Environmental Triggers in Migraine patients in Riyadh: A Cross-Sectional Study

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Abstract

Background: A migraine is a disabling condition that is characterized by persistent headaches which vary in severity. Migraines are extremely common and represent a major public health concern due to their effect on the quality of life and job performance, which can also lead to a significant financial burden on global economies [1].

Methodology: In this cross-sectional study, a self-administered questionnaire was distributed among migraineurs attending primary healthcare centers and hospitals in Riyadh, Saudi Arabia. The survey included questions about sociodemographic data, number of attacks, and environmental factors triggering migraines, in order to assess their prevalence.

Results: A total of 415 participants were recruited. The most common age group was 31– 50 years old (46.5%), with females dominating the males (84.8% vs 15.2%). The prevalence of migraines that affected activities of daily living (ADL) was 80% (CI=75.7% - 84.3%). The most common environmental factors that triggered migraines were noise (87.7%), followed by outdoor light exposure (81.4%), and indoor lighting, such as fluorescent light, and computer systems (79%). In univariate analyses, migraines that interfered with ADL were more common in patients with a bachelor's degree (p=0.019) and those who were taking migraine medication (p=0.003).

Conclusion: Migraines are highly prevalent in our region, most specifically among women. Noise, outdoor light exposure, indoor lighting, fluorescent lights, and computer systems usage were the most triggering environmental factors of migraines. These factors dissuade patients from doing their daily activities.

Key words: Migraine, environmental factors, patients, primary healthcare center.

Introduction

Migraines are amongst the earliest of diseases introduced to human beings, and specifically, are known to be among the most prevalent diseases of the nervous system [1,2]. Migraines can be defined as a disabling chronic condition that is usually characterized by a periodic, recurrent, and persistent unilateral pulsatile attack of headache, lasting from hours to days. It is often characterized by overstimulation by a sensory stimulus. These symptoms can be associated with increased eye sensitivity to light or photophobia, increased sensitivity to sound, also known as phonophobia, nausea, vomiting, blurred vision, and other cognitive symptoms [1,3]. This type of headache is well-known as a type of primary headache, which mostly begins at puberty and most commonly affects those aged between 35 – 45 years old. In addition, migraines have shown to be favouring one gender more than the other, as it affects women more than men in a ratio of 2:1, which can be justified due the cyclic hormonal influences which females experience on a monthly basis [1]. It is remarkable to mention that hormonal changes are not the only factor provoking an attack of migraine. There are a variety of stimuli which can trigger migraine headaches and lead to their burden of recurrence, such as noises, physical activity, fasting, and air pollution. These factors can be changed according to the location of the population in the surrounding environment [4]. Unfortunately in Saudi Arabia, the number of studies on the basis of migraine triggers are limited [4]. Identifying migraine triggers and tailoring them to the population environment in public health is very crucial due to a migraine's high prevalence and the remarkable temporary disability that it can cause. Migraines represent a major public health concern due to their effect on the quality of life and occupational accomplishments, which can reflect an unfavourable impact on life performance, and thus can lead to a significant financial burden on global economies [5]. Hence, analysing and identifying migraine triggers according to a population environment is extremely vital in order to improve the quality of life for those who suffer from migraine attacks.

Subjects and Method

This cross-sectional questionnaire-based study was carried out among 415 migraine patients attending primary healthcare centers and hospitals during 2021. Participants under the age of 18, or who were not confirmed migraineurs, were excluded to achieve precise results. After obtaining the Institutional Review Board of Princess Nourah Bint Abdulrahman University approval, data were collected from patients by utilizing a validated questionnaire. The data analyses were performed using the Statistical Package for Social Sciences, (SPSS, version 26, Armonk, NY: IBM Corp, USA). Descriptive statistics were presented using numbers and percentages. The environmental factors that are likely to precipitate migraine attacks and affect activities of daily living were correlated with the socio-demographic characteristics of the participants using Chi-square test. Two-tailed analysis with $p < 0.05$ was used as the cut-off for statistical significance. Significant results were placed in a multivariate regression model to determine the highest predictor associated with migraines, where the odds ratio, as well as the 95% confidence interval, were also reported.

Ethical Approval: Ethical approval was granted by the Institutional Review Board at Princess Nourah bin Abdulrahman University before conducting any study procedure.

Results

We recruited 415 patients. Table 1 presents the socio-demographic characteristics of the patients in relation to migraines that interfered with activities of daily life (ADL). The most common age group was 31 – 50 years (46.5%), who were nearly all females (84.8%) and more than half (54.2%) were married. With regards to patients' education, the majority held a bachelor's degree or higher (77.1%), with approximately 41% earning less than 5,000 SAR per month. The proportion of patients who had an associated disease was 18.6%, while the proportion of patients who were taking migraine medication was 60.2%. Regarding migraines that interfered with ADL, it can be observed that migraines were more common among those who had a bachelor degree or higher (p=0.019) and those who were taking migraine medications (p=0.003).

In Figure 1, the most common associated chronic disease was hypertension (9.2%), followed by diabetes (7%) and heart diseases (2.4%).

Figure 2 depicts the perceived environmental factors that triggered migraines. It was revealed that the top 5 most common environmental factors that triggered migraines were: noise (87.7%), followed by outdoor light exposure (81.4%), indoor lighting, fluorescent lights, and computer systems (79%), odours (59.8%), and busy visual environments (58.6%) while electromagnetic fields and sferics were the least (29.4%).

When measuring the relationship between the perceived environmental factors and migraines that interfered with ADL, it was found that the prevalence of migraines was significantly less among those who disagreed that electromagnetic fields and sferics are environmental factors of migraines (p=0.001), while the prevalence of migraines was more common among those who agreed that fasting will trigger a migraine (p=0.001) (Table 2).

In the multivariate regression model, patients who had a bachelor's degree or higher (AOR=2.040; 95% CI=1.148 – 3.626; p=0.015) and those who were taking migraine medications (AOR=2.338; 95% CI=1.338 – 3.938; p=0.001) were twice as likely to have a migraine that interfered with ADL. We also observed that patients who disagreed with the effects of electromagnetic fields and sferics (AOR=0.251; 95%=0.118 – 0.532; p=0.001) and fasting (AOR=0.345; 95% CI=0.198 – 0.603; p<0.001) as migraine triggering factors were significantly less likely to be associated with a migraine that interfered with ADL (Table 3).

Table 1. Socio-demographic characteristics of the patients in relation to migraines that interfered with ADL

Study Data	Overall N (%) (n=415)	Migraine Interfered with ADL		P-value
		Yes N (%) (n=332)	No N (%) (n=83)	
Age group in years				
18 – 30 years	182 (43.9%)	145 (43.7%)	37 (44.6%)	0.882
31 – 50 years	193 (46.5%)	156 (47.0%)	37 (44.6%)	
51 – 70 years	40 (09.6%)	31 (09.3%)	09 (10.8%)	
Gender				
Male	63 (15.2%)	52 (15.7%)	11 (13.3%)	0.584
Female	352 (84.8%)	280 (84.3%)	72 (86.7%)	
Marital status				
Unmarried	190 (45.8%)	150 (45.2%)	40 (48.2%)	0.622
Married	225 (54.2%)	182 (54.8%)	43 (51.8%)	
Educational level				
High school or below	95 (22.9%)	68 (20.5%)	27 (32.5%)	0.019
Bachelor or higher	320 (77.1%)	264 (79.5%)	56 (67.5%)	
Monthly income (SAR)				
<5,000	169 (40.7%)	140 (42.2%)	29 (34.9%)	0.160
5,000 – 10,000	102 (24.6%)	75 (22.6%)	27 (32.5%)	
>10,000	144 (34.7%)	117 (35.2%)	27 (32.5%)	
Associated diseases				
Yes	77 (18.6%)	67 (20.2%)	10 (12.0%)	0.088
No	338 (81.4%)	265 (79.8%)	73 (88.0%)	
Taking migraine medications				
Yes	250 (60.2%)	212 (63.9%)	38 (45.8%)	0.003
No	165 (39.8%)	120 (36.1%)	45 (54.2%)	

Figure 1. Associated Chronic diseases

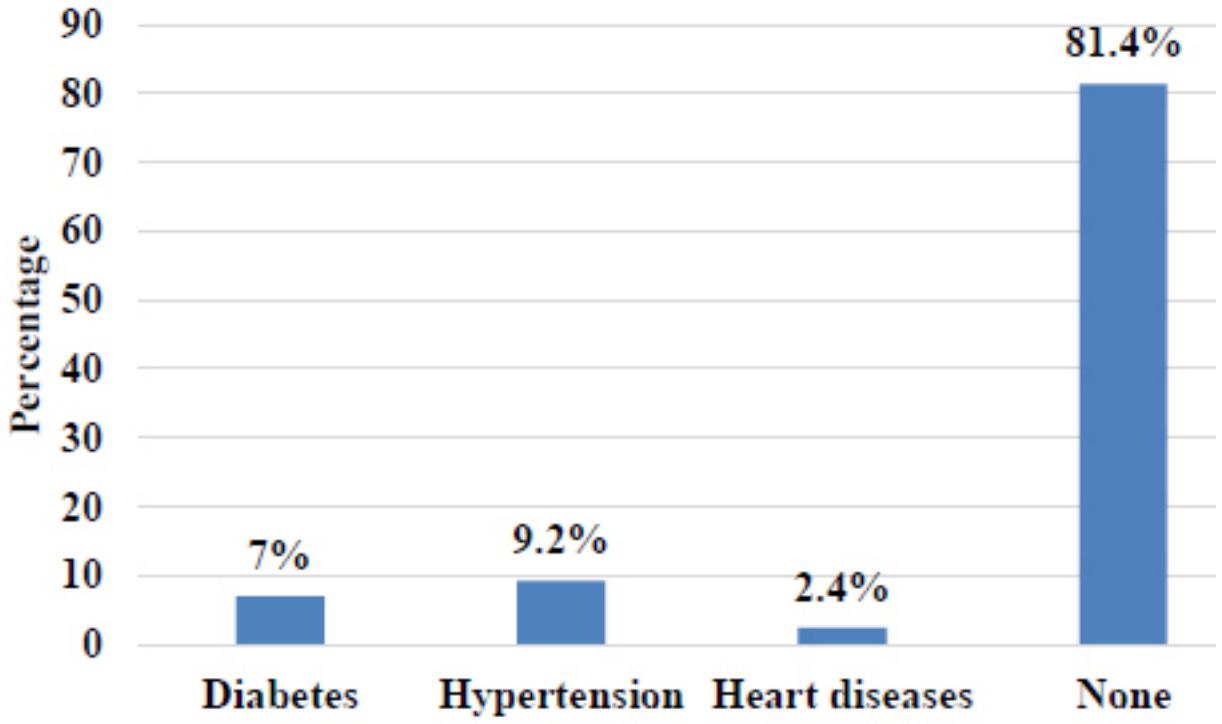

Figure 2. Environmental factors that triggered migraine

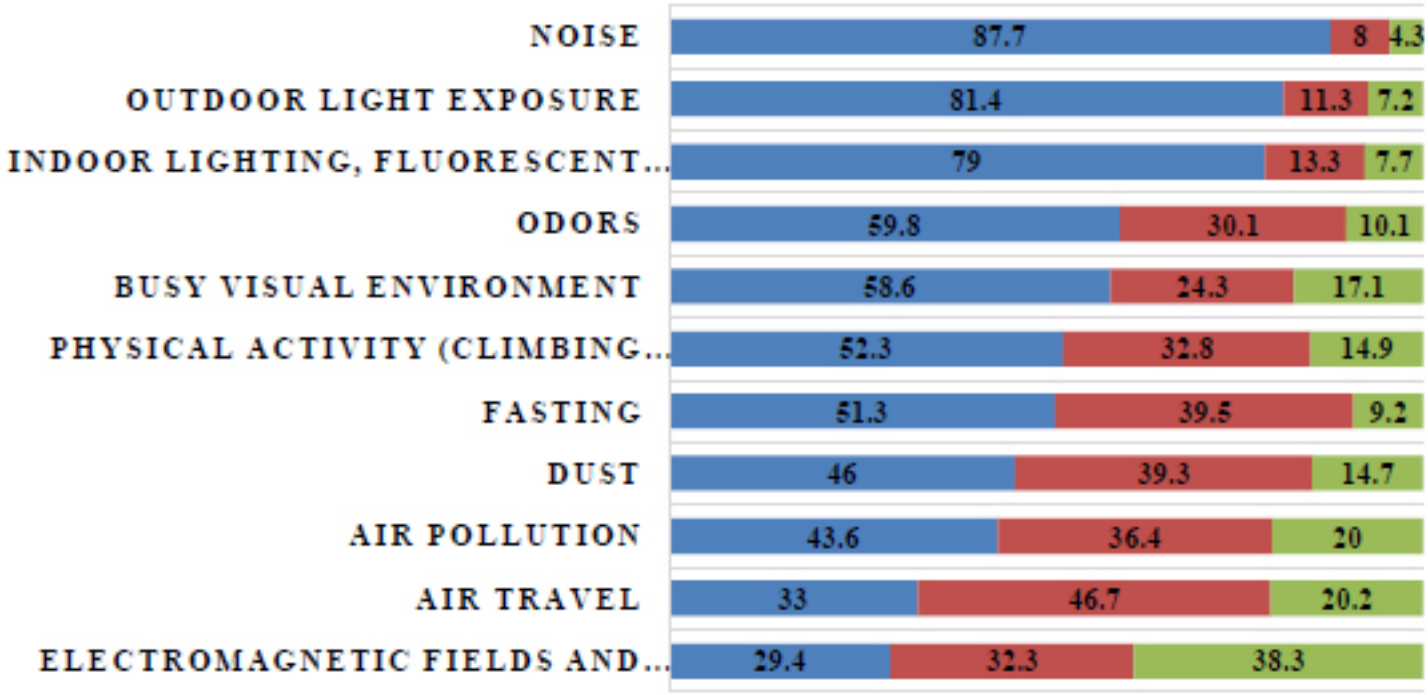

Table 2. Influence of environmental factors toward migraines and their interference with ADL (n=415)

Environmental factors	Migraine interfered with ADL		P-value
	Yes N (%) (n=332)	No N (%) (n=83)	
Air travel			
Agree	111 (33.4%)	26 (31.3%)	0.864
Disagree	153 (46.1%)	41 (49.4%)	
I don't know	68 (20.5%)	16 (19.3%)	
Noise			
Agree	293 (88.3%)	71 (85.5%)	0.103
Disagree	28 (08.4%)	05 (06.0%)	
I don't know	11 (03.3%)	07 (08.4%)	
Electromagnetic fields and spherics			
Agree	111 (33.4%)	11 (13.3%)	0.001
Disagree	98 (29.5%)	36 (43.4%)	
I don't know	123 (37.0%)	36 (43.4%)	
Outdoor light exposure			
Agree	277 (83.4%)	61 (73.5%)	0.111
Disagree	34 (10.2%)	13 (15.7%)	
I don't know	21 (06.3%)	09 (10.8%)	
Indoor lighting, fluorescent lights, Computer screen			
Agree	266 (80.1%)	62 (74.7%)	0.432
Disagree	43 (13.0%)	12 (14.5%)	
I don't know	23 (06.9%)	09 (10.8%)	
Busy visual environment			
Agree	202 (60.8%)	41 (49.4%)	0.111
Disagree	74 (22.3%)	27 (32.5%)	
I don't know	56 (16.9%)	15 (18.1%)	
Odours			
Agree	204 (61.4%)	44 (53.0%)	0.089
Disagree	92 (27.7%)	33 (39.8%)	
I don't know	36 (10.8%)	06 (07.2%)	
Air pollution			
Agree	147 (44.3%)	34 (41.0%)	0.443
Disagree	116 (34.9%)	35 (42.2%)	
I don't know	69 (20.8%)	14 (16.9%)	
Dust			
Agree	156 (47.0%)	35 (42.2%)	0.676
Disagree	127 (38.3%)	36 (43.4%)	
I don't know	49 (14.8%)	12 (14.5%)	

Table 2. Influence of environmental factors toward migraines and their interference with ADL (n=415) (continued)

Fasting			
Agree	186 (56.0%)	27 (32.5%)	0.001
Disagree	118 (35.5%)	46 (55.4%)	
I don't know	28 (08.4%)	10 (12.0%)	
Physical Activity			
Agree	180 (54.2%)	37 (44.6%)	0.283
Disagree	105 (31.6%)	31 (37.3%)	
I don't know	47 (14.2%)	15 (18.1%)	

Table 3: Multivariate regression analysis to determine the independent significant factor associated with migraines that interfered with activities of daily living (n=415)

Factor	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	P-value
Educational level			
High school or below	Ref		
Bachelor or higher	2.040	1.148 – 3.626	0.015
Take migraine medication			
Yes	2.338	1.388 – 3.938	0.001
No	Ref		
Electromagnetic fields and spherics			
Agree	0.679	0.378 – 1.218	0.194
Disagree	0.251	0.118 – 0.532	0.001
I don't know	Ref		
Fasting			
Agree	0.991	0.410 – 2.394	0.984
Disagree	0.345	0.198 – 0.603	<0.001
I don't know	Ref		

Discussion

This study attempted to examine the relationship between environmental changes and their influence on triggering migraines. The findings of this study revealed a high prevalence of environmental triggers for migraines. Approximately 80% of the patients suffered a migraine during the last month. Several published papers reported a high frequency of migraines, varying from 80% to 100% [6-10]. On the other hand, in India, reports indicated that the one-year prevalence of migraines was 14.12%, which was relatively lower than our result [11]. One may argue that the report was based on a one-year prevalence, whereas our study is estimated for a one-month prevalence. Other regions also reported a lower prevalence rate of migraines. For example, in Europe [12], the one-year prevalence rate of migraines was approximately 14%, while in the USA [13], the three-months overall prevalence of migraines was 14.2%. In Latin America, the one-year prevalence of migraines was estimated between 6.1% and 17.4% [14]. Perhaps the differences in prevalence rate depends on the region or it may correlate with patients' history of migraines. The minimal varying rates could be due to the different setup in methodology or the differences in criteria of prevalence and the type of study population [15]. Furthermore, parts of the literature suggest that migraines were more common in women than men [6, 11, 16]. This is consistent with our study, where migraines were more common in females, although, a statistical test revealed that it has no significant impact on the disease after testing their relationship ($p>0.05$).

Of the environmental factors that trigger migraine, our results indicated that the most influential factors were noise, followed by outdoor light exposure, indoor lighting, fluorescent lights, computer screens, and odours. There were varying reports regarding the environmental factors that triggered migraines among patients. For example, in India [8,9,11] as well as in Brazil [10], they reported that prolonged exposure to sunlight and hot humid weather were the most common environmental factors of the disease. This had also been reported by Neut and colleagues [17], where they found that hot and cold weather were the triggering factors of migraines among children and adolescents aged between 7 and 16 years. The researchers explained that in their region the weather is generally mild and rainy unlike in other papers, where hot weather is dominant, such as the study of Chakravarty et al. [8] and Ray et al. [11]. Conversely, Jain and Choudhary [9], denoted that physical activity (43%) and noise (42%) were reported as some of the most common triggering factors of migraines, which is comparable with our study, as 87.7% and 52.3% of the patients agreed that noise and physical activity were the environmental factors that instigated migraines.

Strong odour was also identified as a precipitating factor of migraines. In Kuwait [7], the most common triggers were: the smell of strong odours (62.9%), followed by certain foods (51.8%), which was similarly reported in Brazil [18], where the smell of food was the most common precipitating factor for developing a migraine. In our study, 59.8% of the patients agreed that odours were also an environmental factor that could trigger a migraine, which was consistent with previous reports.

In a study by Ray et al. [11], they found that adverse environmental exposure, long-distance travel, and the use of oral contraception emerged as significant risk factors responsible for the development of migraines.

Moreover, our further investigation noted that patients who were professionals and those who were taking migraine medication were the independent significant predictors associated with an increased risk of migraine that interfered with ADL. Based on our multivariate estimates, we predicted that patients who held a bachelor degree or higher, and those who were taking

medication for the treatment of migraines, were twice as likely to be associated with having migraines ($p<0.05$). These findings are not consistent with Ray et al.'s paper [11]. They documented that lower educational status was the significant risk factor of migraines, while in a paper by Jain and Choudary [9], they indicated that there was no significant difference observed in the prevalence of migraines concerning the socio-demographic characteristics of the patients ($p>0.05$).

Conclusion

Migraines are highly prevalent in our region, most specifically among women. Noise, outdoor light exposure, indoor lighting, fluorescent lights, and computer systems were the most triggering environmental factors of migraines, which dissuaded patients from their activities of daily living. Further, patients who were more educated and those who used treatment methods are likely being affected the most by migraines, which hinder their activities for daily living. An awareness campaign is necessary to educate the patients regarding the influence of environmental factors that could trigger the disease. Proper counseling among the affected is necessary to decrease the burden of the migraine.

List of abbreviations

ADL Activities of daily living
SPSS Statistical package for social sciences
AOR Adjusted Odds Ratio
CI Confidence Interval

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