INSULIN RESISTANCE IN PEDIATRIC MIGRAINE

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ABSTRACT:

Background: *In children, migraines can affect 3% to 10% of the population and are a common complaint. The present study aims to evaluate the relationship between insulin resistance (IR) and migraine in pediatric patients who have migraine. While there is a dearth of data in the pediatric population, several studies in the adult community have demonstrated a correlation between IR and migraine.*

Patients and Methods: *A controlled cross-sectional study including 40 healthy children and 30 patients with migraine who were recruited from the pedi3atric neurology department was carried out on children between the ages of 4 and 16. The International Classification of Headache Disorders (ICHD) -II criteria were used to diagnose migraine. Every patient's anthropometric measures were included. The Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) and the Quantitative Insulin Sensitivity Check Index (QUICKI equation) were used to measure insulin resistance.*

Results: *The average age of migraine patients was 10.03 ± 2.16 years, with a predominance of males. Eighty percent of the patients were not yet in puberty. Of our patients, 13 (43.3%) had an aura-producing headache, 24 (80%) had a family history, and the most prevalent type (71.4%) was bilateral headache. The BMI of the migraine group increased significantly (P= 0.03). Twenty percent of patients with migraine were obese, and fifty percent were overweight. Patients with migraines had significantly higher incidences of insulin resistance according to HOMA-IR and QUICKI (P=0.007 and0.033, respectively).*

Conclusion: *Based on the results of our investigation, it can be said that thirty six percent of patients with pediatric migraine have insulin resistance.*

Keywords: *Insulin Resistance, Pediatric Migraine.*

INTRODUCTION:

A common symptom in pediatrics is migraine. Between 3% and 10% of children and adolescents experience migraines [(1)].

Acute and persistent headaches in children are most frequently caused by migraines, among other headache kinds. Particular clinical features of this illness in pediatrics might worsen with age and have a major negative influence on a child's quality of life by interfering with their family life, schooling, and socialization [(2)].

There are two basic varieties of migraine: Migraine with aura, which is primarily characterized by brief focal neurological symptoms that usually precede or occasionally accompany the headache, and Migraine without aura, which is a clinical illness characterized by headache associated with particular features and symptoms [(3)].

A significant public health concern, metabolic syndrome (MetS) is a cluster of interacting cardiovascular risk factors that includes insulin resistance, dyslipidemia, hypertension, and central adiposity. MetS is linked to an increased risk of type 2 diabetes and atherosclerotic cardiovascular disease [(4)].

The metabolic syndrome and its associated conditions, such as non-alcoholic fatty liver disease (NAFLD), polycystic ovary syndrome (PCOS), obesity-related type 2 diabetes (T2D), and atherosclerotic cardiovascular disease (ASCVD), are generally thought to be largely caused by insulin resistance [(5)].

Recently, co-relation between migraine and insulin resistance has been reported [(6)].

Studies conducted by *Manu* have demonstrated the existence of a correlation in morbidity between vascular illnesses such as stroke and hypertension and migraine. Recent research has demonstrated that abnormal insulin sensitivity increases the risk of stroke and hypertension [(7)].

Nevertheless, it is still unclear from the available data whether migraine is primarily serving as a progressive trigger of MetS or vice versa. Whether the MetS-migraine connection consistently differs by migraine type (chronic, episodic, with or without aura), age, and sex, is still unknown [(8)].

Continuous surveillance of vascular risk factors is crucial for migraine, particularly for migraine with aura, even if the relationship between MetS and migraine is still poorly understood [(9)].

It was shown that the migraine patients had higher levels of insulin and fasting plasma glucose, and that these levels persisted even after glucose loading, indicating insulin resistance. The remaining pancreatic beta cells are further stressed by the elevated plasma glucose load, forcing migraine patients to utilize their full potential [(10&11)].

Insulin resistance may also be associated with an intracellular production of free radicals, which in turn could be the cause for a disrupted insulin action, thus leading to a vicious circle [(12)].

AIM OF THE WORK:

To correlate between migraine and insulin resistance.

PATIENTS AND METHODS:

Out of 50 patients complaining of headache presenting to our hospital and upon thorough history taking for co-morbidities, ophthalmological and ENT assessment; 8 were excluded due to chronic renal disease and hypertension, 6 were excluded due to ENT problems, 4 were excluded due to significant errors of refraction and 2 were excluded due to headache associated with febrile illness. The remaining 30 patients upon the criteria of the International Headache Society were recruited in our study as cases of Migraine. All subjects in our study whether the migraine cases or the healthy controls were developmentally normal, had no history of seizures and had normal neurological examination.

Inclusion Criteria:

The study was conducted on Children aged from 4-16 fitting the ICHD II Diagnostic Criteria for Migraine without Aura: A headache if there are five or more attacks that meet criteria B–D; B if the headache attacks last four to seventy-two hours (untreated or unsuccessfully treated); C if the headache is unilateral in location, pulsating in nature, moderate to severe in pain, and aggravated by avoiding regular physical activity (e.g., walking or climbing stairs); D if at least one of the following occurs during the headache: nausea and/or vomiting; photophobia; phonophobia. E. Not linked to any other illness.

ICHD II Criteria for Typical Aura with Migraine Headache: A. Two or more attacks meeting criteria B-D; B. An aura with no motor weakness but at least one of the following symptoms: Fully reversible sensory symptoms, such as pins and needles, and/or negative features, such as numbness, fully reversible dysphasic speech disturbance, fully reversible visual symptoms, such as flickering lights, spots, or lines, and/or negative features, such as loss of vision. C. two or more of the following: homonymous visual symptoms and/or unilateral sensory symptoms; each aura symptom lasts between five and sixty minutes; at least one aura symptom appears gradually over a period of five minutes; alternatively, several aura symptoms occur successively over a period of five minutes. D. Pain meeting the requirements B-D for migraine without aura starts during the aura or comes on after the aura in 60 minutes, and E stands for not being related to another illness [(3)].

Exclusion Criteria:

children with other neurological or developmental problems, children with ear problems, children with visual problems and children with hepatic or renal problems.

The study was approved by the local ethics committee of Ain Shams University Hospitals and written informed consent was obtained from all participants.

A thorough and comprehensive medical history was obtained, emphasizing the following triggers for migraines: fasting, exercise, sun exposure, sleep deprivation, stress, *noise, etc.* [(13)]; frequency of attacks per week; duration of each attack in hours; age at presentation; response to treatment; headache severity; impairment of daily activities; aura and related symptoms; full neurological examination; developmental history; family history of same condition; and history of seizures.

The average monthly frequency of attacks multiplied by the average headache severity yielded the migraine index (MI). The following formula was used to generate the corrected migraine index: migraine index multiplied by average attack duration. On a 0–3 scale, the intensity of the headache was rated (0 being normal, 1 being mild, 2 being moderate, and 3 being severe). A 0–4 scale was used to grade the functional disability: 0 represented normal, 1 represented mild impairment of activities of daily living (ADL), 2 represented moderate, 3 represented severe, and 4 represented incapacity to conduct ADL activities or bedridden status [(14)].

In a clinical examination, the following measurements are taken: body mass index (BMI), weight in kg, height in cm, standard deviation (SD) for height and weight based on the CDC Growth Charts for the United States, 2000[(15)], and general examination. was determined using the following formula: BMI = weight in kilograms / height in meters squared; BMI percentile; waist circumference (WC); WC percentiles; diagnostic of central obesity; waist to height ratio; symptoms of insulin resistance (e.g., skin tags, Acanthosis negricans, etc.); and blood pressure.

Diagnosis of insulin resistance using HOMA-IR: HOMA-IR= (fasting blood sugar x fasting insulin)/405 [(16)], from severally analyzed studies, it recommended the use of HOMA-IR cutoff >2.5 for both genders [(17)], diagnosis of insulin resistance by QUICKI equation [(18)].

Insulin resistance is a condition when a normal level of insulin causes a physiological response that is abnormal. An increase in blood lipids and free fatty acids in an insulin-resistant condition may cause a migraine attack. According to our research, there was no statistically significant correlation found between the patients' anthropometric measurements (weight, height, waist circumference, and body mass index) and the frequency or severity of migraine attacks [(19)].

Investigations were done as:

BUN, serum creatinine, TSH, whole blood count, and fasting Blood sugar, fasting serum insulin level, lipid profile (serum cholesterol, LDL, HDL, and triglycerides), all those investigations were done to diagnose metabolic syndrome and scan for its complications. Brain MRI (only taken into consideration in the following RED FLAGS: presentation age < 3 years, headache that worsens with straining, headache that appears suddenly, early morning patterns or early morning waking headaches, mood swings, mental health issues, or difficulties in school, underlying neuro-cutaneous syndrome, perioral or hand numbness, and occipital pain (raising the possibility of posterior fossa tumors) [20].

Statistical Analysis:

After being gathered, edited, coded, and imported, the data were added to IBM SPSS, a statistical package for social science, version 23. When the quantitative data were determined to be non-parametric, they were given as the median and inter-quartile range (IQR), and when they were parametric, as the mean, standard deviations, and ranges. Quantitative variables were also shown as percentages and numbers. When the predicted count in any cell was found to be less than 5, the Chi-square test and/or Fisher exact test were used to compare the qualitative data between groups. The independent t-test was used to compare two independent groups with quantitative data and a parametric distribution; the Mann-Whitney test was used for non-parametric distributions.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant at level of p-value < 0.05.

Ethical Considerations

This study was conducted after approval of the ethical committee center of Ain Shams University Hospitals. An informed consent was obtained from legal guardians before enrolment in the study. (FMASU MS 760/2021)

RESULTS:

The average age of migraine patients was 10.03 ± 2.16 years; among our patient sample, 40% of females and 60% of men were female. Of our patients, 13 (43.3%) had an aura-producing headache, 24 (80%) had a family history, and the most prevalent type (71.4%) was bilateral headache. The BMI of the migraine group increased significantly (P-value 0.030). 20% of patients with migraine were obese, and 50% were overweight. Insulin resistance measured by QUICKI and HOMA-IR revealed a significant difference (P-values of 0.033 and 0.007, respectively) between the migraine and control groups. By HOMA-IR, 36.7% of migraine patients had IR, compared to 30% by QUICKI.

Table 1: Socio-demographic data for all included subjects in the study.

		Control group	Migraine group	Test value	P-value	Sig.
		No. = 40	No. = 30			
Age (years)	Mean ± SD	9.58 ± 2.72	10.03 ± 2.16	-0.761•	0.449	NS
	Range	4 – 15	6 – 14			
Gender	Female	16 (40.0%)	12 (40.0%)	0.000*	1.000	NS
	Male	24 (60.0%)	18 (60.0%)			
Puberty	Prepubertal	27 (67.5%)	24 (80.0%)	4.847*	0.303	NS
	Stage I	3 (7.5%)	0 (0.0%)			
	Stage II	5 (12.5%)	5 (16.7%)			
	Stage III	2 (5.0%)	0 (0.0%)			
	Stage IV	3 (7.5%)	1 (3.3%)			
Consanguinity	No	32 (80.0%)	27 (90.0%)	1.294*	0.255	NS
	Yes	8 (20.0%)	3 (10.0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test; •: Independent t-test

Table 2: Shows subtypes of Migraine (migraine with and without aura), frequency/week, duration in hours, common triggers, location, quality of pain and severity.

		Migraine group
		No. = 30
Age of presentation (years)	Mean ± SD	8.23 ± 2.22
	Range	4 – 12
Migraine without aura		17 (56.7%)
Migraine with aura		13 (43.3%)
Aura symptoms	Visual Brainstem Sensory Motor Speech/language	10 (84.6%) 2 (15.3%) 1 (7.7%) 0 (0%) 0 (0%)
Frequency	<once/week Once/week >once/week but less than daily Daily	0(0%) 1(3.3%) 25(83.3%) 4(13.3%)
Frequency/week	<= 3 times	13 (43.3%)
	> 3 times	17 (56.7%)
Duration in hours	<= 4 hours >4 hours	8 (26.7%) 22 (73.3%)
Laterality	Unilateral	8 (26.7%)
	Bilateral	21 (70.0%)
	All over head	1 (3.3%)
Triggers	Exercise	29 (96.7%)
	Sun exposure	14 (46.7%)
	Fasting	10 (33.3%)
	Reading	11 (36.7%)
	Stress	6 (20.0%)
	Studying	1 (3.3%)
	Lack of sleep	1 (3.3%)
	Noise	10 (33.3%)
Severity	Moderate	17 (56.7%)
	Severe	13 (43.3%)
Migraine index	Median (IQR)	30 (24 – 42)
	Range	8 – 90
Corrected migraine index	Median (IQR)	48 (36 – 84)
	Range	8 – 180
Quality of pain	Pulsating in quality	30 (100.0%)
Aggravation by physical activity	Yes	30 (100.0%)
Vomiting or not	No	17 (56.7%)
	Yes	13 (43.3%)
Photo/phonophobia	Yes	30 (100.0%)
Functional disability (ADL)	Normal	0 (0.0%)
	Mild	0 (0.0%)
	Moderate	18 (60.0%)
	Severe	10 (33.3%)
	Inability to perform	2 (6.7%)
Response to treatment	No Yes	3 (10%) 27 (90%)
Family history	No	6 (20.0%)
	Yes	24 (80.0%)

Table 3: Shows anthropometric measurements, general examination (signs of insulin resistance, Blood pressure) and neurological examination for both patients and control groups.

		Control group	Migraine group	Test value	P-value	Sig.
		No. = 40	No. = 30			
BMI	Mean ± SD	18.28 ± 3.23	20.46 ± 4.90	-2.236•	0.029	S
	Range	13 – 27.77	14.67 – 39.3			
BMI centiles	<3rd	6 (15.0%)	2 (6.7%)	12.391*	0.030	S
	3rd-25th	5 (12.5%)	3 (10.0%)			
	25th-50th	12 (30.0%)	3 (10.0%)			
	75th-85th	5 (12.5%)	1 (3.3%)			
	85th-95th (overweight)	7 (17.5%)	15 (50.0%)			
	>95th (obese)	5 (12.5%)	6 (20.0%)			
Waist circumference (cm)	Mean ± SD	63.65 ± 9.72	67.80 ± 13.02	-1.528•	0.131	NS
	Range	48 – 87	53 – 110			
Waist circumference (WC) percentile	<3rd	1 (2.5%)	1 (3.3%)	9.407*	0.094	NS
	3rd-25th	16 (40.0%)	13 (43.3%)			
	25th-50th	13 (32.5%)	5 (16.7%)			
	50th-70th	3 (7.5%)	6 (20.0%)			
	70th-95th	7 (17.5%)	2 (6.7%)			
	>95th (Obese)	0 (0.0%)	3 (10.0%)			
Waist/height ratio	Mean ± SD	0.48 ± 0.05	0.49 ± 0.08	-0.935*	0.353	NS
	Range	0.39 – 0.59	0.38 – 0.75			
Signs of central obesity	No	36 (90.0%)	26 (86.7%)	0.188*	0.664	NS
	Yes	4 (10.0%)	4 (13.3%)			
Systolic BP	Mean ± SD	105.53 ± 6.33	107.13 ± 6.07	-1.070•	0.288	NS
	Range	95 – 122	95 – 118			
Diastolic BP	Mean ± SD	63.45 ± 7.15	64.83 ± 6.15	-0.849•	0.399	NS
	Range	50 – 78	55 – 75			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test; •: Independent t-test

Table 4: Shows laboratory investigations for both patients and control groups.

		Control group	Migraine group	Test value	P-value	Sig.
		No. = 40	No. = 30			
N/L ratio	Median (IQR)	1.36 (1.2 – 2.1)	1.11 (0.69 – 1.5)	-2.387≠	0.017	S
	Range	0.4– 4.6	0.15 – 4.2			
TSH (uIU/mL)	Median (IQR)	1.82 (1.39 – 2.5)	2.78 (1.86 – 3.52)	-2.225≠	0.026	S
	Range	0.66 – 7.65	0.23 – 7.78			
	Subclinical Hypothyrodism (>5-<10)	3 (7.5%)	5 (16.7%)	1.423*	0.233	NS
S. Cholesterol (mg/dL)	Mean ± SD	130.25 ± 34.32	134.27 ± 29.74	-0.513•	0.610	NS
	Range	72 – 257	103 – 210			
LDL (mg/dL)	Mean ± SD	71.45 ± 27.96	68.03 ± 27.10	0.514•	0.609	NS
	Range	37.6 – 176	35 – 139			
HDL (mg/dL)	Mean ± SD	46.78 ± 10.49	49.90 ± 9.13	-1.303•	0.197	NS
	Range	18 – 59	33 – 85			
TAG (mg/dL)	Mean ± SD	95.48 ± 18.66	94.77 ± 18.30	0.158•	0.875	NS
	Range	61 – 130	61 – 135			
Fasting insulin (uIU/mL)	Median (IQR)	4.9 (2.85 – 7.23)	8.3 (2.8 – 13.9)	-1.709≠	0.087	NS
	Range	0.2 – 14.63	0.2 – 24.6			
Fasting glucose (mg/dL)	Mean ± SD	82.03 ± 8.16	83.90 ± 9.22	-0.900•	0.371	NS
	Range	71 – 110	62 – 98			

HOMA IR	Median (IQR)	0.9 (0.5 – 1.45)	1.68 (0.5 – 3)	-1.586≠	0.113	NS
	Range	0.1 – 3.6	0.1 – 4.9			
Insulin resistant according HOMA-IR	No	36 (90.0%)	19 (63.3%)	7.240*	0.007	HS
	Yes	4 (10.0%)	11 (36.7%)			
TyG	Mean ± SD	4.47 ± 0.12	4.48 ± 0.11	-0.223•	0.825	NS
	Range	4.23 – 4.74	4.21 – 4.69			
Insulin resistant according to TyG	No	24 (60.0%)	11 (36.7%)	3.733*	0.053	NS
	Yes	16 (40.0%)	19 (63.3%)			
QUICKI	Mean ± SD	0.40 ± 0.08	0.39 ± 0.10	0.681•	0.498	NS
	Range	0.32 – 0.84	0.3 – 0.78			
Insulin resistant according to QUICKI	No	36 (90.0%)	21 (70.0%)	4.534*	0.033	S
	Yes	4 (10.0%)	9 (30.0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test; •: Independent t-test; ≠: Mann-Whitney test
*TLC: Total leucocytic count, N/L: neutrophil/lymphocyte ratio, Hb: hemoglobin, PLT: platelets, BUN: blood urea nitrogen, Creat: creatinine, TSH: thyroid stimulating hormone, LDL: low density lipoprotein, HDL: high density lipoprotein, TAG: triglycerides, HOMA-IR: Homeostatic Model Assessment for Insulin Resistance, TyG: triglycerides-glucose index, QUICKI: Quantitative insulin-sensitivity check index.

DISCUSSION:

In children, migraines are a prevalent problem. In more than 90% of cases, at least one of the child's parents will report having had migraines in the past during an interview. This indicates that the illness is inherited and has a multifactorial inheritance pattern [(21)].

The aim of this work was to correlate between migraine and metabolic syndrome, including insulin resistance.

In our study, there was a male predominance among the studied groups; males were 18 (60%), females were 12 (40%) among the migraine patients.

This is in accordance with *Lipton et al.* and *Mortimer et al.*, in the years prior to puberty, migraine is more common among boys than girls. By the onset of puberty, migraine is more prevalent in girls, and by the late teens, females are about twice as likely to suffer from migraine as males. This goes with our study where 24 (80%) of the migraine patients were pre-pubertal [(22&23).]

Of the 13 patients with migraine aura, 10 (84.6%) had visual aura, 2 (15.3%) had brainstem aura (dizziness and tinnitus), and 1 (7.7%) had sensory aura. Comparably, 98% of the developed auras were visual, 36% were sensory, and 10% were dysphasic, while none of our patients had a dysphasic aura recorded by *Viana et al.*, 29 people (96.7%) reported having exercised, 14 people (46.7%) reported having sun exposure, 10 people (33.3%) reported fasting, 5 people (23.8%) reported reading, 6 people (20%) reported stress, 10 people (33.3%) reported noise, and 1 person (3.3%) reported not getting enough sleep [(24)].

According to *Peroutko*, stress is the most common cause of migraines. According to *Bhoi et al.*, noise accounted for 95.6% of triggers, with stress coming in second at 94.8%, sun exposure at 89.6%, and fasting at 74.1%. Every patient group in this investigation had physical activity-induced aggravation. This suggests unequivocally that exercise may be a potent migraine trigger in kids [(25)].

The current study showed that there was a significant difference in regard to body mass index (BMI) among patients with migraine and control group. Moreover, 50% and 20% of patients with migraine were overweight and obese respectively compared to 17.5% and 12.5% respectively among controls. However, there was no statistically significant difference between control group and patients group regarding weight, height, waist circumference, waist/height ratio.

Likewise, a study done about the relationship between migraine and lifestyle factors by *Robberstad et al.* among adolescents highlighted that the risk of migraine was greater in those adolescents who were overweight or obese. The association between overweight and migraine (adjusted for age, gender, smoking, and physical activity) was 1.6 times higher and for tension-type headache it was 1.4 times [(26)].

More evidence was deduced from studies conducted by *Pinhas-Hamiel et al.* and *Ravid et al.* which showed that migraine was more prevalent in obese and overweight patients compared with normal weight patients. According to their results, the prevalence of migraine was 2.5% in normal weight children, 4.4% in over-weight children and 8.9% in obese children [(27&28)].

To the contrary, several studies reported no association between obesity and migraine prevalence, frequency or severity[(29&30)].

The association between insulin resistance and migraine remains to be an avid field for research and studies among an adult cohort showed that insulin metabolism plays a role in migraine and could be a new pathogenic mechanism and a therapeutic target [(31&32)].

In the current study, the incidence of insulin resistance by HOMA-IR among the migraine group was 11 (36.7%) compared to four (10%) in the control group denoting a statistically significant difference between both groups. Another method for detecting insulin resistance that we used was the Quantitative Insulin Sensitivity Check Index (QUICKI) with statistically significant difference among the studied groups; where nine (30%) of the migraine patients had insulin resistance compared to only four (10%) in the control group.

In line with our findings, *Polat et al. in* and *Guldiken et al.* evaluated insulin resistance in adolescents with migraine and healthy control subjects. They found that HOMA-IR levels of patients with migraine were significantly higher than those of controls [(32&33)].

Conclusion:

Our findings suggest that migraine is linked to obesity (higher body mass index), with a higher frequency in the population that is overweight or obese. In thirty six of patients, insulin resistance among other characteristics associated with metabolic syndrome correlates with migraine.

Conflict of interest

No any conflict of interest

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مقاومة الانسولين في الصداع النصفي عند الأطفال

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الهدف من الدراسة: تهدف الدراسة الحالية إلى دراسة العلاقة بين مقاومة الأنسولين لدي الأطفال و الصداع النصفي.

خلفية البحث: يعتبر الصداع النصفي لدى الأطفال من الشكاوى المتكررة, إذ تصل نسب الاصابة به من 3 إلى 10% من الأطفال.

أدوات البحث: هذه الدراسة هي دراسة مقطعية لمقارنة الحالات و الشواهد، أجريت على الأطفال الذين تتراوح أعمارهم بين 4 و 16 عاما والذين تم تجنيدهم من عيادة طب أعصاب الأطفال والعيادة الخارجية للأطفال وجناح طب الأعصاب للمرضى الداخليين في مستشفى الأطفال بجامعة عين شمس ، القاهرة ، مصر. شملت مجموعة الدراسة 30 طفلا مصابا بالصداع النصفي و40 طفلا اصحاء لا يعانون من الصداع النصفي و تم جمع الحالات خلال مدة 6 أشهر. و قد تم الأعتماد على معايير التصنيف الدولي لاضطرابات الصداع لتشخيص الصداع النصفي.كما تم استخدام تقييم نموذج التماثل الساكن و مؤشر فحص حساسية الانسولين الكمي لقياس مقاومة الأنسولين.

النتائج: وكان متوسط عمر مرضى الصداع النصفي 10.03 ± 2.16 سنة أغلبهم من الذكور. ثمانون بالمائة من المرضى لم يبلغوا سن البلوغ بعد .من بين مرضانا، كان 13 (43.3%) يعانون من الصداع المصحوب بهالة ، و24 (80%) لديهم تاريخ عائلي، وكان النوع الأكثر انتشارًا (71.4%) هو الصداع في جانبي الرأس. في الدراسة الحالية ، كانت علامات المقاومة للأنسولين / السمنة المركزية موجودة في 4 (13.3٪) مرضي . من ناحية أخرى ، تم الكشف عن فرق كبير للغاية بين مرضى الصداع النصفي ومجموعة الشواهد فيما يتعلق بالمقاومة للأنسولين بواسطة HOMA-IR ، حيث تبين حدوثه في 11 (36.7٪) بين مجموعة المرضى و 4 (10٪) في مجموعة الشواهد. وبالمثل ، كانت المقاومة للأنسولين وفقا ل QUICKI موجودة في 9 (30٪) من مرضى الصداع النصفي مقارنة ب 4 (10٪) في مجموعة الشواهد ، مما يدل على وجود فرق كبير بين كلتا المجموعتين.

الأستنتاج: بناءً على نتائج بحثنا، يمكن القول أن 36.7% من المرضى الذين يعانون من الصداع النصفي من الأطفال لديهم مقاومة للأنسولين.