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Migraine is Strongly Associated with Central Obesity Than with General Obesity: A Case-Control Study

Migren Genel Obeziteden Daha Fazla ve Güçlü Şekilde Santral Obezite ile İlişkilidir: Bir Vaka-Kontrol Çalışması

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Abstract

Objective: Obesity and migraine are common diseases worldwide, but their association is not confirmed. If an association is proved, weight loss can be made a management objective of a migraine. To assess the risk of migraines in Iraqi patients with general obesity and central obesity.

Material and Methods: A case-control, hospital-based study was conducted at Al-Nuaman Teaching Hospital, Baghdad, Iraq from February 2017-September 2017. One hundred-forty Iraqi patients were enrolled, including 50 patients with migraines and 90 controls without any migraine. General obesity and central obesity were assessed by examining the body mass index and waist-to-height ratio, respectively.

Results: There is a significant association between migraines and general obesity and between migraines and central obesity ($p<0.001$, Odds ratio: general obesity 6.8, central obesity 12.2).

Conclusion: The risk of migraines in patients with central obesity is double the risk in patients with general obesity.

Keywords: Central obesity; general obesity; migraine; case-control study; logistic regression

Özet

Amaç: Obezite ve migren dünya çapında yaygın hastalıklardır, ancak birliktelikleri doğrulanmamıştır. Eğer birliktelikleri kanıtlanırsa, kilo kaybı migren yönetiminde hedef hâline gelebilmektedir. Bu çalışmada, genel ve santral obezitesi olan Irak'lı hastalarda migren riskinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Şubat 2017-Eylül 2017 arasında, Al-Nuaman Eğitim Hastanesinde (Bağdat, Irak) vaka-kontrolü, hastane-tabanlı bir çalışma yürütülmüştür. Çalışmaya, 50'si migrenli, 90'ı migrensiz olan (kontrol) 140 Irak'lı hasta dahil edilmiştir. Genel ve santral obezite sırasıyla beden kitle indeksi ve bel-boy oranı incelenerek değerlendirilmiştir.

Bulgular: Migren ile genel ve santral obezite arasında anlamlı bir ilişki bulunmaktadır ($p<0,001$, Odds oranı: genel obezite 6,8, santral obezite 12,2).

Sonuç: Santral obezitesi olan hastalarda migren riskinin genel obezitesi olan hastalardan iki kat fazla olduğu bulunmuştur.

Anahtar kelimeler: Santral obezite; genel obezite; migren; vaka-kontrol çalışması; lojistik regresyon

Introduction

A migraine is a common disorder that manifests as recurrent episodes of a headache accompanied by features of sensitivity to light, sound, and/or nausea, and has a lifetime prevalence of 13-33% (1). Although a migraine is the second common cause of a headache after a tension headache, it is the most common form of a headache that presents to physicians as it is more severe than a tension headache (2). About 67% of patients with a migraine consult primary care physicians, and only 16% of them consult a neurologist (3). Although presentations of a tension headache and migraine are comparable, clinical features specific to a migraine

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than to a tension headache include photophobia, phonophobia, nausea, food triggers, and lack of physical activity (4-6).

Many explanations have been proposed in the pathophysiology of a migraine, including dietary disorder, low physical activity, inflammation, and hypothalamic disorder (7-9). These possible mechanisms also contribute to the pathogenesis of obesity. Some evidence shows that obesity may promote characteristics of migraine episodes (10-12), but not a tension headache (13, 14).

Obesity can be classified as general obesity, measured by body mass index (BMI), and central obesity, measured by many parameters, and the best of these is termed as a waist-to-height ratio (WtHR) (15).

Many studies have evaluated the association between obesity and migraine; most of them were cross-sectional studies that could not document cause and effect. To the best of our knowledge, there are limited case-control studies investigating such an association, at least in Iraq. Therefore, this case-control study aimed to assess the association between parameters of obesity and the risk of a migraine, and to evaluate whether a migraine is strongly associated with central obesity or general obesity.

Material and Methods

The study was done in accordance with the "Principles of the Helsinki Declaration" and the ethics committee's approval is taken for the study.

Study Design

A case-control study was conducted and approved by the Internal Medicine and Neurology Departments of Iraqia Medical College and AL-Nuaman Teaching Hospital.

Cases

All patients complaining from (undiagnosed) a headache or a migraine who visited medical and neurological outpatient departments of AL-Nuaman Teaching Hospital from February 2017 to September 2017 were eligible for enrollment. Magnetic Resonance Imaging of the brain was performed for selected cases to exclude secondary causes. Overall, 50 patients with a migraine were included. Informed consent has been obtained from the patients.

Inclusion Criteria

Simplified diagnostic criteria for a migraine were adapted from the International Headache Society Classification. These criteria include repeated episodes of a headache persisting for 4-72 hs in otherwise normal patients, plus two or more of the following features: moderate-severe intensity, pulsating pain, one-sided pain, and exacerbation by motion, plus one of the following features: photophobia, phonophobia, and nausea (16).

Exclusion Criteria

Any features indicating a life-threatening illness, including:

1-Onset after age 55 years; 2-Considerable fever, vomiting, or weight loss; 3-Important past medical history (malignancy or tuberculosis); and 4-Abnormal neurologic examination (including fundoscopic examination) (17). Additionally, pregnant women were excluded.

Controls

Outpatients in addition to the medical and non-medical staff of AL-Nuaman Teaching Hospital with no history of a migraine or chronic diseases were randomly chosen as controls, and the same patient exclusion criteria were applied. Overall, 90 controls were included.

Patients and controls were categorized according to age as follows: <25, 25-35, 35-45, and 45-55 years.

All patients and controls supplied informed permission for participation in the study.

Anthropometric Measurements

Weight (in kg), height (in m or cm), and waist circumference (WC, in cm) were measured for patients and controls. General obesity assessed by calculating BMI through dividing weight by height (in m^2). A cutoff point of 30 was used to determine general obesity, which was defined as having BMI ≥ 30 kg/m^2. Central obesity determined by calculating WtHR by dividing WC by height. A WHtR cutoff point of 0.5 was used for assessing central obesity, which was defined as having WHtR >0.5.

Statistical Analysis

Data were analyzed using SPSS version

20.0. Cross-tabulation analysis (Pearson's and Chi square) was performed to evaluate the association between obesity (general and central) and migraine. A logistic regression was accomplished to establish the effects of general obesity and central obesity on the possibility to have a migraine. Exp (B) and 95 % confidence intervals (95% CIs) were calculated to establish whether migraine is strongly associated with general obesity or central obesity. A *P* value of <0.05 was indicated as the level of significance.

Results

Study Population

After the exclusion criteria were applied, 40 patients were excluded (75% of them were women) and a total of 50 patients (with a migraine) were enrolled along with 90 persons (without a migraine).The mean (± standard deviation) age of participants was 35.8±8.8 years, and 51.4% of participants were men. Of the 50 patients, 28 were women (56%) and 22 were men (44%), and the male-to-female ratio was 1:1.3. About 75% of women with a migraine were between 25 and 45 years of age, while 63% of men with migraine were between 35 and 55 years of age. No significant gender-specific and age-specific differences were observed between patients and controls (*P*=0.128 and *P*=0.715, respectively). Characteristics of patients and controls are shown in Table 1. Characteristics of patients with a migraine are shown in Table 2. About two-thirds of persons with central obesity had a non-obese pattern of BMI, and less than one-sixth of patients with general obesity had a WtHR <0.5 (Figure 1).

Association Between Obesity and Migraine

The frequency of general obesity in patients with a migraine was 42%, which was about four times more than that in controls, thus, there is a strong association between a migraine and general obesity (*P*<0.001) (Figure 2). The frequency of general obesity (BMI>30 kg/m^2) in male and female migraineurs was 45.4% and 39.3%, respectively *(P<0.*0001)

The frequency of central obesity in patients with migraines was 72%, which was about four times more than that in controls, thus, there is a strong association between a migraine and central obesity (*P*<0.001) (Figure 2). The frequency of central obesity (WHtR >0.5) in male and female migraineurs was 81.8% and 64.3%, respectively *(P*=0.00001).

Odds Ratio for a Migraine in Patients with General Obesity Versus Central Obesity

Patients with general obesity (BMI>30

Table 1. Basic characteristics of patients and controls.

	(patients) Migraine (% of total)	(control) No migraine (% of total)	P Value
Gender			.128
Male	15.7%	35.7%	
Female	20%	28.6%	
Age			.715
<25	4.3%	5.7%	
25 - 35	11.4%	25.7%	
35 - 45	12.1%	22.1%	
45 - 55	7.9%	10.7%	
BMI categories			.000*
<30	20.9%	58.6%	
>30	15%	5.7%	
WHtR categories			.000*
<0.5	10%	53.6%	
>0.5	25.7%	10.7%	

* significant association.

Table 2. Characteristics of patients with migraine.

Variable	Percentage
General obesity (BMI>30)	42%
Central obesity (WHtR>0.5)	72%
Hypertension	32%
Diabetes mellitus	14%
Smoking	23%

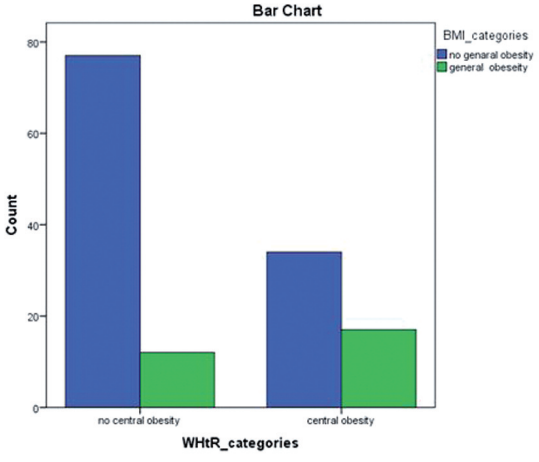

Figure 1: Distrubition of central obesity among patients with general obesity.

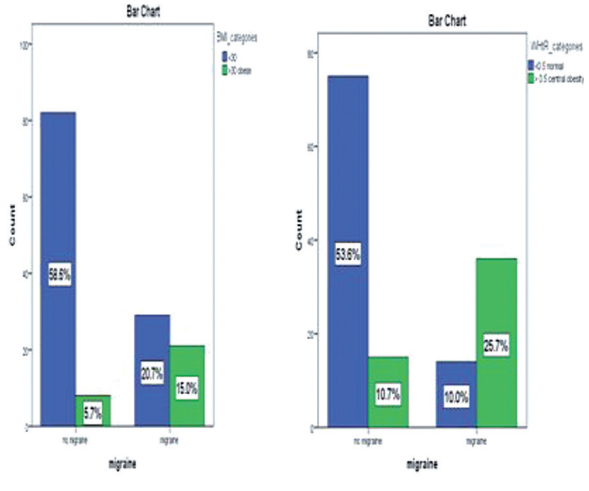

Figure 2: Frequency of general obesity and central obesity among patients and control.

kg/m^2) were six times more likely to have a migraine than those with BMI <30 (odds ratio [OR] 6.8, 95% CI=2.3, 20) (Table 3). Patients with central obesity (WHtR >0.5) were 12 times more likely to have a migraine than those with WHtR <0.5 (OR 12.2, 95% CI=5, 29.8) (Table 3). Therefore, the likelihood of having a migraine was twice more in patients with central obesity than in patients with general obesity.

Discussion

A migraine and obesity are chronic prevalent diseases in the world with undetermined pathogenesis and associations. This study revealed that the frequency of general obesity and central obesity in patients with a migraine (42% vs. 72%, respectively) was much higher than the frequency in controls (9% vs. 17%, respectively). Furthermore, the risk of a migraine in patients with general obesity was six times more than controls (OR 6.8, 95% CI 2.3, to 20), while the risk in those with central obesity was 12 times more than that in controls (OR 12.2, 95% CI=5, 29.8). These data suggest that obesity is a risk factor for a migraine and it is strongly associated with central obesity than general obesity. This is the first case-control study at least in Iraq that examined the association and risk of a migraine in general obesity versus central obesity using categorical variables.

The large difference in the frequency of central obesity between male (82%) and female (64%) migraineurs may be explained by the fact that central obesity in women, in contrast to adult men, is most pronounced after menopause, and most postmenopausal women were excluded from the study as we excluded any patient ≥55 years (18-20).

Obesity is associated with many pain-related medical conditions including fibromyalgia (21,22), osteoarthritis (23,24), abdominal pain (25,26), and back pain (27). Several studies have proven the association between obesity and headache, including migraine. Most of these studies examined the effects of general obesity on migraine and confirmed such significant association (28-34) and some of them found that a migraine is only associated with morbid obesity (35-37). However, some studies have revealed no association between a migraine and general obesity (10,12,38-40), or even showed an association between migraine and being underweight (12,41).

Limited studies have considered the effects of central obesity on migraines, except for

Table 3. Odds ratio for migraines in patients with general obesity versus central obesity.

							95%C.I.for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
General obesity	1.9	.55	12.2	1	.000	6.8	2.3	20.0
Central obesity	2.5	.45	30.4	1	.000	12.2	5.0	29.8

a single category in a study by Lee Peterlin et al. (42), all of these studies confirmed a strong positive association (43-45). Lee Peterlin et al. (42), demonstrated a positive association between migraine prevalence with both general obesity and central obesity in men and women ≤55 years, however, in men >55 years there was no significant association between a migraine and general obesity or central obesity, while in women >55 years, migraine was not associated with general obesity but was inversely associated with central obesity. Most of these studies were cross-sectional, which unlike case-control studies, cannot accord a connection between a cause and an effect.

Several studies have shown that WHtR is superior to other indices of central obesity (28,46,47), as it considers the stature of an individual. Although Omid Sadeghi (44) was the first to use WHtR as an indicator of central obesity, he did not use it to define central obesity. In our study, we defined central obesity as WHtR of ≥0.5.

Although Miri et al. (OR 3.06, 95% CI 1.11-8.43) (48), Scher et al. (OR 5.28, 95% CI 1.3-21.1) (48), and Peres et al. (P< 0.0001) (30) established a strong positive association between general obesity and migraine in case-control studies, our study compared both general and central types of obesity and demonstrated a significant association of migraine with both types, but mainly with central obesity. Many studies have proved that central obesity is commonly an important risk factor of a migraine than general obesity (31,49,50).

The association between obesity and migraine can be elucidated by many factors: inflammatory, hypothalamic, life-style-related like lack of exercise, and psychological comorbidities (51). Adipose tissue, especially visceral adipose tissue, secrete many inflammatory mediators like adipokines (52), tumor necrosis factor α (53), and calcitonin-related peptide (54,55), which can trigger a migraine, and this may explain the strong association between central obesity and migraine than general obesity.

The hypothalamus is integral in the pathophysiology of obesity and migraine, as hypothalamic peptides and neurotransmitters, like serotonin (56), and orixen A (57), play a role in over eating in obese patients, and can trigger a migraine attack.

Furthermore, some evidence suggests that weight loss can improve symptoms of a migraine in obese patients whether behavioral symptoms or after bariatric surgery (58,59), but the strongest evidence was a Women's Health and Migraine randomized controlled trial (60).

This study had many limitations including a small sample size, inequality between cases and controls, overweight persons were categorized within the non obese category, and characteristics of a migraine were not assessed. Further studies are required to prove such an association, which is important in the management of a migraine.

In conclusion, there is a strong association between obesity and migraine and central obesity is an important risk factor for a migraine.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and/or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Bilal Natiq Nuaman, Asaad M. Sadik; Design: Bilal Natiq Nuaman, Asaad M. Sadik; Control/Supervision: Bilal Natiq Nuaman, Asaad M.Sadik; Data Collection and/or Processing: Bilal Natiq Nuaman, Asaad M. Sadik; Analysis and/or Interpretation: Bilal Natiq Nuaman, Asaad M.Sadik; Literature Review: Bilal Natiq Nuaman, Asaad M.Sadik; Writing the Article: Bilal Natiq Nuaman, Asaad M.Sadik; Critical Review: Bilal Natiq Nuaman; References and Fundings: Bilal Natiq Nuaman; Materials: Bilal Natiq Nuaman, Asaad M.Sadik.

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