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IMPACT OF SHORT-TERM EDUCATIONAL NUTRITIONAL PROGRAM ON THE BEHAVIORAL PARAMETERS AND BMI OF A SAMPLE OF OBESE FEMALE PATIENTS AGED (18 - 45 YEARS OLD) IN AL-KINDY OBESITY RESEARCH AND THERAPY UNIT

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ABSTRACT
The obesity is an increase in the fat component of the body. It is associated with a variety of chronic diseases. However, the interrelationship that exists between lifestyle, diet, physical activity, and other determinates of obesity needs to be clarified. Weight reduction reduces health risks associated with chronic diseases and is therefore encouraged by major health agencies. This study aimed to improve the behavioral parameters of the patients to reduce their weight through behavioral therapy and active nutritional program. A total of 100 patients who attended the Obesity Research and Therapy Unit, at Al-Kindy College of Medicine during the period from 2nd of January to the 31th of December 2017, were included in the study (all of them were obese females) from different areas of Baghdad. Data were collected included: patient age, marital status, number of children, residency, level of education, employment, socioeconomic status, body weight, height, waist circumference and a number of behavioral parameters. Results revealed that the mean age of our patients was (32.16±7.14)years, mean BMI at 1st visit was (33.45 ± 1.37), 2nd visit (32.42 ± 1.41), 3rd visit (31.41 ± 1.48), 4th visit (30.67 ± 1.61). The mean of behavioral score at 1st visit, 2nd visit, 3rd visit, 4th visit were (5), (9), (21), (22) respectively, which showed a significant improvement. Having a university level of education, good socioeconomic status, employment, being physically active, younger age(<40 years old) and having 2 or fewer children were significantly associated with better weight reduction, (p-value < 0.05). Single women although not significantly associated with the reduction of BMI, but they have more weight loss than married women.

KEYWORDS: Nutritional Program, Behavioral Parameters, BMI.

INTRODUCTION
Obesity is defined by the World Health Organization (WHO) as abnormal or excessive accumulation of fat that may impair health.[1] It is a chronic metabolic disease characterized by an increased fat stores in the body.[2]

The WHO announced obesity as the largest global chronic health problem which become a more serious problem than malnutrition. It seems like an epidemic, affects all age groups and socioeconomic states, and spread out to involve both developing and developed countries.[2]

In Iraq, the obesity prevalence was 27% of general population according to national survey, this means about 9 millions of Iraqis suffering from obesity.[3] Obesity is one of the causes of morbidity, disability and mortality.[4]

It is an important risk factor for hypertension, diabetes, dyslipidemia and cardiovascular diseases, obstructive sleep apnea, musculoskeletal disorders, osteoarthritis, and cancers (colorectal, prostate, endometrial, and breast cancer). It is important, therefore, to recognize and treat obesity.[5]

The imbalance between calories intake and calories expenditure is the main cause of obesity, other causes are genetics, endocrine diseases like Cushing disease and hypothyroidism, psychological problems like depression, and the use of medication such as anticonvulsants and antidepressants that lead to accumulation of fat in the body.[6]

There are a number of social determinants of obesity that may explain the current dramatic increase seen within specific countries or globally.[7] These determinants include: social class, early malnutrition, number of children, smoking and urbanization.[8]

BMI is a measurement which is worldwide used to assess the prevalence of overweight and obesity within a population. BMI is a simple index of weight-for-height, It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). WHO define obesity in adults by a (BMI of $\geq$30 kg/m^2).[9,10]

- BMI (WHO - Classification):
- BMI < 18.5 = Under Weight
- BMI 18.5-24.9 = Healthy weight range
- BMI 25-29.9 = Overweight
- BMI 30- 34.9 = class 1 obesity
- BMI 35-39.9 = class 2 obesity
- BMI $\geq$ 40 = class 3 obesity(very obese or morbid obesity).[11]

The treatment of obesity have wider goals than weight loss alone, including risk reduction and improvement of health, reduction in Body Mass Index (BMI) and waist circumference (WC), management of co-morbidities, improvement in body composition, improving well-being and quality of life of obese patients. Significant benefits to the patients may be achieved even by modest weight loss (i.e. 5–10% of initial body weight), and modification of lifestyle (improvement of nutritional content of the diet and increasing the physical activity and fitness).[12,13]

1.1. Weight-loss programs

Any successful weight-loss program should have 3 major phases as follows:

1) Pre-inclusion screening phase
2) Weight-loss phase
3) Maintenance phase - This can last for the rest of the patient's life, but ideally lasts for at least 1 year after the weight-loss program has been completed.[14]

The main treatment for obesity consists of a combination from cognitive behavioral therapy, diet therapy and physical activity program.[15]

Cognitive Behavioral Therapy

It targets the behaviors that lead to excessive weight gain like excessive dietary intake, poor dietary habits or choices, and sedentary lifestyle habits. Although this approach can achieve improved results, it is challenging and time-consuming.[16]

Diet Therapy

Generally, diet therapies can be classified into 2 categories: balanced, low-calorie diets (or reduced portion sizes) and diets that are composed of different macronutrient. The latter include the following:

1. Low-carbohydrate diets – E.g. Atkins diet
2. Low-fat diets – E.g. Ornish diet
3. Mid-level diets – E.g. Zone diet, in which the 3 major macronutrients (carbohydrate, protein, fat) are eaten in similar proportions of 30-40%
4. Joslin's Why WAIT diet for diabetic patients - Weight Achievement and Intensive Treatment (Why WAIT) is a 12-week multidisciplinary program for weight control and intensive diabetes management that is offered to those with type 1 or type 2 diabetes. It composed of 40-45% carbohydrates, 20-30% protein, less than 35% fat.[17]

Low-calorie diet (LCD)

LCD is defined as a diet of 800-1500 kcal/day. It reduces the caloric intake by 500-1000 kcal/day from the patient's current dietary intake.[18]

This diet has a mean weight loss of 0.4-0.5 kg/week, with a total of 5-10% of starting weight over 3-6 months, especially higher if the individual is very successful.[19]

Appropriate physical activity: is necessary for weight control, about 150 minute/week of moderate to vigorous intensity exercise is recommended to achieve weight reduction. Its goal is an energy expenditure of about 1000 kcal/wk, through a different types of exercise programs.[20]

Aim of the study

Asses and intervent aiming to improve the behavioral parameters of a sample of obese female patients.

Patients and Methods

Study design, A prospective cohort study. In the Obesity Research and Therapy Unit, at AlKindy College of Medicine –Baghdad University.

total period of study was 14 months (the duration of data collection and follow up was 12 months from 2nd of January to the 31th of December 2017.target population was obese women attending Obesity Research and Therapy Unit.

-**Inclusion criteria:** obese female patients aged (18-45 years old) and their BMI between (30-34.9 kg/m^2).

-**Exclusion criteria:** obese female patients with any chronic disease (hypertension, diabetes mellitus, asthma, cardiovascular diseases, renal failure, cancer), any female patient with class2 obesity and above, and any pregnant woman.

-Sample type was convenient sample, 100 women accept to participate.

The researcher visited the unit 4 days per week, and any patient who met the selection criteria was included in the study.

Educational and nutritional program, 3 months for each patient. each patient received after the acceptation, then socio-demographic information was taken from her, her body weight and measurement taken, some investigation

done to exclude any chronic disease, then she received a simple lecture by the researcher and given a special nutritional & physical activity program, and maintain a weekly food diary and physical activity diary.

Then the patient asked to come to the unit every 1 month for 3 successive months for monitoring and determine the effect of this program on her behavioral parameters and BMI.

Data collection tools by using questionnaire which include:
1- Socio-demographic data include: [subject no., age (years), marital status: (single or married), no. of children, residency, level of education: (primary school, secondary school, university and more), employed: (yes or no), socio-economic level: (low, moderate, high)].
2- Body measurements: weight measured in kilogram (kg), height in centimeter (cm), BMI in (kg/m^2), waist circumference in (cm).
3- A pre-test questionnaire for the behavioral perception regarding life style and dietary habits was applied on the patients at their first visit.

Exposure intervention parameter
1- a standard dietary program: low calorie diet (1200 kcal /day).
2- a simple physical activity program (walking for 30 minute /day, 5 days /wk, a total of 150 min/wk).
3- a simple informative lecture about the nutritional and behavioral habits that can help the patient in weight reduction. The patients learned self-monitoring, and encouraged to augment self-efficacy to sustain healthy behaviors over time.
4- the scoring system for behavior parameters: it consists of a total no. of questions = 14, & a total scores = 23.

Outcome parameter
1- changing the patient's behavioral parameters (through change in behavioral score) by post-test questionnaire.(special scoring technique).
2- measurement of reduction of patient's BMI(kg/m^2).
3- assumption that 8% is a cut point for response.

RESULTS

Our study included 100 clients at the 1st visit, but, 20 clients were defaulted, so they were excluded from the results of the study, defaulter rate was 20%.

The results of this study showed that 30% of our sample got primary school education or below, 22.5% were of poor socioeconomic status, 52.5% were of non-employee category, 38.8% were single, and lastly 30% of them were physically inactive as shown in this table.

Table 1: The frequency distribution of attendants according to socio-demographic variables.

Variables		Frequency	Percent
Educational level	Primary or below	24	30.0
	Secondary	36	45.0
	University	20	25.0
Socio- economic state	Poor	18	22.5
	Moderate	40	50.0
	Good	22	27.5
Employment state	Non-employee	42	52.5
	Employee	38	47.5
Marital state	Single	31	38.8
	Married	49	61.3
Physical activity	In active	24	30
	Active	56	70

Results indicated an improvement in the behavioral scores was very obvious between 1st and 4thone readings as shown table 2.

Table 2: The repeated measures ANOVA shows improvement in means of behavioral scores according to different stages of the study.

Behavioral score (BS)	N	Mean	Std. Dev.	Sig.	Pairwise comparisons (Comparison between different study stages)					
					BS1-BS2*	BS1-BS3	BS1-BS4	BS2-BS3	BS2-BS4	BS3-BS4
BS 1 (1st visit)	80	5.35	2.934	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BS 2 (2nd visit)	80	19.93	1.826							
BS 3 (3rd visit)	80	21.23	1.350							
BS 4 (4th visit)	80	22.22	1.158							

Table-3 showed significant differences between BMI of repeated measures ANOVA at all levels of measurements (p-value < 0.001) in all readings.

Table 3: The repeated measures ANOVA shows differences between means of BMI according to different stages of the study.

BMI	N	Mean	St.dv	sig.	Pairwise comparisons (Comparison between different study stages)					
					B1-b2*	B1-b3	B1-b4	B2-b3	B2-b4	B3-b4
BMI 1 (1st visit)	80	33.452	1.37	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BMI 2 (2nd visit)	80	32.416	1.41							
BMI 3 (3rd visit)	80	31.414	1.48							
BMI 4 (4th visit	80	30.671	1.61							

Table-4 displayed that ANOVA-test proved significant differences between waist circumference mean, between 1st, 2nd, 3rd and 4th visit readings at all levels of measurements.

Table 4: The repeated measures ANOVA shows differences between means of waist circumferences according to different stages of the study.

variables	N	Mean	Std. Dev.	Sig.	Pairwise comparisons (Comparison between different study stages)					
					WC1-WC2*	WC1-WC3	WC1-WC4	WC2-WC3	WC2-WC4	WC3-WC4
wc1 (1st visit)	80	97.050	5.10	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
wc2 (2nd visit)	80	95.113	5.06							
wc3 (3rd visit)	80	93.645	4.98							
wc4 (4th visit)	80	92.700	4.87							
*wc=waist circumference										

Results also, showed that the mean age of the clients was (32.16 ± 7.14) years old. The mean BMI at 1st visit was (33.45 ± 1.37), 2nd visit (32.42 ± 1.41), 3rd visit (31.41 ± 1.48), 4th visit (30.67 ± 1.61)(Table 5).

Same table showed that waist circumference mean at 1st visit, 2nd visit, 3rd visit, 4th visit were (97.05), (95.11), (93.65), (92.7) respectively.

Table 5: Descriptive Statistics of scale measure data of studied attendants.

Variables	N	Mean	Std. Deviation
Age (y)	80	32.16	7.141
*BMI 1 (kg/m^2)	80	33.45	1.370
BMI 2 (kg/m^2)	80	32.42	1.414
BMI 3 (kg/m^2)	80	31.41	1.483
BMI 4 (kg/m^2)	80	30.67	1.616
BMI difference	80	2.78	0.626
BMI difference %	80	8.3434	2.01
*Waist circumference 1 (cm)	80	97.05	5.603
Waist circumference 2 (cm)	80	95.11	5.551
Waist circumference 3 (cm)	80	93.65	5.506
Waist circumference 4 (cm)	80	92.70	5.444
Waist circumference difference %	80	4.4855	0.808
*BMI1= 1st visit, BMI2= 2nd visit, BMI3=3rd visit, BMI4= 4th visit *WC1=1st visit, WC2= 2nd visit, WC3=3rd visit, WC4= 4th visit			

While behavioral changes score were 5, 19, 21, 22 at the 1st, 2nd, 3rd and 4th visit respectively as shown in figure-1, which means a significant improvement in the behavioral parameters.

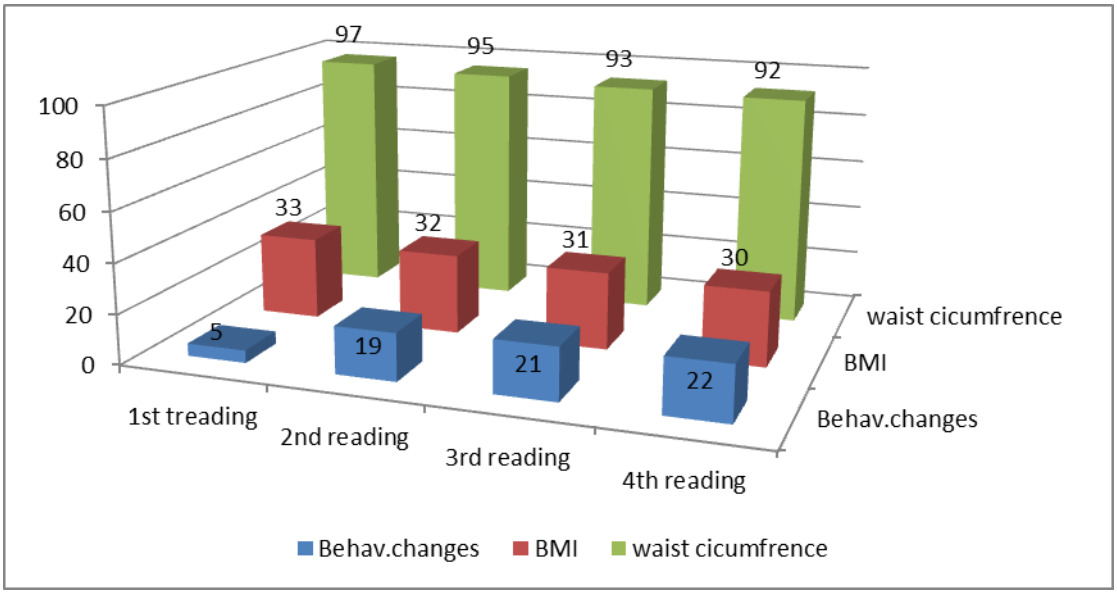

Figure 1: The distribution of clients according to different scaled measured variables in different stages of the study.

In this study age got bad effect on response to the program as shown in figure 2.

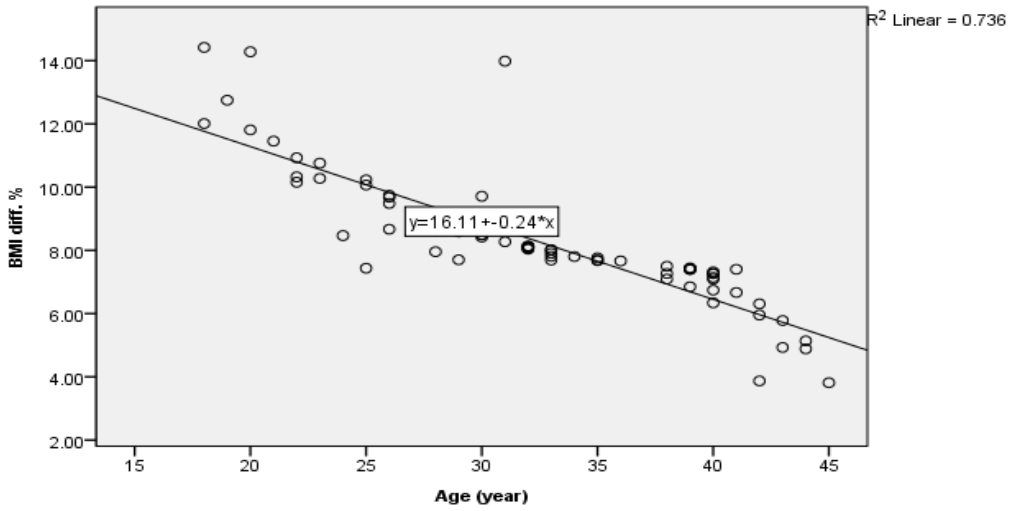

Figure 2 correlation between age and BMI differences

Table-6 illustrated that the single women showed higher level of BMI reduction than married women, but, this reduction was not significant (p-value < 0.21).

But women of university level of education showed better response to the program than other level of education (p-value 0.008). Employed women showed significant reduction in BMI than non-employed (p-value 0.001).

Good socioeconomic status seemed to be more associated with decline in BMI than other socioeconomic groups (p-value 0.034), Active women got better significant decline in BMI than non-active (p-value 0.001).

Table 6: The association between achievement of goal of reduction in BMI (≥8%) and different variables.

Variables		ACHIEVED BMI DIFFERENCE				P-value
		Yes		No		
		N	%	N	%	
Marital state	Single	22	71	9	29	0.21
	Married	21	42.9	28	57.1	
Educational level	Primary	7	29.2	17	70.8	0.008
	Secondary	21	58.3	15	41.7	
	University	15	75	5	25	
Employment state	Employee	29	76.3	9	23.7	<0.001
	Not employee	14	33.3	28	66.7	
Socio-economic state	Poor	8	44.4	10	55.6	0.034
	Moderate	18	45	22	55	
	Good	17	53.8	7	46.3	
Physical activity	Not active	5	20.8	19	79.2	0.001
	Active	38	67.9	18	32.1	

Same observation was true regarding number of children. Where women with large number of children showed bad response to the program(Figure 3).

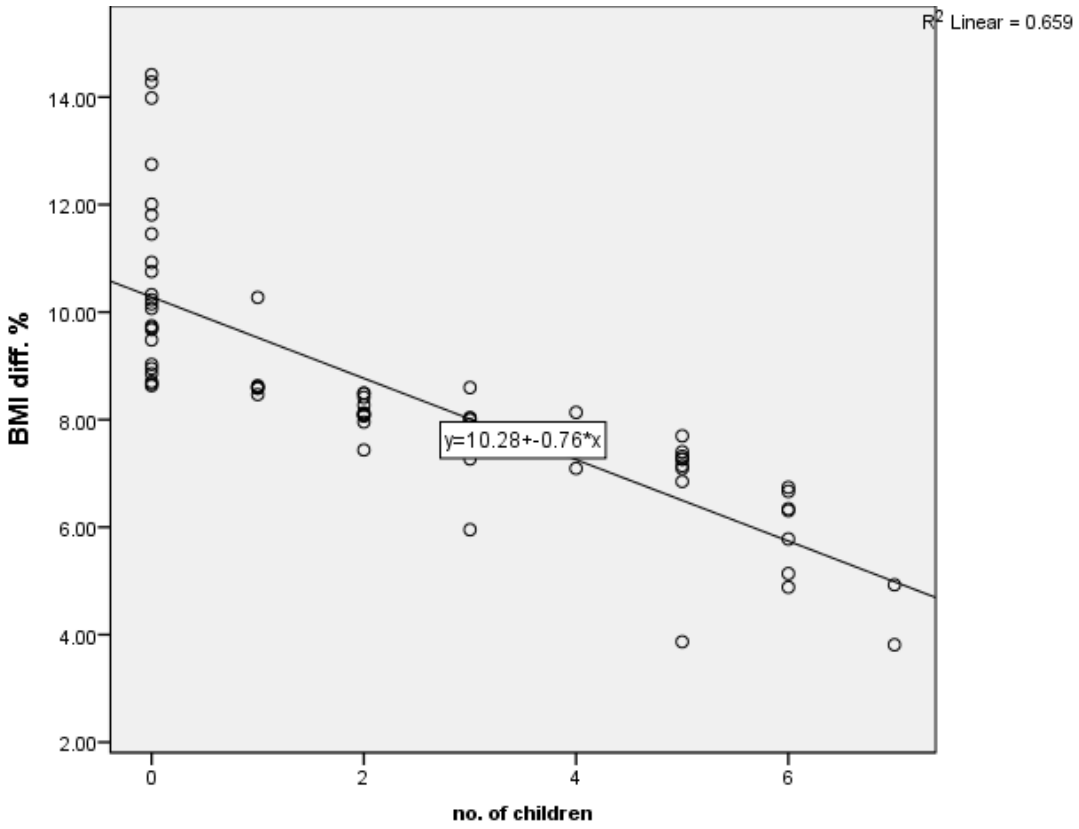

figure 3 correlation between number of children and BMI differences

DISCUSSION

This study consists of 3-months educational nutritional program; including a combination of behavioral therapy, low calories dietary program (1200kcal/day) and a moderate-to-vigorous exercise program; it produced an improvements in the behavioral parameters and clinically important and significant reductions in body weight and waist circumference among a group of obese women aged (18-45 years old). This will lead to improvement in the general health and decreases the risks and complications of obesity on the body.

Behavior therapy is one of the evidence based methods in the treatment of obesity, itinduces a modest(5-10%) weight reduction that is associated with clinically substantial improvements in weight-related health conditions and psychosocial outcomes, and long-term weight maintenance. This agree with the Look AHEAD

study which performed by Look AHEAD Research Group at 16 centers throughout the U.S. in 2014, it conclude that behaviorally-based programs for obesity management are effective techniques within the patient-centered approach to weight management and maintenance. It also shows thatover a quarter of the participants lost ≥10% of body weight, and half of the participants lost more than 5%of their body weight through abehavioral therapy, and there was improvement in the risk factors for cardiovascular diseases.[21]

This may be explained by the increase in the patients awareness about the bad effect of obesity on their health, and improvement in their knowledge about the wrong behaviors in their lifestyle that lead to excessive weight gain, and become able to recognize the fat and carbohydrate rich foods to avoid it and choose a healthy diet.

In this study, at the end of the 3 months, the BMI and WC significantly reduced on average of (8.34%) and (4.48%) respectively, this result agree with three studies; 1st a study done by Wang in New York, USA at 2002, involving a 6 months caloric restriction to decrease the body's subcutaneous fat which shows that weight and BMI were each significantly reduced by 11%, waist circumference by 7.8%, and total body fat by 13%.[22]

A 2nd study also agree with our study results conducted at 2004 in Italia in 15 universities, an observational study on quality of life in obese patients seeking treatments at medical centers accredited by the Italian Health Service for the treatment of obesity. By using a specific programs, including dieting and cognitive behavioral therapy, shows that BMI reduced by about 10%.[23]

Regarding the effect of marital status on BMI, this study shows that single patients had higher level of BMI reduction than married. It agree with a previous study was carried out in Baghdad by N.G. Al-Tawil et al, in the outpatient clinic of Al-Kadhimiya Teaching Hospital at 2002 which found that 85% of the obese women were married and the remaining were single.[24]

Women who have a large number of children (>2 children regarding this study) had a lower response to the program and less decrease in the BMI than women with 1-2 children. This result agree with other two studies one of them involve Arab speaking countries done by Mohammad Badran and Ismail Laher and the other study was done in Qatar by Abdulrahman O Musaiger et al at, to investigate factors associated with obesity in adult patients in Qatar, which found that increase parity is leading factor to increase the occurrence of obesity among females.[25,26]

one study done in Baghdad by Baqir Kareem Abed et al, at Al- Washash & Bab-Almoadham primary health centers disagree with this study and found that overweight and obesity was high among women with 1-2 child, this is may be explained by that they use different type of study which was a cross-section and limited population sample and area.[27]

Regarding the level of education, this study shows that women with university level of education had better response to the program and more reduction in BMI than other levels of education. The same result found in a number of studies worldwide; a study was carried out in Baghdad by N.G. Al-Tawil et al, at Al-Kadhimiya Teaching Hospital, 7, a study done in Basrah by Abbas Ali Mansour et al, found that obesity was more in the illiterate and lower level of education than women with university level.[24,28]

In England in 1996, obesity was commoner among those with less education.[29]

Regarding the effect of employment on the level of BMI; this study found that employed women had significant reduction in their BMI than non-employed. This is in line with other studies in Baghdad by N.G. Al-Tawil et al, at Al-Kadhimiya Teaching Hospital, and by Baqir Kareem Abed et al at Al- Washash & Bab-Almoadham primary health centers, in Qatar by Musaiger and a study by Mohammad Badran and Ismail Laher in Arab speaking countries all of them attributed the reason for this to employed people being more exposed to society, and therefore more interested in taking care of their weight.[24,25,26,28]

This study shows that good socio-economic status seem to be more associated with reduction in BMI than other socio-economic states. This result agree with other three studies in Basrah by Abbas Ali Mansour et al, in South Africa and in England in which found that obesity is high among the poorest women, and reflects the general worldwide finding that obesity is linked to poverty.[28,29,30]

One study carried out in Baghdad by Baqir Kareem Abed et al, disagree with the result of our study which shows that obesity was higher among women who had moderate socioeconomic status, the same result was seen in Ethiopia, this is possibly due to Socioeconomic inequalities in health attributed to a number of different mechanisms, including unhealthy behaviors, inadequate access to health care, nutritional inadequacies and other inequalities and psychological stress.[27,31]

In this study age got bad effect on response to the program. This agree with other 5 studies, one carried out in Baghdad by N.G. Al-Tawil et al, a study in Basrah by Abbas Ali Mansour et al[9], a study in Qatar by Musaiger found that at age 40 years and over, the prevalence of obesity is increased compared to those aged less than 40 years. Studies in the Arab Gulf countries showed that obesity increased with age until age 50 years, then the prevalence decreased gradually. A study in Japan all of showed that obesity increased with increasing age. This

could be attributed to decreasing physical activity with increasing age. They also found significant increases in subcutaneous fat at the lower trunk, such as the waist and intragluteal regions with age. If, for example, a body weight increase by only 1 kg per year, weight would increase by 10 kg at the end of 10 years. This relation of weight with age has been reported by other authors.[24,26,28,32]

One study in USA by Jack Wang et al, disagree with our results, in which there were no significant correlations between age and weight reduction in either ethnic group.[24]

Physical activity had significant effect on reduction of BMI as shown in this study. This is similar to study conducted in 6 different areas. A study in Baghdad by N.G. Al-Tawil et al, a study in Qatar by Musaiger, in Arab speaking countries by Mohammad Badran and Ismail Laher, in University of Pittsburgh by Dr. Bret H. Goodpaster, and in Japan.[24,25,26,32]

The role of physical activity has been studied in these studies and all of them found an association between sedentary life style, physical inactivity and increase body weight, and exercise and weight loss.

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