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Association Between Glucose Level And Prevalence of Headache Among Saudi Population: A Cross-Sectional Study

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RESEARCH

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ABSTRACT

Objective

To investigate the association between glucose levels and the prevalence of headaches among the adult Saudi population.

Methods

This research will employ a cross-sectional study design, which involves collecting data from a sample of the Saudi population at a single point in time. This design allows for the investigation of the association between glucose levels and headache prevalence in a cost-effective and time-efficient manner.

Results

The study included 574 participants. The most frequent weight among them was 51-65 kg (n= 196, 34.1 Per Cent), followed by 66-75 kg (n= 130, 22.6 Per Cent). The most frequent height among study participants was 151-160 cm (n= 229, 39.9 Per Cent), followed by 161-170 cm (n= 195, 34 Per Cent). The most frequent age among study participants was less than 25 years (n= 203, 35.4 Per Cent), followed by 25-30 years (n= 143, 24.9 Per Cent). The most frequent nationality among study participants was Saudi (n= 547, 95.3 Per Cent), followed by non-Saudi (n= 27, 4.7 Per Cent). The most frequent gender among study participants was female (n= 351, 61.1 Per Cent), followed by male (n= 223, 38.9 Per Cent). The perceived blood sugar level intake varied among study participants, with most having normal blood sugar levels. Participants were asked if they smoked. Most were not smoking (n=482, 84 Per Cent), and non-smoking were (n=92, 26 Per Cent). Participants were asked about the nature of the headache. The most frequent were they don't have (n= 345, 60.1 Per Cent), followed by sharp (n= 116, 20.2 Per Cent), and the least was continuous (n=113, 19.7 Per Cent). Participants were asked about a kind of headache. The most frequent were they don't have (n=

367, 63.9 Per Cent), followed by stress headaches (n= 116, 20.2 Per Cent), and the lowest cluster (n=15, 2.6 Per Cent).

Conclusion

The results of the study showed that most of the participants were Saudis. Most of them are women. In addition, the majority of people have normal fasting blood sugar levels. Their physical activity is moderate and the majority are non-smokers. In addition, most of the study participants had good and effective social communication.

Key Words

Headache

Introduction

Migraine is a chronic neurological condition characterized by recurrent headache episodes that last 4 to 72 hours and are often accompanied by other symptoms such as nausea, vomiting, sensitivity to light and sound, and phonophobia [1,2]. Commonly occurring between the ages of 25 and 50, migraine is regarded as a complicated neurovascular brain condition [3]. Migraine is the third most prevalent medical condition and the second most debilitating neurological disorder in the world, with a lifetime frequency of 15-20 Per Cent. Migraine has a higher prevalence in females (33 Per Cent lifetime vs. 13 Per Cent annually) than males (6 Per Cent yearly vs. 13 Per Cent lifetime) [4-6]. Migraine is three times more common in women than in males, according to studies done in the United States and Europe [7]. Loss of productivity and increased use of healthcare services contribute significantly to the monetary burden that migraine places on sufferers and their communities[8]. The social and economic burden of migraines is high [9], with yearly costs of US $20 billion in the United States and €111 billion in the European Union. An estimated 95 Per Cent of migraine headaches can be placed into one of two major clinical subclasses by the International Headache Society (IHS): migraine without aura (MO), which affects 70-80 Per Cent of migraineurs, and Migraine with Aura (MA), in which patients experience auditory, visual, and sensory hallucinations [10,11]. Migraine with aura, hemiplegic, and retinal migraine are the three primary subtypes of MA. According to the frequency of headache attacks, migraine may be classified as either episodic (EM) or chronic (CM) [12].

Environmental variables have also been observed to have a substantial influence in initiating and maintaining migraine in certain patients, adding another layer of complexity to the disease. Migraines may be brought on by things like not eating or eating too late, not drinking enough water, hormonal shifts, exposure to strong light or noise, using oral contraceptives, or taking hormone replacement therapy [13]. The evolution of the illness and the effectiveness of treatment and prevention strategies for migraine may be significantly influenced by the presence of many comorbidities, including those of a neurological, cardiovascular, psychiatric, and endocrine nature. Migraine sufferers, particularly those with MA, have a higher risk of cardiovascular complications such stroke [14], angina [15], and myocardial infarction [16] than the general population. Multiple studies have sought to identify shared metabolic abnormalities in migraine patients because of their increased risk of multiple cardiovascular illnesses. Glucose metabolic characteristics have been the subject of much research. Hypoglycemia has been linked to migraines for than a century. It has long been recognized that low blood sugar levels may bring on or exacerbate migraine symptoms [17-20]. Preliminary experimental research [21] shows that fasting or the injection of glucose or insulin might cause metabolic changes that can trigger migraine symptoms. Hypoglycemia may trigger migraine episodes in CM patients after extended fasting because insulin is a key regulator of brain glucose metabolism[22]. Interictal deficits in glucose tolerance and insulin resistance have been seen in several investigations with migraine[23,24]. The hormone insulin, in particular the insulin-sensitive glucose transporter GLUT4, is the primary regulator of glucose homoeostasis by facilitating glucose uptake from the blood into cells, especially fat and muscle.

Patients with CM have been found to have greater levels of insulin resistance [25], despite the fact that there is conflicting evidence about the prevalence of metabolic problems in migraine. In a study of young, normal-weight, migraine-free individuals, Insulin Resistance (IR) was shown to be significantly higher compared to non-migraineurs [26]. On the other hand, IR is a major pathogenetic element in the development of T2D. Different research have shown contrasting findings on the prevalence of type 2 diabetes in migraine sufferers[26-29]. When other T2D related pathogenetic abnormalities are present, IR linked with CM may enhance the risk of T2D [30-32]. Therefore, if -cell insulin secretion is impaired in CM patients with high IR, these individuals may be at an increased risk of developing T2D. IR is linked to many different diseases and conditions[34], including as dyslipidaemia, obesity, diabetes, high blood

pressure, stroke, and coronary artery disease. Comorbidity between migraine and glucose-related characteristics is not uncommon because of the high prevalence of both illnesses and the fact that they commonly share aetiologies. This narrative review will thus concentrate on observational epidemiology and genetic research to investigate the association between migraine and glucose-related features.

The research problem addressed in this study is of significant concern due to its potential impact on public health in Saudi Arabia and beyond. The primary research problem is the prevalence of headaches among the Saudi population, which has been rising in recent years. Headaches can substantially diminish an individual's quality of life and productivity, and understanding their causes and risk factors is crucial for effective prevention and management. This research aims to investigate whether there is a significant association between glucose levels and the occurrence of headaches, seeking to identify a potential relationship that may guide healthcare interventions.

Another aspect of the research problem is the increasing burden of diabetes and metabolic disorders in Saudi Arabia. The nation has witnessed a surge in the incidence of diabetes, which is closely linked to glucose dysregulation. Understanding how glucose levels might contribute to headaches can provide valuable insights into the broader health implications of this growing epidemic. As such, the research problem addresses the urgent need to delve into the interplay between glucose metabolism and headaches, a multifaceted issue that has not been extensively studied in the Saudi context.

Furthermore, this research problem has implications for global health. Diabetes and headache disorders are not confined to Saudi Arabia; they affect populations worldwide. If a substantial association between glucose levels and headaches is discovered in this study, it could have relevance and applications beyond Saudi Arabia's borders. This research seeks to contribute to the growing body of knowledge on the link between metabolic health and headache prevalence, which may have far-reaching implications for healthcare practices and strategies internationally.

Methods

Study design

This research will employ a cross-sectional study design, which involves collecting data from a sample of the Saudi population at a single point in time. This design allows for the investigation of the association between glucose levels and headache prevalence in a cost-effective and time-efficient manner.

Study approach

The study will be conducted in various healthcare facilities and communities across Saudi Arabia, ensuring a diverse representation of the population. This will include primary care clinics, hospitals, and urban as well as rural settings to capture a comprehensive view of the Saudi population.

Study population

The target population for this research is the adult Saudi population aged 18 and above, regardless of gender, residing in different regions of Saudi Arabia. Individuals with known chronic conditions that could influence glucose levels or headache prevalence, such as diagnosed diabetes or other significant medical conditions, will be excluded.

Study sample

A stratified random sampling technique will be employed to ensure that the sample is representative of different age groups and geographical regions. The sample size will be determined based on statistical power calculations, with an estimated level of significance. It is expected to be sufficiently large to detect significant associations.

Study tool

For the current study, questionnaire was adopted for data collection, which was also categorized as a study tool.

Data collection

Data will be collected through online google form questionnaire. Participants will be asked to provide information on demographics, medical history, lifestyle factors, and dietary habits. Glucose levels will be measured through fasting blood tests, and headache prevalence will be assessed through structured questionnaires and medical records review.

Data analysis

Statistical analysis will involve the use of appropriate tests such as chi-square, t-tests, and regression analyses to investigate the association between glucose levels and headache prevalence. Data will be analyzed using statistical software (SPSS), and p-values less than 0.05 will be considered statistically significant.

Ethical considerations

The study will adhere to ethical principles, including obtaining informed consent from all participants. Ethical approval will be sought from the relevant institutional review board or ethics committee. Confidentiality of participant data will be strictly maintained, and participants

will be informed of their right to withdraw from the study at any point without consequences. The study will also ensure that all procedures are conducted in accordance with the Declaration of Helsinki and other applicable ethical guidelines.

Results

The study included 574 participants. The most frequent weight among them was 51-65 kg (n= 196, 34.1 Per Cent), followed by 66-75 kg (n= 130, 22.6 Per Cent). Figure 1 shows the weight distribution among study participants. The most frequent height among study participants was 151-160 cm (n= 229, 39.9 Per Cent), followed by 161-170 cm (n= 195, 34 Per Cent). Figure 2 shows the height distribution among study participants. The most frequent age among study participants was less than 25 years (n= 203, 35.4 Per Cent), followed by 25-30 years (n= 143, 24.9 Per Cent). Figure 3 shows the distribution of age among study participants.

The most frequent nationality among study participants was Saudi (n= 547, 95.3 Per Cent), followed by non-Saudi (n= 27, 4.7 Per Cent). Figure 4 shows the distribution of nationality among study participants.

The most frequent gender among study participants was female (n= 351, 61.1 Per Cent), followed by male (n= 223, 38.9 Per Cent). Figure 5 shows the distribution of gender among study participants.

The perceived blood sugar level intake varied among study participants with most of them had normal blood sugar levels. Perceived blood sugar level intake is presented in Figure 6.

Participants were asked if they smoked. Most were not smoking (n=482, 84 Per Cent), and non-smoking were (n=92, 26 Per Cent). Participants were asked to assess their diseases. Their results are presented in Table 1.

Participants were asked about the nature of the headache. The most frequent were they don't have (n= 345, 60.1 Per Cent), followed by sharp (n= 116, 20.2 Per Cent), and the least was continuous (n=113, 19.7 Per Cent). Figure 7 shows the participants' nature of the headache.

Participants' activity levels during the day were frequently inactive (n= 51, 8.9 Per Cent), light active per day (n= 160, 27.9 Per Cent), middle active (n=290, 50.5 Per Cent), and high active 73 participants reported that high active per day (12.7 Per Cent).

Participants were asked about a kind of headache. The most frequent were they don't have (n= 367, 63.9 Per Cent), followed by stress headaches (n= 116, 20.2 Per Cent), and the lowest cluster (n=15, 2.6 Per Cent).

Discussion

Migraines and other types of headaches may be brought on or made worse by hypoglycemia (low blood sugar/glucose) [35,36]. When meal intake is inadequate, blood glucose levels may fall too low. If you don't eat, don't change your diet, and don't fast, you'll end up in the same place. One of the early suggestions is that low blood sugar, or hypoglycemia, is a contributing factor in fasting headaches. Migraine attacks may be significantly and uniquely triggered in certain people by elevated blood glucose levels. Migraine episodes are reported to be precipitated or made worse by hypoglycemia[37]. Long-term fasting is associated with an increased risk of migraines, and fasting is one of the most often reported triggers of migraines (39 Per Cent-66 Per Cent across 13 studies, 38 studies, and 40 studies). Fasting headache has been linked to changes in pain receptors in the brain, according to some specialists[38-41]. This is especially true for those who are genetically prone to experiencing such changes. Fasting for religious causes, such as during Ramadan or Yom Kippur, has also been studied in relation to migraine [42-45] with similar results. Some individuals have migraines when they fast overnight [48]. Migraines may be worse by fasting and skipping meals. In one research, a 38-year-old obese lady with migraines saw her episodes lessen when she started drinking orange juice to treat hypoglycemia. The similar correlation between low blood sugar and headaches was also shown by the researchers in a further four subjects. These findings suggest that low glucose levels may have a direct or indirect role in causing headaches associated with fasting. Similarly, six out of twelve patients with migraines reported experiencing pain while fasting, as reported by Blau and Cumings. So, it's possible that hypoglycemia plays a role in the attacks, and eating something is an easy method to avoid headaches if that's the case. Furthermore, Blau and Pyke [46-49] reiterated that the correction of hypoglycemia in T2D and migraine patients led to a significant decrease in migraine. Of the 36 individuals with migraine and T2D studied, 5 had their migraines alleviated or lessened following blood glucose correction, and 4 had their migraines altered by nocturnal hypoglycemia. Fasting or skipping meals was linked to migraine attacks in 6 of the remaining 27 participants.

The insulin receptor has been demonstrated to be activated by fasting in clinical research. An unexpected trigger for migraine aura is intravenous insulin infusion. Research has shown that a decline in blood glucose levels brought on by insulin treatment might cause headache-like symptoms. However, more evidence was supplied ten years later with the discovery that reactive hypoglycemia generated by sugar might cause migraines . Rarely, a high-sugar meal may cause low blood sugar, a condition known as reactive hypoglycaemia, owing to a sudden rise in blood sugar levels (Hyperglycemia) followed by an overproduction of insulin and a subsequent rapid decrease in blood sugar levels. Hypoglycemia may cause a migraine episode in those who suffer from migraines after extended fasting, and insulin is a crucial regulator for brain glucose metabolism. Migraine-related changes in brain glycogen metabolism were reviewed by Dalkara and Kilic. During the intense synaptic activity of a headache episode, astrocytes store plasma glucose as glycogen and rapidly breakdown it for glutamate and potassium absorption. A prolonged state of low blood glucose and continuous sympathetic activity during long-term fasting has been hypothesized by the authors to deplete presynaptic astrocytes' ability to produce glucose from glycogen, hence eliciting aura and headache [41]. Studies using magnetic resonance spectroscopy (MRS) have shown, for instance, that people who suffer from migraines have abnormalities in mitochondrial Oxidative Phosphorylation (OXPHOS) [50], resulting in hypometabolism or low ATP levels. Migraine attacks may be triggered by fasting or the injection of glucose or insulin, according to early research that corroborated these findings. Headache is not a typical complaint in people with symptomatic hypoglycemia, however this is countered by arguments in ICHD-3beta. For instance, most migraine sufferers did not experience headaches when their blood sugar was lowered with insulin. While observing 20 people with migraines for 2 hours, Pearce et al. found that 2 of them had headaches owing to insulin-induced hypoglycemia. Migraine episodes, he reasoned, might result from a combination of low blood sugar and other metabolic processes. Migraine episodes and other metabolic disturbances are thus thought to be linked to an abrupt drop in blood glucose levels.

Hemiplegic migraine and migraine with aura have been linked to a genetic condition called GLUT1 (glucose transport protein type 1) deficient syndrome [51]. The GLUT1 gene (encoded by the SLC2A1 gene) has been reported to have a number of heterozygous mutations. Patients with this condition have a variety of neurological disorders due to impaired glucose transport across the blood-brain barrier. Migraine headaches have been linked to glucose shortage, which is supported by the GLUT1 deficiency syndrome. Also, in contrast to hypoglycemia's influence on CSD durations[52], hyperglycemia makes the cortex more resistant to the onset of CSD and speeds up CSD recovery. Migraine aura and headaches may be generated by insulin-induced hypoglycemia since it greatly increases the duration of CSD in experimental animals. Experimental research released in 2017 indicated that the metabolic alterations brought on by the injection of insulin, glucagon, or leptin significantly modify neuronal activity in the trigeminovascular system, a key mechanism in the etiology of migraine headaches [53-65]. This demonstrates the potential neurobiological connection between migraine and changes in glucose homoeostasis. One of these SNPs (rs1024905, minor allele G) has been linked to increased migraine risk and lower expression of the C12orf5 gene in the brain's blood, cerebellum, and temporal cortex, according to recent bioinformatics analysis [65-75]. Inhibitory regulation of glucose breakdown (glycolysis) in human cells has recently been attributed to the C12orf5 gene, which has been identified to encode the TP53-inducible glycolysis and apoptosis regulator (TIGAR). As a consequence, lower TIGAR expression leads to enhanced glucose breakdown as a result of lessened inhibition of glycolysis. People with the rs1024905-G risk allele for migraines may also have a higher rate of glucose breakdown [80-107].

Conclusion

The results of the study showed that most of the participants were Saudis. Most of them are women. In addition, the majority of people have normal fasting blood sugar levels. Their physical activity is moderate and the majority are non-smokers. In addition, most of the study participants had good and effective social communication.

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Tables & Figures

Table 1: Participant disease in the study.

Survey item	Yes	No
Do you have frequent urination?	148 25.80 Per Cent	426 74.20 Per Cent
Do you have blurred eyes?	158 27.50 Per Cent	416 72.50 Per Cent
Do you have frequent urinary tract infections?	88 15.30 Per Cent	486 84.70 Per Cent

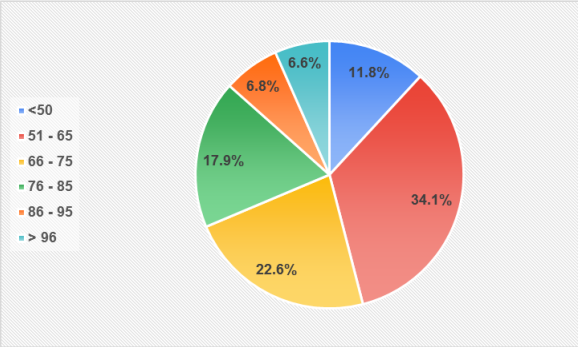

Figure 1: Weight distribution among study participants.

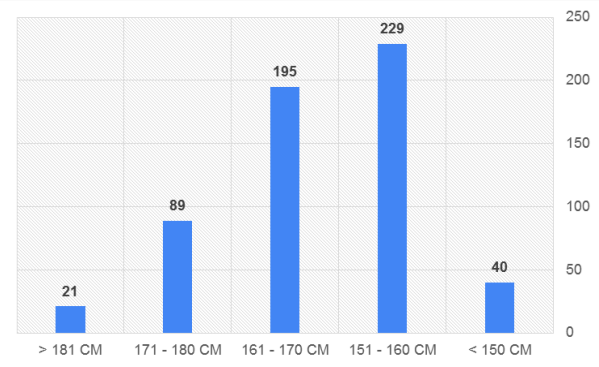

Figure 2: Height distribution among study participants.

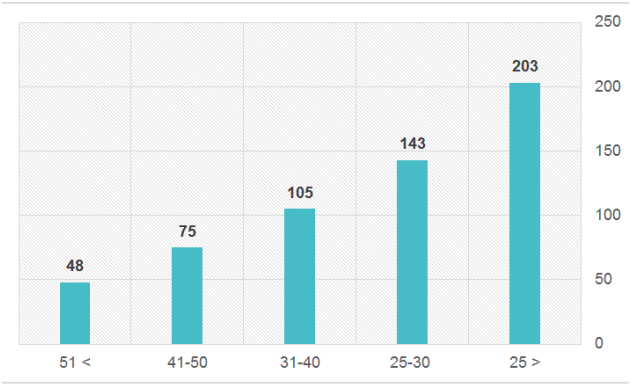

Figure 3: Age distribution among study participants.

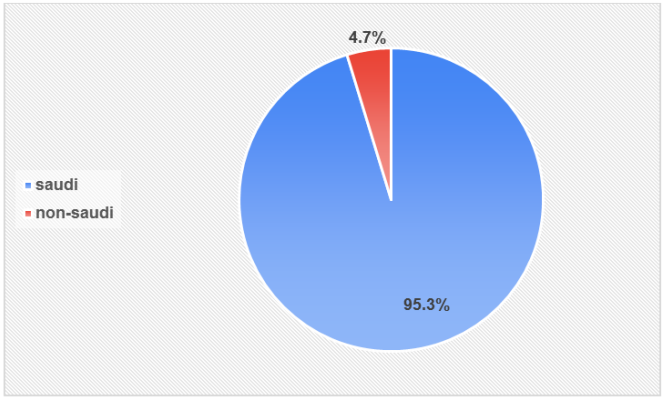

Figure 4: Nationality distribution among study participants.

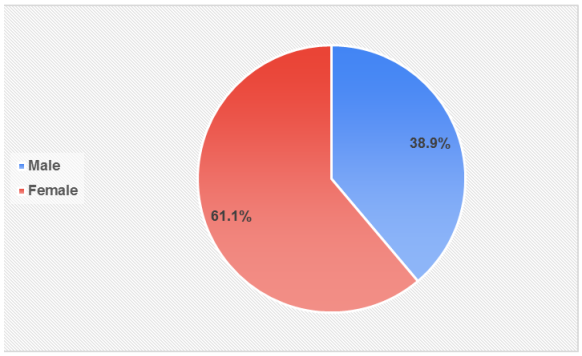

Figure 5: Gender distribution among study participants.

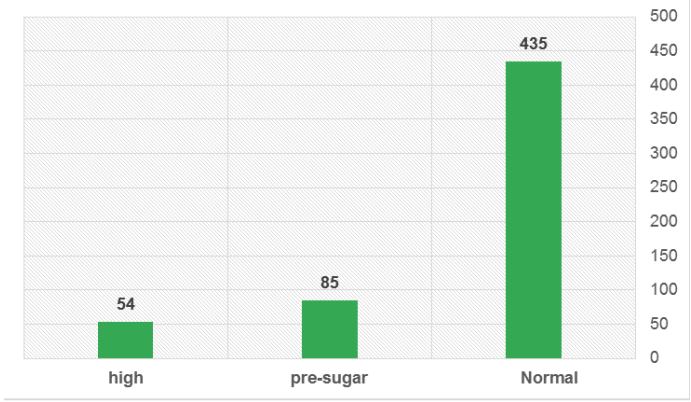

Figure 6: blood sugar level distribution among study participants.

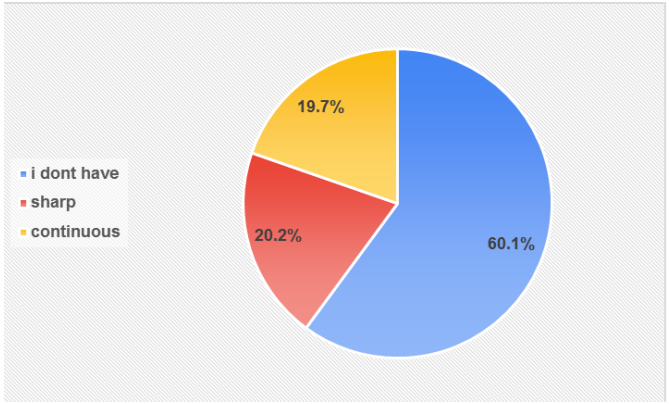

Figure 7 shows the participants' nature of the headache.

ANNEX 1: Data Collection Tool

1. How old are you?
- **25 years and less**
- **25-30 years**
- **31-40 years**
- **41-50 years**
- **50 years and more**

2. What is your gender?
- **Male**
- **Female**

3. What is your nationality?
- **Saudi**
- **Non-Saudi**

4. What is your height?
- **<150 cm**
- **151-160 cm**
- **161-170 cm**
- **171-180 cm**
- **>181 cm**

5. What is your weight?
- **<50 Kg**
- **51-65 Kg**
- **66-75 Kg**
- **76-85 Kg**
- **86-95 Kg**
- **>96 Kg**

6. What is your Measuring blood sugar?
- **Don't suffer from diabetes**
- **Yes, type 1**
- **Yes, type 2**

7. Do you smoke?
- **Yes**
- **No**

8. What is your marital status?
- **Single**
- **Married**
- **Absolute/divorced**
- **idower/widow**

9. Do you smoke?
- **Yes**
- **No**

10. What is your activity level during the day?
- **Inactive**
- **Light**
- **Middle**
- **High**

11. Do you suffer from headaches?
- **I do not suffer from headaches**
- **Migraine**
- **Cluster**
- **Stress**

12. How long have you been suffering from headaches?
- **I don't suffer from headaches**
- **Less than two years**
- **2-5 years**
- **5-10 years**

- **Furthermore**

13. How many headaches do you have during a month?

- **I don't suffer from headaches**
- **One a month**
- **2-3 times a month**
- **4-5 times a month**
- **More than 5 times a month**

14. The nature of the headache

- **I don't suffer from headaches**
- **Sharp**
- **Continuous**

15. Does she suffer from any of these symptoms before the headache?

- **Nausea**
- **Vomiting**
- **Facial numbness**
- **Tinnitus**
- **None of the above**

16. Does she suffer from any of these symptoms before the headache?

- **Nausea**
- **Vomiting**
- **Facial numbness**
- **Tinnitus**
- **None of the above**

17. Do you suffer from polycystic ovary syndrome?

- **Does not apply**
- **Yes**
- **No**

18. How often do you eat sugary meals?

- **Don't eat**
- **Once a month**
- **2-3 times a month**
- **4-5 times a month**
- **More than 5 times a month**

19. Do you eat your daily meals regularly?

- **Yes**
- **No**

20. How many meals do you eat a day?

- **One meal**
- **2-3 meals**
- **4-5 meals**
- **More than one meal**

21. Do you suffer from headache attacks during the same time of the day?

- **I don't suffer from headaches**
- **Yes, during the same time**
- **No, at different time**

22. How many meals do you eat a day?

- **One meal**
- **2-3 meals**
- **4-5 meals**
- **More than one meal**

23. Do you have a frequent urination?

- **Yes**
- **No**

24. Do you have a blurred eye?

- **Yes**
- **No**

25. Do you have a frequent urinary track infection?

- **Yes**
- **No**

Appendix 2: Participants responses to scale items

variable		Frequency	Percent
Age	25 >	203	35.4 Per Cent
	25-30 years	143	24.9 Per Cent
	31-40	105	18.3 Per Cent
	41-50	75	13.1 Per Cent
	51 <	48	8.4 Per Cent
Gender	Male	223	38.9 Per Cent
	Female	351	61.1 Per Cent
nationality	Saudi	547	95.3 Per Cent
	non-Saudi	27	4.7 Per Cent

blood sugar level	Normal	435	75.8 Per Cent
	pre-sugar	85	14.8 Per Cent
	high	54	9.4 Per Cent
weight	<50	68	11.8 Per Cent
	51 - 65	196	34.1 Per Cent
	66 - 75	130	22.6 Per Cent
	76 - 85	103	17.9 Per Cent
	86 - 95	39	6.8 Per Cent
	> 96	38	6.6 Per Cent
high	< 150 CM	40	7.0 Per Cent
	151 - 160 CM	229	39.9 Per Cent
	161 - 170 CM	195	34.0 Per Cent
	171 - 180 CM	89	15.5 Per Cent
	> 181 CM	21	3.7 Per Cent

what are the things that relieve headaches		
	Frequency	**Percent**
Pain killers	185	40.0 Per Cent
Sleep	149	32.2 Per Cent
Ice pack	13	2.8 Per Cent
Coffee	84	18.1 Per Cent
Salty food	18	3.9 Per Cent
Sweet food	10	2.2 Per Cent
Fasting	2	0.4 Per Cent
Hunger	2	0.4 Per Cent
Drought	0	0.0 Per Cent

what are the make headaches worse		
	Frequency	**Percent**
Pain killers	9	2.1 Per Cent
Sleep	24	5.5 Per Cent
Ice pack	15	3.4 Per Cent
Coffee	33	7.6 Per Cent
Sweet food	26	6.0 Per Cent
Fasting	81	18.6 Per Cent
Hunger	145	33.3 Per Cent
Drought	103	23.6 Per Cent

Do you have any of these symptoms before the headache		
	Frequency	**Percent**
Nausea	99	32.7 Per Cent
Vomiting	31	10.2 Per Cent
Facial numbness	26	8.6 Per Cent
Tinnitue	60	19.8 Per Cent
Non of above	87	28.7 Per Cent

Have you changed your lifestyle to reduce headaches?		
	Frequency	**Percent**
Playing sports	65	13.6 Per Cent
Reduce weight	19	4.0 Per Cent
Sleep regulation	113	23.6 Per Cent
Eat sugar	9	1.9 Per Cent
Increase the drinking water	98	20.5 Per Cent
Calm down	87	18.2 Per Cent
Sitting in a dark room	87	18.2 Per Cent

What is your activity level during the day?		
	Frequency	**Percent**
inactive	51	8.9 Per Cent
light	160	27.9 Per Cent
middle	290	50.5 Per Cent
high	73	12.7 Per Cent
Total	574	100.0 Per Cent

Do you have headaches?		
	Frequency	**Percent**
don't have	367	63.9 Per Cent
migraine	76	13.2 Per Cent
cluster	15	2.6 Per Cent
stress	116	20.2 Per Cent
Total	574	100.0 Per Cent

How long you have been suffering from? Headache		
	Frequency	**Percent**
Don't have	367	63.9 Per Cent
Less than 2 years	94	16.4 Per Cent
2-5 years	59	10.3 Per Cent
5-10 years	30	5.2 Per Cent
More than that	24	4.2 Per Cent
Total	574	100.0 Per Cent

What is the nature of the headache?		
	Frequency	**Percent**
dont have	345	60.1 Per Cent
sharp	116	20.2 Per Cent
continuous	113	19.7 Per Cent
Total	574	100.0 Per Cent

How many headache do you have during month		
	Frequency	**Percent**
I dont have	260	45.3 Per Cent
One time a month	95	16.6 Per Cent
2-3 times amonth	124	21.6 Per Cent
4-5 times a month	59	10.3 Per Cent
More than 5 times a month	36	6.3 Per Cent
Total	574	100.0 Per Cent

Do the menstrual cycle effect to headaches		
	Frequency	**Percent**
Does not apply	276	48.1 Per Cent
Yes, it increases	152	26.5 Per Cent
Yes. It reduces	10	1.7 Per Cent
Don't affect	136	23.7 Per Cent
Total	574	100.0 Per Cent

How many sugary meals do you eat?		
	Frequency	**Percent**

Don't eat	45	7.8 Per Cent
Once a month	39	6.8 Per Cent
2-3 times a month	139	24.2 Per Cent
4-5 times a month	112	19.5 Per Cent
More than 5 times a month	239	41.6 Per Cent
Total	574	100 Per Cent

Do you have polycystic ovary syndrome?		
	Frequency	**Percent**
does not apply	251	43.7 Per Cent
yes	56	9.8 Per Cent
no	267	46.5 Per Cent
Total	574	100.0 Per Cent

How many meals do you eat a daily		
	Frequency	**Percent**
One meal	61	10.6 Per Cent
2-3 meals	417	72.6 Per Cent
4-5 meals	83	14.5 Per Cent
More than 5 meals	13	2.3 Per Cent
Total	574	100 Per Cent

Do you have headaches attacks during the same time of the day?		
	Frequency	**Percent**
Don't have headaches	301	52.4 Per Cent
Yes, during the same time	57	9.9 Per Cent
No, at different time	216	37.6 Per Cent
Total	574	100 Per Cent

SPSS

Chi-square

Crosstab						
Count						
		Do you have headaches				Total
		I dont have	Migraine	Cluster	Stress	
Do you have diabetes	I don't have	337	71	11	98	517
	Yes, type 1	15	1	2	10	28
	Yes, type 2	15	4	2	8	29

Total	367	76	15	116	574

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.566[a]	6	.050
Likelihood Ratio	11.439	6	.076
Linear-by-Linear Association	5.109	1	.024
N of Valid Cases	574		

Crosstab

Count

		How long headache					
		i dont have	less than 2 years	2-5 years	5-10 years	more than that	Total
Do you have diabetes	I dont have	338	85	49	23	22	517
	yes, type 1	15	4	4	4	1	28
	yes, type 2	14	5	6	3	1	29
Total		367	94	59	30	24	574

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.176[a]	8	.144
Likelihood Ratio	9.853	8	.276
Linear-by-Linear Association	4.968	1	.026
N of Valid Cases	574		

Crosstab

Count

		How many headache					
		i dont have	one time a month	2-3 times a month	4-5 times a month	more than 5 times a month	Total
Do you have diabetes	I don't have	238	86	110	51	32	517
	yes, type 1	12	5	5	4	2	28
	yes, type 2	10	4	9	4	2	29
Total		260	95	124	59	36	574

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.343[a]	8	.911
Likelihood Ratio	3.204	8	.921
Linear-by-Linear Association	1.790	1	.181
N of Valid Cases	574		

Crosstab					
Count					
		Nature headache			Total
		dont have	sharp	continuous	
Do you have diabetes	I dont have	318	106	93	517
	yes, type 1	13	6	9	28
	yes, type 2	14	4	11	29
Total		345	116	113	574

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.217[a]	4	.037
Likelihood Ratio	9.022	4	.061
Linear-by-Linear Association	7.356	1	.007
N of Valid Cases	574		

Crosstab						
Count						
		Menstrual cycle headaches				Total
		does not apply	yes, it increases	yes. it reduces	don't affect	
Do you have diabetes	I dont have	243	136	9	129	517
	yes, type 1	16	9	0	3	28
	yes, type 2	17	7	1	4	29
Total		276	152	10	136	574

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.187[a]	6	.403
Likelihood Ratio	7.199	6	.303
Linear-by-Linear Association	3.810	1	.051
N of Valid Cases	574		

Regression

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.155[a]	0.024	0.014	0.475

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.140	6	.523	2.319	.032[b]
	Residual	127.974	567	.226		
	Total	131.115	573			

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.115	0.057		19.607	0.000

	Do you have headaches	0.017	0.024	0.042	0.715	0.475
	How long headache	0.021	0.025	0.048	0.815	0.415
	How many headache	-0.021-	0.025	-0.057-	-0.863-	0.388
	Nature headache	0.073	0.042	0.121	1.728	0.085
	Menstrual cycle headaches	-0.031-	0.017	-0.079-	-1.881-	0.060
	Headaches attacks during same time day	-0.020-	0.029	-0.039-	-0.695-	0.487

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