Gender differences and risk factors for smoking among patients with various psychiatric disorders in Saudi Arabia: a cross-sectional study

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Abstract

Background: The higher prevalence of smoking among psychiatric patients is well established. However, gender-specific associations have rarely been the focus of studies among patients with various psychiatric disorders. The aim of this study was to estimate the gender-specific prevalence of current smoking by psychiatric patients and its association with various psychiatric disorders and the use of psychotropic medications.

Methods: A cross-sectional observational study was performed between July 2012 and June 2014. Patients were recruited from six hospitals located in the five regions of Saudi Arabia.

Results: Of the 1193 patients, 402 (33.7%) were current smokers. The incidence of current smoking was much higher among males than females (58.3% versus 6.7%, \( p < 0.001 \)). In one or both genders, current smoking was associated with marital status, education, family income, residence, obesity, physical activity, substance abuse, inpatient status, previous psychiatric hospitalization, and age at onset of psychiatric illness. In both gender, smoking was higher in patients who had a secondary psychiatric disorder (66.7% versus 37.5%, respectively), those who had a primary psychotic disorder (63.7% versus 12.3%), and those taking antipsychotic medication (64.1% versus 8.3%) but lower in patients who had a primary depressive disorder (40.3% versus 4.3%), those who had a primary anxiety disorder (45.8% versus 0.0%), and those taking antidepressant medications (53.7% versus 3.6%). In a multivariate analysis adjusted for demographic/clinical characteristics and psychiatric disorders, current smoking was independently associated with primary psychotic disorders in females (OR = 3.47, 1.45–8.27, \( p = 0.005 \)) but not in males. In a multivariate analysis adjusted for demographic/clinical characteristics and psychotropic medications, current smoking was independently associated with antipsychotic medication use in males (OR = 1.79, 1.10–2.93, \( p = 0.020 \)). Current smoking was strongly associated with substance abuse in both univariate and multivariate analyses.

Conclusion: The prevalence of current smoking is high with marked gender difference in a large sample of mixed psychiatric patients in Saudi Arabia. Smoking-cessation programs may be urgently needed for these vulnerable patients.

Keywords: Current smoking, Gender, Psychiatric disorders, Antipsychotics, Saudi Arabia
Background
Smoking is a global health risk with a well-established serious morbidity and mortality profile. In 2015, the World Health Organization (WHO) estimated that more than 1 billion people smoke tobacco worldwide, resulting in approximately 6 million deaths per year [1]. In Saudi Arabia, the average prevalence of current tobacco smoking among adults was estimated at 22.6%, with a wide range (11.6–52.3%) reported by studies targeting diverse populations [2]. Interestingly, there is a striking difference in the smoking rates between males (26%) and females (3–9%) in Saudi Arabia [2, 3]. This may partially explain the higher smoking rates found in several studies that included only males, for example, 35% in a military population [4] and 34–52% among male patients at primary care centers [5, 6].

Systematic reviews and other types of reviews have found a positive association between smoking and psychiatric disorders [7, 8], especially among females and in younger population [9]. For example, the prevalence of smoking has been reported to be two- to threefold higher among psychiatric patients than in the general population [10–13]. In addition, smokers have been found to have two- to threefold higher risk of developing psychiatric illness and substance use disorders later in life [14]. Moreover, smoking by psychiatric patients is associated with greater disability and poorer quality of life [15]. The impact of smoking on mortality among psychiatric patients is believed to be even greater than that in the general population, probably because of the excess mortality from cardiovascular diseases, stroke, and respiratory cancers among these patients [16]. The impact on mortality is complicated by the effects of smoking on some psychiatric symptoms, which makes cessation more challenging in these patients [17].

Although a higher smoking prevalence among psychiatric patients is well established, the overall impact is probably affected by several patient factors, including sociodemographic profile, type, and number of psychiatric disorders, pharmacological therapies, and concomitant substance abuse [8, 18–21]. The complex interplay of these factors in different populations complicates comparisons between studies. The objective of the current study was to estimate the prevalence of current smoking in a mixed psychiatric population in Saudi Arabia and examine the effect of the above factors on smoking rates. Suitable data from Saudi Arabia are very limited and outdated, and they lack adjustment for several confounders [22]. In addition, the impact of gender, which has received little attention in Western research, cannot be ignored in our population because of the substantial gender-specific difference in smoking prevalence. Therefore, we examined gender-specific associations between smoking and psychiatric disorders.

Methods
Setting
The current study was conducted among patients seeking psychiatric treatment in both inpatient and outpatient psychiatric healthcare services at several hospitals located in the Central, Eastern, Western, Northern, and Southern regions of Saudi Arabia. We aimed to select the largest mental hospital in each of these five major regions. However, because of logistical difficulties, not all the included hospitals were the largest in their region. To compensate, two hospitals were selected from the central region. The final hospitals were King Saud University Medical City in Riyadh and Zulfi General Hospital (Central region), Jeddah Mental Health Hospital (Western region), Al Amal Complex for Mental Health—Dammam (Eastern region), Al Jouf Mental Health Hospital (Northern region), and Abha Mental Health Hospital (Southern region). King Saud University Medical City is a university-affiliated governmental hospital, whereas the other hospitals are service based and operate under the authority of the Ministry of Health. All included hospitals provide free psychiatric inpatient and outpatient healthcare services.

Study design
A cross-sectional observational study was performed between July 2012 and June 2014.

Population
Consecutive male and female patients seeking psychiatric treatment from the included hospitals over the study period were asked to join the study. Those who provided informed consent were included, irrespective of the type or duration of their psychiatric disorder or recent use of psychotropic medications. Patients whose records and interviews indicated an absence of psychiatric illness (n = 59) or lack of smoking status (N = 15) were excluded. Therefore, 1193 of the 1264 initial patients were included in the analysis.

Data collection
A mini-interview form was developed that included sociodemographic characteristics, medical history, current psychiatric disorders, and recent use of psychotropic medications. Data were obtained primarily by reviewing the patients’ charts. The diagnosis of psychiatric disorders in this study was based on routine clinical interviews. The psychiatric consultants in-charge in each study site made psychiatric diagnoses of their patients using the Diagnostic and Statistical Manual of Mental Disorders, fourth
edition, text revision (DSM-IV-TR) criteria. The psychiatric diagnoses were confirmed by the treating teams, primarily following longitudinal evaluation and follow-up in the psychiatric setting. Unclear or missing information was clarified or obtained by interviewing the patient and/or his or her family. Trained psychiatric residents/staff were in charge for reviewing the chart and conducting the mini-interviews with the patients and/or their families. The purpose of these mini-interviews was to gather any unclear or missing information except for the major clinical data like psychiatric diagnoses and treatments which are certainly documented in the patients’ charts.

The smoking status was determined during the mini-interview using face-to-face questions in Arabic language. Patients were asked to define their cigarette smoking status as a current smoker, a previous smoker (i.e., someone who has smoked greater than 100 cigarettes in their lifetime but has not smoked at least in the last month), or a never-smoker [23].

Classification of psychiatric disorders
To analyze the data, the psychiatric diagnoses made by the primary psychiatrist for each patient using DSM-IV-TR criteria were classified into 8 categories [24, 25]: Primary psychotic disorders included schizophrenia, schizoaffective disorder, delusional disorder, and brief psychotic disorder. Primary bipolar disorders included bipolar disorder types I and II. Primary depressive disorders included major depressive disorder and dysthymic disorder. Primary anxiety disorders included generalized anxiety disorder, obsessive–compulsive disorder, social anxiety disorder, specific phobia, panic disorder, post-traumatic stress disorder, and acute stress disorder. Personality disorders included personality disorder not otherwise specified (mixed personality disorder), paranoid personality disorder, antisocial personality disorder, and borderline personality disorder. Secondary psychiatric disorders included psychotic disorder due to another medical condition, depression due to another medical condition, dementia, substance abuse, and substance-induced depressive disorder. Other disorders included undifferentiated somatoform disorder, conversion disorder, mental retardation, attention deficit hyperactivity disorder, dissociative disorder, primary insomnia, adjustment disorder, enuresis disorder, trichotillomania, and anorexia nervosa. Multiple disorders included two or more of the psychiatric illnesses listed above.

Classification of psychotropic medications
Both individual psychotropic medications and pharmacologic groups were used in the analysis. These included antipsychotics (low potency first generation, high potency first generation, and second generation), antidepressants (e.g., selective serotonin reuptake inhibitors (SSRIs) and tricyclics), mood stabilizers, and antianxiety medications.

Statistical analysis
Categorical data are presented using frequencies and percentages, and continuous data are presented using means and standard deviations (SD). Because of the marked difference in smoking prevalence by gender, analysis was completed separately for males and females. As there were very few differences between previous and never-smokers as regards psychiatric disorders and use of psychotropic medications, patients were categorized as either current smokers or non-current smokers (including previous and never-smokers) to simplify data interpretation. Significant differences between current and non-current smokers with regard to demographics, clinical characteristics, disorders, and medications were tested. Categorical data were tested using the χ² test or Fisher’s exact test (as appropriate), and continuous data were tested using Student’s t test or the Mann–Whitney U test (as appropriate). Independent associations of current smoking status with different psychiatric disorders and psychotropic medications, after adjusting for relevant demographic and clinical characteristics, were evaluated using multivariate logistic regression models with stepwise backward elimination. Smoking in small-sized groups with sample size < 20 or with zero smoking prevalence (as those with hypothyroidism) were excluded from the model to avoid instability (very huge or zero odds ratio). All p values were two-tailed. p < 0.05 was considered significant. SPSS software (release 20.3, Armonk, NY: IBM Corp) was used for all statistical analyses.

Results
Prevalence of current smoking
A total of 1193 patients (624 males and 569 females) were included in the analysis; 799 (67.0%) outpatients and 394 (33.0%) inpatients. Of the total group, 402 (33.7%) patients were current smokers, 137 (11.5%) were previous smokers, and 654 (54.8%) were never-smokers. The prevalence of smoking, either currently or previously, was much higher among males (58.3 and 17.6%, respectively) than females (6.7 and 4.7%, respectively), and the difference was statistically significant (p < 0.001). In addition, the prevalence of current smokers was significantly higher among inpatients than among outpatients (44.2% versus 28.5%, p < 0.001, Fig. 1).

Demographic characteristics and smoking
The average age was 38.0 ± 13.0 years, and more than half (54.3%) of the patients were unmarried (Table 1). The majority were either illiterate or had less than a
half (46.0%) had had an average of 3.8±4.4 previous psychiatric hospitalizations. Common comorbidities included diabetes and hypertension. In both males and females, higher rates of current smoking were significantly associated with substance abuse ($p<0.001$ each), inpatient status ($p=0.001$ and $p=0.041$, respectively), and previous psychiatric hospitalization ($p<0.001$ and $p=0.004$, respectively), as well as—in females only—a younger age at onset of psychiatric illness ($p=0.039$, Table 2).

**Psychiatric disorders/medications and smoking**

The majority of patients had a single psychiatric disorder (90.4%): mainly primary psychotic disorders (41.2%), primary depressive disorders (16.8%), and primary bipolar disorders (15.3%, Table 3). The majority of patients were using two or more psychotropic medications (66.5%): primarily antipsychotics (76.7%), antidepressants (41.6%), and mood stabilizers (27.8%). For both males and females, higher rates of current smoking were positively associated with primary psychotic disorders ($p=0.004$ and $p=0.001$, respectively) and antipsychotic medications ($p<0.001$ and $p=0.004$, respectively) but negatively associated with primary anxiety disorders ($p=0.040$ and $p=0.009$, respectively) and antidepressant medications ($p=0.021$ and $p=0.012$, respectively). In addition, higher rates of current smoking were positively associated with the use of multiple psychotropic medications in males ($p=0.004$) and secondary psychiatric disorders in females ($p=0.012$) but negatively associated with primary depressive disorders in males ($p=0.002$, Table 3).

In both males and females, the prevalence of current smoking was higher among patients using antipsychotic medications alone or combined with antidepressant medications and was the lowest among those not using any psychotropic medication or using antidepressant medications alone ($p=0.001$ and $p=0.015$, respectively, Fig. 2). At least two-thirds of male patients using mirtazapine, carbamazepine, risperidone, paliperidone, or venlafaxine were current smokers. Moreover, risperidone and olanzapine were associated with a higher prevalence of current smoking in females.

**Independent associations of smoking**

Multivariate logistic regression analysis models tested the association of current smoking with different psychiatric disorders and the use of different psychotropic medications after adjusting for significant gender-specific demographic, clinical, and behavioral characteristics (Tables 1 and 2). They included marital status, educational level, family income, type of residential area, obesity, physical activity, hospitalization status, previous psychiatric hospitalization, and substance abuse (Table 4). In models additionally adjusted for secondary education (87.1%), were non-working (71.2%), had a monthly family income of 6000 SR or less (62.0%), and were living in urban communities (80.4%). Approximately 37.9% of the patients were obese, and the majority (87.3%) were physically inactive. The sociodemographic characteristics associated with current smoking varied by gender. In males, higher rates of current smoking (average 58.3%) were significantly associated with being unmarried ($p<0.001$), having a secondary education or less ($p<0.001$), having lower family income ($p=0.009$), living in a village ($p=0.004$), and being non-obese ($p=0.010$). In females, higher rates of current smoking (average 6.7%) were significantly associated with having a secondary education or less ($p=0.010$) and being physically active ($p=0.017$, Table 1).

**Clinical characteristics and smoking**

The average age at onset of psychiatric illness was 28.3±12.0 years, with average illness duration of 9.7±9.3 years (Table 2). Approximately 24.4% of the patients have substance abuse disorder. Almost half (46.0%) had had an average of 3.8±4.4 previous smoking variables (Tables 1 and 2). They included marital status, educational level, family income, type of residential area, obesity, physical activity, hospitalization status, previous psychiatric hospitalization, and substance abuse (Table 4). In models additionally adjusted for

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psychiatric disorders, but not for psychotropic medications, current smoking was independently associated with primary psychotic disorders in females (OR = 3.47, 1.45–8.27, \( p = 0.005 \)), but not in males, and with substance abuse in both males (OR = 5.28, 3.52–7.93, \( p < 0.001 \)) and females (OR = 10.56, 3.78–29.53, \( p < 0.001 \)). In addition, education and lower family income were independently associated with current smoking in males. In models additionally adjusted for psychotropic medications but not psychiatric disorders, current smoking was independently associated with antipsychotic medications in males (OR = 1.79, 1.10–2.93, \( p = 0.020 \)) and marginally associated in females (OR = 4.68, 0.95–22.95, \( p = 0.057 \)) and with substance abuse in both males (OR = 5.18, 3.39–7.92, \( p < 0.001 \)) and females (OR = 14.15, 4.32–46.35, \( p < 0.001 \)). In addition, lower family income was independently associated with current smoking in females (Table 4).

### Table 1 Demographic characteristics by gender and current smoking status among psychiatric patients (N = 1193)

|                        | Overall (N=1193) | Current smoking in males (N=624) | Current smoking in females (N=569) |
|------------------------|------------------|----------------------------------|-----------------------------------|
|                        | No (N=260)       | Yes (N=364)                      | p value                           |
|                        | No (N=531)       | Yes (N=38)                       | p value                           |
| **Age (years)**        |                  |                                  |                                   |
| Mean ± SD              | 38.0±13.0        | 37.1±14.0                        | 38.7±13.8                         |
| < 40                   | 708 (59.6%)      | 163 (41.5%)                      | 293 (93.0%)                       |
| 40–60                  | 420 (35.4%)      | 76 (18.4%)                       | 207 (93.2%)                       |
| > 60                   | 60 (5.1%)        | 18 (60.0%)                       | 30 (100.0%)                       |
| **Marital status**     |                  |                                  |                                   |
| Married                | 524 (45.7%)      | 107 (49.8%)                      | 293 (94.8%)                       |
| Single                 | 504 (44.0%)      | 125 (37.5%)                      | 157 (91.8%)                       |
| Divorced               | 106 (9.2%)       | 8 (19.0%)                        | 58 (90.6%)                        |
| Widowed                | 12 (1.0%)        | 0 (0.0%)                         | 12 (100.0%)                       |
| **Number of children** | 3.5 ± 3.2        | 3.9 ± 3.6                        | 3.5 ± 3.2                         |
| **Educational level**  |                  |                                  |                                   |
| Illiterate             | 251 (21.5%)      | 45 (19.9%)                       | 165 (97.1%)                       |
| Secondary or less      | 766 (65.6%)      | 161 (35.8%)                      | 287 (90.9%)                       |
| University/other       | 151 (12.9%)      | 46 (61.3%)                       | 74 (97.4%)                        |
| **Working status**     |                  |                                  |                                   |
| Not working            | 832 (71.2%)      | 151 (42.5%)                      | 450 (94.3%)                       |
| Working                | 336 (28.8%)      | 103 (39.8%)                      | 70 (90.9%)                        |
| **Family income (SR)** |                  |                                  |                                   |
| ≤ 3000                 | 344 (29.8%)      | 73 (38.2%)                       | 143 (93.5%)                       |
| 3001–6000              | 372 (32.2%)      | 72 (35.5%)                       | 161 (95.3%)                       |
| 6001–9000              | 241 (20.8%)      | 53 (44.2%)                       | 112 (92.6%)                       |
| > 9000                 | 199 (17.2%)      | 48 (55.8%)                       | 104 (92.0%)                       |
| **Residential type**   |                  |                                  |                                   |
| City                   | 955 (80.4%)      | 225 (43.1%)                      | 403 (93.1%)                       |
| Village                | 206 (17.3%)      | 29 (30.9%)                       | 106 (94.6%)                       |
| Desert                 | 27 (2.3%)        | 6 (85.7%)                        | 20 (100.0%)                       |
| **Body mass index (BMI)** |              |                                  |                                   |
| Mean ± SD              | 28.7±7.7         | 28.4±6.5                         | 29.8±8.4                          |
| Non-obese              | 719 (62.1%)      | 161 (38.0%)                      | 273 (92.5%)                       |
| Obese                  | 438 (37.9%)      | 94 (49.0%)                       | 234 (95.1%)                       |
| **Physical activity**  |                  |                                  |                                   |
| Active                 | 149 (12.7%)      | 40 (42.1%)                       | 46 (85.2%)                        |
| Not active             | 1028 (87.3%)     | 214 (41.6%)                      | 301 (58.4%)                       |

ps
Discussion
We found a high prevalence of current smoking in a large sample of psychiatric outpatients and inpatients in Saudi Arabia. As in the general Saudi population—although at a higher rate—smoking prevalence was much higher among males than females (58% versus 7%). This was almost double the rate of current smoking recently reported by the WHO for the general Saudi population (26% in males and 3% in females) [3]. However, the prevalence we found was almost identical to the current smoking rates (58%) reported among 505 male outpatients recruited from five hospitals in Saudi Arabia in 1996 and 1997 [22]. Unfortunately, females were not included in the previous study, which reported the only published data regarding smoking by psychiatric patients in Saudi Arabia [22]. Several hypotheses have been suggested to explain the higher smoking rates among psychiatric patients [8, 26]. The most widely accepted hypothesis is self-medication; that is, patients smoke to reduce the impact of specific psychiatric disorders and medications [8, 17, 20, 26]. Other hypotheses include shared genetic factors that control the susceptibility for both smoking and psychiatric disorders and shared environmental factors, such as stress, that can increase the incidence of both smoking and psychiatric illness [8, 26].

Higher rates of current smoking among male psychiatric patients is consistent with the findings of nearly all Western and Eastern studies [20, 27–32]. For example, male versus female rates have been reported as 66% versus 56% in the US [32], 69% versus 48% in France...
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[20], 32% versus 21% in Japan [29], 59% versus 41% in Brazil [28], and 78.4% versus 36.2% in Iran [30]. However, a very large male–female difference, as found in the current study, has been reported in only a few Eastern countries, such as India (53% versus 9%) [31] and Bahrain (47% versus 4%) [27]. This reflects the variability in gender-specific rates of current smoking in the general population of Western and Eastern countries [33]. Smoking among females in a conservative society such as Saudi Arabia could be perceived as impairing the feminine Islamic image of women [2, 34]. Another explanation is that it is more inconvenient for females to obtain cigarettes and find a place to smoke [34]. However, we cannot exclude the possibility that current smoking by female patients is under-reported as a consequence of its social stigma [2]. Interestingly, the persistence of a marked gender difference in smoking rates among our patients, after stratifying by psychiatric disorder and psychotropic medication, might indicate that the gender effect is independent of the psychiatric impact. In addition, the persistence of sociodemographic risk factors for smoking (such as low education, low income, and being unmarried) in a multivariate analysis, especially in men, is more evidence that the motivations for smoking in the general population [4, 35] are the same as those in psychiatric patients [5, 36, 37]. The disappearance/attenuation of sociodemographic risk factors for smoking in multivariate analysis among females could be related to the low prevalence of smoking among this group rather than real lack of associations.

As found in previous studies, smoking rates in the current study were highest among patients with substance abuse disorder [26, 29]. In addition, current smoking and substance abuse were strongly and independently associated, even after adjusting for psychiatric disorder or psychotropic medication [36, 37]. This may further explain the high smoking prevalence among those with secondary psychiatric disorders in the current and previous studies [20, 22, 28]. A large twin study showed that

| Table 3 Psychiatric disorders and use of psychotropic medications by current smoking status |
|---------------------------------------------------------------|
| Overall (N = 1193) Current smoking in males (N = 624) Current smoking in females (N = 569) |
| Number of psychiatric disorders | No (N = 260) | Yes (N = 364) | p value | No (N = 260) | Yes (N = 364) | p value |
| One | 1079 (90.4%) | 233 (41.5%) | 329 (58.5%) | 0.751 | 481 (93.0%) | 36 (7.0%) | 0.391 |
| Two or more | 114 (9.6%) | 27 (43.5%) | 35 (56.5%) | 50 (96.2%) | 2 (3.8%) |
| Psychiatric disorders | | | | | | | |
| Primary psychotic disorders | 491 (41.2%) | 119 (36.3%) | 209 (63.7%) | 0.004 | 143 (87.7%) | 20 (12.3%) | 0.001 |
| Primary bipolar disorders | 183 (15.3%) | 29 (41.4%) | 41 (58.6%) | 0.966 | 106 (93.8%) | 7 (6.2%) | 0.818 |
| Primary depressive disorders | 200 (16.8%) | 37 (59.7%) | 25 (40.3%) | 0.002 | 132 (95.7%) | 6 (4.3%) | 0.208 |
| Primary anxiety disorders | 131 (11.0%) | 32 (54.2%) | 27 (45.8%) | 0.040 | 72 (100.0%) | 0 (0.0%) | 0.009 |
| Personality disorders | 18 (1.5%) | 1 (12.5%) | 7 (87.5%) | 0.148 | 10 (100.0%) | 0 (0.0%) > 0.95 |
| Secondary psychotic disorders | 44 (3.7%) | 12 (33.3%) | 24 (66.7%) | 0.296 | 5 (62.5%) | 3 (37.5%) | 0.012 |
| Multiple disorders | 80 (6.7%) | 15 (35.7%) | 27 (64.3%) | 0.418 | 36 (94.7%) | 2 (5.3%) > 0.95 |
| Other disorders | 46 (3.9%) | 15 (78.9%) | 4 (21.1%) | 0.004 | 27 (100.0%) | 0 (0.0%) 0.245 |
| Number of psychotropic medications | | | | | | | |
| One | 363 (33.5%) | 97 (47.8%) | 106 (52.2%) | 0.004 | 148 (92.5%) | 12 (7.5%) | 0.497 |
| Two or more | 719 (66.5%) | 129 (35.4%) | 235 (64.6%) | 334 (94.1%) | 21 (5.9%) |
| Psychotropic medications | | | | | | | |
| Any antipsychotic | 830 (76.7%) | 164 (35.9%) | 293 (64.1%) | < 0.001 | 342 (91.7%) | 31 (8.3%) | 0.004 |
| First generation, low potency | 59 (5.5%) | 11 (42.3%) | 15 (57.7%) | 0.794 | 32 (97.0%) | 1 (3.0%) | 0.713 |
| First generation, high potency | 177 (16.4%) | 44 (41.9%) | 61 (58.1%) | 0.635 | 66 (91.7%) | 6 (8.3%) | 0.440 |
| Second generation | 733 (67.7%) | 147 (35.7%) | 265 (64.3%) | 0.001 | 292 (91.0%) | 29 (9.0%) | 0.002 |
| Any antidepressant | 450 (41.6%) | 93 (46.3%) | 108 (53.7%) | 0.021 | 240 (96.4%) | 9 (3.6%) | 0.012 |
| SSRI antidepressants | 312 (28.8%) | 63 (50.4%) | 62 (49.6%) | 0.006 | 180 (96.3%) | 7 (3.7%) | 0.062 |
| Tricyclic antidepressants | 69 (6.4%) | 10 (47.6%) | 11 (52.4%) | 0.459 | 45 (93.8%) | 3 (6.3%) > 0.95 |
| Other antidepressants | 158 (14.6%) | 28 (32.6%) | 58 (67.4%) | 0.133 | 70 (97.2%) | 2 (2.8%) | 0.133 |
| Mood stabilizers | 301 (27.8%) | 59 (38.6%) | 94 (61.4%) | 0.701 | 140 (94.6%) | 8 (5.4%) | 0.555 |
| Antianxiety | 68 (6.3%) | 8 (29.6%) | 19 (70.4%) | 0.266 | 39 (95.1%) | 2 (4.9%) > 0.95 |
medications, especially extrapyramidal manifestations was reported to reduce the side effects of antipsychotic at onset of psychotic illness [41]. In addition, smoking with an increased risk of psychosis and an earlier age lism of antipsychotic medications, especially clozapine phrenia [8, 39, 40]. However, smoking is also associated oustudies [12, 18, 20, 22, 32, 36] compared to 64% in the siestantly reported in previous studies: 66–74% in previ - schizophrenia/schizoaffective disorders have been con-
ning in the current study was strongly associated with factors predispose individuals to lifetime comorbidity of common psychiatric and substance abuse disorders [38].

Although attenuated in multivariate analyses, smoking in the current study was strongly associated with primary psychotic disorders and/or use of antipsychotic medications. High smoking rates among patients with schizophrenia/schizoaffective disorders have been consistently reported in previous studies: 66–74% in previous studies [12, 18, 20, 22, 32, 36] compared to 64% in the current study. Higher smoking rates were also reported among patients using antipsychotic medications [20]. It has been suggested that smoking reduces the intensity of some psychiatric symptoms and improves cognitive and concentration functions in patients with schizophrenia [8, 39, 40]. However, smoking is also associated with an increased risk of psychosis and an earlier age at onset of psychotic illness [41]. In addition, smoking was reported to reduce the side effects of antipsychotic medications, especially extrapyramidal manifestations [40, 42]. Yet, smoking can have effects on the metabolism of antipsychotic medications, especially clozapine and olanzapine, such as decreasing their blood levels and increasing the clinically effective dose [43]. Therefore, it has been suggested that doses of clozapine and olanzapine be increased by 50 and 30%, respectively, for smokers to attain an equivalent clozapine or olanzap- ne blood concentration [44]. The complex association between smoking and schizophrenia, as well as antipsy-
chotic medications, can make smoking cessation chal-
Secturing smoking status, (2) the timing of the intervention, (3) counseling, (4) drug treatment using a first-line product (e.g., nicotine replacement therapy, varenicline, bupro-

Several clinical guidelines recommend giving higher priority to providing smoking-cessation advice in everyday clinical practice to patients with a mental health diagnosis [46–48]. A recent systematic review found that people with severe mental illness receive smoking-cessation advice about as often as people without mental illness do, whereas those with non-severe mental illness are slightly more likely to receive smoking-cessation advice compared with people without mental illness [48]. In addition to the benefits of smoking cessation in decreasing morbidity and mortality in people with psychiatric disorders [46], smoking cessation is also associated with reduced depression, anxiety, and stress, and improved positive mood and quality of life to the same extent for those with psychiatric disorders as for those without [49]. The big positive effect-size after smoking cessa-
tion in both those with or without psychiatric disorders may indicate the common personal and social motives of smoking in both groups [49]. However, traditional smoking-cessation programs may need to be tailored to fit the neuropsychological profile of psychiatric patients [50]. The European Psychiatric Association provides seven recommendations regarding the core components of the diagnostics and treatment of tobacco dependence in adults with mental illness [46]: (1) the process for record-
ing smoking status, (2) the timing of the intervention, (3) counseling, (4) drug treatment using a first-line product (e.g., nicotine replacement therapy, varenicline, bupro-

shared genetic and, to a lesser extent, environmental risk factors predispose individuals to lifetime comorbidity of common psychiatric and substance abuse disorders [38].
follow-up visits, and (7) relapse prevention and management [46].

The current study makes several important contributions. It is the first study in Saudi Arabia to estimate the gender-specific prevalence of current smoking and to determine its independent risk factors among male and female psychiatric patients. The mixed population and the relatively large sample size enabled us to examine the association of current smoking with a wide variety of psychiatric disorders and psychotropic medications. Previous studies focused primarily on antipsychotics and rarely on the variability of smoking rates among patients taking different groups of psychotropic medications. However, we acknowledge several limitations. First, the use of convenience sampling may limit the generalizability of our findings to psychiatric patients in Saudi Arabia. The cross-sectional design did not enable us to ascertain causality between psychiatric disorders or psychotropic medications and current smoking. Finally, although cigarette smoking is by far the most common type of smoking in Saudi Arabia, the findings of the current study do not reflect other types of tobacco smoking.

**Conclusion**

We found a high prevalence of current smoking among a large sample of psychiatric patients in Saudi Arabia. As in the general population, there is a striking gender difference in smoking rates. In addition to sociodemographic risk factors for smoking, substance abuse, psychotic disorders, and antipsychotic medications are strong independent associates. The current findings suggest an urgent need for smoking-cessation programs for these vulnerable patients as well as for further studies to test the effectiveness of such programs.

**Abbreviations**

OR: odds ratio; WHO: World Health Organization; DSM-IV-TR: Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision.

**Authors’ contributions**

FA designed the study; supervised the data collection, entry and statistical analysis; and co-wrote the final draft of the manuscript. All other authors participated effectively in most of the stages of this research. All authors read and approved the final manuscript.

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