



## ASSOCIATION OF MIGRAINE SEVERITY AND DISABILITY WITH BODY MASS INDEX.

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### Article received on:

05/08/2019

### Accepted for publication:

16/12/2019

**ABSTRACT... Objectives:** To explore the association of migraine severity and disability with body mass index. **Study Design:** Cross sectional study. **Setting:** Department of Medicine and Physiology of Indus Medical College, Tando Muhammad Khan. **Period:** August 2018 and March 2019. **Material & Methods:** It included all patients both female and male diagnosed with migraine of age group 18-55 years. Diagnosis of migraine was done according to the guidelines by international headache society. Patients were divided into four groups according to various body mass index categories as per the revised guidelines into underweight:  $m2$ , Overweight:  $23.0-24.9 \text{ kg/m}^2$ , Obesity:  $>25 \text{ kg/ m}^2$ . Clinical features of migraine were compared in these groups. The collected data was analyzed in SPSS version 18.00. **Results:** A total 189 ( $n=189$ ) participants recruited in this study, meeting selection criteria were included. Out of 189, 73 presented with aura while 116 presented without aura. So the study population divided into two groups one with aura ( $n=73$ ) and other without aura ( $n=116$ ). Mean  $\pm$  SD of MIDAS score, waist hip ratio, age of onset of headache (in years), frequency of headache per month and the duration of headache (in hours), of the study participants were  $12.18 \pm 4.48$ ,  $0.87 \pm 0.066$ ,  $18.89 \pm 2.97$ ,  $10.93 \pm 2.70$  and  $67.32 \pm 12.52$  respectively. Out of 189 migraine patients ( $n=189$ ), 30 (15.87%) were with normal BMI, 11 (5.82%) were underweight, 111 (58.73%) were overweight and remaining 37 (19.58%) were obese. Similarly, when mean  $\pm$  SD of the duration of headache (in hours) compared among normal BMI ( $n=30$ ), underweight ( $n=11$ ), overweight ( $n=111$ ) and obese ( $n=37$ ), it was  $66.06 \pm 10.70$ ,  $58.9091 \pm 15.62$ ,  $66.64 \pm 9.01$  and  $72.86 \pm 18.82$  respectively. ( $p$  value 0.004 and  $f$  value 4.52) that is statistically significant. **Conclusion:** This study demonstrates that there is strong positive association between the severity and disability due to migraine with increase in body mass index. Future research is required to fill the gap to explore the pathophysiological mechanisms beside this association.

### Key words:

Body Mass Index, Migraine, With Aura, Without Aura.

**Article Citation:** Bai K, Suthar RK, Goswami P, Memon MA. Association of migraine severity and disability with body mass index. Professional Med J 2020; 27(5):979-986. DOI: 10.29309/TPMJ/2020.27.05.4012

## INTRODUCTION

Migraine is a complex besides multifaceted neurological illness comprising of events of head pain usually throbbing, one-sided and severe.<sup>1,2</sup> which may last over several days. It is seventh leading cause of disability affecting the quality of life for many years, may impact on economy of patient because of inability to perform daily activities / work. Nearly 15% of the population worldwide is suffering from this annoying issue. Patient with migraine experiences headache for a long time with recurrent migraine attacks regardless of enhanced acute and prophylactic treatments.<sup>3</sup> According to the International Headache Society (IHS)<sup>4</sup>, migraines attacks usually last four to seventy two hours, commonly related with nausea, vomiting, photophobia, sensitivity to sound, or movement. Almost one-third of migraine patients have attacks that are preceded or accompanied

by an aura. Aura is defined as characteristic transient focal neurological symptoms, visual in most instances, sensory, speech and motor function disabilities may also be encountered.<sup>1</sup> Cross sectional nationwide prevalence survey, reports prevalence of headache among Pakistani population is 76.6%, and of migraine was 22.5%.<sup>5</sup>

According to the World Health Organization, migraine is ranked 20<sup>th</sup> in the world's debilitating disorder, and the resulting burden from migraine alone surpasses the burden of stroke, epilepsy, multiple sclerosis, Alzheimer's disease and Parkinsons Disease.<sup>6</sup> Migraine as well as obesity are two foremost issues of well-being concern, substantially affecting the quality of life physically, mentally and economically. Pakistan is the 9<sup>th</sup> most obese nation in the world.<sup>7,8</sup> Previous studies had revealed that obese

migraine patients had frequent, severe attacks of migraine with raised associated symptoms such as advanced disability grades, aura and an increased frequency of sensitivity to light and sensitivity to sound.<sup>9</sup> The association among obesity and migraine is the attention of current clinical research.<sup>9,10</sup> Migraine has been classically divided into four phases: the premonitory, aura, headache, and postdrome phases.<sup>2</sup> Studies conducted for on pathophysiology of migraine revealed that non-obese female migraineurs suffer from hyperinsulinemia, which is associated with elevated leptin and (glucagon like peptide) GLP-2 levels. Increased leptin and GLP-2 are risk factors for migraine. Neurotransmitter serotonin related abnormalities have been suggested as a neurochemical basis for migraine.<sup>11</sup> Migraine disability assessment questionnaire MIDAS was established to evaluate headache-associated disability with the purpose of improving migraine related care. It is a self-administered questionnaire designed to quantify headache-related disability over a three-month period.<sup>12,13</sup>

This questionnaire consists of five questions that focus on time or productivity lost, as well as the limited ability to participate in work or school, domestic doings and family, and social or leisurely activities. The total MIDAS score can be used to define four grades of migraine-related disability. Grade 1 for “little or no disability” (0–5); Grade 2 for “mild disability” (6–10); Grade 3 for “moderate disability” (11–20); Grade 4 for “severe disability” ( $\geq 21$ ).<sup>12</sup>

The rationale of this study is to explore the association of migraine severity and disability with body mass index. It is hypothesized that severity of migraine and related disability are directly related to the changes in body mass index. BMI determined according to the World Health Organization classification as “underweight” ( $<18.5$ ), “normal” (18.5–24.9), “overweight” (25.0–29.9), “obese” (30–39.9) or “morbidly obese” ( $>40$ ).

## MATERIAL & METHODS

All the volunteers of age group 18 to 45 years of either gender diagnosed with migraine included

in this study.

High blood pressure, diabetes mellitus any other neurovascular condition that cause headache excluded from the study.

This cross sectional research study was done in the Department of Medicine and Physiology of Indus Medical College, Tando Muhammad Khan, from August 2018 and March 2019. It included all patients both female and male diagnosed with migraine of age group 18-55 years. Diagnosis of migraine was done according to the guidelines by international headache society. Patients with any other type of headache, neurological or psychiatric comorbidities, high blood pressure, and diabetes mellitus were not included in the study. This study was approved by the ethical committee of the Institute. Informed written consent was taken from all participants before clinical interview and measurements. Demographic variables were recorded on predesigned proforma, and then structured interview was conducted. Particulars of Migraine history such as age of onset of headache in years, frequency of headache per month, history of presence of aura, duration of headache in hours, severity & disability due to disease followed by clinical neurological examination. Severity of migraine was evaluated according to MIDAS survey questionnaire, which is used to assess the actual impact of headache in last three months on patient's quality of life, influence of migraine on daily life was assessed using the Migraine Disability Assessment Scale (MIDAS) questionnaire.

Obesity was determined from Body mass index, which was calculated as weight in kilograms divided by the square of height in meters ( $\text{kg}/\text{m}^2$ ). Patients were divided into four groups according to various body mass index categories as per the revised guidelines into underweight:  $\text{m}2$ , Overweight: 23.0-24.9  $\text{kg}/\text{m}^2$ , Obesity:  $>25 \text{ kg}/\text{m}^2$ . Clinical features of migraine were compared in these groups.

## RESULTS

A total 189 ( $n=189$ ) participants recruited in this study, meeting selection criteria were included.

Out of 189, 73 presented with aura while 116 presented without aura. So the study population divided into two groups one with aura (n=73) and other without aura (n=116). The overall mean age + SD (range) was 28.80+ 8.54(18 to 48 years). There was no significant difference of age (compare means) between male and ladies subjects (p value = 0.99). Table-I

The study participants (n=189) divided into two types, first migraine with Aura n=73 (38.62%) and second Migraine without aura n=116 (61.36%). Figure-1

Mean±SD of MIDAS score, waist hip ratio, age of onset of headache (in years), frequency of headache per month and the duration of headache (in hours), of the study participants were 12.18+4.48, 0.87+.066, 18.89+2.97, 10.93+2.70 and 67.32+12.52 respectively. Table-I

Mean±SD of MIDAS Score among the migraineurs without aura (n=116) was 12.18±4.48 but among the patients who presented with aura (n=73), it was 16.39±6.39. (P value<0.01) that presents statistically significant association of the type of migraine with MIDAS score. Table-III

Out of 189 migraine patients (n=189), 30(15.87%) were with normal BMI, 11(5.82%) were underweight, 111(58.73%) were overweight and remaining 37(19.58%) were obese. Figure-2

Mean of the MIDAS score among normal BMI (n=30), underweight (n=11), overweight (n=111) and obese (n=37), when compared by applying ANOVA test; MIDAS score among these

four groups were 11.43, 11.18, 10.81 and 17.18 respectively. (f value 27.3 and p value 0.001). That reveals the significant disability and disturbed quality of life among the migraineurs who are overweight and obese. Table-IV

Similarly, when mean ±SD of the duration of headache (in hours) compared among normal BMI (n=30), underweight (n=11), overweight (n=111) and obese (n=37), it was 66.06±10.70, 58.9091±15.62, 66.64±9.01 and 72.86±18.82 respectively. (p value 0.004 and f value 4.52) that is statistically significant. Duration of headache was more among obese migraine patients. Table-IV

When Body mass index evaluated according to type of migraine, among the migraine patients without aura (n=116), 18 (60%) were of normal BMI, 8(72.7%) of underweight BMI, 89(80.2%) were overweight and 1 (2.7%) was obese. Instead, among the migraine patients with aura, 12(40.0%) were of normal BMI, 3(27.3%) of underweight, 22(19.8%) were overweight and 36(97.3%) were obese. P value <0.001 with Pearson chi square value 70.910<sup>a</sup> Table-V.

When MIDAS grade compared among the patients with aura (n=116) and without aura (n=37) there was significant difference of MIDAS grade between these two groups. (p value 0.005) Table-VI.

Waist hip ratio was more among the patients of migraine with aura when matched with the patients without aura. (P value <0.01) Table-VII.

	N	Minimum	Maximum	Mean	Std. Deviation
Age ( in years)	189	18.00	48.00	28.8042	8.54517
MIDAS Score	189	4.00	22.00	12.1852	4.48432
Waist hip ratio	189	.79	1.06	.8711	.06675
Age of onset of headache (in years)	189	14.00	25.00	18.8995	2.97068
Frequency of headache per month	189	4.00	17.00	10.9365	2.70857
Duration of headache (in hours)	189	36.00	144.00	67.3228	12.52005

Table-I

	Gender	N	Mean	Std. Deviation	Std. Error Mean	P-Value
Age (in years)	Male	62	29.0484	8.52850	1.08312	0.99
	Female	127	28.6850	8.58450	.76175	

Table-II. Gender based distribution of study population (n=189)

	Type of Migraine	N	Mean	Std. Deviation	Std. Error Mean	P-Value
MIDAS Score	Without aura	116	9.5345	2.44391	.22691	<0.01**
	With aura	73	16.3973	3.69587	.43257	

Table-III. MIDAS Score in association with type of migraine (n=189)  
 \*\* < 0.01 is considered statistically significant

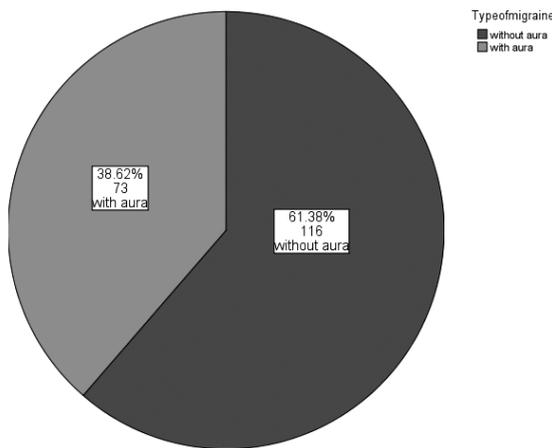


Figure-1. Frequency of type of migraine

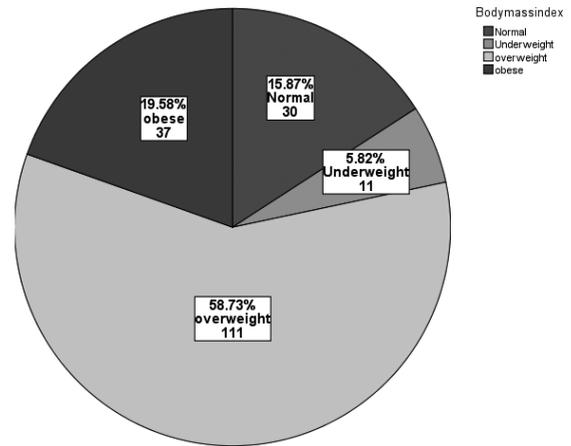


Figure-2. BMI based distribution of migraineurs (n=189)

		N	Mean	Std. Deviation	F-Value	P-Value
MIDAS Score	Normal	30	11.4333	4.50810	27.3	<0.001**
	Underweight	11	11.1818	4.60040		
	Overweight	111	10.8198	3.41440		
	Obese	37	17.1892	3.85744		
	Total	189	12.1852	4.48432		
Duration of headache in hours	Normal	30	66.0667	10.70267	4.52	0.004*
	Underweight	11	58.9091	15.60420		
	Overweight	111	66.6486	9.01277		
	Obese	37	72.8649	18.82988		
	Total	189	67.3228	12.52005		

Table-IV. Association of MIDAS score for migraine and duration of headache with Body Mass Index (n=189)  
 \*\* < 0.01 is considered highly significant  
 \* < 0.05 is considered significant

Type of Migraine	Body mass index				Total	P-Value
	Normal	Underweight	overweight	obese		
without aura	18	8	89	1	116	<0.001**
	60.0%	72.7%	80.2%	2.7%	61.4%	
with aura	12	3	22	36	73	
	40.0%	27.3%	19.8%	97.3%	38.6%	
Total	30	11	111	37	189	
	100.0%	100.0%	100.0%	100.0%	100.0%	

**Table-V. Type of migraine and body mass index cross tabulation Pearson chisquare 70.910<sup>a</sup>  
\*\* p value < 0.01 is considered highly significant**

Count		MIDAS grade				Total
		Grade I	Grade II	Grade III	Grade IV	
Type of migraine	without aura	4	79	33	0	116
	with aura	0	1	48	24	73
Total		4	80	81	24	189

**Table-VI. Association of migraine with MIDAS grade ( n=189)  
Pearson chi square value=1.023E2a  
P value <0.001**

	Type of migraine	N	Mean	Std. Deviation	Std. Error Mean
Waist hip ratio	without aura	116	.8705	.07005	.00650
	with aura	73	.8721	.06160	.00721

**Table-VII. Waist-hip ratio among migraine with aura and migraine without aura  
P value< 0.01by t- test**

## DISCUSSION

Primary headache and obesity are vastly widespread ailments in the general populace. While many research studies have revealed an association between the primary headache and obesity, there is still no overall comprehension about this link. To achieve a more perfect understanding in this favor, this research study has been accompanied.

Mean age of migraine sufferers in several research studies was 33 years while in this research study it is 18 to 48 years. Mean age of subjects was  $34.5 \pm 7.4$  years and 77.9% of them were ladies.<sup>14</sup> According to this research study, migraine is more prevalent in females as compared to males; this finding is supported by cupini LM et al. and his colleagues by concluding in their research that gonadal hormone fluctuation may impact both forms of migraine.<sup>15</sup> Migraine headaches are three times more prevalent in ladies than in men.<sup>16</sup> According to Thierr A et al, 66 migraineurs, more than half 37 (56.06%) had a

migraine with aura but according to this research study 73(63%) presented with aura out of 189 migraine patients.<sup>17</sup> Mean $\pm$ SD waist hip ratio in this study is  $0.87 \pm 0.066$ , that is analogous to a research study published in the Iranian journal of Neurology, also showed mean waist hip ratio in migraineurs as 0.86.<sup>18</sup>

According to this research study, waist hip ratio was raised among the patients of migraine with aura when matched with the patients without aura. (P value <0.01) and according to Laino D et al., a decrease in body weight cause decrease in the incidence and severity of headache and my also represent an key therapeutic strategy.<sup>19,20</sup>

In this research study, out of 189 migraine patients (n=189), 30(15.87%) were with normal body mass index, 11(5.82%) were underweight, 111(58.73%) were overweight and remaining 37(19.58%) were obese. So that most of the migraine patients were overweight. When mean  $\pm$ SD of the duration of headache (in

hours) compared among normal body mass index (n=30), underweight (n=11), overweight (n=111) and obese (n=37), it was  $66.06 \pm 10.70$ ,  $58.9091 \pm 15.62$ ,  $66.64 \pm 9.01$  and  $72.86 \pm 18.82$  respectively. (p value 0.004 and f value 4.52) that is statistically significant. Duration of headache was more among obese migraine patients. When Body mass index evaluated according to type of migraine, among the migraine patients without aura (n=116), 18 (60%) were of normal body mass index, 8(72.7%) of underweight body mass index, 89(80.2%) were overweight and 1 (2.7%) was obese. Instead, among the migraine patients with aura, 12(40.0%) were of normal body mass index, 3(27.3%) of underweight, 22(19.8%) were overweight and 36(97.3%) were obese. P value <0.001 with Pearson chi square value 70.910a. These outcomes are similar to that of Thierr A et al.<sup>17</sup> who found a significant association between migraine and body mass index with a p value at 0.0019. There were more migraine sufferers among obese subjects 24 (36.36%) and overweight subjects 23 (34.85%) and the risk of migraine increases with body mass index. There is increased frequency, severity of migraine and aura, which is obvious by brief focal neurological symptoms frequently preceding or often accompanying the headache, is found to occur more in obese migraine patient.<sup>21</sup> One research study found low severity scores in patients with normal body mass index, which increased with increasing body mass index.<sup>22</sup>

Miri A et al<sup>14</sup> observed that obesity is absolutely positively linked with risk of migraine with aura. In addition, subjects with obesity had higher headache daily result matched with those with normal weight. Mean  $\pm$ SD of MIDAS Score among the migraine sufferers without aura (n=116) was  $12.18 \pm 4.48$  but among the patients who presented with aura (n=73), it was  $16.39 \pm 6.39$ . (P value <0.01) that presents statistically significant association of the type of migraine with MIDAS score. In several research studies, it has been revealed that MIDAS score is less in normal body mass index subjects as compared to obese people, our findings are consistent with such research studies that MIDAS score is raised in obese persons and overweight people as

compared to normal and underweight body mass index populace.<sup>21,22</sup> Mean of the MIDAS score among normal body mass index, underweight, overweight and obese, when compared by applying ANOVA test; MIDAS score among these four groups were 11.43, 11.18, 10.81 and 17.18 respectively. (f value 27.3 and p value 0.001. That shows the significant disability and troubled quality of life among the migraine sufferers who are overweight and obese.

Tiu DN et al.<sup>16</sup> observed that maximum MIDAS score was present in obese patients (19.6) while it was lowest in normal subjects. The difference was significant (P < 0.05). When MIDAS grade compared among the patients with aura (n=116) and without aura (n=37) there was significant difference of MIDAS grade between these two groups. (p value 0.005); Tiu DN et al.<sup>16</sup> also revealed that the proportion of subjects with severe headache pain increased with body mass index, doubling in the morbidly obese relative to the normally weighted. Similar significant associations were demonstrated with body mass index category for disability, photophobia, and phonophobia. Obesity and its related complications, such as insulin-resistance, are risk agents for chronic migraine: this is highlighted by the evidence that an improvement of metabolic control in obese subjects, through body mass index correction, may reduce frequency of migraine attacks. The relationship between obesity and migraine is multifaceted and comprises both central and peripheral pathways, but obesity and migraine are also both influenced by sedentary ways of life factors.<sup>20</sup>

## CONCLUSION

Migraine and its severity are positively associated with body weight (revealed by Body Mass Index) and abdominal obesity (revealed by waist hip ratio). Further the area is open for further research to understand the pathophysiological mechanisms beside increased frequency of migraine among obese people and how loss in weight improves migraine symptoms.

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### AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Kavita Bai	Concept, Statics and data analysis.	
2	Ramesh Kumar Suthar	Data collection.	
3	Pushpa Goswami	Drafting and revision.	
4	Mumtaz Ali Memon	Critical revision and finalizing of article.	