DEPRESSION SYMPTOMS AND ASSOCIATIONS WITH TOBACCO SMOKING DEPENDENCE AND ANALGESIC MISUSE IN AL-MADINAH: CROSS-SECTIONAL STUDY

Alaa Abbas Kurdi, Aljazairi Ahmed Mohammed Azzuz, Alhelali Hassan Fahad Bin, and Alahmadi Ibrahim Mohammad Abdulaziz

Resident Name: (Alaa Abbas Kurdi)

Author:
[1,] Alaa Abbas Kurdi
alaakurdi761@gmail.com:
Preventive medicine resident
Ministry of Health
0000-0001-9426-1487

Coauthor:
Aljazairi, Ahmed Mohammed Azzuz
Medical Student
ahmedazzoz7@gmail.com
0000-0002-8395-6328

Alhelali, Hassan Fahad Bin
Medical Student
hhhad.0@gmail.com
0000-0003-1893-2036

Alahmadi, Ibrahim Mohammad Abdulaziz
Medical student
0009-0007-5047-4641
Ima1510809@gmail.com

Abstract

Background Depression is a global burden that is exacerbated by smoking. A high prevalence of Depression Symptoms is associated with Nicotine Dependence. The use of analgesics is more common with depressive symptoms even after controlling for self-reported pain, significantly contributing to morbidity and premature mortality. This study aims to estimate the prevalence rate of depression symptoms in current smokers, analgesic misuse, and associations between such symptoms and the level of dependence in the Madinah city population.

Methods A cross-sectional analytical study was conducted at the Ministry of Health smoking cessation clinics in Al-Madinah, Saudi Arabia, from February 20 to March 29, 2024. The level of Nicotine Dependence among smoking participants was assessed based on the validated Arabic version of the Fagerstrom test for nicotine dependence (FTND) questionnaire. also assessed Depression Symptoms using a Patient Health Questionnaire with a 9-item depression scale (PHQ-9).

Results Prevalence of Mild and moderate depression were found among 31.9% and 11.1% of the participants, respectively. Higher depression symptoms were associated with Nicotine Dependence, such that those smoking who have psychological problems had an approximately 1.2-fold higher depression score (RR= 1.20; 95% CI 1.05, 1.39). also, Participants who are currently working had a depression score that was significantly higher by a factor of 1.18 relative to those who are not working (RR= 1.18; 95% CI 1.04, 1.33). as well as sociodemographic factors (RR=1.67;95% CI 1.30, 2.14). The prevalence rate of analgesic consumption to ease headaches and/or stomachaches during the last several weeks was 57% among girls and 29% among boys.

Conclusions There is a correlation between Depression and Nicotine Dependence outcomes; people who use nicotine products are more likely to experience depression. Depressive symptoms are significantly associated with analgesic consumption among adolescents, even after controlling for pain.

Keywords: Smoking, Depression, Nicotine Dependence, Fagerstrom test for nicotine dependence. Analgesics

1. Introduction

Smoking is considered a chronic disease and a serious public health problem, and one of the most important causes of the spread of disease and death globally [1], as it is one of the factors causing cardiovascular disease, lung cancer, and other health problems.[2,3]

Among Saudis, 21.4% of adults reported smoking [4], According to international data, smoking is about twice as common among groups with a mental health condition (MHC) compared to those without it [5]. Evidence from studies indicates that people with depression are more likely to smoke and suffer from nicotine dependence [6,7], which confirms the existence of a mutual, bidirectional relationship between smoking and depression [8]. However, the studies conducted on adults, symptoms of depression predict continued smoking and failure of attempts to quit smoking.[9,10] Tobacco is a psychoactive substance that changes nervous activity after ingestion and enhances the mood of smokers. Therefore, the self-medication theory assumes that individuals who suffer from depression resort to smoking to alleviate the symptoms of depression [11]. Also, according to King JL et al., [12] smoking causes individuals to develop symptoms of depression, and symptoms of depression can lead them to smoke.

Current smokers have significantly higher depression rates compared to former-smokers and never-smokers [8]. Importantly, among young adults, the increased risk of major depressive associated with smoking can be reduced by quitting [9,13]. Depression Symptoms may interfere with attempts to quit smoking, creating a situation in which the smoker develops worsening symptoms of depression, making it more difficult to give up this addiction [1]. Identifying potential associations between depressive symptoms and smoking-related nicotine dependence is of great importance for health professionals involved in smoking treatment.[8]

Several studies have found that there is a positive correlation between depression and smoking, as smokers are exposed to relapse and depression when trying to quit smoking [14,15]. According to Munafò MR et al., [16], the presence of depressive symptoms predicts smoking addiction. As the results of the study by Baker T. D. et al. showed, daily and frequent consumption of nicotine by smokers who suffer from mental illnesses is more likely than others, due to attempts to treat symptoms on their own, attempts to counter the sedative side effects of psychotropic medications, or the neurotoxic effects of nicotine on mental health.[17]

It has been suggested that being a victim of psychological distress is associated with elevated self-reported use of medicine for headaches, stomachaches, sleep difficulties, and nervousness, which is not warranted by the higher prevalence of symptoms.This should be taken seriously because elevated analgesic use has been associated with a significantly higher risk for future health risks.In Saudi Arabia, the prevalence reports for depressive symptoms are 37.35% [18]. This study aimed to estimate prevalence rate of depression symptoms in current smokers and associations between such symptoms and the level of dependence in the Madinah city population.

2. Materials and Methods

2.1 Study Design

This study was an analytical cross-sectional questionnaire-based study conducted at the Ministry of Health smoking cessation clinics in Al-Madinah, Saudi Arabia. All participants who attend primary health care centers in Al-Madinah from February 20 to March 29, 2024, were included in the study. Sample size was calculated by the following formula: Sample Size = Z2p(1-p)/c2. Z =

Z value or called confidence level = 1.96 for 95%. p = percentage picking a choice = 0.5. c = confidence interval = ±5% = 0.05. The minimum sample size needed to achieve a precision of ±5% with a 95% confidence interval is 385. At the end, the sample consisted of 386 individuals, fulfilling the required sample number.

2.2 Study Questionnaire

A validated, pilot-tested, and self-administered questionnaire for collecting data from the participants, including sociodemographic profile, health status, and (Fagerstrom Nicotine dependent level) is a valid and reliable tool for assessing the intensity of physical addiction to nicotine [19,20]. A literature review showed that in Malaysian study of reliability found the Cronbach alpha value of 0.61 which is moderate internal consistency [21]. Other literature showed that the Cronbach alpha was (alpha's >0.70) [22]. It consists of 6 questions (time to first cigarette of the day, smoking more in the morning, and which cigarette would you hate to give up) and represented daytime smoking (cigarettes per day, difficulty refraining from smoking, and smoking when ill). Scores of each answer as outlined by scoring codes, for each item and the higher the score the more nicotine dependent. The second tool is PHQ9 for depression screening, total scores of 5, 10, 15, 20 represent cut points for mild, moderate, moderately severe, and severe depression, respectively [23]. A literature review showed that the specificity of the PHQ-9 ranges from 91% to 94% [24]. According to Luigi Costantini et al., the overall sensitivity of PHQ-9 ranged from 0.37 to 0.98, specificity from 0.42 to 0.99 [25]. Also, the reliability of the scale in the context of Saudi Arabia was found to have Cronbach's alpha of 0.81 [26].

2.3 Statistical analysis

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA), version 26. Descriptive statistics were employed by calculating percentages and frequencies for categorical variables, and by calculating means and standard deviations (SD) for continuous variables. The 9 items of the PHQ9, and the 6 items of the FND were summed up to obtain the total score for each scale. Normal distribution of both scales was assessed by using Kolmogorov–Smirnov test, and yielding satisfying normal distribution of the data. To assess the internal consistency of the PHQ9 and the FND, Cronbach's Alpha was calculated and yielded satisfactory values of 83.1 and 65.3, respectively. The enter technique was used to conduct a multiple linear regression analysis to predict FND score. Assumptions of linear regression analysis such as multicollinearity and linearity were checked for. $P<0.05$ was considered statistically significant.

2.4 Ethical considerations

An official letter of approval to conduct the study issued by Research Ethics Committee (Number 23-071, date: August 3,2023). A consent form was also obtained from all participants. Participation in the current study was voluntary, and there is no risk or harm from participating in this study.

3   Results:

3.1 Sociodemographic characteristics and depression score of the participants

Of the total sample of 386 respondents, 77.7% are current smokers. Males represent 97.2% of the respondents and 59.8% are married. For chronic disease, 78.2% of the did not suffer from a chronic disease, while 89.9% of the respondents have not been diagnosed with any psychological problem, and 86.5% don't have Family history of psychological problem The mean (SD) BMI of the participants was 27.1, ranging from 17.7 to 42.3. Table (1) presents the other characteristics of the sample.

Table 1.Descriptive statistics of the sample

Characteristics	Smokers		Non-Smokers		Overall	
	n	%	n	%	n	%
Gender						
Male	289	97.0	86	97.7	375	97.2
Female	9	3.0	2	2.3	11	2.8
Marital status						
Single	103	34.6	22	25.0	125	32.4
Married	168	56.4	63	71.6	231	59.8
Divorced	23	7.7	3	3.4	26	6.7
Widow	4	1.3	-	-	4	1.0
Nationality						
Saudi	272	91.3	82	93.2	354	91.7
Non-Saudi	26	8.7	6	6.8	32	8.3
Having psychological problem						
No	265	88.9	82	93.2	347	89.9
Yes	32	10.7	6	6.8	38	9.8
Family history of psychological problem						
No	256	85.9	78	88.6	334	86.5
Yes	41	13.8	10	11.4	51	13.2
Do you suffer from a chronic disease						
No	241	80.9	61	69.3	302	78.2
Yes	56	18.8	27	30.7	83	21.5

Characteristics	Smokers		Non-Smokers		Overall	
	n	%	n	%	n	%
Are you currently working?						
No	57	19.1	29	33.0	86	22.3
Yes	241	80.9	59	67.0	300	77.7
	Mean (SD)	Minimum, maximum	Mean (SD)	Minimum, maximum	Mean (SD)	Minimum, maximum
BMI	27.0 (6.3)	14.7-27.0	27.6 (5.6)	18.3-27.6	27.1 (9.8)	17.7, 42.3

Mild and moderate depression were found among 31.9% and 11.1% of the participants, respectively. Moderate to severe and severe depression were found among 3.9% and 1.0% of the participants, respectively Table (2).

Table 2.Prevalence of depression among the participants

	n	%
No depression	201	52.1
Mild depression	123	31.9
Moderate depression	43	11.1
Moderate to severe depression	15	3.9
Severe depression	4	1.0

3.2 Smoking pattern and FND score among the participants.

The mean (SD) FND was 4.3 (1.6), ranging from 0 to 0.9. The mean (SD) years of smoking was 13.3 (9.8), ranging from 1 to 60 years. The majority smoke cigarette (76.2%), with 44.3 smoked 10 to 20 cigarettes per day. smoking the first cigarette within 5 minutes and 6-30 minutes after waking up was reported by 17.1% and 26.2%, respectively. About half (49.2%) reported that the first cigarette in the morning was the most difficult for them to abstain from. Approximately 38.6% smoke more during the first hours after they wake up than during the rest of the day, and 36.5% find it difficult to refrain from smoking in prohibited places Table (3). Low dependence was found in 77.5%, whereas high dependence was found in 22.5% of the participants.

Table 3.Smoking pattern and dependence score among the participants

Characteristics	Frequency	Percent (%)
What type of smoking?		
Cigarettes	294	76.2
E-cigarettes	51	13.2
Shisha	41	10.6

How many cigarettes do you smoke per day		
9 or less	125	32.4
10-20	171	44.3
21-30	65	16.8
>30	25	6.5
When do you smoke the first cigarette immediately after waking up?		
Within 5 minutes	66	17.1
6-30 minutes	101	26.2
31-60 minutes	79	20.5
>60 minutes	140	36.3
Which cigarette is the most difficult for you to abstain from?		
The first cigarette in the morning	190	49.2
Others	196	50.8
Do you smoke more during the first hours after you wake up than during the rest of the day?		
Yes	149	38.6
No	237	61.4
Do you smoke cigarettes even if you are very sick and confined to bed?		
Yes	111	28.8
No	275	71.2
Do you find it difficult to refrain from smoking in prohibited places (such as mosques)		
Yes	141	36.5
No	245	63.5
	Mean (SD)	**Minimum, maximum**
Dependence score (FND)	4.3 (1.6)	0-9

3.3 **Predictors of depression in the multivariate analysis**

The in log-linear Poisson regression model was applied to people's mean perceived Nicotine dependence factor-based score. Table (4) shows the association between nicotine dependence and the depression score. Participants who have psychological problem had a depression score that was significantly higher by a factor of 1.2 relative to those that no psychological problem (RR= 1.20; 95% CI 1.05, 1.39). also, Participants who currently working had a depression score that was significantly higher by a factor of 1.18 relative to those that not working (RR= 1.18; 95% CI 1.04, 1.33). in addition. Participants smoke Shisha had a depression score that was significantly higher by a factor of 1.47 relative to those that smoke Cigarettes (RR= 1.47;95% CI 1.22, 1.78).

Other significant findings from this model included significantly more depression symptoms among females (RR=1.67;95% CI 1.30, 2.14), and Nationality was not significantly associated with depression in the multivariate model.

Table 4.predictors of depression in log-linear Poisson regression model

Predictors	Categories	Comparison group	P value	Relative Risk	Lower limit (95% C.I)	Upper limit (95% C.I)
Gender	Female	Male	<0.001*	1.67	1.30	2.14
Marital status	Married	Single	0.504	1.14	0.77	1.69
	Divorced	Single	0.142	0.75	0.51	1.10
	Widow	Single	0.966	0.99	0.66	1.49
Nationality	Saudi	Non-Saudi	0.964	1.00	0.84	1.20
Having psychological problem	Yes	No	0.009*	1.20	1.05	1.39
Family history of psychological problem	Yes	No	<0.001*	1.33	1.18	1.53
Chronic disease	Yes	No	0.014*	1.16	1.03	1.32
Are you currently working	Yes	No	0.007*	1.18	1.04	1.33
What type of smoking?	Cigarettes	Shisha	<0.001*	1.47	1.22	1.78
	E-cigarettes	Shisha	<0.001*	1.66	1.34	2.07
BMI	Per unit increase		<0.001*	1.02	1.01	1.03
How many years of smoking?	Per year increase		<0.001*	1.01	1.005	1.02
Nicotine Dependence Score (FND)	Per unit increase		0.040*	1.03	1.01	1.07

Note: Dependent Variable: Nicotine Dependence Factor based T-score.

Prevalence of depressive symptoms, pain, and analgesic use

Weekly pain (headache and/or stomach ache) was also more common among girls (54.9%) than boys (26.6%; $\chi^2 = 62.2$; df = 1, p < .0001). Use of analgesics to ease headache and/or stomachache was also more common among girls (57.1%) compared to boys (28.7%; $\chi^2 = 65.3$; df = 1, p < .0001). Use of analgesics to ease pain from both headache and/or stomachache during last several weeks was reported by 18.9% girls and 3.4% boys ($\chi^2 = 46.2$; df = 1, p < .0001).

Associations between depressive symptoms and use of analgesics

Depressive symptoms were found to be significantly associated with , pain (headache and/or stomachache) in addition to analgesic use for headache and stomachache during the last several weeks . Participants with depressive symptoms were more likely to experience headache and/or stomachache weekly than students without depressive symptoms and were also more likely to use analgesics for headache and stomachache during the last weeks, compared to participants without depressive symptoms.

4   DISCUSSION

The results of this study revealed the influence of the relationship between smoking and depression, as it showed the relationship between the level of nicotine dependence as measured by the Fagerström test. This is consistent with the relevant literature, where high level of addition by the Fagerström test was associated with severe depressive symptoms [27]. In this study, regarding the socio-demographic data, the male gender was the variable associated with high nicotine dependence, for the log-linear Poisson regression model used. Similar results were observed in the study by Afonso et al. [28] This finding is consistent with some research showing that being male was one of the variables considered to be a predictor of higher nicotine dependence. As many studies have indicated, the greater the daily consumption of cigarettes and tobacco, the higher the level of nicotine dependence [5,28].

In relation to the levels of depression and the association with higher levels of nicotine dependence, the results found high level of depression associated nicotine dependence, which confirms many of the literature reports [29].

According to the results of the present study, Cigarette smokers are more susceptible to depression than shisha and E-cigarette smokers, and there was an increase in the association between smoking and depression when there was a family history of a psychological problem, as well as people with chronic diseases. In addition, it was observed that increased depression was associated with duration of smoking and increased BMI. In the cohort study by Lin et al. [30] Conducted in low- and middle-income countries, there was also an increased risk of depression in smokers even after adjusting for multivariate models such as BMI, age, gender, lifestyle habits and socioeconomic profile.

The association between smoking and depression re related to the likelihood of a person starting to smoke, On the other hand, studies report that Individuals who present depressive symptoms are

more likely to fail to remain abstinent; in fact, smoking reduces the symptoms of depression and improves mood [31]. in other words, smoking can be used to alleviate the symptoms but may aggravate the problem over time [32]. Depressive symptoms are higher in smokers with a high level of addiction, as well as those with a history of high cumulative cigarette consumption [29]. In this study, depression was associated with the level of nicotine dependence, which is consistent with literature findings regarding the association of nicotine with depression. There is significant positive correlation between nicotine dependence and smoking index. According Albarrak et al., [33] indicated a positive and significant relationship between depression scores and nicotine dependence among E-cigarettes users. In addition, there was a strong relationship between gender and nicotine dependence, with men more likely than women.

According to Krebs et al, [34] smoking cessation is important for populations suffering from depression, as improvement in behavior and decrease in depression among individuals who have quit smoking contribute to encouraging smokers to quit smoking, but intervention must be directed towards this type of population because they face more difficulty. To continue to abstain from smoking. These results represent great importance for mental health professionals who provide treatment to patients during smoking cessation, which increases smoking cessation rates and reduces the level of depression.

Also we found that Depressive symptoms were found to be significantly associated with , pain (headache and/or stomachache) in addition to analgesic use for headache and stomachache during the last several weeks . Participants with depressive symptoms were more likely to experience headache and/or stomachache weekly than students without depressive symptoms and were also more likely to use analgesics for headache and stomachache during the last weeks, compared to participants without depressive symptoms.

Other studies have found a significant association between having pain (headache, abdominal pain, and/or back pain) and depressive symptoms among adolescents (35). Psychological distress and painkiller consumption in adolescents have been found to be frequent and related to each other (36), which was also the case in the present study. Potential analgesic overuse in adolescents can be related to comorbidity and have to be taken seriously (37).

The present study has some limitations. The study design is cross-sectional, which limits the ability to prove causality. In addition, the data collection method relied on self-reported electronic surveys, which increases the potential for bias, specifically non-response bias and social desirability bias, that may influence the results. However, this study has multiple strengths, including the validity of the measures used to assess mental health status, which positively impacts the generalizability of this study.

5 ACKNOWLEDGEMENTS

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