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Visfatin as a Biomarker of Obesity in Iraqi Adolescences with Metabolic Syndrome

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Abstract

The present study aims to study the correlation between visfatin levels and metabolic syndrome in Iraqi obese adolescence (with and without metabolic syndrome) and its relation with other studied biochemical parameters**.** Sixty obese adolescences were depended in this study (with and without metabolic syndrome), compared with (30) non-obese children as control group. This study was done in the period from April 2020 until the end of December 2020, in the National Diabetes Centre/Mustansiriya University**,** Baghdad/Iraq**.** There were no significant differences in age, height, waist circumferences (WC), and diastolic blood pressure (DBP) in the patients' groups. In contrast, a significant increase differs ($p<0.05$) was recorded in the values of both weights, body mass index, systolic blood pressure (SBP), and fasting blood sugar in the adolescent group with metabolic syndrome compared with the adolescent group without metabolic syndrome. The study results showed a highly significant increase difference ($P<0.001$) to the levels of insulin, homo stasis assessment insulin resistance, triglyceride, high density lipoprotein, and visfatin in patients' groups when compared with control group. The prevalence of metabolic syndrome between adolescence in developing countries is rising, and this is largely driven by increasing obesity rates. Elevated serum visfatin level in adolescence with metabolic syndrome when compared without metabolic syndrome and give a positive correlation between visfatin level with metabolic syndrome factors in adolescence, therefore, visfatin may be considered a risk indicator for heart diseases and diabetes in these individuals in old age.

Keywords*: Metabolic Syndrome, Obesity, Adolescence, Visfatin*

1. *Introduction*

Metabolic Syndrome (MS) is a group of escalating health problems that occur in adults, children, and adolescents as a result of obesity. Where these individuals are suffering from many collectively risks such as Type2 diabetic mellitus (T2DM), dyslipidemia, hypertension, and cardiovascular disease (CVD) [1]. In 2018 the results of the World Health Organization reports published on Iraq indicate an increase in the rate of obesity (7.9%) and overweight (25.3%) among adolescents aged between (13-18) years [2]. pathogenesis of Mets occurs when some biomolecules adipocytokines levels were raised in our bodies [3]. Adipocytokines are synthesized in white adipose tissue and have biological activity that regulates both metabolic and energy balance [4]. Adipocytokines are also associated with chronic inflammatory conditions and dysmetabolism. White fat tissue is well known in the physiological and pathological processes, as well as in the formation of proteins and hormones as a specialized organ within the endocrine gland, and it is also associated with inflammation and immunity[5].Collectively, adipose tissue releases a variety of active substances, such as leptin, adiponectin, and visfatin, which have a major role in inflammatory or anti-inflammatory activities, also they have closely related to the risk of developing obesity and Mets [4,6,7,8]. Visfatin, is another name for nicotinamide phosphoribosyl transferase (NAMPT), a pre-Bcell colony-enhancing factor involved in early β-cell. Visfatin have about (52 kDa) protein that is created from connective or visceral adipose tissue, and leukocytes also produce this substance. The role of visfatin as pro-inflammatory was seemed to be mediated by the insulin signalling pathway which can be considered

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the substance most associated with fat accumulation and the cause of obesity [9,10]. The bad effect of the visceral adipose tissue is more harmful than the fatty tissue under the skin to release a group of substances that cause the accumulation of fat irregularly, causing obesity [11]. A study focused on the high rate of visfatin formation, especially in visceral tissues, compared to those found under the skin [11] and explain that it is possible to control these rates by reducing weight in obese individuals [12].Visfatin inhibits the release of glucose in the liver by impacting similar to the insulin model , and increases the absorption of glucose in adipocytes and muscle cells. A study found a close association between high levels in the body and increased synthesis of triglycerides and their accumulation in adipocytes [13]. The elimination of visceral adipose tissue improves insulin sensitivity [11]. The role of serum visfatin in the formation of obese and its association with insulin resistance in diabetes establishment is inexplicable. This topic opens doors to understand the association between adolescent obesity and metabolic syndrome.

The present study aims to study the relationship between visfatin levels and metabolic syndrome in Iraqi obesity adolescence (with and without metabolic syndrome) and its relation with other studied biochemical parameters**.** Also, to study whether these obese adolescence with metabolic syndrome are exposed to the risk of developing heart diseases and diabetes mellitus in old ages.

2. Materials and methods

Sixty obese adolescence were participated in this study (30 with MS and 30 without MS), in addition to 30 non-obese adolescence as a control group. The age ranges for all study groups were (12-16) years. This work was done in the period from April 2020 until the end of December 2020. This study was attended at the National Diabetes Centre/ Mustansiriyah University.

Ethical approval

2.1. Criteria for Metabolic syndrome

All adolescence with MS were collected according to international diabetes federation (IDF)criteria [14]. (MS) was defined as finding three or five following criteria (Age; 12 to < 16 years):

1) Obesity (WC ≥ 90th) percentile and BMI ≥ 30 Kg/m^2 for sex and age.
2) High fasting blood glucose > (100 mg/dl).
3) Hypertension; SBP ≥ 130 mmHg or DBP ≥ 85 mmHg.
4) High triglyceride levels TG ≥ (150 mg/dl),
5) Low HDL-C levels < (40 mg/dl).

3.2. Measurements: Anthropologic Assessment:

1.- Determination of Blood Pressure: according to the guidelines of WHO[15].

2- Determination of Body Mass Index (BMI): calculated accordeing to equation (1)[16].

(BMI= mass (kg)/(height (m))^2……equation(1)

3.2.1 Biochemical Parameters Assessment:

All biochemical assessments were estimated enzymatically using the colorimetric following the protocol of the available kits supplied by BIOLABO/French.

1- Fasting blood glucose (FBG): Serum FBG is measured according to Trinder method [17].

2- Serum Triacylglycerol (TG): The method is depended on the enzymatic hydrolysis of triglyceride to glycerol and (FFA) by (LPL)[18].

3- Serum High Density Lipoprotein-Cholesterol (HDL-C):

Serum HDL is directly determination using the accelerator selective detergent methodology [19].

4- Insulin levels: Serum insulin levels were determination by the DRG insulin ELISA kit [20]., and calculated insulin resistancefrom equation:

HOMA-IR= {[fasting insulin (μU/ml)] × [fasting glucose (mmol/l)]}/22.5[21]

5- Serumvisfatin levelwas measured by ELISA kit (Biosource/USA).

2.2. Statistical analysis

The statistical work was depended to using Microsoft office excel 2010 work sheet. Statistically considered highly significance and significant according to the p-value at P<0.01 and P<0.05, respectively. Pearson's connection coefficient (r) is used for explaining the relationship between all studied parameters.

2.3. Results and discussion

The unregulated and hyperinflation of lipids is termed obesity or overweight, such a condition that leads to life-threatening health risks. A body mass index (BMI) of over 25 is considered overweight, and over thirty (30) is considered obese. Big problems in grown of epidemic proportions, with the people more than 4 million each year because of being overweight or obese in 2017 according to the global burden of disease. The anthropometric and biochemical data that taken from table (1) obtained that no significant differences according to age between obese adolescence group and control group, while there were a highly significantly increase (P<0.01) in the value of weight, body mass index (BMI), waist

circumferences (WC), insulin resistance and homeostasis model assessment - insulin resistance (HOMA2-IR) were shown in obese adolescence group compare with control group. Moreover, there were a significant raise ($p<0.05$) in (SBP) and (DBP) levels in obese adolescence groups compare with control group. For the values of (FBG), TG, HDL-C and visfatin showed a highly significant increase ($P<0.01$) when compared patients' group against control group. The results of the currently applied study confirm the high increase in levels of visfatin, fasting blood sugar and lipid profile for obese adolescents who are showed symptoms of metabolic syndrome compared to healthy controls, as shown in the table 1, metabolism abnormalities begin when you overweight, as the level of vital signs of blood circulation increases in the adipokines that support the inflammation associated with obesity[22].The base score in the present study is a high significant increase visfatin levels in additionally highly significantly increase the TG for adolescent obese patients compared to healthy controls, as shown in Table 1, while HDL-C was significantly decreased for the same group compared to the control group. These results indicated a possible symptom of metabolic syndrome that is consistent with prior research [23,24]. The contradictory data available regarding visfatin and obesity, other studies reported possible roles of visfatin in obesity-associated injury. Inflammation activity was shown to be a central player in the pathogenesis of adipose tissue inflammation, obesity-associated metabolic diseases, and insulin resistance [25].

Table (1): Clinical characteristics parameters between obese adolescence and control group

Parameters	Obese adolescence (n=60)	Control group (n=30)	P value
Gender (Boys/Girls) n.	30/30	18/12	-
Age (years)	14.12±2.25	13.00±3.10	NS
Weight (kg)	68.7±6.30	50.20±5.31	0.01
Height (cm)	158.7±4.10	150.5±2.20	0.61
BMI (kg/m^2)	30.37±3.62	21.41±2.30	0.01
WC (cm)	86.6±4.16	70.21±2.11	0.01
SBP (mmHg)	125.0±5.0	90.0±5.0	0.05
DBP (mmHg)	75.0±5.50	65.0±8.0	0.05
FBG (mg/dl)	104.0±5.23	82.11±7.31	0.0001
Insulin (µU/ml)	15.61±3.66	8.81±2.50	0.01
HOMA-IR	5.5±2.50	2.21±0.73	0.01
TG (mg/dl)	135.26±6.00	85.11±7.44	0.0001
HDL-C (mg/dl)	38.27±6.10	58.11±5.00	0.0001
Visfatin (ng/ml)	27.00±5.00	16.52±8.70	0.0001

NS: no significant; $p<0.05$ is significant, $p<0.01$ is high significant

As noted in Table 2, the comparison was made between two groups of adolescents suffering from obesity, one of them suffering from symptoms of metabolic syndrome and the other without symptoms of metabolic syndrome. No significant difference in age, height, WC, and DBP in the patients' groups. In contrast, significantly increase differs ($p<0.05$) was recorded in the values of both weights, BMI, SBP, and FBG in the adolescent with (MS) compared with the adolescent without (MS) groups. Also, there were a highly significant increase ($P<0.01$) in clinical levels of insulin, HOMA-IR, TG, HDL-C, and visfatin when compared between two obese adolescents' groups. Previously white adipose tissue has been considered as a negative storage site, this concept is now different and considered as an important organ of the endocrine system. White fat tissue has a broad and lasting effect on other organ systems through adipocyte production [26]. Altered levels of lipid profile has been demonstrated to be a common feature not only in obesity, but also in Mets in children and adolescents [27,28]. Conversely, understanding the mechanism that causes metabolic syndrome it is not clear, but recent research shows that the main role in the development of this disease is due to the characteristic of interaction between obesity, insulin resistance and inflammation [29].

In the situations of metabolic syndrome and type 2 diabetes, the body is in the state of (IR) for a long time. A positive correlation which is may reverse the expected to observed between visfatin levels and characteristic of metabolic syndrome.

Biologic pathways of metabolic syndrome to adipokines remain obscured. Investigations are suggested on visfatin signalling, functions, and clinical significance, also determinants of serum visfatin level circulating to elucidate the molecule may improve the approach in obesity and MS [30].

The correlations between visfatin and biochemistry parameters in obese adolescence with MS distinguished the following: no significant correlation

were seen in age and height. Whereas visfatin had a positive significantly link (P<0.05) with weight, BMI, WC, and insulin. In addition, the levels of FBG, HOMA-IR, and TG appeared a highly significant positive correlation (P< 0.01) with visfatin levels. A negative significant correlation (P<0.05) was found between visfatin level and HDL-C.On the other hand, correlations were found that clarify the relationship between visfatin and the clinical parameters of Obese adolescence without MS as follows: There is no significant relationship associated between the values of age, weight, height, insulin, and TG with the level of visfatin in those individuals.It was also indicated that there were a positive significant correlation (P<0.05) between BMI, WC, and HOMA-IR values with the visfatin in the previously described group. Finally, the data showed a positive highly significant correlation between FBG and visfatin values, and a negative significant correlation for HDL-C values associated with visfatin values for the same group. All these results were presented above is detailed explanation in Table 3. An explanation of developments in metabolic syndrome has been suggested that free fatty acid accumulation in the liver, Skeletal muscles adipocytes, and the pancreas are in obesity it due to poor insulin secretion and insulin subsequent delivery resistance. Liver can effect on suppressing glucose production and decreased IR [31]. Moreover, hyperinsulinemia causes an elevated in the genes for enzyme lipogenic in the liver, which due to elevated production of triglyceride [32]. Serum insulin has a vasodilator effect to the production of NO in the endothelium [33]. Dysfunction of endothelial and disturbed vasodilator response frequently occur secondary to IR [34]. It is thinking that inflammatory cytokines release from dysfunctional adipocytes, such as, monocyte chemo attractant protein-1, and TNF-α, promotes macrophages migration to those adipose tissues and elevate production of cytokine [35].

Table (2): Clinical characteristics parameters between obese adolescence with and without (MS).

Parameters	Obese adolescence with MS (n=30)	Obese adolescence without MS (n=30)	P value
Gender (Boys/Girls) n.	16/14	13/17	-
Age (years)	15.13±2.54	14.11±2.30	NS
Weight (kg)	66.21±3.50	58.14±3.44	0.05
Height (cm)	160.15±3.44	155.63±2.80	NS
BMI (kg/m^2)	31.24±5.13	26.00±3.00	0.05
WC (cm)	86.55±4.30	82.15±3.17	NS
SBP (mmHg)	135.0±10.0	110.0±8.0	0.05
DBP (mmHg)	85.0±5.0	75.5±8.0	NS
FBG (mg/dl)	108.25±6.25	85.11±4.62	0.05
Insulin (µU/ml)	17.02±2.21	12.00±2.45	0.001
HOMA-IR	6.21±1.25	2.35±0.92	0.001
TG (mg/dl)	155.32±8.00	100.5±10.00	0.001
HDL-C (mg/dl)	32.14±8.21	47.2±4.0	0.001
Visfatin (ng/ml)	34.33±5.15	25.0±3.35	0.001

NS: no significant; p<0.05 is significant p<0.01 is high significant

Table (3): The correlation coefficient (r) of visfatin vs study clinical parameters in obese adolescence with and without (MS)

Obese adolescence with MS	Visfatin		
	Correlation coefficient (r)	Obese adolescence without MS	Correlation coefficient (r)
Age	0.165	Age	0.148
Weight (kg)	0.303*	Weight (kg)	0.311
Height (cm)	0.113	Height (cm)	0.174
BMI (kg/m^2)	0.312*	BMI (kg/m^2)	0.355*
WC (cm)	0.331*	WC (cm)	0.320*
FBG(mg/dl)	0.696**	FBG(mg/dl)	0.598**
Insulin (µU/ml)	0.342*	Insulin (µU/ml)	0.177
HOMA-IR	0.566**	HOMA-IR	0.336*
TG(mg/dl)	0.581**	TG(mg/dl)	0.104
HDL-C(mg/dl)	-0.346*	HDL-C(mg/dl)	-0.139

**Correlation is significant at P< 0.01 , *Correlation is significant at P < 0.05

Conclusion

The prevalence of metabolic syndrome between adolescence developing countries is rising, and this is largely driven by increasing obesity rates. Elevated serum visfatin level in adolescence with (MS) when compared without (MS)and visfatinlevels shown a positive correlation with metabolic syndrome factors in adolescence, it's considered a risk indicator for heart disease in old age. therefore, visfatin may be considered a risk indicator for heart diseases and diabetes in these individuals in old age.

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