



The effect of body mass index on the level of fatigue in young adolescent

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Abstract

Background: Although fatigue is one of the most common complaints that impacts quality of life, no study have been investigated the relation between Body Mass Index (BMI) and level of fatigue. **Purpose:** To investigate the effect of body mass index on the level of fatigue in young adolescent. **Subjects:** Two hundred and twenty normal healthy subjects from both genders, their age ranged from 12 to 18 years old and their body mass index varied between 13 to 39.9 kg/m². Subjects were divided into five equal groups according to their body mass index; each group consists of forty four subjects, **Group 1 (underweight)** BMI <18.5 kg/m². **Group 2 (ideal weight)** with BMI between 18.5-24.9 kg/m². **Group 3 (over weight)** with BMI between 25-29.9 kg/m². **Group 4 (obesity class 1)** with BMI between 30-34.9 kg/m². **Group 5 (obesity class 2)** with BMI between 35-39.9 kg/m². **Methods:** An Arabic version of the fatigue severity scale (FSS) was used to measure the level of fatigue in the five groups. **Results:** There was A negative significant correlation between BMI and FSS score in underweight and ideal weight groups ($r = -0.571, p = 0.000$) and ($r = -0.708, p = 0.000$) respectively, while there was A positive significant correlation between BMI and FSS score in overweight, obesity class 1 and obesity class 2 groups ($r = 0.671, p = 0.000$), ($r = 0.390, p = 0.000$) and ($r = 0.946, p = 0.000$) respectively, which indicate that group 1 with the lowest BMI value and group 5 with the highest BMI value show the highest level of fatigue than other groups. **Conclusion:** there was a significant relationship between the body mass index and the level of fatigue in young adolescent.

Key Words: Body mass index, Fatigue severity scale, Under weight, Obesity

Introduction

Fatigue is one of the most common complaints that impacts quality of life and forces the patient to see their clinicians. Feeling tired for no reason is the most common words said by the persons suffering from fatigue ⁽¹⁾. It decreases the ability to work, enjoy life and to have a good sleep. Fatigue is mostly associated with illness, anemia and depression ⁽²⁾.

In general, obesity negatively affects the quality of life (QOL). Recent studies investigated the relation between BMI and QOL; it found that heavier participants reported lower QOL ⁽³⁾. A huge negative influence on QOL can be observed with obese people as Fatigue is a major symptom associated with many disorders and can be considered a common complaint ⁽⁴⁾.

Anemia and malnutrition should be assessed too as they may be a potential cause of fatigue particularly in the young age, Fatigue showed highly interference with mood, social functions and physical function with patients and normal subjects ⁽⁵⁾.

Previous study revealed that neither of underweight, overweight or obesity were desirable health status, they all have negative health outcomes and constitutes the extremes of malnutrition; Different values of BMI away from the normal range were not considered as desirable or good result. The two extremes of malnutrition have a negative effect on health outcomes. It is very important to fully understand its effect and associated factors in adolescents. This is the second most critical period of physical growth after the first year of life ⁽⁶⁾.

A large number of fatigue scales exist and a large number of scales were developed for specific diseases, since fatigue is an unspecific symptom there is no need for developing disease specific fatigue scales for each individual disease. Fatigue severity scale (FSS) is found to be the most common questionnaire used in researches in the last three decades ⁽⁷⁾The FSS has been shown to have acceptable

psychometric properties, high internal consistency, good test-retest reliability, and good concurrent validity in several clinical populations ⁽⁸⁾.

The two burdens of nutrition may lead to easily fatigability and inability to perform daily activities in normal manner, that's why we need more studies which investigate the degree of relation between the body weight and fatigue.⁽⁹⁾

So this study was designed to investigate the relationship between different values of body mass index and level of fatigue in young adolescent using the Arabic version of fatigue severity scale.

Material and methods

Patients

This study was conducted at schools in maadi. Two hundred and twenty subjects of both genders with age range from 12 to 18 years were selected randomly. This study was accepted and approved by the ethical committee at basic science department in faculty of physical therapy at Cairo University

Exclusion criteria were:

Subject who was out of the selected BMI range, Adolescent with any psychological problems that would bias the results, or suffer from insomnia or any disease and smoker subjects.

Design

The subjects were divided into five equal groups each group consisted of forty four subjects, Group 1 (underweight with BMI < 18.5 kg/m²), group 2 (ideal weight with BMI between 18.5-24.9 kg/m²· Group 3 (over weight) with BMI between 25-29.9 kg/m²· Group 4 (obesity class1) with BMI between 30-34.9 kg/m²· Group5 (obesity class 2) with BMI between

35-39.9 kg/m² contained subjects with body mass index in the same range as shown in the classification table.

All anthropometric data (height in meters and weight in kilograms) were measured using a scale, and then the body mass index was calculated by dividing the weight in kilograms by height in meters squared (kg/m²): Then BMI was grouped to their corresponding nutritional status using the World health care organization criteria

BMI	Classification
< 18.5	underweight
18.5–24.9	normal weight
25.0–29.9	overweight
30.0–34.9	class I obesity
35.0–39.9	class II obesity
≥ 40.0	class III obesity

(quoted from **FORDet al., 2001**)¹⁰

The Arabic version of the questionnaire was introduced to the participants and the items of the questionnaire were explained for each participant before starting and also the grading system was illustrated for the participants for each question as 1 means totally disagree with the statement and 7 means that he was totally agree with the statement. They were asked to fill it once. The score was calculated from each questionnaire by adding all the numbers together and finding the average of all the 9 items answers.

The result of all groups was used to detect the relationship between the different BMI values and the level of fatigue that the subject could express without having any other causes for this fatigue.

Statistical Analysis

Data were collected and then analyzed using SPSS version 22.0 (SPSS Inc. USA) software for Windows through descriptive statistics (the mean and standard deviation). Inferential statistics by using ANOVA test were used to compare the correlation among five groups and Tukey HSD post hoc test were employed to test differences in BMI and FSS score between five groups. The fatigue score was measured by using a scale. Pearson's correlation coefficients (r) were calculated to assess the link and the degree of relation between BMI and fatigue level in relation to 5 groups.

Statistical analysis of data was carried out using the SPSS version 22.0 (SPSS Inc. USA) software for Windows.

Results

- The five groups were comparable regards their body mass index and their score of the fatigue severity scale as shown in table (1)

Table 1: Multiple Comparisons between the groups and each other in BMI and FSS-score

(I) Group number	(J) Group number	Mean Difference (I-J) for BMI	Sig.	Mean Difference (I-J) for FSS-score	Sig.
Underweight	ideal weight	-4.54091 [*]	.000	2.22955 [*]	.000
	Over weight	-10.33182 [*]	.000	1.22727 [*]	.000
	obesity class 1	-15.60909 [*]	.000	.55455 [*]	.001
	obesity class 2	-20.30227 [*]	.000	-.22727 [*]	.459
ideal weight	Underweight	4.54091 [*]	.000	-2.22955 [*]	.000
	Over weight	-5.79091 [*]	.000	-1.00227 [*]	.000
	obesity class 1	-11.06818 [*]	.000	-1.67500 [*]	.000

(I) Group number	(J) Group number	Mean Difference (I-J) for BMI	Sig.	Mean Difference (I-J) for FSS-score	Sig.
	obesity class 2	-15.76136 [*]	.000	-2.45682 [*]	.000
Overweight	Underweight	10.33182 [*]	.000	-1.22727 [*]	.000
	ideal weight	5.79091 [*]	.000	1.00227 [*]	.000
	obesity class 1	-5.27727 [*]	.000	-.67273 [*]	.000
	obesity class 2	-9.97045 [*]	.000	-1.45455 [*]	.000
obesity class 1	Underweight	15.60909 [*]	.000	-.55455 [*]	.001
	ideal weight	11.06818 [*]	.000	1.67500 [*]	.000
	Over weight	5.27727 [*]	.000	.67273 [*]	.000
	obesity class 2	-4.69318 [*]	.000	-.78182 [*]	.000
obesity class 2	Underweight	20.30227 [*]	.000	.22727	.459
	ideal weight	15.76136 [*]	.000	2.45682 [*]	.000
	Over weight	9.97045 [*]	.000	1.45455 [*]	.000
	obesity class 1	4.69318 [*]	.000	.78182 [*]	.000

There were significant differences between the means of the five groups regarding the body mass index and there were statistical significant differences between the five groups regarding the FSS score

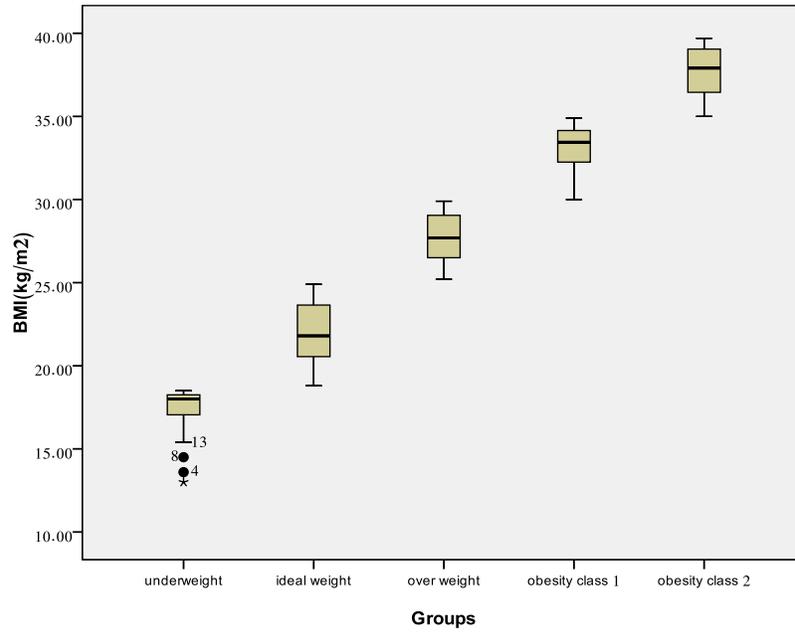


Fig. 1: difference in BMI between the 5 groups

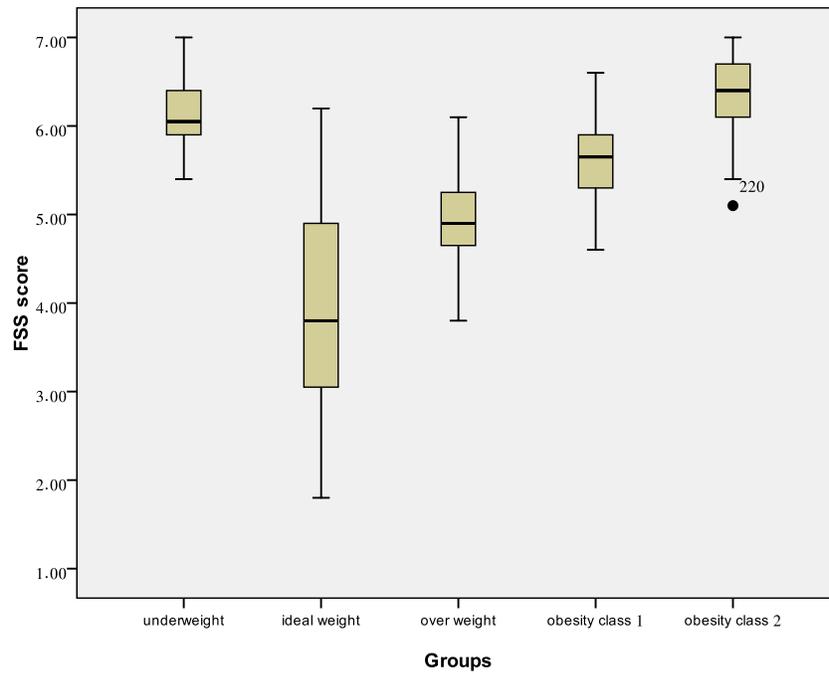


Fig. 2: difference in FSS-score between the 5 groups

-The relationship between body mass index and fatigue level

There was a strong and significant positive correlation between BMI- FSS score between 5 group- ($r = 0.261, p < 0.01$) as shown in table 3

Table 3: correlation between BMI- FSS score between 5 groups

Correlations

		BMI	FSS score
BMI	Pearson Correlation	1	.273
	Sig. (2-tailed)		.000
	N	220	220
FSS score	Pearson Correlation	.273**	1
	Sig. (2-tailed)	.000	
	N	220	220

** . Correlation is significant at the 0.01 level (2-tailed).

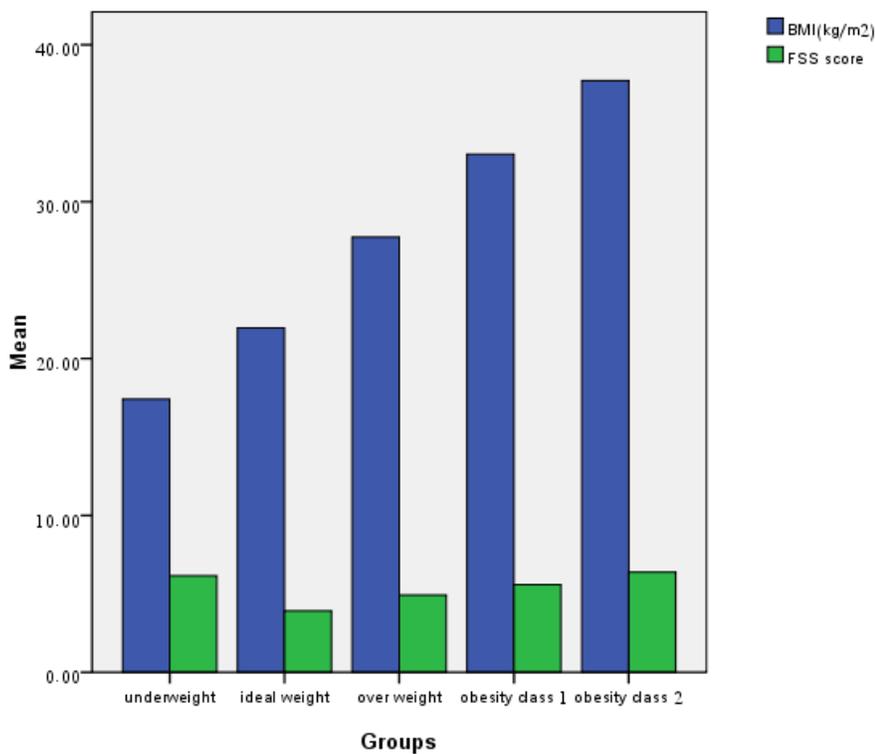


Fig 3: correlation between BMI- FSS score between 5 group

The results indicate that group 1 with the lowest BMI value and group 5 with the highest BMI value showed the highest level of fatigue than other groups.

Discussion

the current study aimed to spot light on the effect of body mass index on the level of fatigue in young adolescent This study was conducted in schools, Two hundred and twenty normal healthy subjects from both genders, their age ranged from 12 to 18 years old and their body mass index varied between 13 to 39.9 kg/m² were included in this study.

The result of current study showed that there was a negative significant correlation between BMI and FSS score in underweight and ideal weight groups as when BMI decrease the FSS increase ($r = -0.571, p = 0.000$) and ($r = -0.708, p = 0.000$) respectively.

These finding was supported by **Bucholz, et al , 2016** who stated that there was an association between low BMI and mortality. Underweight patients also had more severe disease or were at higher risk of having undiagnosed disease. Fatigue and inflammation are thought to be more prevalent in underweight patients. findings imply that underweight patients may benefit from treatment strategies that focus on promoting nutritional status and weight gain to reduce fatigue, regardless of the reason for their low BMI⁽¹¹⁾.

Other study found that when BMI value was near normal average values, the complain of pain showed marked decrease, many diseases were more common

when subjects had low BMI below 18.5 kg/m². Ability to sustain activities for long time decline and quality of life too with underweight subjects ⁽¹²⁾

The result of current study showed that there was A positive significant correlation between BMI and FSS score in overweight , obesity class1 and obesity class 2 groups as when BMI increase the FSS increase ($r = 0.671, p = 0.000$), ($r = 0.390, p = 0.000$) and ($r = 0.946, p = 0.000$) respectively.

These finding was supported by **Timmerman et al,2013** whodocumented that in the growing body there was evidence that excess weight is negatively related to QOL, especially in the area of physical functioning, and is positively related to pain, this study fills in gaps in the relationships between nutritional and health promotion variables and BMI. Since higher BMI was also associated with lower physical functioning, the participants with higher BMIs may have perceived more barriers from a variety of sources. Fatigue was the main barrier. ⁽³⁾

Lim et al found that obesity indices, as measured by BMI and the percentage of body fat, were correlated with the general body power, this might predict that the relationship between obesity and inflammatory markers would be stronger when measured in subjects with more severe obesity, because abdominal fat stores are uniquely rich sites in cytokines, the links among cytokine levels, body power, and obesity may be more evident in a substantially more obese sample. The results show that obesity explains a significant portion of physical exhaustion even after controlling for depressive symptoms and inflammatory markers ⁽¹³⁾.

Conclusion

When the BMI showed very low or/and very high values, the subjects reported more fatigue, so there was a strong relation between body mass index and the level of fatigue in the young adolescent.

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تأثير معدل كتلة الجسم على مستوى الارهاق فى المراهقين

خلفية: يعد الارهاق من اكثر الشكاوى شيوعا و الذى يؤثر على جودة الحياة و على الرغم من ذلك لمتتطرق

اندراسة لبحث العلاقة بين معدل كتلة الجسم و مستوى الارهاق

هدف البحث: فحص تأثير معدل كتلة الجسم على مستوى الارهاق خاصة على من هم فى سن المراهقة

خطة الدراسة: متئين و عشرين حالة طبيعية من كلا الجنسين، تتراوح اعمارهم بين 12 و 18 عام و معدل كتلة اجسامهم متنوعة ما بين 13 و 39.9 كيلوجرام لكل متر مربع ، تم تقسيم هذه الحالات الى خمس مجموعات متساوية بنائا على معدل كتلة اجسامهم حيث تضم كل مجموعة اربعة و اربعون حالة . المجموعة الاولى (دون الوزن) حيث ان معدل كتلة الجسم اقل من 18.5 كيلوجرام لكل متر مربع . المجموعة الثانية (الوزن الامثل) حيث يتراوح معدل كتلة الجسم بين 18.5 و 24.9 كيلوجرام لكل متر مربع . المجموعة الثالثة (الوزن الزائد) حيث يتراوح معدل كتلة الجسم بين 25 و 29.9 كيلوجرام لكل متر مربع . المجموعة الرابعة (المرحلة الاولى من السمنة) حيث يتراوح معدل كتلة الجسم بين 30 و 34.9 كيلوجرام لكل متر مربع . المجموعة الخامسة (المرحلة الثانية من السمنة) حيث يتراوح معدل كتلة الجسم بين 35 و 39.9 كيلوجرام لكل متر مربع

الطريقة: النسخة العربية من مقياس شدة الارهاق الذى استخدم لقياس مستوى الارهاق فى الخمس مجموعات.

النتائج: هناك علاقة متبادلة ايجابية و ملحوظة بين معدل كتلة الجسم و مقياس مستوى الارهاق خاصة لمجموعتين وهم دون الوزن و اصحاب الوزن الامثل على التوالى . بينما وجد علاقة متبادلة ملحوظة وسلبية بين معدل كتلة الجسم و مقياس مستوى الارهاق و ذلك بين مجموعات اصحاب الوزن الزائد ، المرحلة الاولى و الثانية من السمنة على التوالى ، مما يشير الى ان المجموعة الاولى صاحبة اقل معدل لكتلة الجسم و المجموعة الخامسة صاحبة اعلى معدل لكتلة الجسم وذلك يظهر اعلى مستوى للارهاق مقارنة بالمجموعات الاخرى . **الاستنتاج:** هناك علاقة ايجابية بين معدل كتلة الجسم و مستوى الارهاق لمن هم فى سن المراهقة .

الكلمات الدالة: معدل كتلة الجسم ، مقياس مستوى الارهاق ، دون الوزن ، السمنة