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Relation between herpes simplex type 1 and metabolic syndrome in Ismailia primary school children

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Abstract

Metabolic syndrome is defined as the co-occurrence of several cardiovascular risk factors, containing, insulin resistance, obesity, atherogenic dyslipidemia, and hypertension. Herpes simplex virus is an intracellular pathogen that can affect the skin of several parts of the body including the urogenital region, -mouth, eyes, and nervous system, which is life-threatening for children. The present study aimed to assess the percent of antibody of herpes simplex virus type 1 among children with metabolic syndrome (diabetes and obesity) in Primary schools in Ismailia city. Thus, a cross-sectional study was conducted on 46 children from age 6 to 10 years old in Ismailia city. Our method depend on dictation of herpes simplex virus type 1 antibodies (IgG) by commercial ELISA techniques. Serum triglyceride HD, L, LDL and fast blood sugar were measured by using colorimetric assay in accordance with a standardized method, they were analyzed through spectrophotometer Semi-Automatic clinical chemistry analyzer (Micro lab 300-ELITechGroup). In present study we found that a very high frequency of HSV-1 infections among the studied metabolic syndrome children with a percentage of 86% while the control group (children of the same gender and age) were 26% only. Upon the interpretation of the HSVs serological profiles, the past latent infection with HSV-1 (IgG was the most prevalent type of infection than HSV-1 recurrent infection (IgM) (0%), in all the HSV-1 positive cases (n= 46, 56%). Moreover, then there weakly positive correlation between IgG and triglycerides which is significant statistically ($p< 0.05$), while non-significant statistically correlation with HDL and LDL, Cholesterol, while ruling out the equivocal sample as HSV-1 IgM negative. The current study suggested that a very high incidence of HSV-1 antibodies among metabolic syndrome children in Ismailia city.

Keywords: Herpes simplex virus type 1, diabetic children, obesity in children, metabolic syndrome children.

1. Introduction

Metabolic syndrome is known as a cluster of risk factors such as raised blood pressure, hyperglycemia, and central obesity. Metabolic syndrome is associated with a proinflammatory state [1]. Human herpes simplex viruses (HSVs) are a well-known microbial pathogen that causes a variety of diseases [2]. It is a double-stranded DNA virus which belong to the Herpesviridae family and subfamily alpha herpesviridae. It is transmitted through mucosal membranes and the skin then migrates to nerve tissue where it remain in latent status.

HSV-1 is frequently acquired orally it is known as oral herpes, this type could cause cold sores and fever blisters surrounding to mouth in children. It can also be transmitted by direct contact with infected discharge from blisters. Whereas HSV-1

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has the potential to be transferred at any stage of life [3]. However, the shift in HSV ratio have a serious consequence. For example, mothers that infected during pregnancy or delivery could expose their newborn babies to the risk for neonatal herpes infecttion which often leads for neurologic disorders or serious death [4].

Viral infection activates inflammation which considered as a central event in sensing endogenous and exogenous danger signals. For example, there is evidence that individuals infected with multiple pathogens such as HSV 1, HSV 2, Influenza virus a Hepatitis A, CMV, RUBELLA have elevated C-reactive protein levels indicatting released inflammation. It can be causedby direct specific activities of given pathogen [5, 6].

Frist infection occurs when a subjectedto person (without pre-existting HSV-1 and HSV-2 antibodies) is exposed to HSV. First non-prime episode happens when person who has preexisting HSV antibodies (type 1) has first episode with the opposing HSV type. Recurrent infection develops when a person has already antibodies against the same HSV type [7].

All three kinds of HSV infections are prevalent in children may lead to infect eye or skin lesions, meningitis, encephalitis, fetal abnormalities, and even death [8, 9].

2. Materials and methods

2.1. Study Populations, area and data collection

A cross-sectional study conducted in Ismailia city which is in located northeastern Egypt near the midpoint of the Suez Canal. Forty-six (46) children present in Ismailia city primary schools, the sample collection continued from November 2017 to October 2018. After receiving written and verbal permission fromchildren parents, they were asked about the following data: name, age and physical activity, about the diabetes, obesity and their associated complication for patients group.

2.2. Collection and storage of samples

Each participant's blood (10 ml) was taken in a sterile plane tube and centrifuged at 3000 rpm for 5 minutes. Then, the serum obtained from study subject was divided into three different Eppendorf tubes. One was used for serological tests, the second was used for the biochemical test and the third one was a backup sample. Sera for serology were kept at -20°C until being used. Sample was collected two times first one after 7 hours for fasting blood sugar detection and serological tests and the second one after 12 hours for fasting lipid profile assessment.

2.3. The serological assessment

Sera from all the participants were subjected to serological studies by indirect ELISA for HSV-1 IgG detection (MyBioSource. HSV-1 IgG ELISA kit, Cat no. MBS494292, MyBioSource, Inc., San Diego, California, USA); HSV-1 IgM (MyBioSource. HSV-1 IgM ELISA kit, Cat no, MBS495633, MyBioSource, Inc.San Diego, California, USA) and HSV-2 IgG/IgM (gG2 purified) (VIRCELL kits for HSV-2 IgG/IgM, Cat. No. G/M1013, VIRCELL, S.L, Spain). The technique was done according to the manufacturer′s instructions. The absorbance of each well was read at 450 nm and determined by ELISA system using ELISA Reader (Hyperion, USA). The concentrations were determined using standard curves. Construct a standard curve by plotting the average optical density for each standard on the vertical (Y) axis against the concentration on the horizontal (X) axis and draw a best fit curve through the points on the graph.

2.4. Biochemical assessment

Serum triglyceride HD, L, LDL and fast blood sugar were measured by using colorimetric assay in accordance with a standardized method, they were analyzed through spectrophotometer Semi-Automatic clinical chemistry analyzer (Micro lab 300-ELITechGroup).

2.5. Statistical analysis,

Data analyses were performed using SPSS version 23. Quantities data were expressed as means ±SD and qualitative data were expressed as numbers and percentages. The chi-square ($\chi 2$) test was used to test the significance of qualitative variables. $P < 0.05$ was considered to denote statistically significance.

3. Results

3.1. Study population

The studied populations comprised 46 children; their ages ranged from 6 years up to 10 years (mean ± SD = 8.13± 1.82 years). Regarding to metabolic syndrome duration at time of the study, the studied population (n=46) was classified into two groups as follows: Group 1: Children with metabolic syndrome as a study group include 23 obese prepubertal children. Group 2: Normal matched age and sex children without metabolic syndrome as a control group (**Table 1**).

3.2. Serological profile of HSV-1.

Regarding the serological markers for HSV-1 the most prevalence globulins were HSV-1 IgG which was found to be positive in 56.5% of the studied population. Whereas, there was no HSV-1 IgM seropositivity detected at all there for we didn't perform pcr (**Table 2**).

At the following table showed that Total lipid profile increased cholesterol, triglyceride and LDL with a statistically significant value of 0.010, 0.0,41 and 0.020 respectively between patient groups and control group (**Table 3)**.

3.3. ***Correlation between IgG titer and HD, L, triglycerides, LDL and cholesterol in patients***

There was weak positive correlation between IgG and triglycerides which is statistically significant (p<0.05),while non-statistically significant relation with HDL,LDL, cholesterol (**Table 4**).

Figure 1 show a significant relationship in parents' medical condition of obesity between metabolic syndrome patients and control group with P value of 0.005.

3.4. ***Comparison between, weight, height, BMI and waist circumference in patients and control group :***

Metabolic syndrome patients had increase in weight and waist measuring compared to children in control group; although there were no significant difference in height and BMI P (value=0.082) (Table 5).

4. Discussion

In current study the age of the studied group ranged from 6 years up to 10 years; most of the children and control groups were between 9 to 10 years old 91% and 47% respectively. In our study 52% were girls while 48% were boys also the Most common lipid disorders that were observed were decreased HDL (p=0.670) and elevated LDL (p= 0.099). Abnormal triglyceride levels was seen in almost of children (p value =0.020).

On other hand, A Polish study involving 6-10 and 14-year-old overweight and obese children found that 59.5% of girls, and 40.5% of boys with overweight and obesity were having at least one lipid abnormality The most common lipid disorders that were observed were decreased HDL (44.4% in both genders) and elevated LDL (29.6% of both gender). Abnormal triglyceride was observed in a minority of children (14.8% off both gender [10].

A study in France involving 7- to 15-year-olds showed metabolic syndrome to be 18.6% in children below 10 years of age and 14.5% among 10- to 15-year-old children according to national cholesterol Education Program (NCEP**)** [11].

Another studies showed that, total cholesterol and LDL levels were significantly higher in children with metabolic syndrome than in those without metabolic syndrome. Moreover, increased triglyceride, and decreased HDL levels were associated with Metabolic syndrome [12, 13]**.**

In present study diabetic patients had a significant higher serum triglyceride level compared to the, control group (P=0.041). In addition, to that there was a statistically non-significant HDL between both groups (p=0.459) while HDL means, was lower in metabolic syndrome group (58 .57) than control group (62.72) There were a weak positive correlation between IgG and triglycerides which is statistically significant (p<0.05), while non-statistically significant relation with LDL and Cholesterol.

Other studies were performed in children with metabolic syndrome, noted pathological values of total cholesterol and HDL in 40% and 22.9%, respectively hypertriglyceridemia in 31.43%, and

Table 1: Basic Characteristtics of the studied population.

Title		Patient		Control		P-value**
		No. %		No. %		
Sex	Male	11	47.83	10	43.48	0.500***
	Female	12	52.17	13	56.52	
Age groups	6-years	0	0.00	5	21.74	0.004*
	7- years	2	8.70	7	30.43	
	9-10 Years	21	91.30	11	47.83	
	Mean ± SD	9.78	0.60	8.13	1.82	0.000*****

*statistically significant, **spearman correlation, *** Fisher's Exact test, **** student t-test.

Table 2: Serological results of HSV-1 IgG and IgM among the studied groups.

Title	Patients		Control		P-value**
	Mean	SD	Mean	SD	
Herpes IgG	20.60	9.08	7.26	4.97	0.000*
Herpes IgM	5.16	1.21	3.91	1.05	0.001*

*statistically significant, **spearman correlation

Table 3: laboratory investigations for blood lipids among patients and controls.

Title	Patients		Control		P-value**
	Mean	SD	Mean	SD	
Cholesterol	172.43	25.63	149.36	31.77	0.010*
Triglycerides	138.39	47.15	108.57	48.75	0.041*
HDL	58.57	17.45	62.43**	17.70	0.459
LDL	86.34	24.72	67.72	27.31	0.020*

*statistically significant, **spearman correlation

Table 4: Correlation between IgG titer and HDL, triglycerides, LDL and cholesterol in patient.

Title	Mean	SD	R	P –value**
Triglycerides	123.48	49.76	0.343	0.020*
HDL	60.50	17.49	-0.065	0.670
LDL	77.03	27.42	0.001	0.995
Cholesterol	160.90	30.83	0.114	0.449
Herpes IgG	20.60	9.08	–	–

*statistically significant, **spearman correlation

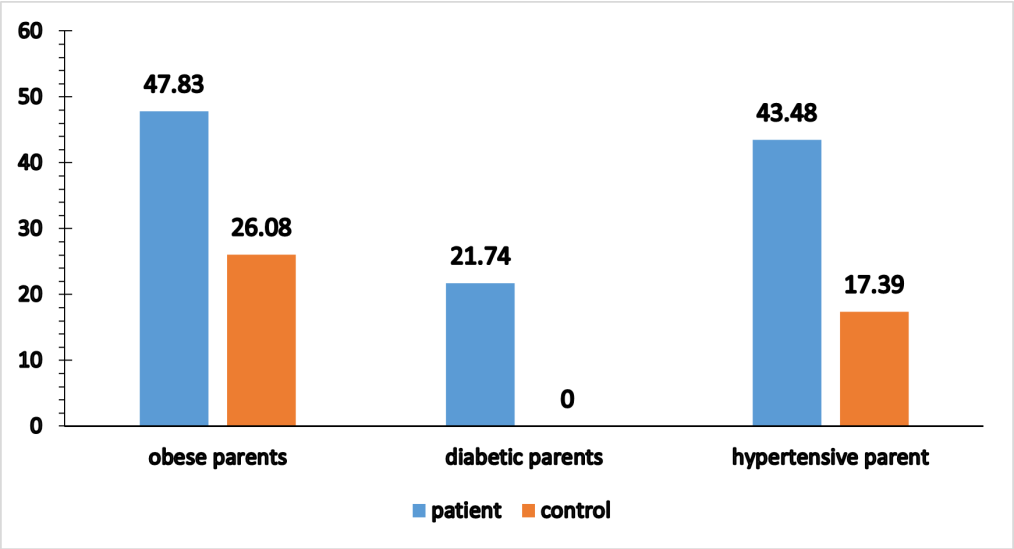

Figure 1: The medical conditions of parents in patients and control groups

Table 5: omparison between weight, height, BMI and waist circumference in patients and control group:

Title	Patient		Control		P-value**
	Mean	SD	Mean	SD	
weight	48.22	17.29	41.22	13.69	0.135
height	137.43	11.78	133.91	8.23	0.246
BMI	26.04	6.23	22.87	5.85	0.082
Waist circumference	4.35	1.47	3.91	1.68	0.354

**spearman correlation

fasting blood glucose 5.7%, The prevalence of metabolic syndrome in prepubertal children, which is lower than the prevalence reported in older children and adulthood, has been reported as ranging from 13% to 20% [14–17].

In the present study seropositivity to Herpes virus IgG is associated with a high level of fasting blood sugar level with p <0.05(p=0.026) compared with control group that were normal fasting blood sugar which indicate statistically significant relation between diabetes and herpes simplex virus**.** Pediatric metabolic syndrome data from [18, 19] provided evidence that HSV-1 IgG positive serostatus associated with increased risk of paediatric metabolic syndrome Moreover, another study reported that seropositivity IgG against HSV were detected in 26% paediatric onset metabolic syndrome [20]**.** In a recent study, sub-group analysis suggested that the seroprevalence of IgG against HSV-1 was significantly increased in the paediatric patients combined with metabolic syndrome compared with the controls [21].

5. Conclusion

The current study results showed that there was a high incidence of HSV-1 among metabolic syndrome children in Ismailia city. Thus, children screening for HSVs is recommended to manage the complications caused by these virus. HSVs can be a significant problem in children since they can infect another children and produce difficulties that can affect children health and even cause maternal mortality. Furthermore, we discovered that the elevated sugar blood level and lipid profile increase the prevalence of HSV-type 1.

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