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in obese& overweight groups was higher compared to control group. Also Hae et.al mentioned that Obesity is associated with an increased risk of impaired glucose tolerance and that An HbA (1c) value of 40 mmol/mol (5.8%) should be used as a screening tool to identify children and adolescents with impaired glucose tolerance. (Hae et.al, 2012). Also a study done among school children in Sri lanka concluded that The mean HbA1c was significantly higher obese children compared to others and that the prevalence of pre- diabetes and diabetes among overweight and obese school children was significantly high (Kisokanth, 2021).

In the current study, IL- 6 level was elevated among the obese and overweight groups and also they were positively correlated with BMI.T hese are similar to the results of another study done among Egyptian children by Ola et.al, whose study revealed a significantly higher serum level of IL- 6 in obese children as compared to those of control (Ola et.al, 2017). Also, the same was previously reported in a study of Filippo et.al, 2015. Also, in this study IL- 1 level was higher in obese and overweight children. This comes in agreement with another study which stated that Compared with their normal weight counterparts, overweight and obese adolescents had lower serum Interleukin- 10 but higher TNFα and Interleukin-1 concentrations. (Chang et.al; 2013). Although nonsignificant, there was positive correlation between IL1 andIL6 levels and MBP. This was also stated by Syrenicz et.al who explained that IL- 6 promotes the proliferation of vascular smooth muscle tissue, an early component of hypertension and atherosclerosis (Syrenicz et.al, 2006).

Conclusion:

Obese and overweight children have high levels of IL- 1 and IL- 6. These are closely related with Mean blood pressure, blood sugar and lipid profile. Healthy dietary habits and physical exercise helps to lower their level and decrease metabolic complications.

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Table (4) Comparison between groups as regards interlukin 1 and interlukin 6 (pg/ml) levels

		Obesity Group (n= 30)	Overweight Group (n= 30)	Control Group (n= 30)	Test Value	P- Value
Interlukin 1 (pg/ml)	Mean± SD	572.87± 65.80	423.00± 105.80	29.48± 0.27C	H: 71.031	<0.001**
	Range	450- 660	260- 600	29.1- 29.9		
Interlukin 6	Mean± SD	39.28± 1.94	35.42± 3.60	35.68± 3.68	F: 13.881	<0.001**
	Range	35.3- 41.7	31.2- 40.9	31.2- 40.9		

Table (5) Comparison between exercise and non- exercise as regards laboratory data in patients group (obese and overweight group).

	Exercises					
	Yes (n= 21)		No (n= 39)			
	Mean	±SD	Mean	±SD		
Interlukin 1 (pg/ml)	412.86	89.62	543.74	101.64	U: −4.951	<0.001**
Interlukin 6	34.93	2.84	38.66	3.07	T: −4.605	<0.001**
Random Glucose (mg/ml)	135.71	13.81	129.62	20.94	T: 1.199	0.235
HbA1C	5.63	0.63	6.01	0.68	T: −2.105	0.400*
HDL	48.57	12.46	52.69	12.29	U: −1.233	0.223
LDL	125.00	26.83	126.03	30.80	T: − 0.128	0.898
Serum Triglycrides	201.43	50.70	215.13	50.59	T: −1.000	0.322
Serum Cholesterol	197.14	45.32	208.72	50.17	T: −0.881	0.382

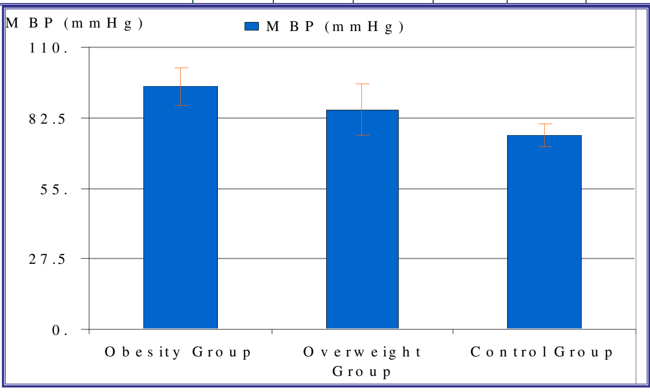

Fig. (1) Comparison between groups as regards MBP.

Discussion:

In the current study, obesity and overweight were more prevelant in the boys, 63.3% and 60.0% of the obese and overweight groups were boys respectively. A study done In Myanmar, also stated ver weight and obesity were more prevalent in boys (Kelishadi R. 2007). Also, The prevalence of both overweight and obesity was 15.9% and 13.7% among 6- to 11- years old Turkish boys and girls (Pirincci et.al. 2010). On the other hand, a study done in Nigeria found that overweight was higher among girls 20.3% than boys 16.2%, whereas a relatively higher incidence of obesity was noted among the boys 3.5% (Danladi et.al; 2012). A study done in Finland by (Vuorela et.al; 2009) stated that the prevalence of overweight and obesity in 5- year- old children was higher among girls, while at the age of 12 years, it was higher among boys.

In this study, exercise performance was more among the control group and least among the obese group. Also, Hassink et.al, stated that obesity in children has been associated with lower levels of physical activity and fitness (Hassink et.al, 2008). Moreover, there was higher frequency of junk food intake among the obese and overweight groups, while, vegetables and fruit intake was higher among the control group. Similarly, a study done in india showed that increased intake of fried foods and artificially sweetened drinks is directly linked to high body mass index and obesity in children (Goel et.al; 2013). In a study done in Riyadh, it was also noted that 72.5% of the overweight or obese students ate fast food at least 4 times/ week, and the other 15.9% were taking fast food 1- 3 times/ week (Monira et.al, 2014). However, Yasmin and Emine stated that regardless of obesity status, a significant portion of the daily calorie needs of children from any socioeconomic level is met with junk food consumption(Yasmin and Emine, 2022). Other studies also stated that normal weight children eat vegetables, fruits and berries more often than overweight children (Kristiansen et.al, 2012), and the consumption of vegetables, cooked meals and eating dinner are negatively correlated with overweight in children (Lissner et.al, 2012). Also, this inverse association between BMI and the increasing intake of vegetables in (6- 7) years old and increasing intake of fruit, vegetables, pulses and nuts in adolescents was stated by Clare et.al 2018. However, some studies have reported that obese adolescents are more likely to eat healthy diet than adolescents who have normal weight (Herman et.al, 2014) and consume sweetened beverages less frequently than non- obese children/adolescents (Natalija et.al, 2015).

In this study, high caloric intake was associated with obese and overweight children. Also, Ebbelling et.al stated that overweight children ate more than lean participants (1860 vs 1458) kcal) (Ebbelling et.al; 2014). However, (Klunder et.al; 2011) showed that normal- weight children had higher intake of calories compared with obese children, explaining that it may involve genetic factors that either predispose or protect against obesity. In the current study, presence of pallor was more among obese children and this comes in agreement with many other studies. Both, Malak et.al and Gozkaman et.al concluded that anaemia is inversely associated with overweight and obesity. (Malak et.al, 2018 and Gozkaman et.al 2015). In contrast to the current study, Shimizu et.al. studies have reported that, High BMI had significantly higher hemoglobin levels than those with a Low BMI (Shimizu et.al, 2014).

In this study, mean blood pressure was higher in obese and overweight groups. In agreement with our results is a study which stated that overweight/obese children and gain in waist circumference were associated with hypertension in chinese children (Bin et.al 2016). Also, Sofia stated that there is a strong association between adiposity, overweight and obesity, and hypertension (Sofia, 2018). In addition to association between high BMI and waist- height ratio and increased blood pressure. (Sarah et.al 2018).

In the current study, obese and overweight children had higher LDL level, serum triglycerides and serum cholesterol and lower HDL level. Similar to our study was another study conducted by Mohamed et.al among egyptian children (Mohamed et.al, 2022). Also, a study carried out in obese and overweight children in Mexico demonstrated similar results with elevated LD Land triglyceride levels and decreased HDL levels (Ruy et.al, 2014). Also, in this study, random glucose and HbA1c were higher serum cholesterol in obese group, followed by overweight and control groups. On the other hand, HDL level was highly statistically significant higher in the control group compared the obese and overweight groups.

Comparing groups as regards interlukin 1 and interlukin 6 (pg/ml) levels showed highly significant higher interlukin1 (pg/ml) and interlukin 6 levels in obese and overweight groups compared to control group. They were highest in the obese group followed by overweight group and was lowest in the control group as shown in table (4).

Correlation between Interlukin 1 (pg/ml), Interlukin 6 and BMI [wt/ht^2] with different parameters, among patients group "overweight& obesity group was done. There was a highly statistically significant positive correlation between interlukin 1 (pg/ml) and interlukin 6 (pg/ml), BMI, serum triglycerides, serum cholesterol, weight for height (z) score, weight for age (Z) score, waist circumference (Z) score, skin fold thickness z- score, and caloric intake quantity/day with p- value (p< 0.001). Also, there was a statistically significant positive correlation between interlukin 1 (pg/ml) and HbA1C, LDL and Frequency of vegetables and fruit intake per week, with p- value (p<0.05). On the other hand there was positive, but non significant correlation between IL- 1 level and MBP. As for IL- 6 level, there was highly statistically significant positive correlation between it and with interlukin 1 (pg/ml), BMI [wt/ht^2], Weight for height (Z) score, Weight for Age (Z) score, Waist circumference (Z) score, Skin fold thickness (Z) score and Caloric Intake Kcal/day with p- value (p<0.001). In addition to statistically significant positive correlation with LDL level, serum triglycrides and Serum Cholesterol, with p- value p<0.05. Again there was positive, but non significant correlation between IL- 6 level and MBP. Concerning BMI, there was highly statistically significant positive correlation between BMI and interlukin 1 (pg/ml), interlukin 6, MBP (mmHg), HbA1C, S.triglycrides, Serum Cholesterol, Weight for height (Z) score, Weight for Age (Z) score, Waist circumference (Z) score, Skin fold thickness (Z) score and Caloric Intake Kcal/day with p- value p<0.001. Also, there was a statistically significant positive correlation between BMI and LDL level and Height for age (Z) score, with p- value p<0.05. While there was a statistically significant negative correlation between BMI and Frequency of junk food intake per week with p- value <0.05.

Comparison between exercise and non- exercise groups as regards laboratory data in patients group (obese and overweight group) showed highly statistically significant higher mean level of Interlukin 1 (pg/ml), Interlukin 6 in non exercise group compared to exercise group with p- value <0.001. Also there was statistically significant higher HbA1C in the non exercise group compared to the exercise group with p value0.040 as shown in table (5).

Table (1) Comparison between groups as regards exercise history, history of dietary control and pallor

		Obesity Group (n= 30)	Overweight Group (n= 30)	Control Group (n= 30)	x^2	P- Value
Exercise	Yes	6 (20.0%)C	15 (50.0%)B	30 (100.0%)A	39.910	<0.001**
	No	24 (80.0%)	15 (50.0%)	0 (0.0%)		
History Of Dietary Control	No	27 (90.0%)	12 (40.0%)	17 (56.7%)	16.544	<0.001**
	Yes	3 (10.0%)C	18 (60.0%)A	13 (43.3%)B		
Pallor	No	3 (10.0%)	27 (90.0%)	16 (53.3%)	38.508	<0.001**
	Yes	27 (90.0%)A	3 (10.0%)C	14 (46.7%)B		

Table (2) Comparison between groups as regards skin fold thickness, dietetic history and analysis

Dietetic History		Obesity Group (n= 30)	Overweight Group (n= 30)	Control Group (n= 30)	Test Value	P- Value
Caloric Intake Kcal/Day	Mean± SD	2969.0± 337.9A	2340.0± 407.4B	1170.0± 91.5C	F: 259.98	<0.001**
	Range	2200- 3400	1590- 2850	1000- 1300		
Protein (gm/kg)	Mean± SD	2.31± 0.22	2.41± 0.38	2.26± 0.24	F: 2.14	0.123
	Range	2- 2.7	2- 3	2- 2.7		
Frequency of Fat intake per week	Mean± SD	5.17± 1.02	5.00± 1.02	4.60± 0.89	F: 2.66	0.076
	Range	3- 7	4- 7	3- 6		
Frequency of junk food intake per week	Mean± SD	5.67± 0.84A	6.60± 0.67A	3.37± 1.19B	H: 63.17	<0.001**
	Range	4- 7	5- 7	1- 5		
Frequency of vegetables and fruit intake per week	Mean± SD	2.90± 0.66B	2.70± 1.02B	6.03± 0.76A	H: 62.36	<0.001**
	Range	1- 4	2- 5	5- 7		

Table (3) Comparison between groups as regards laboratory data

Laboratory Data		Obesity Group (n= 30)	Overweight Group (n= 30)	Control Group (n= 30)	Test Value	P- Value
Random Glucose (mg/ml)	Mean± SD	134.50± 19.58A	129.00± 18.02A	82.93± 7.56B	F: 94.299	<0.001**
	Range	95- 155	100- 155	76- 98		
HbA1C	Mean± SD	6.32± 0.38A	5.43± 0.63B	4.52± 0.28C	F: 118.071	<0.001**
	Range	5.7- 6.9	4.7- 6.5	4- 4.8		
HDL	Mean± SD	49.00± 13.35B	53.50± 11.15B	60.50± 3.31A	H: 15.688	<0.001**
	Range	35- 75	30- 65	55- 65		
LDL	Mean± SD	136.33± 27.48A	115.00± 27.39B	116.33± 18.10B	F: 7.014	<0.001**
	Range	90- 190	85- 170	100- 155		
Serum Triglycrides	Mean± SD	248.17± 36.21A	172.50± 30.70B	145.67± 15.47C	F: 101.994	<0.001**
	Range	180- 295	140- 250	120- 165		
Serum Cholesterol	Mean± SD	236.83± 33.46A	172.50± 38.95B	144.67± 26.09C	F: 60.624	<0.001**
	Range	170- 290	130- 255	100- 175		

Also qualitative variables were presented as number and percentages. Data were explored for normality using Kolmogorov- Smirnov and Shapiro- Wilk Test.

The following tests were done:

1. A one- way analysis of variance (ANOVA) when comparing between more than two means& Post Hoc test: Least Significant Difference (LSD) was used for multiple comparisons between different variables.
2. Kruskall Wallis test: for multiple- group comparisons in non-parametric data& Mann Whitney (U) test: for two- group comparisons in non- parametric data.
3. Independent- samples t- test of significance was used when comparing between two means.
4. Chi- square (x^2) test of significance was used in order to compare proportions between qualitative parameters.
5. Spearman's rank correlation coefficient (rs) was used to assess the degree of association between two sets of variables if one or both of them was skewed.
   a. Positive= Increase in the independent variable leads to increase in the dependent variable.
   b. Negative= Increase in the independent variable leads to decrease in the dependent.
6. Scatter plot: a graph in which the values of two variables are plotted along two axes, the pattern of the resulting points revealing correlation present.
7. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p- value was considered significant as the following:.
8. Probability (P- value): P- value< 0.05 was considered significant, P-value <0.001 was considered as highly significant, and P- value >0.05 was considered insignificant.

Results:

The total number of the study population was 90 patients divided equally into 3 groups, obese, overweight and control group (30 in each group). The study was conducted on a wide age group ranging from 2.3 to 15 years, (mean age of 7.08± 3.14 years SD). There was no statistically significance difference between the 3 groups as regards age distribution, it ranged between 3.2- 12 with Mean± SD 7.71± 2.62 in the obese group, 2.3- 15 with Mean± SD 7.48± 3.32 in the overweight group and 2.5- 12 with Mean± SD 6.06± 3.29 in the control group with p value 0.087. Regarding Sex distribution, 19 were males (63.3%) and 11 were females (36.7%) in the obese group, 18 were males (60.0%) and 12 (40.0%) were females in the overweight group and 17 were males (56.7%) and 13 were females (43.3%) in the control group with no statistically significant difference with p value 0.870.

On comparing the 3 groups as regards exercise history, history of dietary control and pallor shown in table (1). There was highly statistically significant higher frequency of exercise performance in control group, followed by overweight group and lowest was in obese group. Additionally, there was a highly statistically significant higher frequency of dietary control trials in overweight group, followed by control group and the lowest frequency was in the obese group. On the other hand, there was highly statistically significant higher number of patients with pallor in obese group, followed by control group and the lowest number was in the overweight group.

Comparison between groups as regards dietetic history and analysis. There was a highly statistically significant higher caloric intake in obese group, followed by overweight group compared to control group However, there was no statistically significant difference in the protein intake. Also, there was a highly statistically significant higher frequency of junk food intake per week in the obese and overweight groups, compared to the control group. On the other hand, frequency of vegetables and fruit intake per week was highly statistically significant higher in the control group, followed by the overweight group and lowest in the obese group. However, there was no statistically significant difference in the frequency of fat intake per week between the groups. This is shown in table (2).

Comparing between groups as regards anthropometric measurements showed a highly statistically significant higher waist circumference (Z) score, weight for age (Z) score, weight for height (Z) score and skin fold thickness (Z) score in obese group, followed by overweight group and the lowest was in the control group, with p- value (p<0.001). Waist (Z) score ranged between 2- 3, 1.7- 2 and 0.7- 1.2 with Mean± SD 2.48± 0.24, 1.87± 0.11 and 1.00± 0.18 in obese, overweight and control groups respectively. As for weight for age z- score it ranged between 2.2- 28 with Mean± SD 2.51± 0.21 in obese group, 1.6- 1.9 with Mean± SD 1.76± 0.10 in overweight group and 1- 1.3 with Mean± SD 1.12± 0.10 in the control group. Concerning, weight for height z- score, it was highest in the obese group and ranged between 2- 2.7 with Mean± SD 2.33± 0.22, followed by 1.5- 1.9 with Mean± SD 1.70± 0.13 in the overweight group then lowest in the control group with range (1- 1.3) and Mean± SD 1.12± 0.10. Skin fold thickness (Z) score ranged between (2.2- 3), (2- 2.4) and (0.8- 1.2) with Mean± SD 2.51± 0.29, 2.07± 0.14 and 0.98± 0.11 in the obese, overweight and control groups respectively.

Also, there was highly statistically significant higher Mean Blood Pressure (mmHg) in obese group, followed by overweight group and the lowest was in control group, with p- value (p< 0.001). It ranged between 80- 105 with Mean± SD 94.73± 7.28 in the obese group, compared to 75-103 with Mean± SD 85.60± 9.99 in the overweight group and 70- 80 with Mean± SD 75.67± 4.27 in the control group as shown in figure (1).

Comparison between groups as regards laboratory data is shown in table (3). There was a statistically significant higher mean value of random glucose in obese& overweight groups compared to control group. It was highest in the obese group then overweight group and lowest in the control group. Additionally, there was a highly statistically significant higher mean value of HbA1c in obesity group, followed by overweight group and the lowest value in control group. Concerning lipid profile, there was a highly statistically significant higher LDL level, serum triglycerides and collagen disorders, with cancer treated within the last year and who were receiving iron supplements, corticosteroids or immunosuppressive drugs were excluded.

Ethical Considerations:

An informed consent was obtained from caregivers before enrollment in the study according to the Faculty of Medicine, Ain Shams University Research Ethical Committee. The participants had the right to withdraw from the study at any time.

The following was done to the three groups:

1. Detailed Dietetic History: Full dietetic history including 24 hours diet recall which includes breakfast, snack, lunch and dinner. History of bad habits of eating (eating while watching TV, intake of high caloric diet, excessive intake of sweet or fast food intake). In addition to, history of practicing sports, diet control& different systems affection and medication history.
2. Physical Examination:
   a. General examination to exclude systemic or syndromic causes of obesity.
   b. Vital Signs: Heart rate, blood pressure, respiratory rate and temperature.
   c. Anthropometric Assessment:
      - Body Weight (Wt) was measured using a mechanical weight scale ZT- 160. The patient stood on the center of the platform bare footed and was asked not to touch or lean on anything and was wearing the least possible clothes. The measurement was taken to the nearest 0.1 kg and was plotted on growth curves to 2010 CDC growth charts.
      - Body Height (Ht) was measured to the nearest 0.1 centimeter using a calibrated stadiometer. Again the patient stood barefooted on the base plate in an upright straight position, with parallel feet, and his heels, buttocks, shoulders and back of the head touching the stadiometer and the arms were hanging extended on side and the head is held erect. The measuring arm was took down to the subject`s head. The red cursor gave the accurate reading of the height which was taken to the nearest millimetre and plotted on growth curves to 2010 CDC growth charts.
      - Body mass index (BMI) was calculated: Weight (in kilograms)/ Height² (in meters).
      - Waist circumference was measured using a flexible tape measure in a horizontal position parallel to the ground, touching the skin, following the contours without compressing the underlying tissue. It was positioned midway between lower rib and the iliac crest. The tape was located evenly around the waist at this position. Reading had been taken to the nearest millimeter at the end of normal expiration.
      - Skin fold thickness: Using Holtain Skinfold Caliper- The triceps skinfold was measured over the triceps muscle at the midpoint of the upper arm. In addition to it being the site at which skinfold measurements are commonly taken, it provides information on the quantity of extremity fat and a valuable indicator of obesity. Data collected was plotted and compared to the CDC charts.
3. Laboratory Tests: Sampling; Six milliliters (6mL) of venous blood were withdrawn from all subjects under complete aseptic condition, after (8- 10) hours fasting. They were divided into two vacutainers:
   a. Two milliliters (2ml) of blood were collected in a sterile k3 EDTA vacutainer for assay of HbA1c.
   b. Four milliliters (4ml) of blood were collected in a sterile plain vacutainer, and were left to clot for 30 minutes. Serum was separated by centrifugation at 4000 rpm for 10 minutes. Separated serum was used for the immediate assay of glucose, TC, TG, HDL- C, LDL- C, Interleukin- 6 level (IL- 6), and Interleukin- 1 level (IL- 1). Hemolysed samples were discarded.

Analytical Methods:

1. HbA1c: Glycated hemoglobin (HbA1c) was assayed by turbidimetric inhibition immunoassay and was done using Roche/Hitachi Cobas® c501 System (Roche Diagnostics International Ltd; Switzerland).
2. Serum chemistry tests: Assay of Serum glucose- Triglyceride (TG)- Low density lipoprotein (LDL- C)- High density lipoprotein- Cholesterol- Glycosylated Hemoglobin (HbA1c). All were performed using Beckman Coulter AU480 Autoanalyzer (Beckman Coulter Inc; USA).
3. Interleukin- 1: Serum IL- 1 was measured by the Finecare™ IL- 1 Rapid Quantitative Test (Catalog No. W251). The assay is based on fluorescence immunoassay technology, using a Sandwich immunodetection method. When the sample is added into the sample well of the cartridge, the fluorescence- labeled detector IL- 1 antibodies on the sample pad bind to IL- 1 present in blood specimens forming immune complexes. As the complexes migrate on the nitrocellulose matrix of the test strip by capillary action, the complexes of detector antibodies and IL- 1 are captured to IL- 1 antibodies that were immobilized on the test strip. Thus, the higher levels of IL- 1 present in a blood specimen, the higher complexes accumulated on the test strip. The signal intensity of fluorescence of detector antibodies reflects the amount of captured IL- 1. Each Finecare™ IL- 1 Rapid Quantitative Test cartridge contains internal control that satisfies routine quality control requirements. The internal control was performed each time a patient sample was tested. The control indicates that the test cartridge was inserted and read properly by the Finecare™ FIA system.
4. Interlukin- 6: Serum IL- 6 was measured by Finecare™ IL- 6 Rapid Quantitative Test same as Interlukin- 1.

Statistical Analysis:

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc; Chicago, Illinois, USA). The quantitative data were presented as mean± standard deviation and ranges.

Introduction:

According to The Center for Disease Control and Prevention (CDC) overweight in children is defined as BMI falling between the 85th and 95th percentile for sex and age on the body mass index (BMI) growth chart. Obesity is defined as exceeding the 95th percentile for sex and age for BMI (Ogden et.al; 2010). Various organizations have advocated different methods of classifying childhood obesity. CDC considers BMI to be the best tool for following up children's weight, which is calculated using the child's weight and height, then plotted on appropriate age and sex charts (CDC, 2011 and AAP, 2011). The World Health Organization (WHO) does not prefer a method. WHO has developed several charts and tables to be used in assessment of child's weight status. These include weight- for-age, weight for height, BMI for age, and triceps skin fold for age, among others (WHO, 2011). The same guidelines as those of the CDC are used by The American Academy of Pediatrics (AAP) to define childhood obesity for children older than 2 years, and states that BMI is an acceptable method for assessment of obesity (AAP, 2011).

The prevalence of overweight and obesity among children and adolescents aged 5- 19 has risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls: in 2016, 18% of girls and 19% of boys were overweight. While just under 1% of children and adolescents aged 5- 19 were obese in 1975, more 124 million children and adolescents (6% of girls and 8% of boys) were obese in 2016. (Pischon et.al; 2008). Overweight and obesity are linked to more deaths worldwide than underweight. Globally there are more people who are obese than underweight, this occurs in every region except parts of sub- Saharan Africa and Asia. 39 million children under the age of 5 were overweight or obese in 2020. Over 340 million children and adolescents aged 5- 19 were overweight or obese in 2016. (WHO, 2021).

Every system in the child's body can be harmfully affected by obesity including the lungs, liver, heart, muscles, bones, kidneys and digestive tract. It evens affects the hormones controling puberty and blood sugar (Johnson et.al; 2015). Childhood obesity causes social and emotional stress. Also, being obese in a young age will result in having more chance to be an obese adult, with increasing risks of disease, disability, and premature death later in life (Asnawi Abdullah et.al; 2010).

Adipose tissue is now considered the main origin of inflammatory mediators recognized and as it is the source of a large number of cytokines and bioactive mediators, known as the adipokines, it is even considered an active endocrine organ. These adipokines are thought to be involved in a many systemic reactions associated with hemostasis, lipid metabolism, blood pressure regulation, insulin sensitivity, and angiogenesis. (Trayhurn and Wood, 2005). Large number of adipokines linked to inflammation are produced by the white adipose tissue, including adiponectin, IL- 1b, IL- 6, TNF- a, MCP- 1, and MIF (Shoelson et.al; 2006).

There is an increasing believes and proves that obesity is characterized by a condition of chronic low- grade inflammation (Anderson et.al; 2017). This is suggested by the increased expression, production, and release of a large number of inflammation- related adipokines, including TNF- α, IL-6, PAI- 1, haptoglobin, and leptin in obese individuals (Trayhurn and Suliman 2015). Changes in the adipokines levels and several cytokines are believed to contributein the low grade inflammation taking place in the addipose tissue (AT) and resulting in the development of many secondary diseases such as MetS, insulin resistance (IR), diabetes, arterial hypertesion and asthma (Newson et.al. 2014).

In obesity, IL- 6 is mainly produced by the production by the adipocytes in the adipose tissue, however they only contribute to a small percentage of the total IL- 6 released by the adipose tissue because non fat cells in the adipose tissue matrix and stream vascular cells can also produces it. Visceral adipose tissue explants release more IL- 6 than do explants of subcutaneous (sc) adipose tissue (Fain et.al; 2014). This release is closely regulated by other adipokines and activities in the adipose tissue such as leptin or stress and by hormones including insulin, catecholamines, and glucocorticoids (Vincennati et.al; 2012). Plasma IL- 6 in healthy normal weight patients was approximately 1 pg/ml, while, in obese, but otherwise healthy, patients was approximately 3 pg/ml (Kern et.al; 2011). The release of IL- 6 into the systemic circulation in a higher level in the obese subjects supports the possible role of IL- 6 as a systemic regulator of body weight and lipid metabolism (Sopasakis et.al; 2014).

IL- 1 is a pro- inflammatory cytokine which is chronically elevated in the obese children. IL- 1 affects the serum glucose levels through induction of proinsulin production. Low concentrations will stimulate the production of proinsulin, resulting in decreasing serum glucose levels, on the other hand, high levels will suppress proinsulin production and induce β- cell apoptosis, which is postulated to be a major contributor to the development of type II diabetes (Herder et.al; 2009).

Adiponectin, the anti- inflammatory adipokine, can inhibit IL- 6 production accompanied by induction of the anti- inflammatory cytokines IL- 10 and IL- 1 receptor antagonist (Pietsch et.al; 2016).

In this study, we aimed to measure the levels of IL- 1 and IL- 6 as pro-inflammatory cytokines in obese and overweight children and to assess its association with the levels of blood pressure and lipid profile.

Methodology:

This was a case control study conducted in the Nutrition Clinic at The Pediatric Hospital of Ain Shams University during the period from April 2020 to June 2022. The study included 90 patients with age ranging between (6- 12) years. They were divided into 3 groups:

- Group (1): 30 children with obesity. Obesity was diagnosed if BMI is more than 95% for age and sex.
- Group (2): 30 children with overweight. Overweight was diagnosed if BMI is more than 85% for age and sex.
- Group (3): 30 apparently healthy children with BMI between 25 and 74% served as controls.

Patients who were suffering from diabetes mellitus, asthma, renal affection, endocrinal disorders, with disorders associated with inflammation such as inflammatory bowel disease, autoimmune or

Role of pro-inflammatory cytokines Interleukin-1 and Interleukin-6 as systemic regulators of overweight and obesity in children

Ahmed G. Samy,[2] Howaida H. El- Gebaly,[1] Ashraf H. Shaalan,[2] Ehab K. Emam,[3] Salwa R. Elbatrawy,[2] Marwa A.Abdel Wahed,[4] Heba E. Elkholy.[3]

[1]Dean of Faculty of Postgraduate Childhood Studies Ain Shams University

[2]Biological Anthropology, Medical Division National Research Centre

[3]Pediatrics, Faculty of Medicine Ain Shams University

[4]Clinical Pathology Faculty of Medicine Ain Shams University

أحمد سامي،[٢] هويدا حسنى الجبالي،[١] أشرف شعلان،[٢] إيهاب إمام،[٣] سلوى البطراوي،[٢] مروة عبدالواحد،[٤] هبة الخولي [٣]

[١]كلية الدراسات العليا للطفولة جامعة عين شمس

[٢]الأنثروبولوجيا البيولوجية القسم الطبي المركز القومي للبحوث

[٣]طب الأطفال كلية الطب جامعة عين شمس

[٤]الباثولوجيا الإكلينيكية كلية الطب جامعة عين شمس

Summary

Background: There is increasing prevalence of overweight and obesity among children nowadays. This is associated with increased evidence that obesity is characterized by low-grade inflammation indicated by the increase release of in-flammatory adipokines. These adipokines are related directly to the occurrence of the obesity complications.

Aim: The aim was to detect the levels of IL-1 and IL-6 as pro-inflammatory cytokines in obese and overweight children and to assess its asso-ciation with the levels of blood pressure and lipid profile.

Subjects& Methods: This case control study was conducted on 90 patients who were divided equally into 3 groups (30 obese, 30 overweight and 30 control). All subjects were subjected to full dietetic history, general examination in-cluding measuring blood pressure, full anthropometry including weight, height, waist circumference, skin fold thickness and BMI was calculated and laboratory investigations including Serum glucose- Triglyceride (TG)- Low density lipopro-tein (LDL)- High density lipoprotein (HDL)- Cholesterol- Glycosylated Hemo-globin (HbA1c)- Interleukin-1 and Interleukin-6.

Results: The study was conducted on a wide age group ranging from 2.3 to 15 years, with no statistically significance difference between the 3 groups as regards age distribution. 54 (60%) were males and 36 (40%) were females with no signifi-cant difference between the groups as regard sex distribution. Caloric intake and frequency of eating junk food were statistically significantly higher among obese group, while vegetables intake was significantly higher in the control group. Mean blood pressure and pallor were also significantly higher in the obese group followed by the overweight group then the control. As for laboratory results , there was statistically significant higher mean value of random glucose, HbA1c ,LDL level, serum triglycerides and serum cholesterol and lower HDL level in obese group.

Conclusion: Obese and overweight children have high levels of pro-inflammatory cytokines , which are closely related with serum lipid level and HbA1c.

Keywords: Obesity, Interleukin-1, Interleukin -6, serum lipids.

دور السيتوكينات المصاحبة للالتهابات انترلوكن ١ وانترلوكن ٦ كمنظمين لزيادة الوزن والسمنة فى الاطفال

الخلفية: هناك انتشار متزايد لزيادة الوزن والسمنة بين الاطفال في الوقت الحاضر. ويرتبط ذلك بزيادة الأدلة على أن السمنة يصاحبها التهاب منخفض الدرجة يمكن ربطها بزيادة إطلاق الأديبوكينات الالتهابية حيث ترتبط هذه الأديبوكينات مباشرة بحدوث السمنة الزائدة.

الهدف: كان الهدف هو الكشف عن مستويات على أنها سيتوكينات منظمة للالتهابات عند الأطفال الذين يعانون من السمنة المفرطة وزيادة الوزن وتقييم ارتباطها بمستويات ضغط الدم وتحليل الدهون الكلي فى الدم.

المنهجية: أجريت دراسة مراقبة الحالة هذه على ٩٠ مريضا تم تقسيمها بالتساوي إلى ٣ مجموعات (٣٠ يعانون من السمنة المفرطة و٣٠ يعانون من زيادة الوزن و٣٠ أطفال أصحاء). خضع جميع الأشخاص لتدقيق النظام الغذائي العام، وفحص عام بما في ذلك القياس لضغط الدم، والقياسات الأنثروبومترية الكاملة بما في ذلك الوزن والطول ومحيط الخصر وسمك الجلد ومؤشر كتلة الجسم والفحوصات المخبرية بما في ذلك الجلوكوز الثلاثية- الدهون- البروتين الدهني منخفض الكثافة- البروتين الدهني عالي الكثافة لكوليسترول- الهيموغلوبين الغليكوزيلاتي- إنترلوكين- ١ وإنترلوكين- ٦.

النتائج: أجريت الدراسة على فئة عمرية واسعة تتراوح بين ٢٫٣ إلى ١٥ سنة، مع عدم وجود فرق دلالة إحصائية بين ٣ مجموعات فيما يتعلق بالتوزيع العمري ٥٤ (٦٠%) من الذكور و٣٦ (٤٠%) من الإناث دون فرق كبير بين المجموعات فيما يتعلق نوع الجنس، فيما يتعلق بتناول السعرات الحرارية وتناول الطعام: كانت الوجبات السريعة أعلى إحصائيا بشكل ملحوظ بين مجموعة البدناء ، في حين أن الخضروات كان المدخول أعلى بكثير في مجموعة الاطفال الاصحاء. متوسط ضغط الدم والشحوب كانتا أيضا أعلى بكثير في مجموعة السمنة تليها مجموعة زيادة الوزن. أما بالنسبة للنتائج المخبرية، كان هناك ارتفاع ذو دلالة إحصائية متوسطة فى قيمة الجلوكوز العشوائي ، الهيموغلوبين الغليكوزيلاتي، مستوى البروتين الدهني منخفض الكثافة، الدهون الثلاثية في الدم والكوليسترول في الدم وانخفاض مستوى البروتين الدهني عالي الكثافة في مجموعة السمنة.

الكلمات المفتاحية: السمنة، إنترلوكين- ١ ، إنترلوكين- ٦، دهون مصل الدم.

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