The Impact of Obesity and Weight Reduction Program with Xenical Drug Treatment on Health Status of Obese Adolescent Girls in Saudi Arabia

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Abstract: The present investigation aimed to assess the health problems and diseases associated with obesity in Saudi Arabian adolescent girls, and to evaluate the impact of obesity and weight reduction program with xenical (Orlistat) drug treatment on health status of tested obese adolescent patients. This study was performed on a group of 160 obese adolescent girls, aged 15 – 20 years, attending Physical Rehabilitation and Obesity Treatment Centers at Jeddah, Saudi Arabia. The obese patients group, under investigation, was selected from the adolescent girls who want in the treatment of obesity after obtaining their consent to participate in this study. The present results revealed that most tested obese adolescent girls suffered with a lot of health problems and diseases. The obesity was associated with deterioration of health status for obese subjects. Also, the weight reduction program with xenical (Orlistat) drug treatment caused a significant loss (≤ 0.01) in body weight of obese adolescent girls by 7.42 and 11.35 % after 30 and 60 days respectively. In addition that tested weight reduction program with orlistat treatment exhibited a significant enhancing impact (≤ 0.01) on all tested health status parameters of obese patients ; especially when obese patients engaged with tested weight – reduction program based upon being on a nutritionally balanced , reduced – calorie dietary regimen and practicing the physical activities regularly at least 6 hours a day , as showing by its enhancing effect on liver functions, serum lipid profile , liver and renal functions and by its lowering effect on blood glucose , insulin and LDL - cholesterol levels ; within the reference reported range of all health status items for health individual adolescent girls. Therefore, it is recommended that the obese adolescent girls and women should be orally treated with xenical drug capsules with their obligation by being on a dietary regimen ; a nutritionally balanced , reduced – calorie diet (800 – 1200 calorie) , and practicing the physical activities regularly at least 6 hours a day.
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Key words : Obesity ; Weight reduction program ; Obese adolescent girls ; Liver functions ; lipid profile ; Renal functions ; Health status ; Xenical drug ; Physical activity ; Dietary regimen.

Introduction :

Obesity is defined as the accumulation of fatty tissue to such a level that overall health might be adversely affected and it reflects an imbalance between energy uptake and expenditure that is mediated by behavior (Neeley and Gonzales , 2007 and Knecht *et al*., 2008). The corpulence is not only a disease itself , but the harbinger of others , recognizing that obesity is a medical disorder that leads to many comorbidities (Lavie and Milani , 2003). Obesity is associated with physical and endocrine changes of the body. Adipose tissue synthesizes and releases into the bloodstream peptides and nonpeptide compounds. Like in other organs with endocrine function , disequilibrium o the released hormones affects the homeostasis of other systems throughout the body (Schindler *et al*., 2006 ; Knecht *et al*., 2008 and Nejat *et al*., 2010). Environmental factors including sedentary lifestyle and the consumption of high-energy foods and drinks are thought to play key roles in the development of obesity (Baur & O'Connor , 2004 and Neeley & Gonzales , 2007). Television viewing has been particularly implicated (Robinson , 2001). Dietary intake is also important. High-fat foods and sugar-containing soft drinks have been associated with increases in obesity (Astrup , 2001 and Ludwig *et al*., 2001) , as well as more high fructose corn syrup foods and drinks (Bray *et al*., 2004 and Elliott *et al*., 2002). Lack of physical activity was shown to be associated with obesity is a risk factor (Whitaker *et al*., 1997 and Neeley & Gonzales , 2007).

Overweight and obesity in children and adolescents are a serious issue with many health and social consequences that often continuo into adulthood (Foxhall , 2006 and Rimmer *et al*., 2007). The world wide epidemic of obesity that has emerged with the dawning of the 21st century are a major public health problem , having struck developed

countries as well as those still developing (Wang *et al*., 2005). Globally , at the turn of the century more than 300 million persons were considered obese. This increased prevalence of obesity , in part driven by over-nutrition and physical inactivity , leads to many public health problems (WHO , 2005 and Engelgau *et al*., 2007). The global obesity epidemic is advancing at an ever-accelerating pace with the United States taking an embarrassing lead (NCHS., 2006). Currently , 32% of U.S. adults are obese as defined by a body mass index (BMI) of greater than 30 Kg/m^2 , according to the latest National Health and Nutrition Examination Survey (Ogden *et al*., 2006). It is estimated that by 2015 , 75% of U.S. adults will be overweight or obese (BMI) of greater than 25 Kg/m^2 and 41% will be obese (Wang and Beydoun , 2007). Excess weight has emerged as one of the leading factors in predicting chronic disease and even death in later life (Strauss & Pollack , 2001 and Dietz & Robinson , 2005). Accruing data identify detrimental consequences of early obesity on life time health ; BMI greater than 25 Kg/m^2 at age 18 was associated with an increased risk of premature death in a large cohort from the Nurses' Health Study (Van-Dam *et al*., 2006). National Health and Nutrition Examination Survey (NHANES) studies have been undertaken in the United States since the early 1960s and evaluate many parameters of health and growth. In these studies , children aged 6 to 11 had a prevalence or overweight of only 4.2 % in 1965 compared with 15.8 % in 2002. Those aged 12 to 19 experienced a similar change in prevalence. The prevalence of obesity in adults increased from 13.3 % to 31.3 % , and the prevalence of overweight increased from 45 % to 65.2 % in that same time period (Wang and Beydoun , 2007). In the last two decades , an alarming increase in the prevalence of overweight and obesity has been reported and become a serious public health problem affecting different social and economic classes as well as different age-groups in Saudi Arabia and other Asian countries (Abahussain *et al*., 1999 ; Al-Mousa and Parkash , 2000 ; Sakamoto *et al*., 2001 ; Ramachandran *et al*., 2002 ; Al-Almaie , 2005 and Khalid , 2008)

The primary concern with obesity is the health risks that it imparts on the afflicted person. It has been reported that obesity and overweight have been associated with an increased risk of many diseases and complications include non-insulin-dependent diabetes mellitus (Wang *et al*., 2002 ; Foxhall , 2006 and Brennan *et al*., 2009) , gastro – intestinal problems (Kaats *et al*., 1996 and Knecht *et al*., 2008) , hypertension and hyperlipidemia (Anon , 1998 ; Sanchez – Castillo *et al*., 2005 ; Poirier *et al*., 2006 and Knecht *et al*., 2008) , stroke disease (Suk *et al*., 2003 and Thomas *et al*., 2005) , cerebro – and cardiovascular diseases (Berenson , 2001 and Wilson *et al*., 2002) , dementia (Yaffe *et al*., 2004 and Whitmer *et al*., 2005) , sleep disorders (O'Donnell *et al*., 2000 and Knecht *et al*., 2008) , depression (Faith *et al*., 2002 and Knecht *et al*., 2008) ; cholelithiasis , particularly in women (Bellentani *et al*., 2000 and Knecht *et al*., 2008) , pulmonary and renal diseases (Bray , 2004 and Nejat *et al*., 2010) , psychosocial problems (Everson *et al*., 2002 , Knecht *et al*., 2008 and Brennan *et al*., 2009) , musculoskeletal disolders (Cicuttini *et al*., 2002 and Brennan *et al*., 2009) ; alteration of the endocrine and immune systems (Heber *et al*., 2000 and Knecht *et al*., 2008) , and various cancers including breast , cervical , ovarian , gall bladder , prostate , stomach and colon cancer (Must *et al*., 1999 ; Van den – Brandt *et al*., 2002 ; Call *et al*., 2003 ; Schouten *et al*., 2004 ; Olsen *et al*., 2007 ; Renehan *et al*., 2008 ; Fader *et al*., 2009 and Nejat *et al*., 2010).

Orlistat is approved for weight reduction. It is a hydrogenated derivative of a bacterial lipase inhibitor that blocks pancreatic lipase , thus decreasing intestinal digestion of fat and increasing fecal fat loss. Its efficiency in weight reduction depends on the dietary fat content. It can reduce digestion of up to 30 % of orally ingested triglyceride from a diet containing 30 % fat. The drug was reported to produce a weight loss of about 9 – 10% (Bray and Tartaglia , 2000 and Knecht *et al*., 2008). In secondary prevention studies for weight maintenance , orlistat also attenuated the regain of weight. (Li *et al*., 2005)

The immobile life style and consumption of high – calorie food are the most remarkable risk – factors of the obesity. It is well known that moderate weight loss (5 – 10 %) in overweight and obesity is clinically beneficial in reduction the risk of obesity – related diseases and health hazards , as well as in improving quality of life (Toplak *et al*., 2005 and Knecht *et al*., 2008).

Therefore , this work was performed to assess the obesity – associated diseases and health problems , as well as to determine the impact of obesity and tested weight – reduction program with orally treatment of xenical drug on body weight loss and health status of obese adolescent girls in Saudi Arabia.

Material and Methods :

Xenical drug capsules:

Xenical capsules contained 120 mg of the active ingredient ; orlistat , for each produced on August 2009 by Roch Pharmaceutical Industries Co., Jeddah , Saudi Arabia.

Subjects :

This study was performed on 160 obese adolescent girls , aged 15 – 20 years , which were chosen from whom attending the physical rehabilitation and obesity treatment centers at Jeddah , Saudi Arabia on August 2009. The obese patients , under investigation , were selected from the adolescent girls having a desire to treatment of obesity after obtained their consent to participate in this study. The body mass index (BMI) of selected obese patients was ranged from ≥ 30 to < 40 Kg / m². At the beginning of study , the selected obese patients were kept to weight – reduction program based upon there obligation with being on a dietary regimen ; feeding on a nutritionally balanced , low – calorie diet (800 – 1200 calorie) , and in practicing the physical activities regularly at least 6 hours per day. Whereas , the selected obese patients were divided randomly into two equal main groups composed of 80 obese female patients for each. The first group was not treated with xenical drug capsules , while all individual subjects of the second were orally given one xenical capsule 3 times a day with each main meal ; during the 60 days of studying period. Each main group of the selected obese adolescent girls was divided into 4 unequal subgroups according to their obligation and regularity on the tested weight – reduction program throughout the two experiment periods (30 and 60 days) as follows:

Group 1 : The obese individual patients group was neither being on the tested dietary regimen program nor practicing the physical activities regularly at least 6 hours a day.

Group 2 : The obese individual patients group was being obligation on the tested dietary regimen with no practicing the physical activities regularly at least 6 hours a day.

Group 3 : The obese individual patients group was not being obligation on the tested dietary regimen with practicing the physical activities regularly at least 6 hours a day.

Group 4 : The obese individual patients group was being obligation on the tested dietary regimen with practicing the physical activities regularly at least 6 hours a day.

Lifestyle exposures :

All measures of dietary intake were self – reported using a validated food – frequency questionnaire (Cancer Council of Victoria , 2005 and Brennan *et al*., 2009). The nutritive value and the energy value (calories) of the daily consumed food were calculated by using food composition tables of WHO (1992). The obligation of individuals obese patients was self – reported using a special lifestyle questionnaire which was included information about Leisure – Time Physical Activity (LTPA) , Occupational activity (OA), afternoon siesta, sleeping hours, means of transportation are used for even short – distance, availability of domestic help, and thereupon practicing hours of the physical activities a day were calculated (Cancer Council of Victoria , 2005).

Assessment of health problems and diseases associated with obesity :

The information about health problems and diseases associated with obesity for each patient was collected from the records of the Physical Rehabilitation and Obesity Treatment Centers depending upon the clinical examination and from interviewing the obese patient and his parents about what are the health problems and diseases which is he suffering from?.

Anthropometric measurements :

Body weight of obese girls was measured and recorded using an Avery Beam weighing scale (SECA , Hamburg , Germany) to the nearest 0.1 kg. Standing height of patients was measured and recorded to the nearest 0.1 cm with a stadiometer (SECA , Hamburg , Germany) without shoes. The body mass index (BMI) of obese patients was calculated as weight / height squared (kg / m²) and categorized as being normal < 25 (kg / m²) , overweight 25.0 – 29.9 (kg / m²) or obese ≥ 30 (kg / m²) ; as reported by NHMRC. (2003).

Biochemical analysis :

Biochemical analysis methods were carried out on all selected obese adolescent girls orally treated or not with xenical drug capsules at the beginning of experiment and after 30 and 60 days (the half and the end of this study period).

Serum total lipids , triglyceride (TG) , total cholesterol and high density lipoprotein cholesterol (HDL) levels by using enzymatic colorimetric methods of Knight *et al*. (1972) ; Foster and Dunn (1973) ; Hewitt and Pardue (1973) and Lopes – Virella *et al*. (1997) , respectively. Serum low density lipoprotein cholesterol (LDL) and very low density lipoprotein cholesterol (VLDL) levels were calculated by using the following equations of Lee and Nieman (1996) as follows:

VLDL = Triglycerides (TG) level / 5

LDL = Total cholesterol – (HDL + VLDL)

Atherogenic indices were calculated as reported by Aviram & Fuhrman (1998) and Hollander *et al*. (1998) as : (1). Total cholesterol / HDL. (2). LDL / HDL. (3). (LDL + VLDL) / HDL.

Serum aspartate and alanine aminotransaminase (AST; ALT) and alkaline phosphatase (ALP)

activities were determined by using enzymatic colorimetric methods of Reitman and Frankel (1957) and Haussement (1977) , Respectively.

Serum creatinine , urea , uric acid and glucose levels were estimated by enzymatic colorimetric methods reported by Schirmeister (1964) ; Patton and Crouch (1977) ; While *et al*. (1970) and Trinder (1969) , respectively. Serum insulin level was determined by radioimmunoassay reported by Wilson and Miles (1977).

Statistical analysis:

Statistical analysis for the obtained data was carried out using IBM-PC computer and SAS program as the procedure of ANOVA and Duncan's Multiple Range according to Helwing (1983).

Results and Discussion :

Distribution of the subjects among obesity associated health problems and diseases :-

Obesity is a serious health hazard. It puts extra strain on heart , lungs , muscles , bones and joints , and it increases the susceptibility to diabetes mellitus and hypertension. It increases surgical risks , shortens the life-span , causes psychosocial problems , and is associated with a lot of health problems and diseases.

The obtained data (Table 1) illustrated that the most evident health problem among the obese adolescent girls was osteoarthritis ; bone and joint diseases , which represented 48.1 % of obese subjects , this is possibly as the result of the excess weight on the joints. As also shown in Table (1) , the second predominant health compliant , linked to obesity was pulmonary problems which found in 39.4 % of obese subjects. The present results (Table 1) also showed that the third order of obesity – associated health complaints was gastrointestinal problems , which were exhibited in 31.9 % of selected obese adolescent girls , including gallbladder disease , gallstones , constipation , flatulence , irritable colon , sensation of bloating , anorexia , heart burn , nausea , vomiting , dyspepsia and gastric , and peptic ulcers. In addition , the obtained results (Table 1) also showed that neuropsychiatric problems , cardiovascular disease , hypercholesterolemia , hypertension , dyslipidemia , diabetes , reproductive problems and cancer disease were present in 22.5 , 20 , 18.8 , 16.9 , 21.3 , 17.5 , 14.4 and 10.6 % of the selected obese adolescent girls, respectively. These results are in accordance with those reported by Knecht *et al*. (2008) ; Brennan *et al*. (2009) and Nejat *et al*. (2010).

Table (1) : Distribution of the subjects among obesity - associated health problems and diseases

Health problem and disease	Distribution of obese subjects	
	Number	%
Osteoarthritis	77	48.1
Pulmonary problems	63	39.4
Gastro - Intestinal problems	51	31.9
Neuropsychiatric problems	36	22.5
Cardiovascular (CV) disease	32	20.0
Hypercholesterolemia	30	18.8
Dyslipidemia	27	16.9
Hypertension	34	21.3
Diabetes	28	17.5
Reproductive problems	23	14.4
Cancer diseases	17	10.6

Impact of obesity and weight – reduction program on tested anthropometric measurements of obese subjects :

As shown in Table (2) , the body weight and body mass index (BMI) of untreated obese adolescent girls with xenical drug were increased significantly (at ≤ 0.01) throughout the experiment period (60 days) at different rates affecting by their obligation on tested weight – reduction program based upon being on a dietary regimen and practicing the physical activities regularly at least 6 hours a day. The increment rate was significantly decreased (at ≤ 0.01) with the engagement by the tested former weight reduction program.

The obtained results (Table 2) also illustrated that the body weight and the BMI of obese subjects orally treated with xenical drug ; as a source of orlistat , were significantly decreased (at ≤ 0.01) during the experiment period ; especially in obese subjects group which engaged with weight – reduction program (G4). Whereas , the body weight of the fourth group (G4) of treated subjects with orlistat were decreased by 7.42 ; 11.35 % and its BMI was reduced from 35.1 kg/m² at the beginning of experiment to 31.7 and 29.6 kg/m² ; after 30 and 60 days , respectively.

On the other hand , the height (161.9 – 165.5 m) of all tested obese adolescent girls treated or not with orlistat was not , somewhat , significantly changed during the experiment period. In this respect , Carolynn *et al*. (2000) and Knecht *et al*. (2008) noted that there is no magic way of losing weight and maintaining the reduced weight , but there is a key to it. That key is changing eating habits and doing physical activities regularly at least 3 to 5 times a week for 30 minutes. These results are in accordance with those obtained by Bray and Tartaglia (2000) ;

Toplak *et al*. (2005) ; Garcia *et al*. (2006) ; Totoian *et al*. (2006) and Knecht *et al*. (2008) whom reported that orlistat is an anti – obesity agent , especially for treatment of obese woman. It blocks pancreatic lipase , thus decreasing intestinal digestion and absorption of dietary fat by approximately 30 % and increasing fecal fat loss , and thereupon promotes weight loss. Furthermore, Li *et al*. (2005) and Zanella *et al*. (2006) that orlistat treatment of obese subjects attenuated the regain of body weight and long – term orlistat therapy helped to reduce and maintain a lower body weight. Furthermore , Hutton and Fergusson (2004) suggested that the orally ingestion of 120 mg orlistat 3 times a day is effective for improving the weight loss , health status and quality of life , as well as maintaining the body weight in obese patient.

Table (2): The most important anthropometric measurements of different tested obese adolescent girls.

Variables	Anthropometric Measurement (M±SE*)								
	Initial	After 30 days				After 60 days			
		G1	G2	G3	G4	G1	G2	G3	G4
Untreated with Orlistat Drug:-									
Weight (kg)	92.1^{a}	96.9^{bc}	93.8^{ab}	95.3^{b}	93.7^{ab}	98.2^{c}	95.6^{b}	97.7^{c}	96.1^{bc}
	± 3.84	± 3.9	± 4.26	± 3.13	± 3.97	± 5.18	± 4.41	± 5.05	± 4.89
Height (cm)	161.9^{ab}	160.3^{a}	160.9^{a}	161.7^{ab}	162.2^{ab}	160.6^{a}	161.3^{ab}	162.3^{ab}	162.8^{b}
	± 7.07	± 6.61	± 8.14	± 7.56	± 7.99	± 6.73	± 9.86	± 7.90	± 9.05
BMI (kg/m²)	35.1^{a}	37.7^{b}	36.2^{ab}	36.9^{ab}	35.6^{a}	38.1^{b}	36.7^{b}	37.1^{ab}	36.3^{ab}
	± 2.19	± 2.63	± 1.99	± 2.01	± 2.73	± 3.07	± 1.81	± 3.28	± 2.97
Treated with Orlistat Drug:-									
Weight (kg)	92.1^{cd}	94.2^{d}	89.5^{c}	93.6^{d}	84.8^{b}	97.9^{c}	86.1^{b}	91.7^{cd}	81.2^{a}
	± 3.84	± 3.19	± 2.76	± 3.93	± 2.60	± 4.06	± 2.99	± 3.56	± 2.81
Height (cm)	161.9^{a}	162.4^{a}	162.8^{ab}	163.1^{ab}	163.5^{ab}	162.7^{a}	163.5^{ab}	163.9^{ab}	165.5^{b}
	± 7.07	± 5.98	± 6.21	± 6.67	± 7.39	± 6.71	± 7.83	± 5.95	± 7.70
BMI (kg/m²)	35.1^{d}	35.7^{de}	33.8^{c}	35.2^{d}	31.7^{b}	37.0^{e}	32.2^{bc}	34.1^{cd}	29.6^{a}
	2.19	± 2.43	± 1.77	± 2.09	± 1.81	± 2.63	± 1.86	± 2.09	± 1.83

M±SE*: *Mean ± Standard error of each anthropometric measurement of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.* ***G1****: Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day.* ***G2****: Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day.* ***G3****: Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***G4****: Patients group was being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.*

Impact of obesity and tested weight – reduction program with Xenical drug treatment on serum lipid profile fractions of obese subjects :

From the obtained results (Table 3) , it could be noticed that serum lipids profile fractions for untreated obese adolescent girls with xenical drug treatment were increased significantly (≤ 0.01) during the experimental period (60 days) , with the exception of high density lipoprotein cholesterol (HDL) which was exhibited a significant reduction (≤ 0.05) throughout the same periods. The engagement with both being on tested dietary regimen and values of serum lipids profile fractions of obese subjects were much higher than the normal ranges of practicing physical activity regularly caused a marked improvement in serum lipids profile of obese subjects as illustrated in subgroups No.4 (G4). The mean these fractions for health individual adolescent girls reported by Murray *et al*. (1993) and Anon (1998) , except the high density lipoprotein cholesterol (HDL) values which were within the normal values (70 – 170 mg/dL).

Table (3): Serum lipids profile fractions (mg / dL) of different tested obese adolescent girls.

Variables	Serum lipid profile fractions (M±SE*) as mg/dL									N R •
	Initial	After 30 days				After 60 days				
		G1	G2	G3	G4	G1	G2	G3	G4	
Untreated with Orlistat Drug:-										
Total lipids	832.6^{a} ± 31.3	996.8^{e} ± 37.1	917.3^{c} ± 39.9	982.9^{de} ± 27.3	832.5^{a} ± 30.1	1064.7^{f} ± 42.3	954.2^{d} ± 37.4	1020.8^{ef} ± 41.6	873.1^{b} ± 33.5	650: 800
Triglycerides	201.8^{b} ± 7.72	264.5^{d} ± 8.99	232.0^{c} ± 7.87	258.5^{d} ± 8.30	190.9^{a} ± 6.85	297.0^{f} ± 9.16	269.7^{d} ± 8.33	283.5^{e} ± 9.01	226.3^{c} ± 7.80	65 : 150
Total Cholesterol	322.8^{b} ± 11.6	363.5^{e} ± 13.3	346.1^{d} ± 12.5	360.7^{e} ± 10.9	327.3^{bc} ± 10.6	362.4^{e} ± 9.98	331.9^{c} ± 9.24	359.4^{e} ± 10.2	311.7^{a} ± 8.85	140: 230
HDL - Cholesterol	102.5^{g} ± 4.71	83.9^{d} ± 3.83	92.2^{f} ± 4.09	88.1^{e} ± 3.94	93.8^{f} ± 5.10	70.1^{a} ± 3.63	77.5^{bc} ± 4.09	74.6^{b} ± 5.19	79.9^{c} ± 4.31	70 : 170
LDL - Cholesterol	179.9^{a} ± 6.83	226.7^{e} ± 7.40	207.5^{d} ± 5.31	220.9^{f} ± 7.25	195.3^{c} ± 6.98	232.9^{e} ± 8.16	200.5^{cd} ± 6.32	228.1^{e} ± 7.05	186.5^{b} ± 6.09	60 : 130
VLDL - Cholesterol	40.4^{b} ± 1.79	52.9^{de} ± 2.31	46.4^{c} ±1.96	51.7^{d} ± 2.44	38.2^{a} ± 1.86	59.4^{g} ± 2.71	53.9^{e} ± 1.83	56.7^{f} ± 2.09	45.3^{c} ± 1.77	-
Treated with Orlistat Drug:-										
Total lipids	832.6^{e} ± 31.3	809.2^{e} ± 40.8	721.7^{c} ± 27.2	769.3^{d} ± 31.8	691.9^{bc} ± 29.4	743.1^{cd} ± 41.0	636.5^{a} ± 29.8	701.2^{bc} ± 34.1	693.6^{b} ± 37.8	650: 800
Triglycerides	201.8^{a} ± 7.72	173.5^{e} ± 9.07	136.5^{d} ± 6.31	164.0^{f} ± 7.55	126.1^{c} ± 7.08	188.5^{f} ± 9.12	112.0^{b} ± 5.98	159.5^{e} ± 6.70	108.0^{ab} ± 5.49	65 : 150
Total Cholesterol	322.8^{d} ± 11.6	256.5^{bc} ± 12.9	249.2^{b} ± 10.7	258.8^{c} ± 10.3	219.2^{a} ± 9.48	316^{f} ± 11.4	270.6^{d} ± 12.2	281.9^{e} ± 11.64	258.7^{c} ± 10.1	140: 230
HDL - Cholesterol	102.5^{b} ± 4.71	94.7^{a} ± 4.39	119.0^{de} ± 5.64	107.6^{c} ± 3.99	125.3^{f} ± 4.72	117.9^{d} ± 3.66	130.3^{g} ± 6.01	121.7^{e} ± 5.28	146.3^{h} ± 6.75	70 : 170
LDL - Cholesterol	179.9^{g} ± 6.83	127.1^{e} ± 5.20	102.9^{c} ± 5.16	118.4^{d} ± 6.07	68.7^{a} ± 3.99	160.4^{f} ± 5.21	117.9^{d} ± 4.87	128.3^{e} ± 5.11	90.8^{b} ± 3.93	60 : 130
VLDL - Cholesterol	40.4^{g} ± 1.79	34.7^{e} ± 2.31	27.3^{c} ± 1.29	32.8^{de} ± 1.95	25.2^{b} ± 1.36	37.7^{f} ± 2.03	22.4^{a} ± 1.61	31.9^{d} ± 2.04	21.6^{a} ± 1.38	-

M±SE*: *Mean ± Standard error of each biological parameter in serum of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.* ***G1:*** *Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day.* ***G2:*** *Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day.* ***G3:*** *Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***G4:*** *Patients group was being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***N R •:*** *Normal Range* (mg/dL) *for health adolescent girls reported by Murray et al. (1991) and Anon (1998).*

With regards orally treated obese adolescent girls with orlistat, as a source of orlistat , as shown in Table (3) , serum lipid profile of treated – obese subjects with orlistat was improved significantly (≤ 0.01) ; especially in subgroup No.4 (G4) which obligated with the tested weight – reduction program based on being a dietary regimen and practicing the physical activities regularly. As illustrated in Table (3) , serum total lipids , triglyceride , total cholesterol , low density lipoprotein cholesterol (LDL) , very low density lipoprotein cholesterol (VLDL) values of the obese adolescent girls were decreased significantly (≤ 0.01) during the experiment period (60 days) , compared to the corresponding untreated – obese subjects. On the contrary , the HDL – cholesterol values of obese patients were increased significantly (≤ 0.05). The alteration rates in serum lipid fractions of obese subjects treated with orlistat were varied depending upon their engagement with the tested weight – reduction program , lipid fraction itself and the period of experiment. It is worth to note that the mean values of serum lipid fractions for treated –

obese subjects with orlistat after 30 and 60 days of treatment were within the normal values reported for health individual adolescent girls. These finding are in agreement with those found by Sanchez – Castillo *et al*. (2005) and Knecht *et al*. (2008) who reported that overweight and obesity are associated with elevation the serum total lipids , triglyceride and the LDL concentrations values , as well as with lowering the HDL ; especially in adolescent girls. Also , these results are in a quite accordance with those obtained by Bray and Tartagila (2000) ; Bettina *et al*. (2001) ; Mulls *et al*. (2001) and Knecht *et al*. (2008) who reported that orlistat is a bacterial lipase inhibitor that blocks pancreatic lipase , thus decreased intestinal digestion and absorption of fat and increasing fecal fat derivatives from a diet containing 30 % fat. Therefore, orlistat therapy is associated with improving lipid loss. It can decrease the digestion and absorption of up to 30 of orally ingested triglyceride and cholesterol metabolism processes and serum lipid profile in obese patients as shown by a greater decline in serum total lipids and cholesterol, triglyceride and LDL levels.

Table (4): Atherogenic indices of different tested obese adolescent girls.

Variables	Atherogenic Index (M±SE*)									Risk ratio•
	Initial	After 30 days				After 60 days				
		G1	G2	G3	G4	G1	G2	G3	G4	
Untreated with Orlistat Drug:-										
Total Cholesterol / HDL	3.15^{a}	4.33^{e}	3.75^{c}	4.09^{d}	3.49^{b}	5.17^{g}	4.28^{de}	4.82^{f}	3.90^{cd}	3.5 : 5.5
	± 0.29	± 0.36	± 0.31	± 0.27	± 0.23	± 0.40	± 0.34	± 0.37	± 0.31	
LDL / HDL	1.76^{a}	2.70^{e}	2.25^{c}	2.51^{d}	2.08^{b}	3.32^{g}	2.59^{e}	3.06^{f}	2.33^{cd}	1.4 : 3.5
	± 0.18	± 0.23	± 0.18	± 0.20	± 0.16	± 0.29	± 0.26	± 0.29	± 0.21	
(LDL + VLDL) / HDL	2.15^{a}	3.33^{e}	2.75^{c}	3.09^{d}	2.49^{b}	4.17^{g}	3.28^{e}	3.82^{f}	2.90^{c}	-
	± 0.21	± 0.27	± 0.21	± 0.26	± 0.18	± 0.31	± 0.23	± 0.30	± 0.19	
Treated with Orlistat Drug:-										
Total Cholesterol / HDL	3.15^{e}	2.71^{d}	2.09^{b}	2.41^{c}	1.75^{a}	2.86^{d}	2.08^{b}	2.32^{c}	1.77^{a}	3.5 : 5.5
	± 0.29	± 0.23	± 0.17	± 0.21	± 0.18	± 0.25	± 0.17	± 0.23	± 0.19	
LDL / HDL	1.76^{e}	1.34^{d}	0.86^{b}	1.10^{c}	0.54^{a}	1.36^{d}	0.90^{b}	1.05^{c}	0.62^{a}	1.4 : 3.5
	± 0.18	± 0.13	± 0.08	± 0.12	± 0.07	± 0.14	± 0.07	± 0.11	± 0.05	
(LDL + VLDL) / HDL	2.15^{f}	1.71^{e}	1.09^{d}	1.41^{c}	0.75^{a}	1.68^{d}	1.08^{b}	1.32^{c}	0.77^{a}	-
	± 0.21	± 0.16	± 0.12	± 0.15	± 0.09	± 0.17	± 0.11	± 0.13	± 0.09	

M±SE**: Mean ± Standard error of each atherogenic index of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.* ***G1**: Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day.* ***G2**: Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day.* ***G3**: Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***G4**: Patients group was being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***Risk ratio •:Risk ratio of atherogenic index for obesity associated diseases and health problems reported by Vazquez – Freire *et al*. (1996) and Hollander *et al*. (1998)

From the results represented in Table (4), it could be showed that all determined atherogenic indices; including total cholesterol / HDL, LDL / HDL and (LDL + VLDL) / HDL , for untreated obese adolescent girls with orlistat were increased significantly (≤ 0.01) with prolonging the tested period of experiment. The atherogenic indices' values were within the risk ratios for obesity – associated diseases and health hazards. The increment rates of atherogenic indices in untreated patients by orlistat were decreased with their obligation and attendance by the tested weight – reduction program as shown in subjects' subgroups No.4 (G4).

Therefore , the risk of obesity – associated decreases and health hazards were elevated during the span – life of obese subjects ; especially with no obligation by being on tested dietary regimen and practicing physical activities regularly (Lavie and Milani , 2003 ; Knecht *et al*., 2008 and Brennan *et al*., 2009).

Concerning orlistat – treated obese patients as illustrated in Table (4) , the orally orlistat treatment caused a significant reduction and improvement (≤ 0.01) in the values of all atherogenic indices for the risk factors of obesity – associated diseases and health problems in obese adolescent girls. The highest reduction rates in the values of atherogenic indices were observed in the individuals obese patients engaged by the tested weight – reduction program as evident in obese patients' subgroup No.4 (G4). Whereas , all atherogenic indices of different orlistat – treated obese patients' groups were much lower than those causing the increased risk of obesity – associated diseases and health problems. Therefore , the orally treatment of obese patients with orlistat (120 mg – capsule 3 times a day with the main diets) with attendance by their being on tested weight – reduction program caused a greater reduction in the risk of many diseases and health problems associated with obesity in adolescent girls and therefore improved their health status , and the quality of life in obese patients. These results are in agreement with those found by Vazquez – Freire *et al*. (1996) ; Hollander *et al*. (1998) ; Bray (2004) ; Hutton and Fergusson (2004) ; Shaheen (2007) and Knecht *et al*. (2008) who reported that orlistat treatment for overweight and obese patients caused a significant reduction (≤ 0.01) in atherogenic indices and therefore a greater improvement in the risk factors' numbers of coronary heart disease (CHD) and other diseases , and health problems associated with overweight and obesity.

Impact of obesity and tested weight – reduction program with Xenical drug treatment on liver and renal functions in the serum of obese subjects :

The liver functional enzymes (AST , ALT and ALP) activity in serum are most frequently measure for diagnosis of liver diseases particularly infective hepatitis , alcoholic cirrhosis , biliary obstruction , toxic hepatitis and liver cancer. The former liver functional enzymes are not secreted into the blood , therefore any elevation in their values in blood is resulted from leakage of liver damage cells and from the disturbance and dysfunctions in liver functional enzymes activity. In addition, the liver functional enzymes (AST, ALS and ALP) activity in human and experimental animals are considered the excellent markers of liver dysfunctions and damages that probably associated with overweight and obesity or caused by exposure to the toxic substances or some drugs and therapeutic substances. Therefore, they are considered the good successful criterion for health status of obese adolescent girls (Murray *et al*., 1993 and Sabuncu *et al*., 2003).

As shown in Table (5), the obesity was associated with hyper activity of liver functional enzymes; aspartate and alanine amino transferases (AST; ALT) and alkaline phosphatase (ALP), during the tested experimental period (60 days), as illustrated in untreated obese adolescent girls with orlistat. The hyperactivity extent of liver functional enzymes in the serum of untreated subjects with orlistat was less with their obligation by tested weight – reduction program based upon being on tested dietary regimen and practicing physical activities regularly at least 6 hours a day. Whereas , the liver functional enzymes' activities in obese patients' serum were much higher throughout the period of experiment than the normal ranges for healthy individuals adolescent human females. This finding is in accordance with those reported by Hickman *et al*. (2004) and Knecht *et al*. (2008) who mentioned that overweight and obesity were associated with an exceptional elevation of liver functional enzymes activity in serum of adult women.

The obtained results (Table 5) also exhibited that the orally orlistat drug treatment caused a high significant improvement (≤ 0.01) in liver functional enzymes (AST , ALT and AST) activity in serum of obese patients ; especially with their engagement by attending the tested weight – reduction program , as shown in the fourth group of obese adolescent subjects. Where ; AST , ALT and ALP activities were reduced from 42.8 , 36.2 and 97.7 Unit / L at the beginning of experiment period to 21.6 , 17.8 and 51.2 Unit / L at the end of experiment period (after 60 days) for the orlistat – treated subgroup (G4) which engaged by the attendance with the tested weight – reduction program ; respectively. The functional liver enzymes ' activities for orlistat – treated obese patients , which engaged with the tested weight – reduction program , were within the normal values range for health individuals adolescent human females reported by Murray *et al*. (1993) and Anon (1998). The improvement effect of orlistat drug treatment on liver functions of obese subjects may be due to the protection effect of orlistat against the oxidation of lipids ; especially the LDL – cholesterol in liver and plasma , and to its reduction effect on the heart disease risk by improving blood profile of lipid constituents with decreasing the LDL – cholesterol level and lowering the blood pressure (Gacob , 1994 ; Sabuncu *et al*., 2003 ; Hickman *et al*., 2004 and Knecht *et al*., 2008) , as well as to its enhancement effect on metabolic processes (Demidova *et al*., 2006).

With regards the renal functions in the serum of obese patients as affected by obesity and tested weight – reduction program , it worth to mention that the normal levels' range of kidney functions in the serum of health individuals adolescent girls are 2.6 –

6.0, 10 – 50 and 0.6 – 1.1 mg / dL for uric acid , urea and creatinine , respectively (Murray *et al*., 1993 and Anon , 1998). The exceptional elevation of the former levels into two times or more in mammalian blood is resulted from kidney damage cells, disturbance and dysfunctions (Murray *et al*., 1993 and Jacob, 1994).

From the data presented in Table (6), it could be observed that the renal functions; serum uric acid, urea and creatinine values of untreated obese patients with orlistat were elevated exceptionally during the experiment period (60 days). The highest elevation rate was observed in the individual obese patients of subgroup No.1 (G1) whom was neither being on the tested dietary regimen nor practicing the physical activity regularly at least for 6 hours a day. The renal function values for all untreated obese subjects with orlistat drug were much higher than the normal values for health adolescent human female. These data are in accordance with those found by Vasanthi *et al*. (2003) ; Shaheen (2007) and Knecht *et al*. (2008).

Table (5): Liver functions (Unit / L Serum) of different tested obese adolescent girls.

Variables	Liver function (M±SE*) as (Unit / L Serum)									N R •
	Initial	After 30 days				After 60 days				
		G1	G2	G3	G4	G1	G2	G3	G4	
Untreated with Orlistat Drug:-										
AST	42.8^{a}	54.3^{e}	48.7^{c}	51.5^{d}	45.9^{b}	68.2^{g}	52.8^{de}	56.6^{f}	47.9^{bc}	0 : 30
	± 3.35	± 4.57	± 3.90	± 4.73	± 3.48	± 5.15	± 4.92	± 5.04	± 3.62	
ALT	36.2^{a}	46.9^{e}	41.4^{c}	43.1^{cd}	38.6^{bc}	61.8^{f}	44.3^{d}	60.7^{f}	39.5^{b}	0 : 34
	± 2.19	± 3.44	± 2.78	± 2.96	± 3.01	± 4.99	± 3.70	± 4.12	± 2.88	
ALP	97.7^{a}	129.2^{e}	106.5^{b}	120.8^{d}	112.3^{c}	143.1^{g}	128.0^{e}	135.9^{f}	121.1^{d}	24 : 90
	± 6.02	± 7.87	± 5.92	± 7.76	± 6.20	± 8.04	± 6.96	± 7.58	± 6.09	
Treated with Orlistat Drug:-										
AST	42.8^{g}	40.5^{f}	31.9^{cd}	36.3^{e}	27.8^{b}	39.4^{f}	30.7^{c}	33.2^{d}	21.6^{a}	0 : 30
	± 3.35	± 3.91	± 2.67	± 3.09	± 1.66	± 3.72	± 2.80	± 2.69	± 1.33	
ALT	36.2^{e}	33.9^{h}	26.1^{d}	30.6^{f}	21.4^{b}	32.7^{g}	23.9^{c}	28.5^{e}	17.8^{a}	0 : 34
	± 2.19	± 2.74	± 1.87	± 1.99	± 1.23	± 2.18	± 1.53	± 1.91	± 1.26	
ALP	97.7^{h}	81.1^{f}	69.6^{d}	75.2^{e}	60.7^{c}	87.3^{g}	56.5^{b}	62.9^{c}	51.2^{a}	24 : 90
	± 6.02	± 6.38	± 5.10	± 5.64	± 4.79	± 5.90	± 4.82	± 5.07	± 4.54	

M±SE: Mean ± Standard error of each liver function in serum of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.* ***G1**: Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day.* ***G2**: Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day.* ***G3**: Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***G4**: Patients group was being on tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***N R •**: Normal Range* **(***Unit / L Serum***)** *for health adolescent girls reported by Murray et al. (1991) and Anon (1998).*

Concerning orlistat – treated obese subjects , as evident from the results recorded in Table (6) , the tested renal functions for orlistat – treated adolescent girls were improved significantly (≤ 0.01) as shown from a high decrement of the values of these functions , when compared with those of the corresponding subgroups of untreated obese patients with orlistat. The highest improvement in renal functions was found in the individuals obese subjects 'subgroup No.4 (G4) which engaged by their attendance with being on the tested weight – reduction program. Whereas , serum uric acid , urea and creatinine levels for orlistat – treated obese patients were decreased from 7.23 , 61.6 and 1.32 mg / dL at the beginning of experiment to 4.83 , 27.5 and0.73 mg / dL at the end of experiment (after 60 days) , within the normal levels of the health individuals adolescent girls , respectively.

These results are in agreement with those reported by Demidova *et al*. (2006) and Shaheen (2007) whom reported that xenical ; orlistat , treatment was beneficial for patients to correct obesity because it improved metabolic processes and therefore kidney and liver functions.

Table (6): Renal functions (mg / dL) of different tested obese adolescent girls.

Variables	Renal function (M±SE*) as (mg/dL)									N R •
	Initial	After 30 days				After 60 days				
		G1	G2	G3	G4	G1	G2	G3	G4	
Untreated with Orlistat Drug:-										
Uric acid	7.23^{a}	8.86^{c}	7.91^{b}	8.29^{bc}	7.65^{ab}	9.72^{d}	8.54^{bc}	8.80^{c}	7.97^{b}	2.6: 6.0
	± 0.38	± 0.51	± 0.43	± 0.36	± 0.42	± 0.54	± 0.47	± 0.39	± 0.31	
Urea	61.6^{a}	79.2^{de}	71.5^{c}	73.5^{c}	68.1^{b}	87.6^{f}	76.9^{d}	81.2^{e}	72.4^{c}	10 : 50
	± 4.10	± 5.69	± 4.81	± 5.74	± 4.99	± 6.07	± 5.18	± 6.64	± 5.06	
Creatinine	1.32^{a}	1.77^{f}	1.60^{d}	1.67^{de}	1.43^{b}	1.90^{g}	1.72^{e}	1.85^{fg}	1.59^{c}	0.6 : 1.1
	± 0.14	± 0.18	± 0.15	± 0.12	± 0.16	± 0.18	± 0.15	± 0.13	± 0.11	
Treated with Orlistat Drug:-										
Uric acid	7.23^{e}	7.05^{de}	5.97^{bc}	6.82^{d}	5.30^{ab}	6.71^{d}	5.40^{b}	6.29^{c}	4.83^{a}	2.6: 6.0
	± 0.38	± 0.42	± 0.29	± 0.33	± 0.25	± 0.28	± 0.21	± 0.30	± 0.19	
Urea	61.6^{g}	54.9^{f}	41.5^{d}	48.6^{e}	32.1^{b}	46.8^{e}	34.3^{c}	43.1^{d}	27.5^{a}	10 : 50
	± 4.10	± 3.76	± 3.87	± 4.01	± 2.63	± 3.96	± 2.80	± 4.06	± 2.18	
Creatinine	1.32^{f}	1.19^{e}	0.92^{c}	1.08^{d}	0.86^{bc}	1.02^{d}	0.84^{b}	0.90^{bc}	0.73^{a}	0.6 : 1.1
	± 0.14	± 0.12	± 0.09	± 0.11	± 0.09	± 0.07	± 0.08	± 0.07	± 0.06	

M±SE*: *Mean ± Standard error of each renal function in serum of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.* ***G1****: Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day.* ***G2****: Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day.* ***G3:*** *Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***G4:*** *Patients group was being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day.* ***N R •:*** *Normal Range (mg / dL) for health adolescent girls reported by Murray et al. (1991) and Anon (1998).*

Impact of obesity and tested weight – reduction program with Xenical drug treatment on serum glucose and insulin levels of obese subjects :

As shown in Table (7) , there was a significant increase (≤ 0.01) in serum glucose level of obese adolescent girls throughout the experiment period (60 days) at different rates affecting by their obligation with tested weight – reduction program based upon being on the tested dietary regimen and practicing the physical activities regularly at least 6 hours a day. The lowest increment rate in serum glucose level was observed in subgroup of obese individual patients No.4 (G4) which engaged by their attendance with selected weight – reduction program. Serum glucose level for untreated obese patients with orlistat ranged from 154.2 to 194.5 mg / dL ; that much higher than the normal levels for healthy obese individuals adolescent girls which ranged from 70 to 140 mg / dL (Murray *et al*., 1993 and Anon , 1998). These results are well in line with those obtained by Foxhall (2006) and Knecht *et al*. (2008) whom reported that obesity is associated with much elevation in serum glucose level in obese adult human as well as with non – insulin dependent diabetes mellitus disease.

The obtained data (Table 7) also illustrated that orlistat orally treatment of obese adolescent girls caused a significant reduction (≤ 0.01) in their serum glucose level during the experiment period (60 days) when compared to patients no treated with orlistat , especially in those engaged by tested weight – reduction program as shown in subgroup No.4 (G4). The serum glucose level for orlistat – treated obese subjects was ranged from 86.1 to 124.5 mg / dL throughout the experiment period (60 days) ; within the normal value (70 – 140 mg / dL) for health individuals adolescent girls reported by Murray *et al*. (1993) and Anon (1998). This observation is in agreement with those of Hollander *et al*. (1998) ; Demidova *et al*. (2006) and Shaheen (2007).

With regards serum insulin level of obese subjects , as illustrated in Table (7) , the insulin level in serum of untreated obese patients with orlistat was increased significantly (≤ 0.01) during the experiment period (60 days) from 11.8 mg / dL at the beginning of experiment to 12.7 – 17.8 mg / dL , affecting by

Table(7): Serum glucose and insulin levels (mg/dL) of different tested obese adolescent girls.

Variables	Tested Variable level (M±SE*) as (mg/dL)									N R •
	Initial	After 30 days				After 60 days				
		G1	G2	G3	G4	G1	G2	G3	G4	
Untreated with Orlistat Drug:-										
Glucose	154.2^{a}	186.8^{e}	174.2^{d}	167.7^{bc}	161.9^{b}	194.5^{f}	191.8^{f}	182.3^{e}	169.5^{c}	70 : 140
	± 9.65	± 11.21	± 10.69	± 8.43	± 9.10	± 11.38	± 10.53	± 9.10	± 8.92	
Insulin	11.8^{a}	14.2^{d}	12.7^{b}	13.5^{c}	16.3^{f}	15.9^{ef}	13.6^{c}	15.4^{e}	17.8^{g}	9 : 12
	± 0.51	± 0.76	± 0.59	± 0.72	± 0.87	± 0.69	± 0.62	± 0.78	± 0.63	
Treated with Orlistat Drug:-										
Glucose	154.2^{g}	124.5^{f}	112.1^{d}	98.8^{c}	90.4^{b}	116.2^{e}	101.5^{e}	93.7^{b}	86.1^{a}	70 : 140
	± 9.65	± 8.08	± 6.44	± 5.10	± 4.82	± 7.19	± 5.74	± 6.01	± 5.86	
Insulin	11.8^{f}	11.2^{e}	10.3^{d}	10.6^{d}	9.1^{bc}	10.6^{d}	8.9^{b}	9.5^{c}	8.3^{a}	9 : 12
	± 0.51	± 0.47	± 0.36	± 0.41	± 0.29	± 0.43	± 0.27	± 0.36	± 0.29	

M±SE*: Mean ± Standard error of either glucose level or insulin level in serum of obese patients' group throughout experiment period (in the same row) having different superscripts are significantly varied.
G1: Patients group was neither being on the tested dietary regimen nor practicing physical activities regularly at least 6 hours a day. ***G2***: Patients group was being on the tested dietary regimen with no practicing physical activities regularly at least 6 hours a day. ***G3:*** Patients group was not being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day. ***G4***: Patients group was being on the tested dietary regimen with practicing physical activities regularly at least 6 hours a day. ***N R •:*** Normal Range (mg / dL) for health adolescent girls reported by Murray et al. (1991) and Anon (1998).

the experimental period and the obligation of patients with their being on tested weight – reduction program. Serum insulin levels for obese patients were much higher than the normal values for health individuals adolescent girls (9 – 12 mg / dL) reported by Murray *et al*. (1993) and Anon (1998) . These results are in accordance with those reported by Hickman *et al*. (2004) and Heilbronn *et al*. (2006).

The results presented in Table (7) also showed that serum insulin levels for orlistat – treated obese patients were reduced significantly (≤ 0.05) during the experiment period , on the contrary to untreated ones. The highest reduction in or controlling on insulin secretion into the blood of obese subjects was observed throughout tested experimental period in obese patients' subgroups No.4 (G4) which engaged by their obligation and attendance with the tested weight – reduction program. Whereas , the serum insulin level for orlistat – treated subjects was ranged from 8.3 to 11.2 mg / dL ; within the normal values (9 – 12 mg / dL) reported for health individuals adolescent girls. These observations are in agreement with those noticed by Hickman *et al*. (2004) and Heilbronn *et al*. (2006) who reported that weight – reduction program with orlistat treatment caused a significant decrease in serum insulin of obese patients and other benefits included improvement in quality of life , amelioration of dyspnea and chest pain , and reduction in number of risk leave days. While , these results are in a disagreement with those obtained by Shaheen (2007) who reported that the serum insulin levels in obese experimental animals did not significantly affected by orlistat treatment.

Conclusion and Recommendation :

It can be concluded that over consumption of high calorie – foods and the lack of practicing the physical activity regularly at least 6 hours a day were the two important factors in the development of obesity among the adolescent girls. Furthermore , the attendance of obese patients by the tested weight – reduction program with the orally treatment of xenical drug (orlistat) for 60 days caused the loss of body weight of obese adolescent girls by about 11.35 % with high enhancement the health status parameters such as serum lipid profile , renal and liver functions and glucose , and insulin levels.

Therefore , it is recommended that : (1) – Women whom are mothers of today need to be targeted for health education programs related to an awareness of appropriate body weight , healthy life style and obesity control. (2) – Adequate facilities for healthy foods teaching , and physical activity programs must be introduced by the different specific institutions. (3) – The obese adolescent girls and women should be orally treated with xenical drug capsules with their obligation and attendance by being

on a dietary regimen ; a nutritionally balanced , reduced – calorie diet (800 – 1200 calorie) , and practicing the physical activities regularly at least 6 hours a day.

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