

Relationship between Body Mass Index and Menstrual Pattern for Female Students

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ABSTRACT

Respirator Background: Obesity is often expressed in terms of body mass index (BMI). Obesity is a condition of having excess body weight with a BMI over 30 Kg/m². **Aim** of this study is to assess relationship between body mass index and menstrual pattern among female university students. **A descriptive design** was used in this study. Convenience sample consisted of 100 female students in Nursing and Medicine colleges from total number of eligible female students in two faculties of Nursing and Medicine at Benha University was 2362: 1288 in faculty of medicine, and 1074 in faculty of nursing students, constituted the main study sample after applying inclusion criteria: -Students age ranging from 18-25 years old, Unmarried, willing to participate in study, Weight over 30 kg of normal weight (Normal weight: BMI is 18.5 to 24.9). Data were collected through **Tools**, a structured self-administered questionnaire, a physical assessment sheet and menstrual abnormality sheet. **The result** the majority of students were suffering from menstrual disorders, mostly (93%) dysmenorrhea. **The study recommended** that undergraduate must be involved in nutrition and weight control education to help preventing overweight. , importance of herbs and measure that relieves premenstrual syndrome.

Key words: Obesity, Body mass index, Menstruation.

INTRODUCTION

Body mass index is estimated by dividing a person's weight in kilograms by height in squared meters; the mathematical formula is Weight (kg)/height squared (m²). BMI below 18.5 means underweight, BMI 18.5≤25.0 means normal weight, BMI 25.0≤30.0 is considered overweight and BMI 30.0 and above means obesity (National Institutes of Health et al., 2010).

Underweight usually refers to people with body mass index of fewer than 18.5 or a weight 15% to 20% below that normal for their age and height group. (Hira, et al, 2012) Both

obesity and underweight are associated with a high incidence of menstrual disorders. The menstrual cycle is usually 28-30 days. Women who have long or irregular cycle often exhibit ovulation disorders or decreased fertility. When BMI is 22-23, the incidence of menstrual disorders is the lowest. The risk of menstrual disorders is double in women with a BMI of 24-25 and fivefold higher in those with a BMI 35 or more. In contrast, obesity is common among women with menstrual disorders (Kurachi et al., 2008)

The menstrual cycle is influenced by body fat, and obesity can lead to irregularities in the menstrual cycle. 30 - 47% of obese women with irregular cycles, although the

incidence of infertility among obese women is not that high. Infertility in obese seems to be related to ovulatory dysfunction. An ovulatory women with fertile controls found a relationship between BMI at age 18 and subsequent an ovulatory infertility (**Robert & Filer, 2009**).

Body mass index and menstruation are with a strong relation between obesity such as ovarian dysfunction, hormone-related cancers etc., which are directly related to fat distribution. Menstruation is affected by obesity regardless of fat distribution and menarche occurs at an earlier age in obese girls. Weight loss with beneficial effects on ovarian function and may result in the normalization of the menstrual cycle in obese women with amenorrhea. Women with morbid obesity usually suffer from menstrual pattern disorders such as oligomenorrhea, amenorrhea whether primary or secondary, menorrhagia, dysmenorrhea, polymenorrhea, and dysfunctional uterine bleeding (**National Women's Health Resource Center, 2010**).

The nurse has a pivotal role to educate people about the importance of health promoting behaviors, which serve to affect their nutritional pattern and increase overweight/obesity. In addition, she can educate them about the importance of physical activity and early check-up which must be on regular basis (**Lazarou & Kouta, 2010**).

The nurse can educate, promote, modification of health life style, which promote normal weight as, provide dietary advice and increase their awareness about health dietary habit for all age groups especially for teenage and young adults because this will have good impact on their health in the future. In addition, the nurse must be aware of any individual whose body weight causes concern by advising them about the dangerous of over dieting. The nurse advise with focusing on fruits, vary your veggies

from fruit and vegetables, get calcium rich food, limit saturated fats (**El-Kaluby, 2009**).

Significance of the study

In Egypt, the prevalence of obesity by age groups was 44.1-54% at 15-19 years old, 57.8-63% at 20-24 years old, and 68.9-73% at 25-29 years old (**El-Fattah, et al, 2009**). Excess body fat leads to menstrual irregularities especially chronic oligo-anovulation and infertility. Obesity leads to hyperinsulinemia and consequent ovarian hyperandrogenism. Obesity is also known to affect fertility. Several prospective studies have shown that obesity lead to an ovulatory infertility (**Sathya et al., 2010**).

Therefore, this study was carried out to assess, the relation between obesity and menstrual pattern among adolescent female university students..

Aim of the study

The aim of this study Relationship between body mass index and menstrual pattern through:

- 1- Assess obesity among female university students at faculty of nursing and faculty of medicine in Benha University.
- 2- Assess of body mass index and its relation to menstrual pattern.

Research Hypothesis:

There are associations between obesity and menstrual disorder, with a trend towards higher percentages of disorders among obese students. In addition to the relation between the number of menstrual disorders, as an index of severity and body mass index.

Materials and methods:

Descriptive study was used. This study was conducted in two faculties, faculty of medicine and faculty of nursing at Benha University. Convenience sample consisted of 100 students from two faculties' students were selected from the total number of female students in two faculties of Nursing and Medicine at Benha University was 2362: 1288 in faculty of medicine, and 1074 in faculty of nursing. Ten percent of these students were selected for the pilot study and were excluded from the sample. Therefore, the remaining students constituted the main study sample after applying inclusion criteria: - Students age ranging from 18-25 years old, UN married, willing to participate in study, Weight over 30 kg of normal weight (Normal weight: BMI is 18.5 to 24.9).

Tools of data collection:

Data were collected through the following tools:

*First tool:

Part -1

I-Self structured interviewing questionnaire; (Appendix 1)

It was developed by the researcher after reviewing related literature under guidance of supervisors. It was written in Arabic language and composed of closed and open ended questions and consisted of four parts:

Socio demographic data which include, student's age, tel number, Name of faculty, parents' occupation, education of parents, family income), Assessment nutritional habits Sheet, Assessment of menstrual pattern for students regarding to menstrual disorder .

Part -II

2-likert scale (Appendix II): to assess physical and psychological symptoms of premenstrual syndrome: 7 items such as (psychological change, concentration, skin change ...ect).

Physical, psychological premenstrual syndrome scale scoring system:

- None 0
- Mild 1
- Moderate 2
- Severe 3

Part -III

3-Analogue scale (Appendix III): to assess pain during menstruation this includes (6) items such as (when occur, how many days of pain occurect)

Analogue scale (AS):

The analogue scale is simple scale used to measure level of pain that used by (*Reips and anfunke, 2008*)

Scale scoring system

- | | |
|------------|----------------------------|
| Score 0 | Indicated no pain |
| Score 3 | Indicated mild |
| Score 3:5 | Indicated moderate |
| Score 6:8 | indicated severe |
| Score 8:10 | indicated extremely severe |

***Second tool**

1-Physical assessment sheet (Appendix IV): it was developed by the researcher to measure the students Wight, height and body mass index. Its classification into 3 degree, the 1st degree of obesity (BMI between 30 – 34.99 kg / m²), 2ed degree of obesity (BMI ranges between 35 - 39.99 kg

/m²), 3 rd. degree of obesity (BMI ranges ≥ 40.00 kg /m²), BMI below 18.5 means underweight, BMI $18.5 \leq 25.0$ means normal weight (WHO, 2014).

Operational design

To fulfill the aim of the study the following structured interviewing questionnaire to develop study tools and content. The study conducted from the beginning of March to end of June 2014. At the beginning of interview the researcher greeted the girls, introduced herself to all girls included in the study, explained the purpose of the current study and provided girls with all information about the study and took oral consent.

The researcher visited the previously faculties mention setting four days per week (Saturday, Tuesday for medicine and Sunday, Wednesday for nursing) from 9 AM for 4 PM and distributed the questionnaire to find out the general character of obesity girls in all years of two faculty then application of the study according to inclusion criteria average time for completion of each student in interview was around (10-20 minute) average number collected was 1-4 students per day.

Statistical design:-

Data was verified prior to computerized entry. The statistical package for social sciences (spss version 11.0) was used for that purpose, followed by data tabulation and analysis. Descriptive statistics were applied (e.g. mean, standard deviation, frequency and percentage). A significant level value was considered when $p \leq 0.05$ and a highly significant level value was considered when $p < 0.01$.

Result

Socio demographic characteristics of students illustrated in **Table (1)** that the mean age of students 2.17 with standard deviation ± 20.67 , also the majority (71.0%) of students were mild obese (class 1), while mean obesity of the students is 2.17 with standard deviation ± 34.3 , Also the majority of the sample are employed fathers (78.0%) and house wife mothers (61.0%) with secondary school (52.0%).

Nutritional habits showed in **table (2)** that the majority (82.0%) of students don't eat meals regularly, also more than two third of students take snake and fast food with foundy cooking method and eat in front of TV while (3.0%) of students eat parboiled food, also (84.0%) of the sample don't follow special diet.

Menstrual pattern showed in **(table 3)** that the mean age of menarche was 12.74 with standard deviation 1.33. Also, the majority (48.0%) of students have oligomenorhea. Also, the majority (74.0%) of students have normal menstrual cycle. While, the amount of blood loose measured by number of diaper, mostly (57.0%) of students have normal amount of blood loose with using 3-5 diaper daily.

Relation between body mass index and menstrual disorders showed in **(table 4)** that statically highly significant relation between body mass index and number of menstruation days, also menstrual regularity.

Relation between BMI and premenstrual syndrome showed in **(table 5)** that there is statistically significant relation between body mass index and physical symptoms of premenstrual syndrome.

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Relation between BMI and number of pain days and statistically dysmenorrheashowed in (table 6) statistically significant of severity of pain. highly significant relation between BMI and

Table (1): Frequency distribution of students according to socio demographic characteristics (N=100)

Items	N	%
student of Faculty		
• Nursing students	52	52.0
• Medical students	48	48.0
Educational years		
• First	24	24.0
• Second	8	8.0
• Third	15	15.0
• Fourth	15	15.0
• Fifth	14	14.0
• Six	8	8.0
• Internship	16	16.0
Age		
Mean_±SD	20.76±2.17	
Height		
Mean ± SD	159.9±8.46	
Weight		
Mean ± SD	88.1±11.97	
Body mass index(obesity)		
Class1	71	71.0
Calss2	19	19.0
Class3	10	10.0
Mean ± SD	34.3±3.38	
Father job		
• employed	78	78.0
• un employed	22	22.0
Mother job		
• employed	39	39.0
• house wife	61	61.0
Mother education		
• Illiterate	8	8.0
• Read &write	1	1.0
• Secondary school	52	52.0
• High educated	39	39.0
Income of family		
• Satisfied	39	39.0
• Un satisfied	61	61.0

Table (2): Frequency distribution of student's according to nutritional habits (N=100)

Items	N	%
Eat meals at regular daily schedule		
• Yes	18	18.0
• No	82	82.0
Take breakfast daily before going to university		
• Yes	35	35.0
• No	65	65.0
Take fast food		
• Yes	65	65.0
• No	35	35.0
Take snack		
• Yes	76	76.0
• No	24	24.0
Type of snack (n=76)		
• Pulp	21	27.6
• Sudanese	14	18.4
• Potato	30	39.5
• Karate	9	11.9
• Popcorn	1	1.3
• Chocolate	1	1.3
Take Soda between meals		
• yes	35	35.0
• no	65	65.0
Cooking methods		
• Foundry	76	76.0
• Ni	21	21.0
• Parboiled	3	3.0
Follow up of a special diet		
• Yes	16	16.0
• No	84	84.0
Type of a special diet (n=16)		
• Regulate the amount of food	6	37.5
• Diet water	4	25.0
• Banana	2	12.5
• Vegetables	3	18.8
• Fare from fats	1	6.2
Eat in front of TV		
• Yes	62	62.0
• No	38	38.0
If yes: type of eat(n=62)		
• Chocolate	9	14.5
• Potato	9	14.5
• Vegetables	7	11.3
• Popcom	5	8.1
• Pub and substances	6	9.7
• Karata	7	11.3
• Chickpeas	3	4.8
• Fruit	9	14.5
• Dinner	5	8.1
• Lupine	2	3.2

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Table (4): Relation between body mass index and menstrual disorder (N=100).

Items	BMI						X ²	P
	Class1 (30 ≥ 35 kg/m ²)		Class2 (35 ≥ 40 kg/m ²)		Class3 (≥ 40 kg/m ²)			
	N	%	N	%	N	%		
*Age of menarche								
.10-12	38	53.5	6	31.6	7	70.0	4.49	>0.05
.13-15	33	46.5	13	68.4	3	30.0		
Interval between each cycle								
<25 days	11	55.0	22	68.8	38	79.2	4.33	>0.05
(polymenorrhea)								
26-34days	6	30.0	6	18.8	7	14.6		
Normal								
≥35days	3	15.0	4	12.4	3	6.3		
(oligomenorrhea)								
Duration of menstruation								
Hypomenorrhea<3	0	0.0	4	21.1	0	0.0	19.24	<0.001
Normal (3-6)	57	80.3	10	52.6	7	70.0		
Hypermenorrhea>6	14	14.7	5	26.3	3	30.0		
Amount of blood loose								
scanty	23	32.4	9	47.4	3	30.0	3.00	>0.05
Normal	41	57.7	10	52.6	6	60.0		
Heavy	7	9.9	0	0.0	1	10.0		
Regularity								
yes	22	31.0	10	52.6	8	80.0	10.33	<0.006
no	49	69.0	9	47.4	2	20.0		
Longest secondary amenorrhea								
9 days	2	2.8	6	0.0	0	0.0	10.96	>0.05
1-2 weeks	6	8.5	2	10.5	3	30.0		
1-3 weeks	32	45.1	12	63.2	6	60.0		
4-6 weeks	27	38.0	3	15.8	1	10.0		
Not cut	4	5.6	2	10.5	0	0.0		

Table (5): Relation between BMI and premenstrual syndrome (N=100)

Item	BMI						X2	P
	Class1 (30 ≥ 35 kg/m ²)		Class2 (35 ≥ 40 kg/m ²)		Class3 (≥ 40 kg/m ²)			
	N	%	N	%	N	%		
How long days girl suffering from premenstrual syndrome								
1day	46	64.8	10	52.6	7	70.0	3.89	>0.05
2days	20	28.2	6	31.6	3	30.0		
3days	4	5.6	3	15.8	0	0.0		
4days	1	1.4	0	0.0	0	0.0		
Mean ±SD	1.46 ± 0.67							
Physical symptoms of premenstrual syndrome (pain, skin change, body edema, involuntary nervous system)							19.26	<0.004
.nothing								
. mild	30	45.5	11	64.7	4	50.0		
.moderate	17	25.8	6	35.3	3	37.5		
.sever	19	28.7	0	0.0	0	0.0		
Psychological symptoms of premenstrual syndrome(behavioral change ,concentration ,behavioral effect)	0	0.0	0	0.0	1	12.5		
Nothing							8.51	>0.05
Mild								
Moderate	37	52.1	7	36.8	3	30.0		
Sever	9	12.7	3	15.8	3	30.0		
	13	18.3	7	36.8	4	40.0		
	12	16.9	2	10.6	0	0.0		

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Table (3): Frequency distribution of students according to menstruation pattern (n=100).

Items	N	%
Age of menarche		
Mean±SD	12.74±1.33	
sensation at menarche		
• Cry	47	47.0
• Happy	2	2.0
• Normal	32	32.0
• Nothing	14	14.0
• Fear/panic	4	4.0
• Stress	1	1.0
Doing at menarche		
• Told my mother	79	79.0
• Told my teacher	2	2.0
• Told my sister	11	11.0
• Nothing	8	8.0
Interval between each menstruation (menstrual cycle length)		
• ≤25 days (poly menorrhea)	20	20.0
• 26-34 normal	32	32.0
• ≥35 (oligomenorrhea)	48	48.0
menstruation days		
• <3 days (hypo-menorrhea)	4	4.0
• 3-6 (normal)	74	74.0
• >6 (hyper-menorrhea)	22	22.0
Amount of blood loss (measured by Number of diapers used)		
• 2/day (scanty)	35	35.0
• 3-5/day (normal)	57	57.0
• 6-7/day (heavy)	8	8.0
Form of blood		
• Liquid	66	66.0
• Clots	18	18.0
• Don't known	16	16.0
Blood colour		
• light Red	72	72.0
• Dark deep	28	28.0
Take medication during menstruation		
• Yes	40	40.0
• No	60	60.0
Type of medication taking (n=40)		
• Antispasmodic	2	5.0
• Analgesic	38	95.0

Table (4): Relation between body mass index and menstrual disorder (N=100).

Items	BMI						X ²	P
	Class1 (30 ≥ 35 kg/m ²)		Class2 (35 ≥ 40 kg/m ²)		Class3 (≥ 40 kg/m ²)			
	N	%	N	%	N	%		
*Age of menarche								
.10-12	38	53.5	6	31.6	7	70.0	4.49	>0.05
.13-15	33	46.5	13	68.4	3	30.0		
Interval between each cycle								
<25 days	11	55.0	22	68.8	38	79.2	4.33	>0.05
(polymenorrhea)	6	30.0	6	18.8	7	14.6		
26-34days								
Normal	3	15.0	4	12.4	3	6.3		
≥35days								
(oligomenorrhea)								
Duration of menstruation								
Hypomenorrhea<3	0	0.0	4	21.1	0	0.0	19.24	<0.001
Normal (3-6)	57	80.3	10	52.6	7	70.0		
Hypermenorrhea>6	14	14.7	5	26.3	3	30.0		
Amount of blood loose								
scanty	23	32.4	9	47.4	3	30.0	3.00	>0.05
Normal	41	57.7	10	52.6	6	60.0		
Heavy	7	9.9	0	0.0	1	10.0		
Regularity								
yes	22	31.0	10	52.6	8	80.0	10.33	<0.006
no	49	69.0	9	47.4	2	20.0		
Longest secondary amenorrhea								
9 days	2	2.8	6	0.0	0	0.0	10.96	>0.05
1-2 weeks	6	8.5	2	10.5	3	30.0		
1-3 weeks	32	45.1	12	63.2	6	60.0		
4-6 weeks	27	38.0	3	15.8	1	10.0		
Not cut	4	5.6	2	10.5	0	0.0		

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Table (5): Relation between BMI and premenstrual syndrome (N=100)

Item	BMI						X2	P
	Class1 (30 ≥ 35 kg/m ²)		Class2 (35 ≥ 40 kg/m ²)		Class3 (≥ 40 kg/m ²)			
	N	%	N	%	N	%		
How long days girl suffering from premenstrual syndrome								
1day	46	64.8	10	52.6	7	70.0	3.89	>0.05
2days	20	28.2	6	31.6	3	30.0		
3days	4	5.6	3	15.8	0	0.0		
4days	1	1.4	0	0.0	0	0.0		
Mean ±SD 1.46 ± 0.67								
Physical symptoms of premenstrual syndrome (pain, skin change, body edema, involuntary nervous system)								
.nothing	30	45.5	11	64.7	4	50.0	19.26	<0.004
. mild	17	25.8	6	35.3	3	37.5		
.moderate	19	28.7	0	0.0	0	0.0		
.sever	0	0.0	0	0.0	1	12.5		
Psychological symptoms of premenstrual syndrome (behavioral change ,concentration ,behavioral effect)								
Nothing	37	52.1	7	36.8	3	30.0	8.51	>0.05
Mild	9	12.7	3	15.8	3	30.0		
Moderate	13	18.3	7	36.8	4	40.0		
Sever	12	16.9	2	10.6	0	0.0		

Table (6):Relation between BMI and dysmenorrhea (N=100)

Items	BMI						X ²	P
	Class1 (30 ≥ 35 kg/m ²)		Class2 (35 ≥ 40 kg/m ²)		Class3 (≥ 40 kg/m ²)			
	N	%	N	%	N	%		
Severity of pain								
No pain	6	8.5	1	5.3	0	0.0	19.33	<0.05
Mild	6	8.5	0	0.0	0	0.0		
Moderate	24	33.8	11	57.8	10	100.0		
Sever	13	18.2	1	5.3	0	0.0		
Worst pain (imaginable)	22	31.0	6	31.6	0	0.0		
*First sense of pain							9.05	>0.05
Non	6	8.7	1	4.8	0	0.0		
With menarche	34	49.3	9	42.9	8	80.0		
After 6 month of menarche	16	23.3	8	38.0	0	0.0		
After 1 year	5	7.2	1	4.8	0	0.0		
After 2 years	8	11.6	2	9.5	0	0.0		
Time of pain							7.96	>0.05
• non	6	8.5	1	5.3	0	0.0		
• before menses	32	45.1	14	73.4	4	40.0		
• During menses	23	32.4	3	15.8	3	30.0		
• After menses	10	14.1	1	5.3	3	30.0		
Number of pain days							33.60	<0.001
• Non	6	8.5	1	5.3	0	0.0		
• 1day	9	12.7	5	26.3	0	0.0		
• 2days	29	40.8	6	31.6	6	60.0		
• 3days	27	38.0	5	26.3	2	20.0		
• 4days	0	0.0	2	10.5	2	20.0		

other disorders as polymenorrhea, hypo/hypermenorrhea is less common. Furthermore, a statistically significant association revealed between obesity and the presence of type of menstrual disorders.

Discussion

Obesity has become a worldwide epidemic with ever increased incidence and public health problems in both developing and developed countries (MaJedah et al., 2014). Result of the present study illustrates the relation between obesity and menstrual disorder. More than two thirds of the students in the sample had at least one menstrual disorder. These disorders are, dysmenorrhea was the most common commonly reported. As about more than three quarter of the sample have secondary amenorrhea, also less than two third have irregular menstruation also less than half have oligomenorrhea. The

Hypomenorrhoea the Duration of menstrual flow which last for 1-2 days but hypermenorrhoea: Duration of menstrual flow which may last for more than five days as illustrated by (Mohite&Mohite, 2013). Our study showed that high percent (74.0%) of students have normal days from 3 - 6 this study agreed with (Sadiaetal, 2009)also agreed with (Shadia&Yassin, 2012While 40.8% had their menstrual flow for 3≤5 for days. There statistically significant relation between obesity and menstrual cycle days

<0.001, this agree may be due to the same age group, nutritional status or health status. Teenage girls use three to five pads per day (Montoya et al., 2012). Our study reported that high percentage, (57.0%) of the sample; their amount of blood were normal (3 - 5 diaper daily) while low percent were heavy 6-7 diaper. Also agreed with (Shadia&Yassin, 2012) who studied : Herbal Remedy used by Rural Adolescent girls with Menstrual Disorders, founded that Most of the sample (84.9%) used to change 2-4 sanitary pads per day, also agreed with (Dars et al., 2014) who studied : Relationship of menstrual irregularities to BMI and nutritional status in adolescent girls. Found that mostly (76.0%) of the sample have normal menstrual follow, also agree with (Amaze et al., 2012) who founded that (71.6%) menstrual flow was average, while in (21.0%), it was scanty and heavy in (7.4 %) while, also this reported disagree with a study by (Begum et al., 2009) which showed a higher percentage of girls to have scanty flow, this difference due to geographical and nutritional factors. The relationship between menstrual pain and BMI are showed by Nohra et al. (2011).

The relation between obesity and menstrual disorders, this result agree with the present study. In the same line (ElFattah et al., 2009) have mentioned that women who are obese have a much higher rate of dysmenorrhea than those who have normal BMI, dysmenorrhea. Also, (Yehia et al., 2008) have also denied any relation between obesity and abnormal menstrual cycle patterns or disorders, depending on the understanding, concepts, and beliefs of the studied subjects regarding the types of menstrual disorders. In study mostly location of pain was in lower abdomen more than three quarter, this percent agreed with (Karout et al., 2012).

Conclusion and recommendation:

Based on the results revealed by the present study, it can be concluded that the prevalence of obesity among female medical and nursing university students. The majority was suffering from menstrual disorders, mostly dysmenorrhea. The prevalence and severity of menstrual disorders were significantly higher among obese students. Additionally, therefore, obesity in early adulthood increases the risk of menstrual problems and PCOS. Hence, these health problems are likely to increase with the current trends of increasing fatness in the general population.

The study recommended that:

Undergraduate based programs must be reconstructed to improve student's knowledge about factors contributing to overweight and its complications. Integrate the healthy nutrition pattern and importance of regular measurement of body weight and body mass index in curriculum of undergraduate at nurse school. Further research about obesity and the role of the nurse in obesity, its prevention is suggested for large sample.

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