



ORIGINAL ARTICLE

Association of oral parafunctional habits with anxiety and the Big-Five Personality Traits in the Saudi adult population



Adel F. Almutairi^{a,*}, Nouf Albeshar^a, Modi Aljohani^b, Messm Alsinanni^c,
Ohood Turkistani^d, Mahmoud Salam^{a,e}

^a King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

^b King Abdulaziz University, Jeddah, Saudi Arabia

^c Mustaqbal University, Saudi Arabia

^d Riyadh Elm University, Saudi Arabia

^e Hariri school of nursing, American University of Beirut, Lebanon

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Abstract *Background:* Oral parafunctional habits are related to any abnormal hyperactivity of the oromandibular system. They are prevalent in all societies in varying intensity and have potential physical and psychological implications. The aim of this study was twofold: (1) to determine the prevalence of various types of oral parafunctional habits in the Saudi adult population, and (2) to examine their association with and the level of anxiety and personality factors.

Methods: This cross-sectional study was conducted with an electronic data collection form distributed to the public through social media. The questionnaire comprised of the following: (a) demographic information, (b) the Hamilton Anxiety Rating Scale (HAM-A), (c) the Ten-Item of Big-Five Personality Traits, (d) a list of oral parafunctional habits. Data were analysed using a Pearson's Chi square and binary logistic regression.

Results: The participants reported several parafunctional habits including daily gum chewing (86%), lip/object biting (59%), clenching (45%), nail biting (36%) and grinding (32%). Males were 3 [2.3–3.7] times and younger age groups were 1.5 [1.1–2.0] times more likely to be associated with nail biting compared to their counter groups (adj.P < 0.001 and adj.P = 0.007). Lip/object biting was significantly 1.3 [1.1–1.7] times more prevalent in males (adj.P = 0.015). Participants who

* Corresponding author at: Science and technology Unit, King Abdullah International Medical Research Center, King Saud Bin Abdulaziz University of Health Sciences.

E-mail address: almutairiad1@ngha.med.sa (A.F. Almutairi).

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reported being extroverts were more likely to be associated with clenching (46.4%) ($P = 0.024$). An emotionally stable person was significantly less likely to be associated with nail biting (28.4%), grinding (24.9%), clenching (35.8%), and lip/object biting (48.4%) ($P < 0.001$ each). Participants who reported conscientiousness and emotional stability were significantly less associated with TMD ($P = 0.007$, $P < 0.001$).

Conclusion: Oral parafunctional habits are highly prevalent in the Saudi adult population in varying degrees. Possible risk factors include males, younger age groups, single people, and being financially constrained.

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1. Introduction

Before explaining the concept and significance of oral parafunctional habits, it is important to have a clear operational definition of a “habit” as a concept. A habit refers to an action that is regularly practiced consciously or unconsciously by individuals during their activities of daily living (Shah et al., 2014). In the current study, we apply the term to any abnormal hyperactivity of the oromandibular system (Alharby et al., 2018), for instance, bruxism, lip and nail biting, thumb sucking, self-injurious habits, mouth breathing, and tongue thrusting (Nowak and Warren, 2000). Such activities are contrary to the normal functioning of the masticatory structures, performing essential movements without harming vital oral structures. Given the potential physical and psychological implications of such negative habits, it is essential to understand the underlying causes to develop supportive interventions.

One of the most frequent parafunctional habits is bruxism, also known as tooth grinding. It often occurs during sleep but can also be a subconscious habit during waking hours. Awake bruxism (AB) involves jaw clenching and bracing with tooth contact. It is related to stress conditions, occlusal disorders, and/or allergies (Murali and Priyadarshni Rangarajan, 2015). AB occurs more frequently in females than males (Shetty et al., 2010), with a prevalence ranging from 22.1% to 31% in the general population (Manfredini et al., 2013). There are indications that bruxism decreases with age (Shetty et al., 2010). Sleep bruxism (SB) on the other hand, refers to an abnormal forceful movement disorder that involves tooth clenching and grinding during sleep. SB occurs in 14% of children and decreases to 8% and 3% in adults older and younger than 60 years, respectively (Selvaratnam et al., 2009). Studies have reported several complications of bruxism, such as dental attrition, headaches, temporomandibular joint dysfunction (TMD), and soreness of the masticatory muscles (De Souza Barbosa et al., 2008). Notably, TMD as a major complication of bruxism, is frequent in children and adolescents in Saudi Arabia (27.2%) (Al-Khotani et al., 2016).

Nail biting is perceived as frequent in many societies (Ghanizadeh, 2008). The estimated prevalence of nail biting ranges from 20% to 33% in children, however, for teenagers the prevalence is 45%, which tends to decrease after 18 years of age, but may persist into adulthood (Marouane et al., 2016). In Saudi Arabia, the prevalence of nail biting in the Riyadh region in preschool children and children in the 12 to 16 year age group, is 27% and 29%, respectively (Aloumi et al., 2018, Feteih, 2006). The prevalence is comparable with

Iran (22.3%) (Ghanizadeh and Shekoohi, 2011). Nail biting may be associated with multiple psychological factors, including emotional disturbance, anxiety disorders, obsessive-compulsive disorder (OCD) (Pacan et al., 2014). In terms of complications, it can cause damage to the tissues surrounding the nail, infection, and nail bed disappearance (Ghanizadeh, 2011). Nail biting also cause dental complications, as the nail biting force could be transferred to the root of the tooth, causing root resorption, alveolar bone destruction, malocclusion, and temporomandibular joint problems (Vyas, 2017). In addition, the consequences of nail biting could have a negative impact on the psychological health and social well-being of children and their parents as it can increase the person’s concerns about the evaluation of others and decrease self-evaluation (Ghanizadeh, 2011).

Another parafunctional habit is chronic oral mucosal biting, referring to an unintentional self-inflicted injury mostly on the lip, cheek, and lateral tongue borders. Oral mucosal biting is more prevalent in females, and estimated to occur in 750 of every million people (Bhatia et al., 2013). In a Mexican study with 23,785 patients, the prevalence of cheek-biting lesions was reported as 21.7 cases per 1000 patients (Castellanos and Díaz-Guzmán, 2008). Lip biting is also a frequent problem with a prevalence of 37% of students in the 10 to 19 year age group in India (Motghare et al., 2015). Similarly, a study conducted in Saudi Arabia highlighted that the prevalence of lip/cheek biting is 41% in children aged 12 to 16 years (Feteih, 2006). The problem of lip/cheek biting is exacerbated with repetitive biting, causing chronic trauma and leading to soft tissue hyperkeratosis, edema, purpura, erosions, scarring, and ulceration (Aloumi et al., 2018).

As indicated in the literature, the causes of parafunctional oral habits are multifactorial, such as parasomnia, traumatic brain injury and neurological disabilities, and may be related to emotional stress and anxiety (Gungormus and Erciyas, 2009, Murad et al., 2016). Personality factors could also influence the psychological status of an individual, including how that person responds to and recovers from a stressor (Childs et al., 2014) and psychological issues could lead to oral parafunctional activities. No study in literature examined the association between personality factors and parafunctional habits. Thus, the aim of this study was to determine the prevalence of various types of oral parafunctional habits among the Saudi adult population, as well as to examine the association between such habits and the level of anxiety and personality factors.

2. Materials and Methods

2.1. Population and sampling

This cross-sectional study was conducted in September 2018. Eligible participants were male and female Saudis, older than 18 years of age. Recruitment was done using an electronic data collection form distributed to the public through social media platforms, including Twitter and WhatsApp (Topolovec-Vranic and Natarajan, 2016). The sample size was calculated using the sample calculation formula. Based on previous studies conducted in Saudi Arabia and other countries, the prevalence of parafunctional habits is estimated to be 27%, and with a margin of error of 3% and a 95% confidence limit, the calculated sample size was 842. Due to the possible lack of response, we oversampled by 50%, making the final sample size 1263.

2.2. Data collection

The data were collected using an electronic questionnaire designed on Google forms. It comprised of four sections with 38 items. The first section had nine demographic statements including gender, age, occupation, nationality, social status, financial status, and medical conditions. The second section measured the severity of participants' anxiety symptoms using the Hamilton Anxiety Rating Scale (HAM-A). It is one of the first scales developed to measure anxiety symptoms and is widely used in clinical practice. Some of the items were altered slightly to adapt it to a self-scoring questionnaire (Thompson, 2015). The HAM-A has 14 items, each of which is defined by a set of symptoms that measure both psychic and somatic anxiety. Every item is scored on a five-point Likert scale where 0 is "not present" and 4 is "very severe." The total score ranges from 0 to 57, and ≤ 17 indicates mild anxiety, 18 to 24 mild to moderate anxiety, and 25 to 30 moderate to severe anxiety. The Arabic version was developed and validated by Lotfy Fateem in 1998 (Fahmy et al., 2015).

The third section was the Ten-Item Personality Inventory, used to measure the Big-Five Personality factors (extraversion, agreeableness, conscientiousness, emotional stability/neuroticism and openness) (Ghabr, 2015; Garcia-Argibay, 2019). An extrovert person is social, energized by social interaction, and making new friends easily. Agreeableness is an expression of politeness, cooperation, empathy, and caring. People with neuroticism complain of unpleasant emotions including stress, anxiety, and depression. Persons with conscientiousness describe goal-directed behaviors, organization, self-discipline, and devotion. Lastly, the openness factor refers to imagination, curiosity, and creativity (Garcia-Argibay, 2019). Each personality factor was assessed using two statements, one of which is reversed scored. Responses were scored on a five-point Likert scale, where 0 is "disagree strongly", 1 is "disagree", 2 is "neutral", 3 is "agree" and 4 is "agree strongly." For each of the five types of personality factors, the scores of the two questions were summated, and converted to percentage mean score. Participants who scored 6 and above (range 0–8), or $PMS \geq 75$ (range 0–100) for each pair of statements correspond to one of the five personality factors. The Arabic version was developed and validated by Luai Ghabr in 2015 (Ghabr, 2015). The fourth section assessed information

about oral parafunctional habits, including nail biting, grinding, clenching, biting lip/objects, and gum chewing. These habits were rated on a four-point frequency scale, ranging from 0 (never) to 4 (always).

2.3. Data analysis

The collected data were analyzed using the latest version of the Statistical Package for the Social Sciences (Version 24, SPSS Inc., Chicago, IL, USA). Raw data were cleaned and processed to recognize any errors or incompleteness prior to data analysis. Descriptive statistics were used with categorical and continuous data to summarize sample demographic characteristics. Categorical variables were presented in terms of frequency and percentage. Bivariate statistics (Pearson's Chi square) and binary logistic regression analyses were conducted to determine factors associated with the study outcomes.

4. Results

4.1. Participants and outcome characteristics

In total, there were 1403/1520 (92.3%) eligible cases, with the majority (65%) female and the age 34 ± 12 years. Just more than half (55%) were unemployed and 80% were affluent financially. Half of the sample was single. Mild anxiety was prevalent in 84% of the sample, mild-to-moderate anxiety in 10%, moderate-to-severe in 4%, with a small proportion (2%) in the very severe category. The most frequent parafunctional habit was daily gum chewing (86%), followed by lip/object biting (59%), clenching (45%), nail biting (36%) and grinding (32%) (non-mutually exclusive). Participants reported various personality factors, with the majority (79.4%) in the Conscientiousness category [$PMS \pm SD = 72.25 \pm 19.30$], agreeableness (76.6%) [$PMS \pm SD = 68.92 \pm 17.05$], openness to experience (63.3%) [$PMS \pm SD = 64.11 \pm 19.45$], emotional stability (59.7%) [$PMS \pm SD = 60.51 \pm 19.92$], and extraversion (25.8%) [$PMS \pm SD = 47.74 \pm 14.90$] (Note: the personality factors are not mutually exclusive). Notably, TMD symptoms were reported by 38.1% of the sample.

4.2. Oral parafunctional habits across personality factors and other characteristics

Initial bivariate analyses indicated that gender, age, occupation, financial status and marital status were associated with each of the individual parafunctional habits (Table 1). A significantly positive relationship was observed between the severity of anxiety levels and nail biting, grinding, clenching, and lip/object biting. To adjust for any possible confounder, a series of binary logistics regression analyses have been done (Table 2). Males were 3 [2.3–3.7] times and a younger age group was 1.5 [1.1–2.0] times more likely to be associated with nail biting compared to their counter groups ($adj.P < 0.001$ and $adj.P = 0.007$ respectively). The male gender was also 1.9 [1.5–2.4] times more likely to be associated with the grinding oral habit compared to females ($adj.P < 0.001$). A younger age group was 1.7 [1.3–2.2] times more likely and the

Table 1 Prevalence of Para functional oral habits across sample characteristics.

	Nail Biting n(%)	Grinding n(%)	Clenching n(%)	Lip/objects biting n(%)	Gum Chewing n(%)
Gender					
Male	265(50.2%)	202(38.3%)	240(45.5%)	323(61.2%)	421(79.7%)
Female	239(24.1%)	244(24.6%)	392(39.5%)	503(50.7%)	780(78.6%)
	$\chi^2 = 105.885,$ P < 0.001*	$\chi^2 = 31.017,$ P < 0.001*	$\chi^2 = 5.003,$ P = 0.025*	$\chi^2 = 15.22,$ P < 0.001*	$\chi^2 = 0.254,$ P = 0.614
Age (Years)					
< 30	292(41.6%)	217(30.9%)	343(48.9%)	464(66.1%)	571(81.3%)
≥30	212(25.9%)	229(28.0%)	289(35.3%)	362(44.3%)	630(77.0%)
	$\chi^2 = 41.901,$ P < 0.001*	$\chi^2 = 1.550,$ P = 0.213	$\chi^2 = 28.472,$ P < 0.001*	$\chi^2 = 72.644,$ P < 0.001*	$\chi^2 = 4.256,$ P = 0.039*
Occupation					
Unemployed	289(34.7%)	232(27.9%)	366(43.9%)	476(57.1%)	657(78.9%)
employed	215(31.3%)	214(31.3%)	266(38.7%)	350(50.9%)	544(79.2%)
	$\chi^2 = 1.962,$ P = 0.161	$\chi^2 = 1.976,$ P = 0.160	$\chi^2 = 4.221,$ P = 0.040*	$\chi^2 = 5.827,$ P = 0.016*	$\chi^2 = 0.022,$ P = 0.881
Financial Status					
Comfortable	375(31.0%)	337(27.9%)	469(38.8%)	630(52.2%)	946(78.3%)
Uncomfortable	129(41.3%)	109(34.9%)	163(52.2%)	196(62.8%)	255(81.7%)
	$\chi^2 = 11.876,$ P = 0.001*	$\chi^2 = 5.925,$ P = 0.015*	$\chi^2 = 18.382,$ P < 0.001*	$\chi^2 = 11.374,$ P = 0.001*	$\chi^2 = 1.748,$ P = 0.186
Marital Status					
Single/ separated	305(40.1%) 199(26.2%)	236(31.0%) 210(27.7%)	355(46.6%) 277(36.5%)	486(63.9%) 340(44.8%)	615(80.8%) 586(77.2%)
Married					
	$\chi^2 = 32.937,$ P < 0.001*	$\chi^2 = 2.049,$ P = 0.152	$\chi^2 = 16.128,$ P < 0.001*	$\chi^2 = 55.683,$ P < 0.001*	$\chi^2 = 2.983,$ P = 0.084

n: frequency, %: percentage, χ^2 : Pearson Chi-square test, df: degree of freedom, P: p-value *: P-value statistically significant at < 0.05.

Table 2 Factors significantly associated with oral Para functional habits.

	Nail biting	Grinding	Clenching	Lip/object biting	Gum Chewing
	Adjusted OR, [95%, CI]	Adjusted OR, [95%, CI]	Adjusted OR, [95%, CI]	Adjusted OR, [95%, CI]	Adjusted OR, [95%, CI]
	Adjusted P value	Adjusted P value	Adjusted P value	Adjusted P value	Adjusted P value
Gender	Adj.OR = 3	Adj.OR = 1.9	Adj.OR = 1.1	Adj.OR = 1.3	Adj.OR = 1.0
Male vs. female	[2.3–3.7] P < 0.001*	[1.5–2.4] P < 0.001*	[0.9–1.4] P = 0.304	[1.1–1.7] P = 0.015*	[0.8–1.3] P = 0.937
Age	Adj.OR = 1.5	Adj.OR = 1.0	Adj.OR = 1.7	Adj.OR = 1.954	Adj.OR = 1.2
< 30 vs ≥30 years	[1.1–2.0] P = 0.007*	[0.7–1.3] P = 0.948	[1.3–2.2] P < 0.001*	[1.5–2.6] P < 0.001*	[0.9–1.7] P = 0.232
Financial	Adj.OR = 1.2	Adj.OR = 1.0	Adj.OR = 1.4	Adj.OR = 1.2	Adj.OR = 1.2
Uncomfortable vs. comfortable	[0.9–1.5] P = 0.308	[0.8–1.4] P = 0.627	[1.1–1.8] P = 0.011*	[0.9–1.6] P = 0.177	[0.8–1.6] P = 0.349
Marital status	Adj.OR = 1.3	Adj.OR = 1.1	Adj.OR = 1.0	Adj.OR = 1.4	Adj.OR = 1.1
Single VS married	[1.0–1.8] P = 0.059	[0.8–1.5] P = 0.582	[0.8–1.4] P = 0.755	[1.0–1.8] P = 0.022*	[0.8–1.5] P = 0.686
Anxiety	Adj.OR = 1.6	Adj.OR = 2.5	Adj.OR = 3.2	Adj.OR = 2.4	Adj.OR = 1.2
Moderate/severe vs. none/ mild	[1.1–2.1] P = 0.003*	[1.8–3.3] P < 0.001*	[2.4–4.3] P < 0.001*	[1.7–3.2] P < 0.001*	[0.8–1.8] P = 0.252
Constant	Adj.OR = 0.2 P < 0.001*	Adj.OR = 0.3 P < 0.001*	Adj.OR = 0.4 P < 0.001*	Adj.OR = 0.6 P < 0.001*	Adj.OR = 3.1 P < 0.001*

OR: odds ratio, [95%CI]: 95% confidence interval, P: p-value *: P-value statistically significant at < 0.05.

financially constrained group was 1.4 [1.1–1.8] times more likely to be associated with clenching compared to their counter groups (adj.P < 0.001 and adj.P = 0.011 respectively). Lip/object biting was significantly 1.3 [1.1–1.7] times more prevalent in males, 1.95 [1.5–2.6] times higher in a younger age group, and 1.4 [1.0–1.8] times more likely to occur in single persons (adj.P = 0.015, adj.P < 0.001, and adj.P < 0.022). Anxiety (moderate to severe) was significantly associated with nail biting (adj. OR = 1.6 [1.1–2.1]), grinding (adj. OR = 2.5 [1.8–3.3]), clenching (adj. OR = 3.2 [2.4–4.3]), lip/object biting (adj. OR = 2.4 [1.7–3.2]), (adj.P < 0.001 each).

Specific parafunctional habits were significantly associated with specific personality factors (Table 3). Persons with an extraversion personality factor were more likely to clench (46.4%, P = 0.024). Participants with an agreeable personality factor were less associated with lip/object biting (52.5%, P = 0.009) and the conscientiousness personality factor group was significantly less associated with grinding (27.8%),

clenching (39.3%), and lip/object biting (52.9%) (P = 0.008, P < 0.001, and P = 0.023). Participants who reported being emotionally stable were significantly less likely to have a nail biting habit (28.4%), grinding (24.9%), clenching (35.8%), and lip/object biting (48.4%) (P < 0.001 each). The open to experience group were not significantly associated with any oral parafunctional habit.

4.3. Self-reported TMD by personality factors, anxiety levels and parafunctional habits

Self-reported TMD was significantly more prevalent in females (39.9%) compared to males (34.7%, P = 0.044). A significant direct relationship was observed between the severity of anxiety levels and self-reported TMD (P < 0.001). Participants with grinding and clenching were significantly more prone to develop TMD, but lip/object biting was less associated with TMD (P < 0.001 each). The groups with conscientiousness

Table 3 Relationship between Para functional oral habits and personality types.

	Nail Biting n(%)	Grinding n(%)	Clenching n(%)	Lip/objects biting n(%)	Gum Chewing n(%)
Extraversion**					
No	368(32.6%)	319(28.3%)	450(39.9%)	606(53.7%)	882(78.2%)
Yes	136(34.7%)	127(32.4%)	182(46.4%)	220(56.1%)	319(81.4%)
	$\chi^2 = 0.562,$ P = 0.453	$\chi^2 = 2.379,$ P = 0.123	$\chi^2 = 5.114,$ P = 0.024*	$\chi^2 = 0.675,$ P = 0.411	$\chi^2 = 1.781,$ P = 0.182
	OR[95%] = 1.1[0.9–1.4]	OR[95%] = 1.2[0.9–1.6]	OR[95%] = 1.3[1.0–1.6]	OR[95%] = 1.1[0.9–1.4]	OR[95%] = 1.2[0.9–1.6]
Agreeableness**					
No	129(36.2%)	115(32.3%)	150(42.1%)	215(60.4%)	291(81.7%)
Yes	375(32.2%)	331(28.4%)	482(41.4%)	611(52.5%)	910(78.2%)
	$\chi^2 = 1.987,$ P = 0.159	$\chi^2 = 1.966,$ P = 0.161	$\chi^2 = 0.059,$ P = 0.808	$\chi^2 = 6.861,$ P = 0.009*	$\chi^2 = 2.087,$ P = 0.149
	OR[95%] = 0.8[0.7–1.1]	OR[95%] = 0.8[0.6–1.1]	OR[95%] = 1[0.8–1.2]	OR[95%] = 0.7[0.6–0.9]	OR[95%] = 0.8[0.6–1.1]
Conscientiousness**					
No	114(36.4%)	111(35.5%)	158(50.5%)	188(60.1%)	258(82.4%)
Yes	390(32.3%)	335(27.8%)	474(39.3%)	638(52.9%)	943(78.1%)
	$\chi^2 = 1.895,$ P = 0.169	$\chi^2 = 7.124,$ P = 0.008*	$\chi^2 = 12.854,$ P < 0.001*	$\chi^2 = 5.201,$ P = 0.023*	$\chi^2 = 2.772,$ P = 0.096
	OR[95%] = 0.8[0.6–1.1]	OR[95%] = 0.7[0.5–0.9]	OR[95%] = 0.6[0.5–0.8]	OR[95%] = 0.7[0.6–0.9]	OR[95%] = 0.8[0.6–1.1]
Emotional Stability**					
No	246(40.1%)	220(35.9%)	307(50.1%)	387(63.1%)	475(77.5%)
Yes	258(28.4%)	226(24.9%)	325(35.8%)	439(48.4%)	726(80.0%)
	$\chi^2 = 22.535,$ P < 0.001*	$\chi^2 = 21.239,$ P < 0.001*	$\chi^2 = 30.574,$ P < 0.001*	$\chi^2 = 31.991,$ P < 0.001*	$\chi^2 = 1.441,$ P = 0.230
	OR[95%] = 0.6[0.5–0.7]	OR[95%] = 0.6[0.5–0.7]	OR[95%] = 0.6[0.5–0.7]	OR[95%] = 0.5[0.4–0.7]	OR[95%] = 1.2[0.9–1.5]
Openness to Experience**					
No	188(33.7%)	167(29.9%)	216(38.7%)	293(52.5%)	443(79.4%)
Yes	316(32.8%)	279(29.0%)	416(43.2%)	533(55.4%)	758(78.8%)
	$\chi^2 = 0.113,$ P = 0.736	$\chi^2 = 0.146,$ P = 0.702	$\chi^2 = 2.988,$ P = 0.084	$\chi^2 = 1.194,$ P = 0.275	$\chi^2 = 0.076,$ P = 0.783
	OR[95%] = 1[0.8–1.2]	OR[95%] = 1[0.8–1.2]	OR[95%] = 1.2[1.0–1.5]	OR[95%] = 1.1[0.9–1.4]	OR[95%] = 1[0.7–1.2]

n: frequency, %: percentage, χ^2 : Pearson Chi-square test, OR: odds ratio, [95%CI]: 95% confidence interval, P: p-value *: P-value statistically significant at < 0.05, **: non mutually exclusive.

Table 4 Prevalence of self-reported TMD across personality types, anxiety levels and Para functional habits.

	Self-reported TMD		Statistical analysis χ^2 , P
	Yes n(%)	No n(%)	
Gender			
Male	183(34.7%)	345(65.3%)	$\chi^2 = 4.04$, P = 0.044*
Female	396(39.9%)	596(60.1%)	
Age (Years)			
< 30	275(39.2%)	427(60.8%)	$\chi^2 = 0.647$, P = 0.421
≥30	304(37.2%)	514(26.8%)	
Occupation			
Unemployed	322(38.7%)	511(61.3%)	$\chi^2 = 0.248$, P = 0.618
Employed	257(37.4%)	430(62.6%)	
Financial Status			
Comfortable	437(36.2%)	771(63.8%)	$\chi^2 = 9.167$, P = 0.002*
Uncomfortable	142(45.5%)	170(54.5%)	
Marital Status			
Single/separated	303(39.8%)	458(60.2%)	$\chi^2 = 1.921$, P = 0.166
Married	276(36.4%)	483(63.6%)	
Anxiety Severity Levels			
Mild	407(32.2%)	857(67.8%)	$\chi^2 = 103.695$, df = 3, P < 0.001*
Mild to moderate	92(63.0%)	54(37.0%)	
Moderate to severe	48(67.6%)	23(32.4%)	
Very severe	21(80.8%)	5(19.2%)	
Para functional habits **			
Nail biting	206(40.9%)	298(59.1%)	$\chi^2 = 2.473$, P = 0.116
Grinding	255(57.2%)	191(42.8%)	$\chi^2 = 97.471$, P < 0.001*
Clenching	340(53.8%)	292(46.2%)	$\chi^2 = 113.152$, P < 0.001*
Lip/objects biting	380(46.0%)	446(54.0%)	$\chi^2 = 48.033$, P < 0.001*
Gum Chewing	467(38.9%)	734(61.1%)	$\chi^2 = 1.523$, P = 0.217
Personality types**			
Extraversion	165(42.1%)	227(57.9%)	$\chi^2 = 3.583$, P = 0.058
Agreeableness	432(37.1%)	732(62.9%)	$\chi^2 = 2.019$, P = 0.155
Conscientiousness	439(36.4%)	768(63.6%)	$\chi^2 = 7.361$, P = 0.007*
Emotional Stability	311(34.3%)	596(65.6%)	$\chi^2 = 13.795$, P < 0.001*
Openness to Experience	363(37.7%)	599(62.3%)	$\chi^2 = 0.143$, P = 0.706

n: frequency, %: percentage, χ^2 : Pearson Chi-square test, df: degree of freedom, OR: odds ratio, [95%CI]: 95% confidence interval, P: p-value *: P-value statistically significant at < 0.05, **: non mutually exclusive.

and emotional stability were significantly less associated with TMD (P = 0.007 and P < 0.001) (Table 4). Fig. 1 illustrates the odds of exhibiting self-reported TMD in relation to gender, financial status and anxiety level.

5. Discussion

This study assessed the prevalence of oral parafunctional habits and the association with anxiety levels and personality factors in the Saudi adult population. Although the prevalence of oral parafunctional habits varies in literature, the current findings indicate a high prevalence. The most frequent parafunctional habits were gum chewing and lip/object biting, with grinding the lowest (31.8%). The findings are supported by a study done in Poland with college students, indicating gum chewing and bruxism the most frequent oral parafunctional habits (Panek et al., 2012). A study in Brazil conducted with high-school students reported the prevalence of oral parafunctional habits of adolescents as 75% and 79% in another study (Motta et al., 2013), with nail biting the most prevalent habit (16.4%). The studies reported a significant association between parafunctional habits and TMD and, in addition, that TMD is

more prevalent in cases with bruxism. The current study also found that grinding and clenching can cause TMD and that TMD is more prevalent in females, which was not supported by Emodi-Perlman et al (2012).

The current study found a significant relationship between TMD and some personality factors. TMD is less prevalent in participants with conscientiousness and emotional stability. Similar to the findings of a comparative study investigating the personality factors of females with TMD pain compared to a pain free control group (Mohn et al., 2010), reporting that extraversion and openness were lower in the TMD group. Another study with children aged 8 to 11 years in Colombia, reported that TMD is highly correlated with a high tension personality factor of children (Restrepo et al., 2008). Several other studies reported a positive correlation between TMD pain and neuroticism as a personality factor (Moayed et al., 2011; Pallegama et al., 2005).

A relationship exists between parafunctional habits and anxiety, with the severity of anxiety contributing to the prevalence of these habits. In the current study, a significant positive relationship was observed between the severity of anxiety symptoms and oral parafunctional habits. This finding is sup-

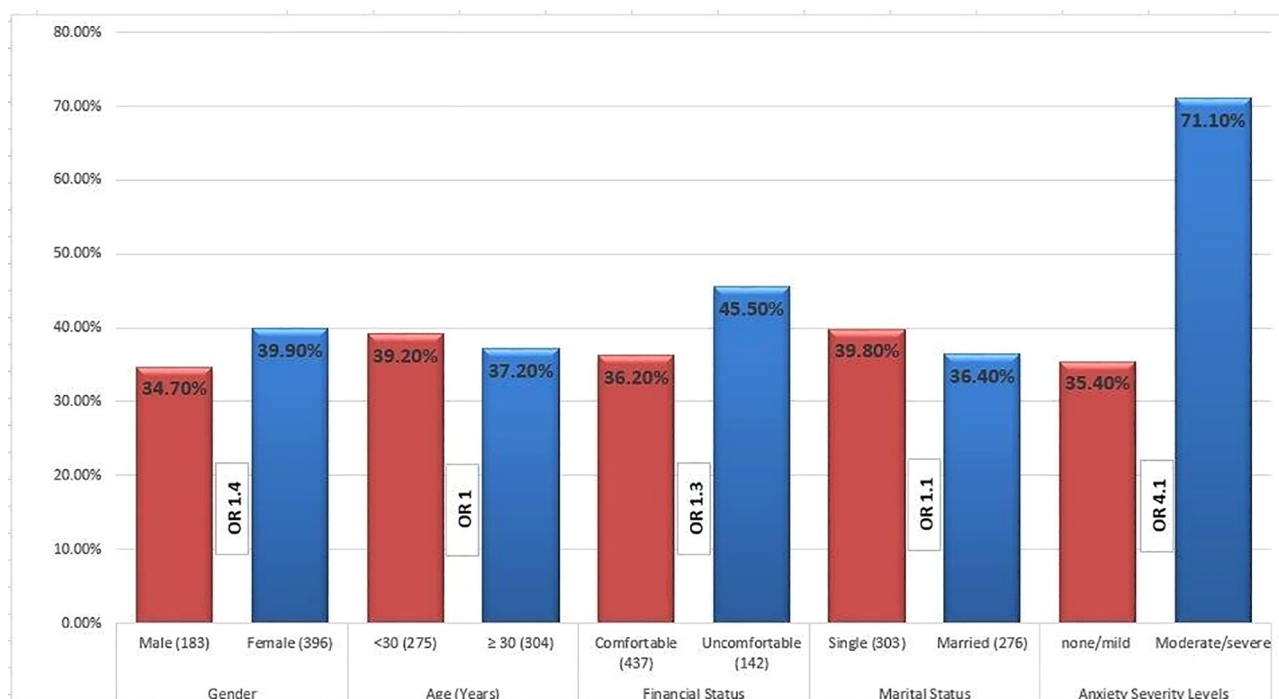


Fig. 1 Factors significantly associated with TMD.

ported by Alkan and his colleagues, studying the association between psychological status and oral behaviors, and concluded that subjects with parafunctional habits have higher anxiety and depression scores (Alkan et al., 2015). Another study by Emodi-Perlman et al (2012) found that children who are subjected to stressful life events are more likely to perform oral parafunctional activities. In addition, Leme et al (2014) concluded that children and adolescents with harmful oral habits are more likely to present with anxiety symptoms. Conversely, a study by Alamoudi (2002) with Saudi children found that there was no association between oral parafunctional habits and emotional status. This might be due to the age group studied (3 to 7 years) with a different methodology asking the parents whether their child is calm or nervous.

Some personality factors influence the psychological status of an individual as well as the response and recovery from a stressor (Childs et al., 2014). The present findings indicate that participants expressing neuroticism as a personality factor were significantly associated with oral parafunctional habits. This finding is in agreement with Gabriela Cortese et al. (2013) investigating the frequency of oral habits and personality factors in bruxing and nonbruxing children (Gabriela Cortese et al., 2013). They reported that the bruxers group was more likely to be linked to neuroticism personality factors. This can be explained because individuals with neuroticism may be prone to increased levels of psychological stress and anxiety.

In the current study, males, younger age groups, single people, and the financially constrained group had higher levels of oral parafunctional habits. In contrast, literature frequently report females to be more prone to oral parafunctional activity (Alkan et al., 2015; Winocur et al., 2006). In literature, the prevalence of bruxism is reported to decrease with aging (Selvaratnam et al., 2009). However, gender and age factors

were not significantly associated with parafunctional habits in some studies (Friedman Rubin et al., 2018; Seraj et al., 2010).

The current study has a number of limitations. The study used a self-report questionnaire which may cause over or under reporting of oral parafunctional habits. A study using a clinical examination of participants' level of anxiety and oral-parafunctional habits compared with their personality factors is recommended. Case-control studies could be conducted with groups with and without TMD to compare personality factors and the association with oral parafunctional habits with the severity of TMD. Due to the electronic distribution using social media platforms and the wide geographical area of Saudi Arabia, region-based data was not captured.

6. Conclusions

Self-reported parafunctional habits are prevalent in the Saudi adult population, significantly associated with moderate to severe levels of anxiety, and varying in people with different personality factors. It should be noted that most types of parafunctional habits were significantly related to individuals with conscientiousness and neuroticism. The study highlighted that males, younger age groups, and single people, being unemployed or financially constrained tend to have higher prevalence rates of parafunctional habits. In addition, TMD is significantly reported by females, with anxiety a risk factor. Two types of parafunctional habits, grinding and clenching, are associated with the development of TMD.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

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