Socio-economic Determinants, Lifestyle Choices, and Working Conditions: A Triad's Influence on Migraine

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ABSTRACT

Migraine is a neurological disorder that affects approximately 1 billion people worldwide. It is characterized by recurring attacks of moderate to severe headache, often accompanied by other symptoms such as nausea, vomiting, and sensitivity to light and sound. Given the scarcity of studies concerning the influence of lifestyle and environmental factors on migraine, we aimed to examine the links between socioeconomic factors, lifestyle, and working conditions with migraines. A cross-sectional study was carried out among adults over 18 years old in Malaysia. The survey used an online questionnaire and convenience sampling. To evaluate migraine, Structured Migraine Interview (SMI) was employed. The questionnaire also included questions about socioeconomic status, lifestyle, and working conditions. Simple and multiple logistic regression were used. The study had 514 participants. 8.4% of participants had migraines. Emotional belittlement was a significant risk factor for migraines, while socio-economic and lifestyle factors were not significantly associated. High noise levels that required participants to raise their voice and chemicals, steams or gases exposure at work were significantly associated with a higher odd of experiencing migraines. Our study highlighted the importance of emotional well-being, and occupational exposure as determinants of migraine. More research is required to comprehend the complex interplay between these factors related to migraine and to develop improved strategies for preventing and treating the condition.

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INTRODUCTION

Migraine is a type of headache that occurs frequently and causes intense throbbing pain on either side of the brain. It is the sixth most common disorder and ranked as the second leading cause of disability. Migraine contributes 45.1 million of Years Lived with Disability (YLDs) in 2016. Migraine symptoms include nausea, vomiting, dizziness, and sensitivity to bright lights and sounds, which can interfere with a person's ability to carry out their daily activities. The International Headache Society (IHS) has established criteria for diagnosing migraine without aura, which include headache episodes that last from 4 to 72 hours, with at least two or four of the characteristics such as pulsating pain, moderate to severe pain, headache on one side of the head, and avoidance of physical activities. Migraine may also be associated with aura, which can cause periodic neurological symptoms before or during the headache. Some individuals may experience a prodromal phase before the onset of the headache, and a postdrome phase characterized by hyperactivity, sadness, food cravings, yawning, tiredness, neck stiffness, or pain.[1,2]

The prevalence of migraine around the world was 11% but it varies significantly from one region to another and among different populations. In North America, Asia, Europe, and Australia, approximately 9% to 15% of the population suffers from migraine, whereas the prevalence is lowest in Africa, where it is around 5%.[3] Previous research from Malaysia indicates that the prevalence of migraines is 9.0% and in 2016, it was identified as the third most common contributor to Years Lived with Disability (YLDs).[1,4]

Various studies have examined the relationship between socioeconomic status and migraine. These studies have found that factors such as age, income, marital status, education, and occupation are associated with the occurrence of migraines.[5-8] A decreased likelihood of experiencing migraines was linked to a higher level of educational attainment while risk of migraines was increased among individuals who were retired and without employment.[8] The prevalence of migraines is higher among those who are lone parents, divorced, single, or have experienced belittlement or poor social support.[9] Economic hardship has also been linked to migraines, as low-income individuals have a higher likelihood of experiencing migraine.[5] Lifestyle factors such as physical activity, heavy alcohol consumption, smoking, skipping breakfast, dietary factors, and Body Mass Index (BMI) have also been studied for their association with migraines.[4,7-14] Physical and psychosocial working environment have been found to be significantly correlated with migraine.[4,15,16] Workplace factors, such as exposure to chemicals and fumes, time restrictions, and physical and mental stress, have been shown to increase the likelihood of developing migraine.[6,17]

While there have been investigations in Malaysia that have explored dietary triggers, environmental factors, and the impact on the quality of life in connection with migraines among specific populations such as bank employees, patients, and medical students, a more comprehensive understanding of how lifestyle factors, socioeconomic factors, and working conditions relate to migraine in the adult population is still.[4,7,18,19] Therefore, the purpose of this study is to ascertain the prevalence of migraine and

investigate the links between socioeconomic factors, lifestyle choices, and working conditions with migraine in the adult population of Malaysia.

MATERIALS AND METHODS

In this study, an analytical cross-sectional approach was utilized to assess both the prevalence of migraine and its influencing factors. The research spanned a six-week period from March to April 2023 and encompassed adults aged 18 years and older residing in Malaysia. To determine the sample size, OpenEpi sample size calculator (version 3) was utilized. Based on a community-based migraine prevalence rate of 9.5%,[4] with a type I error of 5% and a precision requirement of 3%, the minimum sample size was determined to be 383. To accommodate potential non-responses, we included a 30% non-response rate, leading to a final sample size of 548 participants. We utilized a non-probability convenience sampling approach and distributed an electronic survey using Google Forms. The inclusion criteria encompassed individuals who were aged 18 years or older and currently residing in Malaysia irrespective of their gender, ethnicity, or nationality. Participants were given access to information sheet in electronic document format, and each participant received an electronic informed consent form, allowing them to make an informed decision about their participation. Participation was entirely voluntary and devoid of any form of coercion or inducements. The information collected from participants was treated with strict confidentiality, exclusively for the purpose of this research analysis. Personal data of the participants would not be disclosed to any third party. Ethical approval for this research was granted by the Research Ethics Committee at Manipal University College Malaysia (MUCM) (MUCM/ Research and Ethics Committee – 009/2023).

We adapted the questionnaire used in a previous study to assess sociodemographic factors, lifestyle, and working conditions. [5] The sociodemographic profile section included variables such as country of origin, education level, age, ethnicity, living area, occupation, marital status, gender, family status, total monthly income, support during emotional crises or problems, economic problems, and emotional belittlement. The lifestyle-related questions inquired about the frequency of physical exercise during leisure time, smoking and drinking habits, breakfast-skipping tendencies, and Body Mass Index (BMI). As for working conditions, participants provided feedback on their satisfaction with their current work situation, concerns about job security, working hours, exposure to factors like noise and chemicals, involvement in heavy weightlifting, and their absenteeism frequency over the past 12 months. Total of six experts who were from internal medicine and public health departments were selected using expert sampling to review our questionnaire. Item-content validity index (ICVI) was calculated to check the content validity of the questionnaire. Notably, the ICVI value for all the factors in our study exceeded 0.78, indicating a strong level of content validity.[20] As a result, all these factors were retained in the questionnaire. Pretesting was done with five respondents to check question comprehension. Feedback from the pretest was used to make necessary revisions.

Structured Migraine Interview (SMI) was used to gather information about headache symptoms, as well as any associated symptoms such as nausea, vomiting, and hypersensitivity to light or sound [21,22]. The SMI questionnaire comprised a total of 10 items, with the initial four items designed for diagnosing migraines and the subsequent six items intended to screen for symptoms commonly linked to migraines. In our research, we categorized the participants into two groups based on the initial four questions such as those with migraine and those without migraine.

Microsoft Excel was used for data entry and the data were analysed using SPSS version 28. Data entry check was done to identify missing data during data collection. Regarding descriptive statistics, frequency and percentage were calculated for qualitative data, and mean and standard deviation were calculated for quantitative data. Simple and multiple logistic regression were used to assess the relationship between various independent variables, including sociodemographic and economic factors, lifestyle choices, working conditions, and the dependent variable, which was migraine, while accounting for covariate adjustments. P value less than 0.05 was considered to be statistically significant. This article was written in accordance with the STROBE reporting guidelines for observational studies.[23]

RESULTS

A total of 514 respondents participated in this study. The prevalence of migraine was 8.4% (43/514) as shown in figure 1. Table 1 shows that there were no significant association between age, gender, ethnicity, living area, country of origin, education level, occupation, marital status, family status, total monthly household income and migraine. Those who can get support during emotional crises or problems were significantly less likely to have migraine than those who do not have support. The participants who had problems in paying running bill such as utility bill, grocery bill in the past three months were significantly more likely to have migraine. There was significant association between ever been downgraded or belittled in the past three months and migraine. The odds of having migraine among those who had been downgraded or belittled several times was 5.76 times of the odds among those never been experienced. [Table 1]

Table 2 shows that there were no significant associations between exercise, smoking, habit of having breakfast and migraine. However, those who drink at least half a bottle of strong liquor month or less were significantly less likely to have migraine. [Table 2]

The association between working conditions and migraine is shown in table 3. The participants who thought the working condition was good or very good were significantly less likely to have migraine. There were no significant associations between worrying about losing job, primary working hour, and migraine. The workers who did heavy lifting over 20 kg some days a week, those who were exposed to noise every day, individuals who were exposed to chemicals, steams, or gases had significantly higher odds of having migraine. Moreover, there was significant association between absent from work several times during the last 12 months and migraine. [Table 3]

We included the significant variables and variables which had P value less than 0.025 in simple logistic regression were selected for multiple logistic regression model. Moreover, age and gender were included into the model as these factors were important predictors according to previous literatures. Firstly, we included socio-economic and demographic characteristics, and lifestyle variables as predictors in the model of all adult population (n=504). The logistic regression model was statistically significant, $\chi2(19) = 35.011$, P value = 0.014. The model explained 15.6% (Nagelkerke R2) of the variance in migraine. Of the ten predictors, only two were statistically significant. Those who had been downgraded or belittled several times in the past three months were significantly more likely to have migraine. The individuals who drink strong liquor at least half a bottle monthly or less had significantly lesser odds of having migraine. [Table 4]

Secondly, we performed multiple logistic regression analysis of working adult (n=252). This analysis included socio-economic and demographic characteristics, lifestyle and working conditions as predictors. The logistic regression model was statistically significant, $\chi2(19) = 56.542$, P value = 0.003. The model explained 47.2% (Nagelkerke R2) of the variance in migraine. Of the 16 predictors, five variables were statistically significant. The individuals being downgraded or belittled several times in the past three months, those who had exposure to noise every day, and the participants who had exposure to chemicals, steams or gases some days a week at work had significantly higher odds of having migraine. The participants who were satisfied of their work, and whose work included heavy lifting were less likely to have migraine.

DISCUSSION

We conducted a cross-sectional study to assess how socioeconomic factors, lifestyle choices, and working conditions relate to the prevalence of migraines in Malaysia. Our current investigation revealed that migraine prevalence among the adult population in Malaysia was 8.4%. In a prior Malaysian study, the reported migraine prevalence was slightly higher at 9.0%.[4] Migraine prevalence worldwide was 11.6%, with variations across different regions: 10.4% in Africa, 11.4% in Europe, 9.7% in North America, and 16.4% in Central and South America.[24] In Asia, the one-year prevalence of migraines among adults ranged from 6.0% to 14.3%. The highest prevalence rates were observed in the range of 11% to 20% for adult women and 3% to 8% for adult men.[25]

In our study, variables such as age, gender, ethnicity, place of residence, country of origin, education level, occupation, marital status, family status, and income did not demonstrate a significant association with migraine. Notably, the age group between 36 to 45 years exhibited the highest migraine prevalence at approximately 11.6% in our investigation. This finding aligns with another study, which suggests that migraine prevalence generally increases until around the age of 40 and then decreases.[4,5] Among our study participants, females displayed a higher prevalence of migraine, a result consistent with prior research findings.[4,7,11,25] Interestingly, our study revealed that individuals in a relationship and those living with their families had a higher prevalence of migraine, which contrasts with a previous study indicating that divorced individuals experienced a higher frequency of migraines compared to married individuals.[5] Furthermore, while

our findings indicated that women were more likely to experience migraines than men even though this difference did not reach statistical significance, aligning with the gender disparities observed in previous studies.[4,5,7] In terms of education, our research findings indicated that individuals who had attained tertiary education or higher showed a lower prevalence of migraines when compared to those with lower levels of education. This contrasts with a prior study where individuals with a higher level of education were found to have a decreased likelihood of suffering from migraines.[8] Our study's findings mirrored those of a previous study in Norway, which associated low income with an increased risk of headaches in both genders,[26] as we found that the lowest income group had the highest migraine prevalence. Our analysis revealed a significant link between increased migraine attacks and difficulties in settling financial obligations within three months. Comparable observational studies in Malaysia and Sweden also found a notable association between economic hardship and migraines. Participants facing economic difficulties had nearly twice the migraine incidence compared to those without financial struggles. [4,5] Additionally, our findings indicated that having social support during emotional crises significantly reduces the risk of migraines, while experiencing belittlement is associated with an increased migraine risk which was aligned with the finding of prior study.[5]

This study delved into the examination of the relationship between lifestyle factors and migraines. Among the various lifestyle aspects considered, our findings suggest that infrequent consumption of strong liquor (monthly or less) is associated with a significant reduction of odds of having migraine. This observation aligns with the earlier study, which revealed a negative association between heavy alcohol use of at least once a month and migraine. [5,27] Regarding other lifestyle factors examined in our survey, including exercise, smoking, skipping breakfast, and BMI, our results did not reveal any significant associations with migraine. However, our results differ from those of population-based studies that have established associations between physical activity, body mass index, smoking, the practice of skipping breakfast, and migraine. [5,6,12,14]

Our study reveals that having a high level of satisfaction with one's working conditions significantly reduces the odds of migraines. Conversely, exposure to chemicals and noise in the workplace were found to play a significant role in increasing the likelihood of migraines. Furthermore, our findings indicated that exposure to heavy lifting every day was significantly associated with a decreased odd of migraines. Heavy lifting and manual labour often involve significant physical activity, which can promote overall health and well-being. While physical activity can sometimes act as a migraine trigger, regular exercise has been associated with a decreased risk of experiencing migraine attacks.[28] It's noteworthy that a study conducted in Sweden did not find any association between physical working conditions (such as exposure to heavy lifting, noise, and chemicals or gases), working hours, and migraines.[5] In contrast, a prior study reported that exposure to chemicals and fumes was associated with both migraines and tension-type headaches.[17] Moreover, our study did not indicate any significant associations between working hours, concerns about job security, and migraines. On the contrary, a population-based study demonstrated a significant correlation between psychosocial working conditions and migraines. Participants who were dissatisfied with their jobs and worried about job security reported more frequent headaches than those who were content with

their work and had no job security concerns.[7] These findings support the notion that stress and mental strain are frequent triggers of migraines.[17] Furthermore, a study conducted among employees in the banking sector in Malaysia showed a significant association between migraine and absenteeism which was similar to our finding.[18]

We had few limitations. We distributed the questionnaire primarily through online social media channels, which restricted our access to participants residing in rural areas. This poses limitations on the generalizability of our study's results. Future investigations should encompass a wider range of demographic groups and different workforces to gain insights into how these factors may contribute to migraines. This enhanced diversity in the participant which would improve the generalizability of the findings. Furthermore, cross-sectional studies capture data at a single point in time, which makes it difficult to establish causality. Moreover, it is crucial to explore the cultural and dietary factors as well as environmental exposures to better understand their influence on migraines. These enhancements will contribute to a more thorough exploration of migraine's multifaceted associations and facilitate broader accessibility to migraine research within Malaysia's diverse population.

APPENDIX

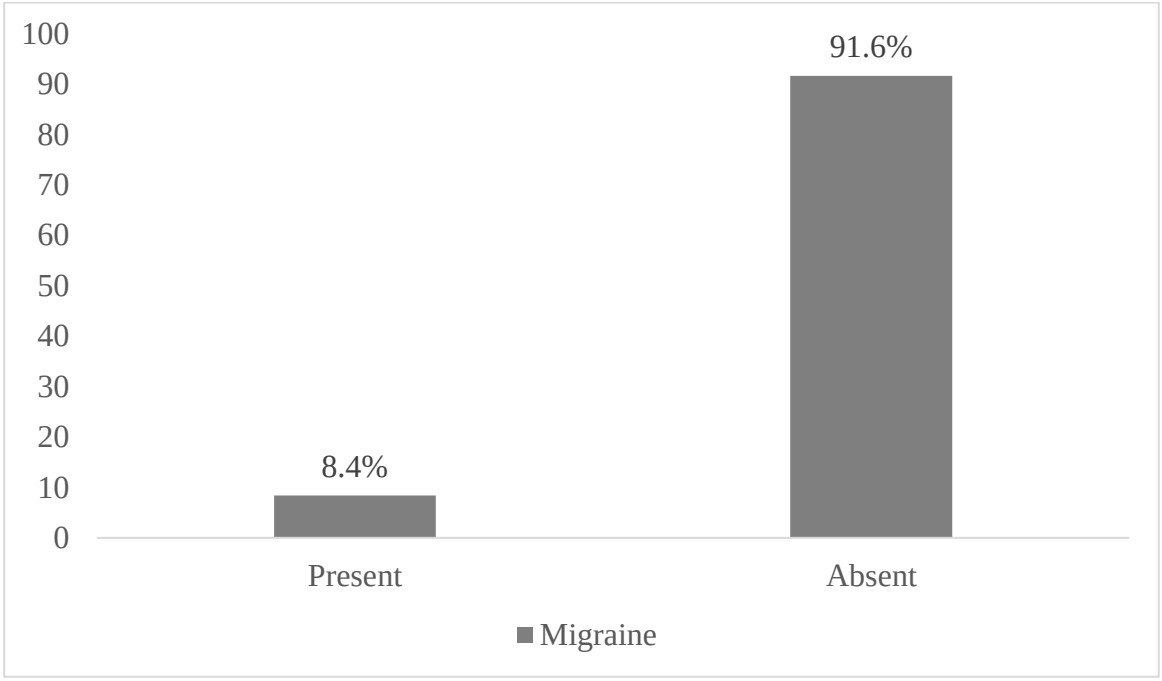

Figure 1: Prevalence of migraine among Malaysian adults (n=514)

Table 1: Simple logistic regression analysis of association between socio-economic, demographic characteristics and Migraine (n = 514)

Independent variable	**N (%)**	**Migraine N (%)**		**Unadjusted OR (95% CI)**	***P***
		Yes	**No**		
Age (years)					
18-25	298 (58.0)	24 (8.1)	274 (91.9)	Reference	
26-35	73 (14.2)	8 (11.0)	65 (89.0)	1.40 (0.60, 3.28)	0.430
36-45	51 (9.9)	6 (11.8)	45 (88.2)	1.52 (0.59, 3.93)	0.385
over 46	92 (17.9)	5 (5.4)	87 (94.6)	0.66 (0.24, 1.77)	0.406
Gender (n=493)					
Male	247 (48.3)	19 (7.7)	228 (92.3)	Reference	
Female	264 (51.7)	23 (8.7)	241 (91.3)	1.15 (0.60, 2.16)	0.675
Ethnicity					
Malay	63 (12.3)	5 (7.9)	58 (92.1)	Reference	
Chinese	262 (51.0)	13 (5.0)	249 (95.0)	0.60 (0.20, 1.77)	0.360
Indian	156 (30.4)	21 (13.5)	135 (86.5)	1.80 (0.65, 5.02)	0.258
Others	33 (6.4)	4 (12.1)	29 (87.9)	1.60 (0.40, 6.41)	0.507
Living area					
Rural area	43 (8.4)	3 (7.0)	40 (93.0)	Reference	
Semi-urban area	121 (23.5)	8 (6.6)	113 (93.4)	0.94 (0.24, 3.73)	0.934
Urban area	350 (68.1)	32 (9.1)	318 (90.9)	1.34 (0.39, 4.58)	0.639
Country of origin					
Malaysia	486 (94.6)	41 (8.4)	445 (91.6)	Reference	
Others	28 (5.4)	2 (7.1)	26 (92.9)	0.84 (0.19, 3.64)	0.810
Educational level					

Primary (Completed Primary School) & Secondary school	84 (16.3)	11 (13.1)	73 (86.9)	Reference	
Tertiary (College, University, Diploma, Degree, Postgraduate)	430 (83.7)	32 (7.4)	398 (92.6)	0.53 (0.26, 1.10)	0.091
Occupation					
Student	222 (43.2)	19 (8.6)	203 (91.4)	Reference	
Government employee & Private employee	191 (37.2)	18 (9.4)	173 (90.6)	1.11 (0.57, 2.18)	0.760
Self-employed/Own account worker & Employer	72 (14.0)	3 (4.2)	69 (95.8)	0.47 (0.13, 1.61)	0.229
Unpaid family worker, Not working & Housewife	29 (5.6)	3 (10.3)	26 (89.7)	1.23(0.34, 4.45)	0.749
Marital status (n=507)					
Married	168 (33.1)	12 (7.1)	156 (92.9)	Reference	
Single	238 (46.9)	17 (7.1)	221 (92.9)	1.00 (0.46, 2.15)	0.999
In relationship	93 (18.3)	10 (10.8)	83 (89.2)	1.57 (0.65, 3.78)	0.318
Other	8 (1.6)	2 (25)	6 (75)	4.33 (0.79, 23.83)	0.092
Family status (n=513)					
Living alone	104 (20.3)	7 (6.7)	97 (93.3)	Reference	
Living with parents + partner + children + extended family	409 (79.7)	36 (8.8)	373 (91.2)	1.34 (0.58, 3.01)	0.497
Total monthly household income					
B40 (RM <4360)	227 (44.2)	21 (9.3)	206 (90.7)	Reference	
M40 (RM 4360 – RM 9619)	177 (34.4)	12 (6.8)	165 (93.2)	0.71 (0.34, 1.49)	0.370
T20 (RM >9619)	110 (21.4)	10 (9.1)	100 (90.9)	0.98 (0.45, 2.16)	0.962

Do you have any persons in your surroundings you can get support from in emotional crises or problems?					
No	77 (15.0)	12 (15.6)	65 (84.4)	Reference	
Yes	437 (85.0)	31 (7.1)	406 (92.9)	0.41 (0.20, 0.85)	0.016
Have you had any problems in paying running bills in the past 3 months? (Utility bill, grocery bill, etc)					
No problem	464 (90.3)	35 (7.5)	429 (92.5)	Reference	
1-2 months/3 months	50 (9.7)	8 (16.0)	42 (84.0)	2.34 (1.02, 5.36)	0.045
Have you been downgraded/ belittled/loss of self-esteem in the past three months?					
Never	245 (47.7)	11 (4.5)	234 (95.5)	Reference	
Once or twice	208 (40.5)	19 (9.1)	189 (90.9)	2.14(0.99, 4.60)	0.052
Several times	61 (11.9)	13 (21.3)	48 (78.7)	5.76 (2.43, 13.63)	<0.001

OR=Odds ratio; 95%CI=95% confidence interval

Table 2: Simple logistic regression analysis of association between lifestyle and Migraine (n = 514)

Independent variable	**N (%)**	**Migraine N (%)**		**Unadjusted OR (95% CI)**	***P***
		Yes	**No**		
How much do you exercise physically in your leisure time?					
Little Exercise (Walking, bicycling or other light activities less than 2 hours a week)	257 (50.0)	23 (8.9)	234 (91.1)	Reference	
Moderate Regular Exercise (Exercising 1-2 times a week at least for half an hour at a time in jogging, playing tennis, bicycling, exercising at a gym, or other moderate exercise that makes one sweat)	184 (35.8)	11 (6.0)	173 (94.0)	0.65 (0.31, 1.36)	0.252
Vigorous exercise and training (Exercising or competing at least 3 times a week at least for half an hour at a time in team sports, jogging, playing tennis, swimming, or other vigorous exercise)	73 (14.2)	9 (12.3)	64 (87.7)	1.43 (0.63, 3.24)	0.391
Do you smoke?					
Never smoke	415 (80.7)	32 (7.7)	383 (92.3)	Reference	
Ex-smoker	34 (6.6)	3 (8.8)	31 (91.2)	1.16 (0.34, 3.99)	0.816
Occasional smoker & daily	65 (12.6)	8 (12.3)	57 (87.7)	1.68 (0.74, 3.82)	0.217
How often do you drink at least half a bottle of strong liquor (vodka, whiskey, rum, gin,					

tequila, 3 Litre beer, 1 Litre wine)?					
Never	307 (59.7)	29 (9.4)	278 (90.6)	Reference	
Monthly or less	161 (31.3)	6 (3.7)	155 (96.3)	0.37 (0.15, 0.91)	0.031
2-4 times a month, a week & 4 or more	46 (8.9)	8 (17.4)	38 (82.6)	2.02 (0.86, 4.74)	0.107
How often do you eat breakfast? (n=513)					
Seldom or never	52 (10.1)	5 (9.6)	47 (90.4)	Reference	
Some days a week	147 (28.7)	13 (8.8)	134 (91.2)	0.91 (0.30, 2.69)	0.868
Daily or almost daily	314 (61.2)	25 (8.0)	289 (92.0)	0.81 (0.30, 2.23)	0.688
BMI (kg/m^2) (n=511)					
Normal weigh	287 (56.2)	24 (8.4)	263 (91.6)	Reference	
Underweight	50 (9.8)	3 (6.0)	47 (94.0)	0.70 (0.20, 2.42)	0.572
Overweight	174 (34.1)	15 (8.6)	159 (91.4)	1.03 (0.53, 2.03)	0.923

OR=Odds ratio; 95%CI=95% confidence interval

Table 3: Simple logistic regression analysis of association between working conditions and Migraine (n = 262)

Independent variable	**N (%)**	**Migraine N (%)**		**Unadjusted OR (95% CI)**	***P***
		Yes	**No**		
How satisfied are you with your working condition?					
Poor & very poor	9 (3.4)	3 (33.3)	6 (66.7)	Reference	
Neither good nor poor	54 (20.6)	5 (9.3)	49 (90.7)	0.20 (0.39, 1.07)	0.061
Good & very good	199 (76.0)	13 (6.5)	186 (93.5)	0.14 (0.31, 0.62)	0.010
How worried are you about losing your job during the next year?					
Not at all & no especially	209 (79.8)	16 (7.7)	193 (92.3)	Reference	
Quite worried & very worried	53 (20.2)	5 (9.4)	48 (90.6)	1.26 (0.44, 3.60)	0.671
What are your primary working hours? (n=261)					
Daytime	228 (87.4)	16 (7.0)	212 (93.5)	Reference	
Evening, night & shift work	33 (12.6)	5 (15.2)	28 (84.8)	2.37 (0.81, 6.96)	0.118
How often are you exposed to the following 3 elements in your work:					
My work includes heavy lifting (over 20 kg) (n=260)					
Never	151 (58.1)	11 (7.3)	140 (92.7)	Reference	
More seldom	62 (23.8)	3 (4.8)	59 (95.2)	0.65 (0.18, 2.40)	0.516
Some days a week	29 (11.2)	6 (20.7)	23 (79.3)	3.32 (1.12, 9.86)	0.031

Every day	18 (6.9)	1 (5.6)	17 (94.4)	0.75 (0.09, 6.17)	0.788
I am exposed to noise (have to raise my voice when speaking					
Never	115 (43.9)	6 (5.2)	109 (94.8)	Reference	
More seldom	79 (30.2)	4 (5.1)	75 (94.9)	0.96 (0.27, 3.55)	0.962
Some days a week	37 (14.1)	4 (10.8)	33 (89.2)	2.20 (0.59, 8.28)	0.242
Every day	31 (11.8)	7 (22.6)	24 (77.4)	5.29 (1.63, 17.1)	0.005
I am exposed to chemicals, steams, or gases (n=259)					
Never	177 (68.3)	10 (5.6)	167 (94.4)	Reference	
More seldom	43 (16.6)	3 (7.0)	40 (93.0)	1.25 (0.32, 4.76)	0.741
Some days a week	17 (6.6)	3 (17.6)	14 (82.4)	3.57 (0.88, 14.5)	0.074
Every day	22 (8.5)	5 (22.7)	17 (77.3)	4.91 (1.50, 16.05)	0.008
Absent from work due to illness during the last 12 months (n=259)					
Never	120 (46.3)	6 (5.0)	114 (95.0)	Reference	
Once	92 (35.5)	8 (8.7)	84 (91.3)	1.81 (0.60, 5.41)	0.289
Several times	47 (18.1)	7 (14.9)	40 (85.1)	3.32 (1.05, 10.48)	0.040

OR=Odds ratio; 95%CI=95% confidence interval

Table 4: Multiple logistic regression analysis of association between socio-economic, demographic characteristics, lifestyle, and Migraine (n = 504)

Variable	**B**	**SE**	**Adjusted OR (95% CI)**	***P***
Age (years)				
18-25	Reference			
26-35	0.60	0.69	1.82 (0.48, 6.99)	0.381
36-45	0.93	0.83	2.53 (0.50, 12.85)	0.263
over 46	0.003	0.86	1.00 (0.19, 5.44)	0.997
Gender				
Male	Reference			
Female	-0.17	0.38	0.85 (0.40, 1.79)	0.664
Educational level				
Primary (Completed Primary School) & Secondary school	Reference			
Tertiary (College, University, Diploma, Degree, Postgraduate)	-0.57	0.47	0.57 (0.23, 1.42)	0.226
Occupation				
Student	Reference			
Government employee & Private employee	-0.26	0.60	0.77 (0.24, 2.51)	0.668
Self-employed/Own account worker & Employer	-0.80	0.82	0.45 (0.09, 2.22)	0.326
Unpaid family worker, Not working & Housewife	0.19	0.86	1.21 (0.22, 6.59)	0.822
Marital status				
Married	Reference			
Single	0.02	0.67	1.02 (0.28, 3.75)	0.978
In relationship	0.55	0.72	1.73 (0.42, 7.11)	0.450
Other	1.60	1.03	4.93 (0.66, 37.12)	0.121
Do you have any persons in your surroundings you can get support from in emotional crises or problems?				
No	Reference			
Yes	-0.49	0.42	0.62 (0.27, 1.40)	0.249

Have you had any problems in paying running bills in the past 3 months? (Utility bill, grocery bill, etc)				
No problem	Reference			
1-2 months/3 months	-0.19	0.56	0.82 (0.28, 2.46)	0.729
Have you been downgraded/ belittled/loss of self-esteem in the past three months?				
Never	Reference			
Once or twice	0.79	0.43	2.20 (0.95, 5.09)	0.065
Several times	1.82	0.52	6.16 (2.22, 17.08)	<0.001
Do you smoke?				
Never smoke	Reference			
Ex-smoker	0.01	0.74	1.01 (0.24, 4.33)	0.991
Occasional smoker & daily	0.20	0.55	1.22 (0.42, 3.55)	0.721
How often do you drink at least half a bottle of strong liquor (vodka, whiskey, rum, gin, tequila, 3 Litre beer, 1 Litre wine)?				
Never	Reference			
Monthly or less	-1.22	0.49	0.29 (0.11, 0.77)	0.012
2-4 times a month, a week & 4 or more	0.48	0.57	1.61 (0.53, 4.91)	0.405

OR=Odds ratio; 95% CI=95% confidence interval

Table 5: Multiple logistic regression analysis of association between socio-economic, demographic characteristics, lifestyle, working condition and Migraine among working adult (n=252)

Variable	**B**	**SE**	**Adjusted OR (95% CI)**	***P***
Age (years)				
18-25	Reference			
26-35	0.91	1.09	2.47 (0.29, 21.2)	0.406
36-45	2.20	1.36	9.05 (0.64, 129.04)	0.104
over 46	0.58	1.45	1.78 (0.10, 30.24)	0.691
Gender				
Male	Reference			
Female	-1.13	0.90	0.32 (0.06, 1.88)	0.209
Educational level				
Primary (Completed Primary School) & Secondary school	Reference			
Tertiary (College, University, Diploma, Degree, Postgraduate)	-0.75	0.86	0.47 (0.09, 2.51)	0.378
Occupation				
Government employee & Private employee	Reference			
Self-employed/Own account worker & Employer	-0.970	0.877	0.379 (0.07, 2.11)	0.269
Marital status				
Married	Reference			
Single	-1.54	1.146	0.21 (0.02, 2.02)	0.178
In relationship	2.09	1.308	8.08 (0.62, 104.97)	0.110
Other	0.99	1.730	2.71 (0.09, 80.40)	0.564
Do you have any persons in your surroundings you can get support from in emotional crises or problems?				
No	Reference			
Yes	-0.54	0.83	0.58 (0.11, 2.95)	0.513

Have you had any problems in paying running bills in the past 3 months? (Utility bill, grocery bill, etc)				
No problem	Reference			
1-2 months/3 months	-0.02	1.05	0.98 (0.12, 7.70)	0.982
Have you been downgraded/ belittled/loss of self-esteem in the past three months?				
Never	Reference			
Once or twice	0.898	0.885	2.45 (0.43, 13.91)	0.310
Several times	3.855	1.289	47.24 (3.77, 591.27)	0.003
Do you smoke?				
Never smoke	Reference			
Ex-smoker	-2.57	1.59	0.07 (0.00, 1.74)	0.107
Occasional smoker & daily	0.15	0.91	1.16 (0.20, 6.98)	0.867
How often do you drink at least half a bottle of strong liquor (vodka, whiskey, rum, gin, tequila, 3 Litre beer, 1 Litre wine)?				
Never	Reference			
Monthly or less	-1.23	0.93	0.29 (0.05, 1.82)	0.188
2-4 times a month, a week & 4 or more	1.17	0.92	3.21 (0.54, 19.32)	0.202
How satisfied are you with your working condition?				
Poor & very poor	Reference			
Neither good nor poor	-3.01	1.60	0.05 (0.002, 1.14)	0.060
Good & very good	-2.84	1.44	0.06 (0.003, 0.99)	0.049
What are your primary working hours?				
Daytime	Reference			
Evening Night Shift Work	0.42	1.01	1.52 (0.21, 10.94)	0.678

How often are you exposed to the following 3 elements in your work:				
My work includes heavy lifting (over 20 kg)				
Never	Reference			
More seldom	-2.492	1.238	0.08 (0.01, 0.94)	0.044
Some days a week	-0.884	1.066	0.41 (0.05, 3.34)	0.407
Every day	-5.767	2.302	0.003 (0.00, 0.29)	0.012
I am exposed to noise (have to raise my voice when speaking				
Never	Reference			
More seldom	0.76	1.03	2.14 (0.28, 16.15)	0.460
Some days a week	0.63	1.22	1.87 (0.17, 20.4)	0.607
Every day	2.24	1.09	9.36 (1.11, 79.11)	0.040
I am exposed to chemicals, steams, or gases				
Never	Reference			
More seldom	1.22	1.10	3.40 (0.39, 29.41)	0.267
Some days a week	3.09	1.43	21.90 (1.33, 361.87)	0.031
Every day	1.86	1.18	6.42 (0.64, 64.98)	0.115
Absent from work due to illness during the last 12 months	Reference			
Never				
Once	-0.32	0.83	0.73 (0.14, 3.74)	0.705
Several times	-0.67	1.03	0.51 (0.07, 3.86	0.515

OR=Odds ratio; 95% CI=95% confidence interval

CONCLUSION

This survey has assessed the relationship between socioeconomic factors, lifestyle choices, working conditions, and migraine, revealing a current migraine prevalence of 8.4% among the adult population in Malaysia. Recurrent experiences of emotional belittlement were found to have significant association with migraine. Moreover, exposure to heavy lifting, exposure to noise, and exposure to chemicals, steam, or gases were all notably associated with migraine. It is important to promote awareness about migraine and its risk factors at school, workplaces, and among the public. Encouraging lifestyle adjustments and offering assistance within school and workplace settings can potentially alleviate the frequency and intensity of migraines. Furthermore, the establishment of support communities for individuals affected by migraines can serve as a catalyst for the exchange of valuable insights, coping strategies, and the provision of emotional support.

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REFERENCES

1. Vos T, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F. et al., Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet. 2017 Sep 16;390(10100):1211-59.
2. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders. Cephalalgia. 2018;38(1):1-211.
3. Stovner LJ, Hagen K, Jensen R, Katsarava Z, Lipton RB, Scher AI. et al., The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia. 2007 Mar;27(3):193-210.
4. Alders EE, Hentzen A, Tan CT. A community-based prevalence: study on headache in Malaysia. Headache: The Journal of Head and Face Pain. 1996 Jun;36(6):379-84.

5. Molarius A, Tegelberg Å, Öhrvik J. Socio-economic factors, lifestyle, and headache disorders—a population-based study in Sweden. Headache: The Journal of Head and Face Pain. 2008 Nov;48(10):1426-37.
6. Winter AC, Berger K, Buring JE, Kurth T. Body mass index, migraine, migraine frequency and migraine features in women. Cephalalgia. 2009 Feb;29(2):269-78.
7. Lau YH, Kurien JK, Lau KM, Adenan S. Clinical Profile of Migraine Patients: A Descriptive Study of a Single Tertiary Centre in Malaysia. SN Comprehensive Clinical Medicine. 2022 Dec;4:1-7.
8. Le H, Tfelt-Hansen P, Skytthe A, Kyvik KO, Olesen J. Association between migraine, lifestyle and socioeconomic factors: a population-based cross-sectional study. The journal of headache and pain. 2011 Apr;12(2):157-72.
9. Winter AC, Berger K, Buring JE, Kurth T. Associations of socioeconomic status with migraine and non-migraine headache. Cephalalgia. 2012 Jan;32(2):159-70.
10. Tai MLS, Yap JF, Goh CB. Dietary Trigger Factors of Migraine and Tension-Type Headache in a Southeast Asian Country. Journal of Pain Research. 2018 Jun;Volume 11:1255–61.
11. Al-kotb H, Ibrahim MH. The Effect of Lifestyle Modification Program on Reducing Migraine Disability Among Migraineurs Suffers. American Journal of Nursing. 2016;5(6):280-7.
12. Varkey E, Hagen K, Zwart JA, Linde M. Physical activity and headache: results from the Nord-Trøndelag Health Study (HUNT). Cephalalgia. 2008 Dec;28(12):1292-7.
13. López-Mesonero L, Márquez S, Parra P, Gámez-Leyva G, Munoz P, Pascual J. Smoking as a precipitating factor for migraine: a survey in medical students. The journal of headache and pain. 2009 Apr;10(2):101-3.
14. Yu S, Liu R, Yang X, Zhao G, Qiao X, Feng J. et al., Body mass index and migraine: a survey of the Chinese adult population. The journal of headache and pain. 2012 Oct;13:531-6.
15. Antonov K, Isacson D. Headache in Sweden: the importance of working conditions. Headache: The Journal of Head and Face Pain. 1997 Apr;37(4):228-34.
16. Crystal SC, Robbins MS. Epidemiology of tension-type headache. Current pain and headache reports. 2010 Dec;14:449-54.
17. Peroutka SJ. What turns on a migraine? A systematic review of migraine precipitating factors. Current pain and headache reports. 2014 Oct;18(10):454.
18. Wong LP, Alias H, Bhoo-Pathy N, Chung I, Chong YC, Kalra S. et al., Impact of migraine on workplace productivity and monetary loss: a study of employees in the banking sector in Malaysia. The journal of headache and pain. 2020 Dec;21(1):1-1.
19. Thiagarajan A, Aziz NA, Tan CE, Muhammad NA. The profile of headaches and migraine amongst medical students and its association to stress level, disability and self-management practices. Malaysian Family Physician: the Official Journal of the Academy of Family Physicians of Malaysia. 2022 Jul 7;17(2):81.

20. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Research in nursing & health. 2006 Oct;29(5):489-97
21. Samaan Z, MacGregor EA, Andrew D, McGuffin P, Farmer A. Diagnosing migraine in research and clinical settings: the validation of the Structured Migraine Interview (SMI). BMC neurology. 2010 Dec;10:1-7.
22. Shaik MM, Hassan NB, Tan HL, Bhaskar S, Gan SH. Validity and reliability of the Malay version of the Structured Migraine Interview (SMI) Questionnaire. The journal of headache and pain. 2015 Dec;16:1-9.
23. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. The Lancet. 2007 Oct 20;370(9596):1453-7.
24. Woldeamanuel YW, Cowan RP. Migraine affects 1 in 10 people worldwide featuring recent rise: a systematic review and meta-analysis of community-based studies involving 6 million participants. Journal of the neurological sciences. 2017 Jan 15;372:307-15.
25. Takeshima T, Wan Q, Zhang Y, Komori M, Stretton S, Rajan N. et al., Prevalence, burden, and clinical management of migraine in China, Japan, and South Korea: a comprehensive review of the literature. The journal of headache and pain. 2019 Dec;20:1-5.
26. Hagen K, Vatten L, Stovner LJ, Zwart JA, Krokstad S, Bovim G. Low socioeconomic status is associated with an increased risk of frequent headache: a prospective study of 22,718 adults in Norway. Cephalalgia. 2002 Oct;22(8):672-9.
27. Aamodt AH, Stovner LJ, Hagen K, Bråthen G, Zwart J. Headache prevalence related to smoking and alcohol use. The Head-HUNT Study. European Journal of Neurology. 2006 Nov;13(11):1233–8.
28. Amin FM, Aristeidou S, Baraldi C, Czapinska-Ciepiela EK, Ariadni DD, Di Lenola D. et al., The association between migraine and physical exercise. The journal of headache and pain. 2018 Dec;19:1-9.