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The effects of self-perceived stress on smoking status and dependence among primary healthcare visitors in Makkah city, 2023

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ABSTRACT

Background: Tobacco use results in more than eight million fatalities annually. By 2030, if global smoking patterns remain unchanged, more people will perish annually from diseases linked to tobacco use. *Objectives:* To measure the effect of self-perceived stress on the status and dependence of smoking among the general population of Makkah, Saudi Arabia. *Methods:* The present study was done in Makkah city over a six-month period, using a stratified random sampling method to select participants. All individuals aged 18 years and above were eligible to participate in the study with the exception of those who enrolled in a smoking cessation program. Information was obtained through interviews using a questionnaire, with nicotine dependence being evaluated using the Fagerström Test. *Results:* Our study involved 190 participants, with over half of them being male. Of those surveyed, 28.4% reported smoking. The nicotine dependence average score was calculated to be 4.1±2.48. According to the Perceived Stress Scale, the average stress score was 16.4±6.7, and most of the respondents demonstrated moderate levels of stress (57.9%). A significant association was observed between nicotine dependence and level of stress (P = 0.033). Individuals who had multiple relapses after quitting smoking trials showed significantly higher levels of stress (P = 0.010). *Conclusion:* The study found that people of the city of Makkah, experienced moderate levels of self-perceived stress, and a significant proportion of them were smokers with a high prevalence of smoking. The study emphasizes the necessity of taking actions to decrease smoking rates and encourage healthier lifestyles.

Keywords: Self-perceived stress, smoking, association, Makkah, dependence

1. INTRODUCTION

Tobacco smoking has long been recognized as the leading cause of preventable premature mortality worldwide, attributing to the devastating health consequences associated with prolonged exposure to tobacco smoke.

The emergence of lung cancer as a sentinel disease highlighted the alarming magnitude of the tobacco-induced epidemic. Although encouraging progress has been made in reducing smoking rates, particularly in high-income countries, the persistent threat of tobacco-related diseases continues to loom over low-income and middle-income nations, partly due to the relentless efforts of multinational tobacco companies (Samet, 2013).

All bodily organs are affected by cigarette smoking, which, in turn, causes pathological diseases and minimizes general health and quality of life. Moreover, nine out of 10 lung cancer-related deaths are attributed to cigarette smoking (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2014). Cigarette smoking increases the risk of death among men and women due to various causes (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2014). A study conducted in Saudi Arabia by Qattan et al., (2021) revealed the smoking prevalence in the country to be 14.09%. Further, the prevalence was higher among men (25.34%) than women (1.91%) (Qattan et al., 2021).

Additionally, a recent study highlighted that high perceived stress is associated with high rates of smoking and that the odds ratio (OR) of daily smoking among men was 2.16 (95% confidence interval (CI): 1.93–2.41; P = 0.0005), which was higher than the OR of 1.78 among women (95% CI: 1.62–1.96; P = 0.0005) (Buhelt et al., 2021). Perceived stress can be defined as feelings or thoughts any person has regarding the level of stress they are under, along with unpredictability and uncontrollability feelings of life (Phillips, 2013).

A large number of people reported tobacco use as the primary solution to decreasing perceived stress (Lawless et al., 2015). A systemic overview indicated that smoking is the primary means to control stress (Twyman et al., 2014). Hence, psychological and social stress plays a substantial role as a predisposing factor for tobacco use (Lawless et al., 2015). While the association between perceived stress and nicotine withdrawal symptoms is robust for both genders, it is particularly prominent among women, with a ratio of 2:1 compared to men (Lawless et al., 2015).

According to a cross-sectional study on perceived stress and smoking conducted by Stubbs et al., (2017) across 41 countries, including Europe, Asia, Africa, and America, a one-unit increase in perceived stress resulted in a 5% increase in smoking (OR = 1.05; 95% CI = 1.03–1.06). Moreover, in Africa, smoking was associated with increased risk of smoking. This finding was similar also in America, and Asia. Despite similarities, this finding was not similar in Europe countries, with heavy smoking referring to the consumption of more than 30 cigarettes (OR = 1.08; 95% CI = 1.02–1.15).

In a systematic review conducted by Alasqah et al., (2019) that focused on the prevalence and associated factors of smoking in the Saudi population, adolescents had a relatively high smoking prevalence. The review highlighted that the desire to alleviate stress is the primary contributing factor for smoking among this population, affecting approximately 63.2% of the surveyed individuals. The students from different cities, who ranged from 65–85.6% of the population (surveyed data) in Saudi Arabia, reported being aware of complications related to smoking (Alasqah et al., 2019).

Another cross-sectional study conducted by Fatani et al., (2022) in Jeddah city demonstrated that nicotine dependence had a statistically significant association with perceived stress (OR: 2.09; 95% CI: 1.20–3.63). The utilization of smoking as a means to alleviate stress was identified as one of the prevailing reasons for individuals not being able to quit smoking (33.3%; OR: 2.23; 95% CI: 1.48–3.37; P < .01). However, the limitations of this study were that it was conducted during the pandemic of COVID-19 and used self-reported questionnaires (Fatani et al., 2022).

The prevalence of smoking globally is approximately 22.3% (WHO, 2017). This pervasive issue poses a significant public health threats in history, surpassing eight million annual deaths attributed to its detrimental effects (WHO, 2011). Many researchers have evidenced a high correlation between an individual's perceived levels of stress and whether or not they smoke, with smoking being identified as the primary means to control stress (Buhelt et al., 2021).

To date, there is a lack of epidemiological research in Saudi Arabia, specifically in Makkah city, examining the link between stress and smoking. Therefore, this study aimed to address this research gap by investigating the relationship between perceived stress and current smoking status among the population of Makkah. The main objective of our study was to assess the impact of self-perceived stress on smoking status and dependence among individuals visiting primary healthcare centers in Makkah city.

2. STUDY METHODOLOGY

Study setting

The cross-sectional study in Makkah city, which is estimated to have a population of 1,578,722 million people based on a prior study (Fatani et al., 2022). The study and data collection were conducted during the months from January to March, 2023.

Study population

All individuals aged ≥18 years were eligible for participation in our study. The participants currently following up in a smoking cessation program were excluded from the study. The calculation of the sample size was based on the assumption that the current prevalence rate of smokers in Saudi Arabia was 14.1%, as reported (Qattan et al., 2021). The equation ($n = Z^2 P (1-P)/d^2$) was formulated using a CI of 95% and a 5% marginal error. The minimum required sample size was estimated to be 190 participants.

The current study employed a stratified random sampling method. The city of Makkah was divided into four main divisions. Two primary healthcare (PHC) centers were selected randomly from each division. From each center, 190 participants were selected randomly among those who met the inclusion criteria.

Data collection

The data were collected from the visitors of the PHC centers using face-to-face interviews. The questionnaire included three sections. The first section sought socio-demographic information (such as age, sex, marital status, and level of education) and health history (including smoking and other comorbidities).

The second section was targeted at evaluating the self-perception of stress levels. For this, we utilized a validated and reliable tool (Perceived Stress Scale (PSS)), which contains a total of 10 questions. Each question was rated on a five-point Likert scale from 0 as 'never' to 4 as 'very often' with reference to the previous month. Before the analysis, the scoring was reversed for some questions as appropriate. The total scores were subcategorized as follows: 0–13 was considered to be low stress, 14–26 to be moderate stress, and 27–40 to be high perceived stress.

The third section was designed to measure nicotine dependence, for which we employed The Fagerström Test for Nicotine Dependence is a widely-used tool for evaluating the severity of a person's physical addiction to nicotine. The purpose of the test is to evaluate the level of nicotine addiction related to cigarette smoking. It consists of six questions designed to assess factors such as the quantity of cigarettes smoked, the urge or compulsion to use, and the level of dependence. Scores on the Fagerström test are classified into four categories, ranging from high dependence (>8) to low dependence (0-2).

A pilot study was conducted on the questionnaires using 10% of the participants to test the questionnaires and the timing to answer them, following which the questions were adjusted accordingly or excluded from the main study if required.

Ethical considerations

Ethical approval for our study was obtained from the Research Ethical Committee and Institutional review board (IRB) of security forces hospital Makkah (SFHM) registered at the National Bio Medical Ethics Committee, King Abdulaziz City for Science and Technology on 71711436 (Registration no: HAP-0 2-K-052) with the approval number (0550-191222). Furthermore, consent from the directors of the selected PHC centers was obtained before the data collection. Each participant was asked to provide written informed consent for participation. Informed consent was obtained after explaining the study's nature and objectives. The participants were also informed that the data would be used for research purposes only.

Statistical analysis

For data analysis, the Statistical Package for the Social Sciences (SPSS) software, specifically version 23, was employed. Categorical variables were presented as frequency and percentages, while numerical variables were presented as mean and standard deviations (SD). Significant associations were considered for tests with P value less than 0.05. A chi-square test was employed to assess the effect of self-perceived stress among smokers and non-smokers. Moreover, we utilized multivariable logistic regression to investigate the relationship between stress as perceived by the participants and smoking status (outcome variable). Age and sex were further stratified to assess for the confounding effect.

3. RESULTS

Socio-demographic characteristics of the PHC center victors and the association with smoking status

The study comprised a sample of 190 individuals, with an average age of 40.9 years and a standard deviation of 11.8 years. The results indicated that age did not exert a significant influence on the smoking status of the participants. Furthermore, the findings revealed that males accounted for over half of the participants (55.3%), and they exhibited a significantly higher proportion of smokers and ex-smokers compared to females (54.3% vs. 12.9%) ($P < 0.001$). The majority of the participants were married (72.1%), and a notable percentage had attained a university education (54.2%).

Regarding the occupational status of the study population, we found that most of them were employees (62.6%). Furthermore, participants who had private businesses tended to smoke more than others (60%), and this association was found to be significant (P = 0.001). A total of 49 (25.8%) participants indicated having a chronic disease and 14 (7.4%) had a history of psychiatric disease. The most reported chronic illness was diabetes mellitus (12.1%), followed by hypertension (7.4%), and the most reported psychiatric disease was depression (3.2%), followed by anxiety (1.1%). The socio-demographic variables of the participants and their association with smoking status are in (Table 1).

Table 1 Socio-demographic characteristics of the study participants and their association with smoking status

(n = 190)	Overall	Smoking status		95% CI	P-value
		Non-smokers (%)	Smokers/ex-smokers (%)		
Age (in years): Mean ± SD (range)	40.9 ± 11.8 (18–65)	41.5 ± 11.5	39.8 ± 12.3	−1.9–5.2	0.359¥
Gender					
Male	105 (55.3)	48 (45.7)	57 (54.3)	1	<0.001£
Female	85 (44.7)	74 (87.1)	11 (12.9)	0.1–0.3	
Marital status					
Single	41 (21.6)	23 (56.1)	18 (43.9)	1	0.587
Married	137 (72.1)	91 (66.4)	46 (33.6)	0.3–1.3	
Divorced	4 (2.1)	2 (50)	2 (50)	0.2–9.9	
Widow	8 (4.2)	6 (75)	2 (25)	0.1 –2.4	
Educational level					
Illiterate	1 (0.5)	1 (100)	0 (0)	0.00	0.526
Primary education	4 (2.1)	2 (50)	2 (50)	0.4–23.6	
Secondary education	47 (24.7)	27 (57.4)	20 (42.6)	0.8 –5.6	
University education	103 (54.2)	66 (64.1)	37 (35.9)	0.7–3.8	
Postgraduate	35 (18.4)	26 (74.3)	9 (25.7)	1	
Occupational status					
Student	9 (4.7)	8 (88.9)	1 (11.1)	1	<0.001£
Employee	119 (62.6)	71 (59.7)	48 (40.3)	0.7–44.6	
Unemployed	32 (16.8)	30 (93.8)	2 (6.3)	0.04–6.7	
Private business	10 (5.3)	4 (40)	6 (60)	1.1–136.8	
Retired	20 (10.5)	9 (45)	11 (55)	1–93.4	
Chronic disease					
No	141 (74.2)	87 (61.7)	54 (38.3)	1	0.221£
Yes	49 (25.8)	35 (71.4)	14 (28.6)	0.3–1.3	
Psychiatric disease					
No	176 (92.6)	11 (63.1)	65 (36.9)	1	0.244£
Yes	14 (7.4)	11 (78.6)	3 (21.4)	0.1–1.7	

¥ P-values were calculated using independent samples t-test and £ Chi-square test.
Other P-values were calculated by Fisher's exact test.

Self-perceived stress

Upon employment of the PSS, we found that the average stress score was 16.4 ± 6.7, range (1–34) out of 40. More than half of the respondents showed moderate level of stress (57.9%). In addition, the level of stress was low among (35.8%) of the participants. However, only (6.3%) of the participants revealed high level of stress. The stress levels are in (Figure 1).

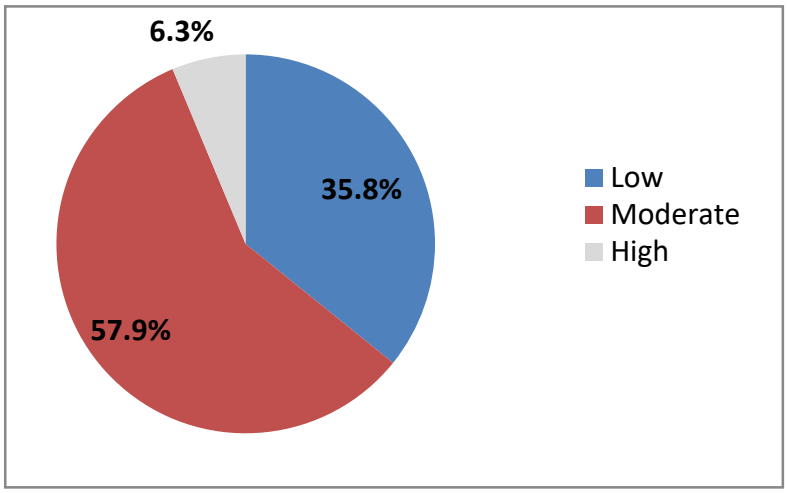

Figure 1 Demonstration of the stress level among primary health care center visitors

The Perceived Stress Scale

Our results highlighted that more than one third of the respondents get upset due to an unexpected event (32.6%). Furthermore, 25.8% of the participants felt of inability to control the critical things in their life. Approximately one fourth of the respondents stated that they felt nervous and stressed fairly often (22.6%). On the other hand, 31.1% of the participants felt confident about their ability to handle their personal problems and things going their way fairly often (38.9%). However, a significant proportion of the study population (38.4%) reported struggling to cope with all their responsibilities at times.

We found that 38.4% of them were occasionally able to manage the things that annoyed them in their life, and 33.7% of them thought they were controlling things fairly commonly. Furthermore, 37.4% of the participants indicated that they occasionally experienced feelings of anger due to events or circumstances beyond their control. Only 5.3% of the respondents reported commonly feeling that the problems were becoming overwhelming and insurmountable. The responses of the perceived stress scale are in (Table 2).

Table 2 Perceived Stress Scale

The frequency of smoking-related factors in the last month	Never	Almost never	Sometimes	Fairly often	Very often
	n (%)				
Been upset because of something that happened unexpectedly?	38 (20)	48 (25.3)	62 (32.6)	30 (15.8)	12 (6.3)
Felt that you were unable to control the critical things in your life?	49 (25.8)	48 (25.3)	66 (34.7)	19 (10)	8 (4.2)
Felt nervous and stressed?	31 (16.3)	35 (18.4)	65 (34.2)	43 (22.6)	16 (8.4)
Felt confident about your ability to handle your personal problems?	16 (8.4)	19 (10)	56 (29.5)	59 (31.1)	40 (21.1)
Felt that things were going your way?	11 (5.8)	25 (13.2)	61 (32.1)	74 (38.9)	19 (10)
Found that you could not cope with all the things you had to do?	37 (19.5)	50 (26.3)	73 (38.4)	22 (11.6)	8 (4.2)
Been able to control irritations in your life?	11 (5.8)	22 (11.6)	73 (38.4)	59 (31.1)	25 (13.2)
Felt that you were on top of things?	11 (5.8)	23 (12.1)	61 (32.1)	64 (33.7)	31 (16.3)
Been angered because of things that happened outside of your control?	12 (6.3)	49 (25.8)	71 (37.4)	46 (24.2)	12 (6.3)
Felt difficulties were piling up so high that you could not overcome them?	38 (20)	59 (31.1)	55 (28.9)	28 (14.7)	10 (5.3)

Smoking characteristics

Our results revealed that the prevalence of smoking among participants was 28.4%, and that 7.4% were ex-smokers. Moderate and high-level stress was higher in smokers and ex-smokers than in non-smokers without any significant difference. The vast majority of smokers had been smoking for more than six months (98.1%). Participants who had started smoking within six months reported higher levels of stress. Approximately one-third of the individuals who had previously quit smoking did not relapse and return to smoking. We observed higher level of stress among participants who had returned to smoking within a month after quitting without significant association.

The Fagerström Test investigating nicotine dependence was administered to assess the level of nicotine dependence, and the results showed a mean score of 4.1±2.48 (Range 0-9). However, no significance was observed between the nicotine dependence score and the level of stress (P = 0.055). Regarding level of smoking dependence, we noted that the highest proportion of respondents had low to moderate dependence (33.3%), followed by moderate dependence (31.5%) and low dependence (27.8%), while the least percentage of participants had high dependence (7.4%) (Figure 2).

There was a significant association between higher levels of stress and participants who had low dependence on nicotine. The association between severity of dependence and the level of stress was significant (P = 0.033). Additionally, individuals who had previously quit smoking but restarted after two or more attempts were related with higher levels of stress (P = 0.010). Finally, our results demonstrated no significant association between the stress level and the duration of stopping smoking (P = 0.505) (Table 3).

Table 3 Smoking dependence and its association with self-perceived stress

Variable	Categories	Overall (%)	Stress level		95% CI	P-value
			Low	Moderate/ High		
Are you smoker?	No	122 (64.2)	49 (40.2)	73 (59.8)	1	0.242£
	Yes	54 (28.4)	15 (27.8)	39 (72.2)	0.9–3.5	
	Ex-smoker	14 (7.4)	4 (28.6)	10 (71.4)	0.5–5.7	
Nicotine Dependence	Mean ± SD	4.1 ± 2.5	5.1 ± 1.8	3.7 ± 2.6	-0–2.9	0.055¥
Nicotine Dependence categories	Low	15 (27.8)	0 (0)	15 (100)	0.00	0.033
	Low to moderate	18 (33.3)	7 (38.9)	11 (61.1)	0–6.1	
	Moderate	17 (31.5)	7 (41.2)	10 (58.8)	0–5.6	
	High	4 (7.4)	1 (25)	3 (75)	1	

¥ P-value calculated using independent samples t-test and £ Chi-square test. Other P-values calculated by Fisher's exact test.

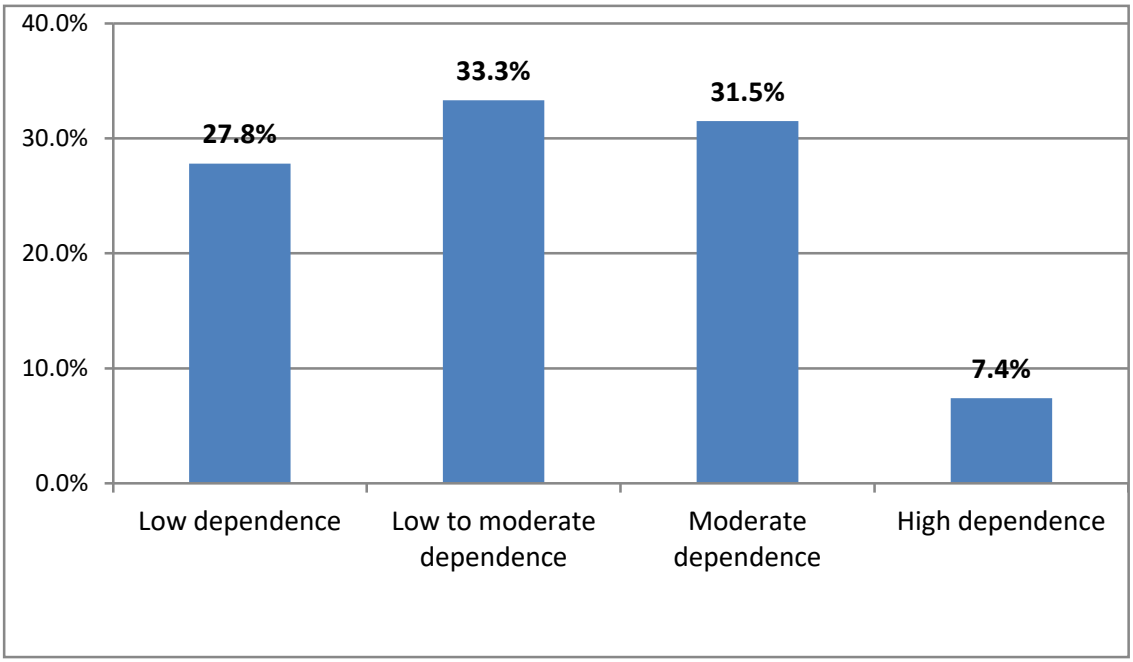

Figure 2 Nicotine dependence (n = 54)

The Relationship between Perception or Stress and Smoking Status

To investigate the potential relationship between perceived stress as an exposure variable and current smoking status as an outcome variable, logistic regression analysis was conducted while considering the influence of sex and age as potential confounders. The findings of our study revealed a significant correlation between moderate levels of stress perception and smoking status (P = 0.049), indicating a relatively higher association. However, when stratified by age groups and gender, no significant relationship was observed between the level of stress perception and smoking status among the participants.

Table 4 Relationship between Stress Perception and Current Smoking Status

	Variable	Smoking status		Odds ratio	95% CI for odd ratio	P-value
		Non-smoker	Smoker /ex-smoker			
All	Perceived stress					0.055
	Low	49 (72.1)	19 (27.9)	1		
	Moderate	63 (57.3)	47 (42.7)	1.924	1–3.7	0.049
	High	10 (83.3)	2 (16.7)	0.516	0.1–2.6	0.420
Male	Perceived stress					0.159
	Low	23 (57.5)	17 (42.5)	1		
	Moderate	24 (38.1)	39 (61.9)	2.199	0.9–4.9	0.056
	High	1 (50)	1 (50)	1.353	0.1–23.2	0.835
Female	Perceived stress					0.466
	Low	26 (92.9)	2 (7.1)	1		
	Moderate	39 (83)	8 (17)	2.667	0.5–13.6	0.237
	High	9 (90)	1 (10)	1.444	0.1–17.9	0.775
18-25 years	Perceived stress					1.000
	Low	3 (100)	0 (0)	1		
	Moderate	3 (23.1)	10 (76.9)	0.538	-	0.999
	High	2 (100)	0 (0)	1.000	-	1.000
26-35 years	Perceived stress					0.394
	Low	9 (75)	3 (25)	1		
	Moderate	22 (55)	18 (45)	2.455	0.6–10.4	0.224
	High	5 (71.4)	2 (28.6)	1.200	0.1–9.8	0.865
36-45 years	Perceived stress					0.995
	Low	12 (70.6)	5 (29.4)	1		
	Moderate	18 (72)	7 (28)	0.933	0.2–3.6	0.921
	High	2 (100)	0 (0)	0.000	-	0.999
46 or more years	Perceived stress					0.834
	Low	25 (69.4)	11 (30.6)	1		
	Moderate	20 (62.5)	12 (37.5)	1.364	0.5–3.7	0.546
	High	1 (100)	0 (0)	000	-	1.000

4. DISCUSSION

The objective of the current research was to examine the effect of self-perceived stress on smoking status and dependence among primary healthcare visitors. Multiple psychological factors have been connected to both the initiation and persistence of smoking. Smokers frequently believe that smoking is a successful means of dealing with both insignificant and significant stressful events in daily life (Koval and Pederson, 1999). A key contributing factor to the onset of smoking behavior is stress and the resulting distress or sadness (Pritchard et al., 2007). Emerging research suggests a positive correlation between smoking and elevated levels of perceived stress (Richards et al., 2011; Cummings et al., 1985).

Our observations revealed that the majority of participants were male, accounting for the majority of the study population (55.3%) who constituted a significantly higher proportion of smokers and ex-smokers than females. This finding was in line with

another study that revealed that the rate of tobacco users among all the participants (18.8%), with men constituting 24.90% and women constituting 16.6% (Sun et al., 2011). Furthermore, a previous study conducted in Saudi Arabia reported a smoking prevalence rate of 14.09%, which was higher among men (25.34%) than women (1.91%), which also supports our findings (Qattan et al., 2021).

This may be because men are more likely to participate in high-risk behaviors than women. However, contrary to our investigation, another study demonstrated that the current smoking status was substantially correlated with marital status, age, and location of residence (Qattan et al., 2021), although a different survey conducted by Algabbani et al., (2018) in Saudi Arabia confirmed our findings by showing no connection between smoking and marital status. In our results, it was found that the participants who had private businesses tended to smoke more than others (60%), and this association were found to be significant ($P < 0.001$).

A previous Australian study by Sun et al., (2011) established that the middle-income level ($40,000–59,999) was connected with tobacco usage. This can be attributed to the fact that spending power is a key indicator of smoking consumption (Peterson et al., 2005). Moreover, we found the average stress score to be 16.4±6.7 (range: 1–34) out of 40. A majority of respondents showed moderate levels of stress (57.9%). These results align with a study conducted by Al-Ateeq et al., (2020) which also indicated that over half of the participants (55%) exhibited moderate levels of stress.

The findings also revealed that approximately one-fourth of the respondents reported feeling nervous and stressed fairly often, and only 5.3% of our participants indicated that they commonly felt that difficulties were becoming increasingly substantial so high they could not overcome them. This proportion was lower than that highlighted by another study, which found a majority of the respondents felt nervous, stressed, angry, and unable to overcome a mounting number of challenges either fairly or very frequently (Al-Ateeq et al., 2020). The fact that this previous study was conducted among students, who typically carry a high stress load, may help explain the discrepancy between the two studies.

In addition, our findings indicated a smoking prevalence of 28.4% among the participants, which was higher than the prevalence reported in another study conducted in Saudi Arabia (Qattan et al., 2021). In addition, we administered the Fagerström Test for Nicotine Dependence to assess the level of nicotine dependence in the subjects. Surprisingly, our analysis did not reveal any significant association between the level of nicotine dependence and the level of stress ($P = 0.033$). Stress reduction is one of the main justifications for smoking cited by dependent smokers (Mc-Ewen et al., 2008).

Genetic factors, behavioral traits, and family history are just a few of the unobserved features that have been linked to variations in nicotine dependency (Shiffman and Paton, 1999). The most popular theory is that stress likely increases the responsiveness of the hypothalamus-pituitary-adrenal (HPA) axis, negative emotions, physiological reactivity, and nicotine craving (Mc-Kee et al., 2011). According to the findings of Stubbs et al., (2017) their research revealed a significant association between increased stress levels and smoking behavior in the Americas (OR = 1.03; 95% CI = 1.01–1.05), Asia (OR = 1.06; 95% CI = 1.04–1.08), and Africa (OR = 1.06; 95% CI = 1.04–1.09). However, no significant association was reported in Europe countries (OR = 0.99; 95% CI = 0.95–1.02) (Stubbs et al., 2017).

Contrary to our findings, a study conducted in America reported a marginally significant negative relationship between nicotine dependence and females reported feeling stressed about them, whereas males did not (Lawless et al., 2015). Additionally, the majority of smokers (31.5%) were found to have made more than two attempts to stop smoking, and they displayed lower levels of stress compared with other people without any discernible association. According to the existing literature, those who are under more stress are more prone to making unsuccessful attempts to quit smoking (Slopen et al., 2013).

According to our research, there was no significant link between the amount of cigarettes smoked daily and stress levels ($P = 0.146$). These results do not corroborate other observations that indicated heavy smoking (i.e., smoking more than 30 cigarettes per day) to be strongly connected with rising levels of perceived stress (Stubbs et al., 2017). Besides, we observed that the respondents who continued smoking after quitting twice or more were considerably more stressed ($P = 0.010$), which was supported by a separate study (Cohen and Lichtenstein, 1990). These discrepancies could result from the diverse educational and cultural backgrounds of the studies' sample population.

The present study offers valuable insights into the prevalence of smoking and its relationship with stress among the general population aged over 18 years in Makkah. The calculation of sample size was done while considering the minimum required sample size. The sampling process involved selecting a sample that could be representative of the reference population in the region to ensure the generalizability of the findings. However, certain limitations of the present study design must be kept in mind. First, we could not establish causality or temporal connections because of the cross-sectional methodology used in the study. As in the

case of smoking rates, it is probable that some people under-reported social desirability rates. Additionally, the limited sample size was another disadvantage of the study.

5. CONCLUSION

In conclusion, this study found that individuals in Makkah, Saudi Arabia, reported moderate levels of self-perceived stress, while smoking prevalence was found to be high among the population. Further, we discovered a statistically significant correlation between dependence on nicotine and stress level. The study revealed a significant association between individuals who resumed smoking after quitting multiple times and higher levels of stress. Our findings suggest that programs for preventing and controlling tobacco use should evaluate perceived stress and provide instruction on healthy coping mechanisms. To create interventions that decrease tobacco use in the general public, a more in-depth knowledge of the environmental background for enduring high rates of smoking is essential.

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Authors' contributions

Dr Haneen Bukhari started the research, wrote the research proposal, collected and analyzes data, wrote the final manuscript. Dr Jehad Alqurashi has contributed in the study design, intellectual content, and reviewed all versions of the manuscript. Both authors have reviewed and approved the current version of the manuscript and approved it for publication.

Ethical approval

The study was approved by the Medical Ethics Committee of security forces hospital Makkah (SFHM) registered at the National BioMedical Ethics Committee, King Abdulaziz city for Science and Technology (Ethical approval code: 0550-191222).

Informed consent

Before the data collection, consent was obtained from the directors of the selected Primary Healthcare (PHC) centers. Each participant was provided with a clear explanation of the study's nature and objectives, and written informed consent was obtained for participation. The participants were assured that the data would be used solely for research purposes. Written and oral informed consent was obtained from all individual participants included in the study. Furthermore, additional informed consent was obtained from all individual participants whose identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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