



## Is smokeless tobacco used to mitigate the daytime sleepiness and depression? A case-control study in Tabuk City, Saudi Arabia

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### General Note



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## ABSTRACT

**Background:** smokeless tobacco use is prevalent worldwide, however, its association with depression and daytime sleepiness is not well-studied. This study aimed to assess the association between depression, daytime sleepiness, and smokeless tobacco use. **Methodology:** This case-control study was conducted among 212 male subjects (84 smokers vs. 128 controls) in Tabuk City, Kingdom of Saudi Arabia during the period from January to April 2020. Cases were matched with controls for age. A structured questionnaire based on demographic data and the Arabic versions of the Epworth Sleepiness Scale and HADS questionnaires were used to assess the daytime sleepiness and depression respectively. The statistical Package for Social Sciences (SPSS) was used for data analysis and the ethical committee of the University of Tabuk approved the research. **Results:** There were 84 males smokers and 128 non-users control subjects, their ages were  $37.65 \pm 10.74$ , vs.  $34.21 \pm 12.91$  years with no significant statistical difference,  $P$ -value  $> 0.05$ , depression was found in 38.1% of smokers and 4.7% of non-smokers and the daytime sleepiness was reported in (35.7% subjects vs. 17.2% of controls), with a significant statistical difference,  $P$ -values  $< 0.05$ . It is interesting to note that 57.1% of smokers tried to quit due to illness and social factors, the main barriers were dependence and stress. **Conclusion:** depression and daytime sleepiness were common among smokeless tobacco users compared to their non-user counterparts. More than half of smokers attempted quitting due to illness and their feeling that smokeless tobacco is not social. Barriers to quitting were dependence and stress felt after stopping. Studies addressing barriers to quitting are recommended.

**Keywords:** smokeless tobacco, depression, daytime sleepiness, Saudi Arabia

## 1. INTRODUCTION

Smokeless tobacco has been linked to various physical and mental disorders including cancer, adverse pregnancy outcomes, gingivitis, and periodontitis, the association with major depressive disorder is controversial (Sawchuk et al., 2012)

Mental disorders account for half of the disease burden in young adults. It is observed that people with mental health consume more than half of cigarettes. Few types of research have assessed depression among smokeless tobacco users despite the lethal health effects. Previous studies found a significant association between e-cigarettes and mental health disorders including depression, anxiety, and stress (King et al., 2018).

Half of the tobacco users attempted to quit, barriers were family members (husbands' smokers), depression, withdrawal symptoms (Schensul et al., 2018), patients with depression and anxiety were more prone to smoking including smokeless tobacco (Keith et al., 2017). Other studies found no association between depression and smokeless tobacco (Redner et al., 2014). Smokeless tobacco use was shown to be associated with insufficient sleep (Sabanayagam et al., 2011), short sleep duration and sleepiness (Boakye et al., 2018). The association between smokeless tobacco and cancer is well-established (Muthukrishnan et al., 2018) however; its association with sleep disorders and psychiatric disorders is not well-studied. The current survey was conducted to answer is smokeless tobacco is associated with depression and if smokers used the habit of smoking to mitigate the daytime sleepiness.

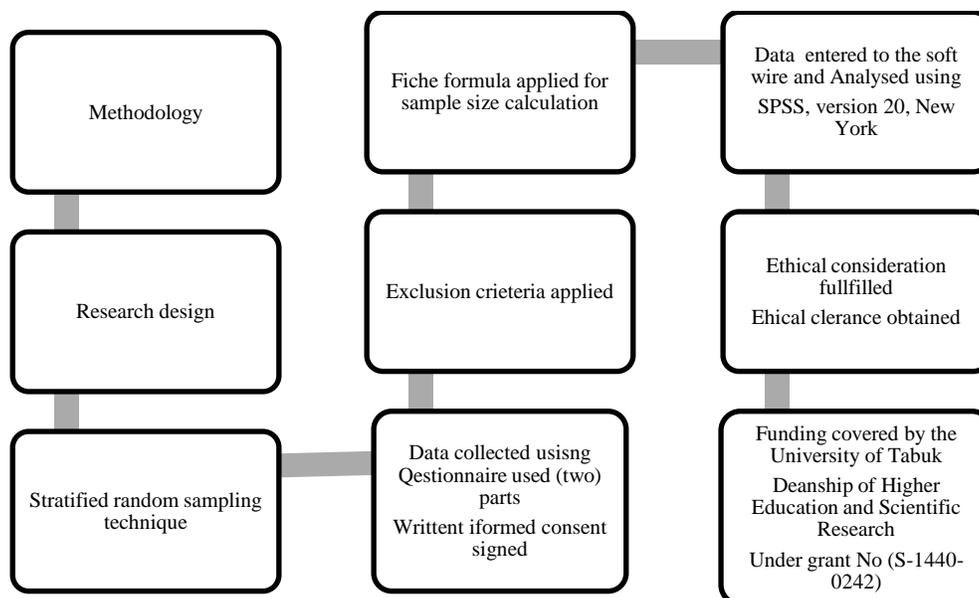
## 2. METHODOLOGY

This is a case-control study conducted among 212 males (84 smokeless tobacco users and 128 control subjects) in Tabuk City, Saudi Arabia during the period from January to April 2020. Cases were matched with controls using age. A stratified random sampling technique was used to enroll the participants from three different sites in Tabuk city. The Fische formula for case-control studies was used to calculate the sample size for this study (Charan et al., 2013).

Patients with other sleep disorders, on sleep medications, or chronic diseases including rheumatic disorders were excluded. A structured questionnaire was used to collect information from participants. The questionnaire consisted of two parts, the first part was based on the demographic data, the model and amount of smokeless tobacco, the reason behind the habit of smoking (whether relatives, school, or friends), the symptoms after the use, whether attempted to quit, and the reason for failure to quit. The second part was based on the Epworth sleepiness scale (ESS) and the HADS scales questionnaire for depression. The ESS scale is an eight components questionnaire with four (4) choices (no=0, mild=1, moderate=3, and high =4). The questionnaire inquires about feeling sleepy. If feeling sleepy is reported by the participant; further inquiries about the details of sleeping will be obtained such as the time of feeling sleepy, whether it is while reading, watching the television, sitting in a commonplace, traveling for one hour or more without a break, talking to one person, lying flat in the afternoon when time permits, sitting after lunch, or in a car when

stopping for minutes. The maximum score for ESS is 24, with a score  $\geq 10$  to be considered as daytime sleepiness. The HADS inventory for depression is a seven components scale each with four responses with 0=no and 3 is the maximal response. The components are if you still enjoy things that you used to enjoy, can laugh, cheerfulness, if slowed down, lost interest in appearance, look forward to enjoyment, and can enjoy a good book, radio, or television. The Arabic versions of the questionnaires have been previously validated to assess daytime sleepiness and depression (Al Aseri et al., 2020, John et al., 1999, Ahmed et al., 2014). Ethical clearance was obtained from the ethical committee of the, deanship of postgraduate studies and research, Faculty of Medicine, University of Tabuk (Ethical No. READ 0091). All the participants signed written informed consents.

The statistical package for social sciences (SPSS, version 20, New York) was used for data analysis. Data was described first, then chi-square test was used for categorical data analysis and T-test was used for numerical data analysis. P-value of  $<0.05$  was considered as significant (figure 1).



**Figure 1** Methodology flow chart

### 3. RESULTS

There were 212 male participants (84 smokers and 128 control subjects) matched for age ( $37.65 \pm 10.74$ , vs.  $34.21 \pm 12.91$  years, P-value=0.171, 95%CI=-1.46-8.15), (Table 1).

No significant statistical difference was found between the amount of smokeless tobacco consumed at the beginning of smoking and the present time ( $1.46 \pm 0.80$  vs.  $1.39 \pm 1.02$  measures, P-value=0.721, 95%CI=-0.33-0.47), (Table 2).

The most common site for smokeless tobacco was under the cheeks in 40.5% followed by under the lips in 40.5%. The friends were the most influential regarding the smoking habit followed by school and relatives, 36.6%, 34.1%, and 26.8% respectively. The amount of tobacco consumption was 1-2 measures in 82.7%. Regarding the symptoms, the pleasure was reported in 21.4%, vomiting in 19%, and dizziness in 26.2%, while tingling sensation was felt by 14.2% of the participants. It is interesting to note that 57.1% attempted to quit due to illness in 33.3% and they thought that smoking is not social in 11.9%. However, the majority (95.8%) relapsed due to dependence in 40.4%, and stress in 14.3% (Table 3).

In the current study, depression was found in 38.1% of smokers and 4.7% of non-smokers with a significant statistical difference, P-value=0.030, 95%CI =3.35-46.6, a high statistical difference was evident between smokers and non-smokers regarding the daytime sleepiness ( $35.7\%$  vs.  $17.2\%$ ), P-value=0.000, 95%CI =1.08-6.62 (Table 4, figure 2 & 3).

**Table 1.** Age of the study group\*

Character	Smokers	Controls	P-value	95%CI
Age	$37.65 \pm 10.74$	$34.21 \pm 12.91$	0.171	-1.46-8.15

\*Independent-Sample T-Test

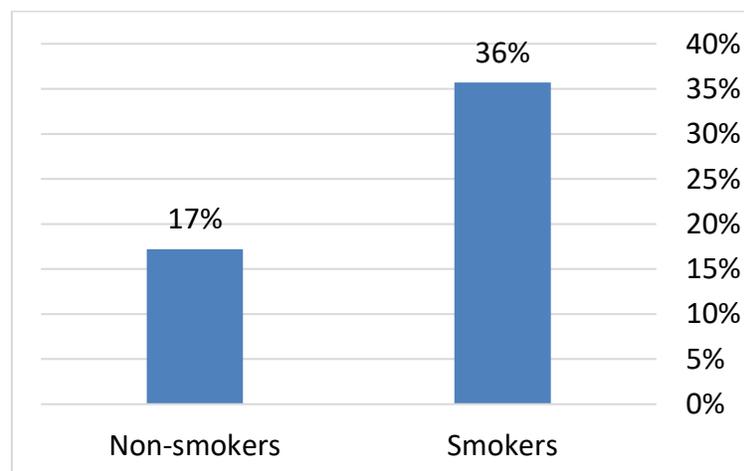
**Table 2.** The amount of smokeless tobacco among the study group\*

Character	At the beginning	Now	P-value	95%CI
Amount/measure	1.46±0.80	1.39±1.02	0.721	-0.33-0.47

\*Independent-Sample T-Test

**Table 3.** Characters of the study group

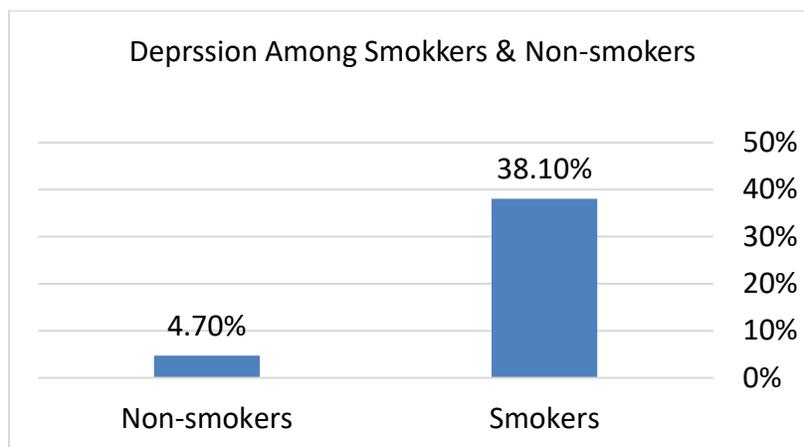
Character	No %
Route of administration	
Under the lips	34 (40.5%)
Under the cheek	50 (59.5%)
Source	
Friends	30 (36.6%)
School	28 (34.1%)
Relatives	22 (26.8%)
Other source	2 (2.4%)
Amount	
1	54 (65.9%)
2	22 (26.8%)
3	4 (4.9%)
5	2 (2.4%)
Symptoms	
Dizziness	22 (26.2%)
Pleasure	18 (21.4%)
Vomiting	16 (19%)
Tingling	12 (14.2%)
Attempted to quit	48 (57.1%)
Reason behind quitting	
Illness	28 (33.3%)
Not social	10 (11.9%)
Relapse	46 (54.8%)
Reasons behind relapse	
Dependence	34 (40.4%)
Stress	12(14.3%)

**Figure 2** Daytime Sleepiness among Smokers & Non-smokers

**Table 4.** Depression and daytime sleepiness among smokers and non-smokers\*

Character	Smokers	Non-smokers	P-value	95% CI
Daytime sleepiness	15 (35.7%)	11 (17.2%)	0.030	1.08-6.62
Depression	16 (38.1%)	3 (4.7%)	<0.001	3.35-46.6

\*Chi-square test

**Figure 3** Depression among Smokers & Non-smokers

#### 4. DISCUSSION

In the present study, smokeless tobacco users were more likely to be depressed and had more daytime sleepiness. The commonest mode for using smokeless tobacco was placing it under the lip or inside the cheeks in-line with Shaik et al., 2019. Our findings are in-line with previous studies which found that tobacco users expressed desire to quit due to health concerns and social issues (Gierisch et al., 2012). In the present study, the daytime sleepiness was higher among smokeless tobacco compared to their counterparts. This may imply that participants use smokeless tobacco to mitigate sleepiness and stay alert supporting the previous findings that smokers use this habit to stay alert and in the combat zone for stress (Widome et al., 2011). A strong relationship was observed between the use of smokeless tobacco and having a friend who uses smokeless tobacco highlighting the role of social acceptability in a peer relationship. In the current survey, friends, and school were the most influential risk factors in acquiring the habit of smokeless tobacco habit (Berg et al. 2018, Gupta et al., 2017, Patten et al., 2019). In the current study, nearly half of those who failed to quit smoking attributed that to dependence and smokeless tobacco is known for its dependence effect due to the nicotine content (Sung et al., 2012). The association of smokeless tobacco use with psychosocial stress was reported among females' users (Islam et al., 2019, Hrywna et al., 2014). Other studies reported high prevalence of psychological distress among smokeless tobacco users with differences across gender (Peiper et al., 2013). The current findings highlight the importance of addressing dependence and psychological distress as preventive strategies in smoking cessation clinics. Previous studies showed contradicting results regarding the association of smokeless tobacco use and depression. A longitudinal study conducted in the USA among 2397 College students (Bierhoff et al., 2019) found that smokeless tobacco was associated with internalizing symptoms. Other studies found that women who use smokeless tobacco are at risk of depression (Han et al., 2018) and these results were supported by Schensul et al. (2018). The present findings are in line with a study published in the United States of America and found that smokeless tobacco is associated with major depressive disorder (Wang et al., 2018). The association of smokeless tobacco use with short sleep duration and sleepiness was in line with the current findings in which smokeless tobacco users had a higher rate of daytime sleepiness supporting our hypothesis that smokeless tobacco habit maybe used to mitigate sleepiness. The present findings of higher rates of depression and daytime sleepiness among tobacco users heightened the importance of addressing these disorders to reinforce smoking quitting programs.

The small size of the study sample could be considered a limitation in this study however the fact that the study was conducted at a single City, could explain this limitation along with the reliance on a self-administered questionnaire, which is more prone to subjectivity.

## 5. CONCLUSION

Depression and daytime sleepiness are common among smokeless tobacco users. Dependence and stress are major barriers to quitting, while illness and social factors are major causes behind quitting. Further larger multi-center studies addressing barriers and facilitators of smokeless tobacco use.

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### Author contributions

Izzaddinn Elawad Ahmed: Manuscript design and drafting

Mohammed Ahmed Mesaik: Manuscript design and drafting

Yassin Ibrahim Mohammed: Manuscript design and drafting

Khalid Saad Alqarni: Data collection and drafting

Hyder Osman Mirghani: Concept, design, and manuscript design

Asaad Khalid: Manuscript design and drafting

All the authors revised the manuscript critically and approved it before submission

### Conflicts of interest

The authors declare that there are no conflicts of interests.

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### Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information are included.

### Ethical approval

Ethical clearance was obtained from the ethical committee of the, deanship of postgraduate studies and research, Faculty of Medicine, University of Tabuk (Ethical No. READ 0091). All the participants signed written informed consents.

### Data and materials availability

All data associated with this study are present in the paper.

### List of abbreviation

SPSS: The Statistical Package for Social Sciences

HADS: Hospital Anxiety and Depression Scale

ESS: Epworth sleepiness scale

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