, hip circumference, and waist-hip ratio are not associated with pain intensity in patients with CNLBP. Obesity has limited effect on the intensity of pain in CNLBP patients.

Keywords: Association, Obesity, Pain, Chronic non-specific low back pain.

INTRODUCTION

Chronic non-specific low back pain (CNLBP) is the commonest type of low back problems. It has a high incidence and prevalence rate and occurs at any age during life (Meucci et al., 2015). The majority of LBP cases seen in practice were nonspecific (cannot be attributed to any particular pathoanatomical cause) (Traeger et al., 2019).

Different risk factors can predispose for the onset of LBP and or worsen the condition such as physical inactivity (Heneweer et al., 2011), job (Coenen et al., 2014), smoking (Shiri et al., 2010), in addition to obesity (Shiri et al., 2009).

Obesity progressively increases in the community during recent years and has occupied number one of health problems in many countries including Egypt (Chooi et al., 2019). Obesity has been associated with many serious diseases as diabetes (Okamura et al., 2019), cancer (Arnold et al., 2016; Lin et al., 2018), cardiovascular (Caleyachetty et al., 2017) and pulmonary problems (Piché et al., 2018), and CNLBP.

Increasing mechanical load on the musculoskeletal structures of the lumbar spine may increase the stress on those structures and worsen the pain perception. Several studies have listed obesity among the risk factors for development of LBP (Dario et al., 2016; Gopalakrishnan et al., 2018; Heuch et al., 2013; Nilsen et al., 2011; Shiri et al., 2009), but they did not address the impact of such problem on the degree of pain perceived by the patients. They

also did not mention clearly the type of LBP being studied.

Obesity can be measured using different anthropometric indices. Body mass index (BMI) is the standard method that has been used in multiple studies (Croft et al., 1999; Croft & Rigby, 1994; Heuch et al., 2015; Yip et al., 2001). On the other hand, fewer studies used waist circumference and hip circumference (Lean et al., 1998; Shiri et al., 2013; Taanila et al., 2012) or hip-waist ratio (Han et al., 1997; Shiri et al., 2008; Yip et al., 2001).

Investigating the association between anthropometric measures and CNLBP may provide more understanding of the role of mechanical factors in development and worsening of the non-specific type of chronic low back pain. This study designed to answer the following research question, "Are the anthropometric measures of obesity associated with the intensity of pain in CNLBP patients". The purpose of the study was to investigate the association between anthropometric measures of obesity and intensity of pain in CNLBP patients.

MATERIALS AND METHODS

This study was conducted in the period between January and April 2019. The local Ethical Committee approved this study.

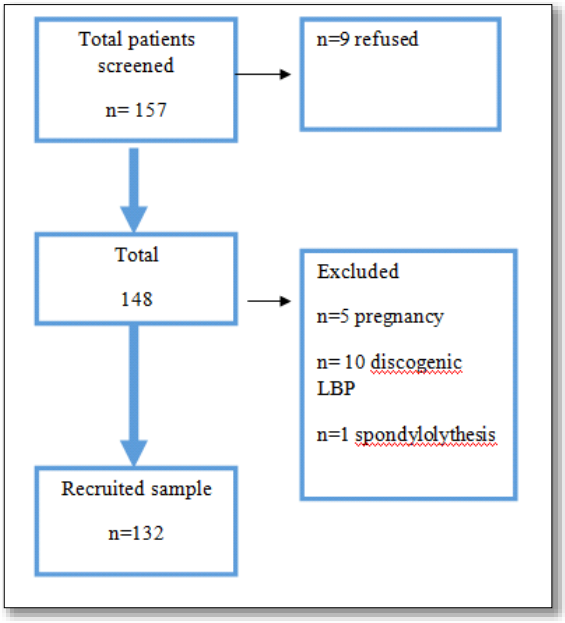

Figure (1): Flowchart of the sampling process

Study sample

A total of 157 subjects with LBP were screened, from which, 148 were suffering from CNLBP and met the inclusion criteria (localized LBP, continuous or recurrent, for at least 3 months). Their ages ranged from 19 to 48 years. Details of sampling process were summarized in (fig. 1)

All participants were examined and diagnosed by their physician and referred for physical therapy. Measurements were performed before the start of a physical therapy program.

Patients having any musculoskeletal or neurological involvement, low back or abdominal operations, pregnancy, lumbar discogenic lesion, lumbar spondylolisthesis, and bone inflammation were excluded.

Procedures and Outcome assessment

In order to avoid interrater reliability errors; the same examiner was responsible for collecting all data. Personal data including age, sex, and occupation were recorded. Height, weight, waist circumference, hip circumference were measured then BMI and hip-waist ratio were calculated for all participants. The intensity of pain was rated using non-numerical Visual Analog Scale (VAS). After rating the level of pain, examiner measures the distance in millimeters from the 0 point until the point representing the pain and the degree of pain was recorded (Hawker et al., 2011). The reliability of VAS for assessing chronic musculoskeletal pain ranged from moderate to good (Olaogun et al., 2004).

The authors selected the Anthropometric measures according to the simplicity and clinical accessibility criteria. Stretching height was measured to avoid the diurnal variation in relaxed standing height. Circumferential measurements procedures were adopted from those performed by Dario and colleagues (Dario et al., 2016)

1-Height and weight were measured using a recalibrated stadiometer. Patients were instructed to remove their shoes and wear light clothes during measurements.

2-Waist circumference; measured using a flexible measuring tape. At the narrowest level of the torso. The examiner assumed a sitting position so that the tape is in the level of examiner's eyes.

3-Hip circumference; measured using flexible tape at the level of the widest point of the hip region. The examiner squatted beside the patient to see the maximum contour at the hip region.

4-BMI was calculated by dividing the individuals' body weight in kilograms by the square of their height in meters.

5-Waist-hip ratio was calculated by dividing the respective values measured before.

RESULTS

The statistical analysis was conducted by using the statistical package of social science version 20 for windows (SPSS, Inc., Chicago, IL)

. The statistical analyses were expressed as minimum, maximum, mean and standard deviation for demographic data (age, weight, height, BMI). Scatter plots have been drawn to ensure the presence of linear relationships or monotonic relationships between variables. Kendall's tau-b coefficient was performed to determine the correlation between variables as the data showed neither linear nor monotonic relationship. The significance level was set at $p < 0.05$

132 patients met the inclusion criteria and joined this study. Patients' characteristics were summarized in Table (1). The sample consisted of 82 males forming 62%, and 50 females forming 38% of the total sample.

Table (1): Patients' characteristics:

Variable	Minimum	Maximum	Mean	SD
Age (Years)	19.00	48.00	33.11 y	9.23
Height (Meter)	1.50	1.9	1.7 m	0.079
Weight (Kg)	52.20	97	76.39	10.19
BMI (Kg/m^2)	18.06	32.49	26.31	2.75

SD, Standard Deviation; BMI, body mass index, Kg, Kilogram; m^2, squared meter

The intensity of pain was not associated with any of the selected anthropometric measures as described in table (2). P-value for all measures was > 0.05.

Table (2): Correlation between pain intensity and selected anthropometric parameters of obesity:

	VAS	
	Kendall's tau-b	***P*-value**
Weight	0.037	0.539
BMI	0.053	0.373
Waist circumference	- 0.024	0.692
Hip circumference	0.036	0.551
Waist hip ratio	- 0.04	0.503

VAS, visual analog scale; BMI, body mass index;

The authors did not perform a regression analysis because it is not applicable to this condition.

DISCUSSION

The results of the current study revealed that anthropometric measures of obesity (weight, BMI, waist circumference, hip circumference, waist-hip ratio) were not associated with the degree of pain intensity in patients with CNLBP.

The comparison between the current results and those presented in the previous literature maybe not applicable because of the differences in the purpose of these studies and the current one. The majority of the previous work was aimed to decide if obesity is a risk factor for development of LBP (Heuch et al., 2013; Nilsen et al., 2011), while no studies were directed to investigate the effect of increasing weight on the intensity of pain. Another reason makes the comparison not applicable is the type of population, the available studies did not explain clearly which type of LBP, either specific or non-specific was studied (Gopalakrishnan et al., 2018), others did not mention the stage whether acute, sub-acute or chronic (Čelan and Turk, 2005)

Previous studies found that obesity could predispose the onset of LBP. A heavy mechanical load may lead to greater compressive forces or increased shear stresses on the structures of the lumbar spine, which may develop LBP (Gallagher and Marras, 2012). However, after controlling the familial factors, limited association was found between obesity and low back pain (Dario et al., 2015).

However, the current study findings did not find an association between pain intensity and anthropometric indices of obesity. This unique finding may be attributed to

Obesity may play a role in the onset of LBP but it seems that it has a limited effect on the worsening of the degree of the experienced pain. The anatomical structures may demonstrate some degree of adaptation to the increase in weight after certain point so that, any further weight gain might have minor effect on pain intensity.

Other factors such as occupational demands (Xu et al., 1997) and fitness level (park et al., 2019) may alter the influence of obesity on lumbar spine structures and hence the intensity of perceived pain.

The current study results should be taken with caution because of the small sample size and the heterogeneity of occupations of the recruited sample.

CONCLUSION

Anthropometric measures of obesity are not associated with pain intensity in patients with CNLBP. Obesity role on worsening of chronic non-specific low back pain might be overestimated

CONFLICT OF INTEREST

The authors declared that present study was performed in the absence of any conflict of interest.

AUTHOR CONTRIBUTIONS

HMH developed the idea, research design, scientific Writing and performed the practical part. EMK reviewed statistical design and manuscript. RMK conducted the statistical analysis and wrote the results section. All authors read and approved the final version.

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