ORIGINAL ARTICLE

Risk Factors for Temporomandibular Disorders among Amphetamine Users in Indonesia

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Abstract

Objective: To determine the possible risk factors for temporomandibular disorders (TMD) among amphetamine users in Indonesia. **Material and Methods:** This cross-sectional study involved 152 male amphetamine users, aged 18-45 years, who were undergoing rehabilitation. Data were obtained from medical records, questionnaires, and clinical examinations. Data obtained from medical records included age, gender, duration of amphetamine use, duration of rehabilitation, and psychiatric status. Collected data were analyzed using the Chi-square and logistic regression tests to identify correlations between TMD and bruxism, oral habits, tooth wear, duration of amphetamine abused, and duration of rehabilitation. **Results:** TMD was found in 84.2% of amphetamine users, with clicking being the most frequently reported sign (72.4%). Tooth wear (72.4%), oral habits (60.5%), and bruxism (56.6%) were also frequently found. Statistically, a significant association was found between TMD and bruxism (p<0.001), tooth wear (p<0.001), and oral habits (p<0.001). However, there was no association observed between TMD and duration of amphetamine abused (p=0.526), and duration of rehabilitation (p=0.679). Odds ratios produced by logistic regression for tooth wear, oral habits, and bruxism were 6.657, 6.2, and 1.659, respectively. **Conclusion:** Tooth wear, oral habits, and bruxism were identified as risk factors for TMD among amphetamine users in Indonesia.

Keywords: Temporomandibular Joint Disorders; Oral Health; Drug Users.

Introduction

Temporomandibular disorders (TMD) compose a set of joint and muscular dysfunctions of the cranio-orofacial area, characterized by joint and/or muscular pain, noise in the temporomandibular joints, and limited mandibular movement. The prevalence of TMD varies widely in the literature, ranging from 7% to 85%. In females, the prevalence is 1.5–2-fold higher than that reported in males [1]. The etiology of TMD is multifactorial and complex, including occlusal disharmonies, parafunction, trauma, deep pain input, and stress [2]. Activities causing excessive and continuous loading to the masticatory joint and muscles may lead to TMD. Drug users are susceptible to such joint and muscle loading and have a significantly higher prevalence of TMD [3].

According to a national survey conducted in 2004, 1.5% of the Indonesian population aged 15–64 years have ever used drugs. The most commonly abused substance reported in the survey was cannabis and amphetamines. Amphetamines are potent and addictive stimulants of the central nervous system (CNS). They stimulate the CNS by increasing the release of catecholaminergic neurotransmitters [3]. This results in a feeling of higher energy, focus, confidence, and euphoria. Types of amphetamines commonly abused in Indonesia include crystalline methamphetamine (sabu-sabu) and 3,4-methylenedioxymethamphetamine (MDMA or ecstasy). The use of amphetamine-type stimulants, particularly crystalline methamphetamine, has expanded throughout Indonesia. In 2011, it was estimated that 1.2 million individuals used crystalline methamphetamine, while 950.000 individuals used ecstasy during the year in Indonesia [4].

Many studies, surveys, and case reports have described the social, medical, and oral effects of drug abuse. However, there are currently no studies investigating the development of TMD among amphetamine users in Indonesia. It was suggested that amphetamine addicts perform typical, continuous movements, and rub the tongue along the inside of the lower lip. In addition, it was later reported that bruxism is an adverse effect of amphetamines. Users of ecstasy had a higher prevalence and severity of tooth wear compared with nonusers, with 89% of those reporting clenching or grinding after consuming the drug [5]. Occlusal overloading and bruxism are frequently involved as biomechanical factors that may contribute to TMD. The purpose of this study was to determine the risk factors for TMD among amphetamine users in Indonesia.

Material and Methods

Study Design and Sample

A total of 152 male amphetamine users, aged 18–45 years (29.72 ± 6.73 years), who were undergoing rehabilitation participated in this cross-sectional study.

The study was conducted in March 2018 at the National Rehabilitation Center, Lido, West Java, Indonesia (Balai Besar Rehabilitasi Badan Narkotika Nasional). The inclusion criteria were: (1) age between 18 and 45 years, (2) history of amphetamine use, (3) presence of incisor, canine, premolar, and molar, (4) no history of facial or cervical injury, and (5) no history of general neurologic, hormonal, psychiatric, or neoplasm diseases.

Data Collection

Data obtained from medical records included age, gender, duration of amphetamine use, duration of rehabilitation, and psychiatric status. Subjects meeting the inclusion criteria and voluntarily expressing the desire to participate in this study were enrolled.

Questionnaires validated in the Indonesian version and clinical examination were used to collect data. Three questionnaires, i.e., TMD - Diagnostic Index (TMD-DI), sleep bruxism questionnaire established by the American Academy of Sleep Medicine, and bad habits questionnaire from etiology of TMD index were completed by the subjects [6-8]. Clinical examination, i.e., palpation of the temporal and masseter muscles (1 kg of pressure), palpation of TMJ (0.5 kg of pressure), joint clicking during movement (opening and closing) of the jaws, and limited mouth opening (<40 mm including overbite) were assessed by an experienced examiner according to the DC-TMD [9]. Tooth wear was examined visually and classified according to a 6-point scale (0: no apparent wear, 1: slight wear, 2: wear of enamel only, 3: wear into the dentin in a single spot, 4: exposure of dentin in an area >2 mm², and 5: wear of more than one third of the clinical crown). The highest score for each of the four dental regions (incisors, canines, premolars, and molars) at the upper and lower jaws was recorded. Subjects with a score of 3 in at least one region were defined as having tooth wear [10].

Statistical Analysis

The IBM SPSS Statistics Software, version 22 (IBM Corp., Armonk, NY, USA) was used to analyze the data. Bivariate analysis using the Chi-square test for qualitative variables (TMD, bruxism, oral habits, tooth wear, duration of amphetamine use, and duration of rehabilitation) was performed. Multivariate analysis using logistic regression was performed to determine the risk factors for TMD among amphetamine users. The level of significance was set at $p<0.05$.

Ethical Aspects

This study was approved by the Ethics Committee of the Faculty of Dentistry, Universitas Indonesia. All subjects provided written informed consent prior to their participation in the study.

Results

TMD was found in 84.2% of the subjects, with joint clicking being the most frequently reported sign (70.4%). Tooth wear (72.4%), oral habits (60.5%), and bruxism (56.6%) were also frequently found among the subjects (Table 1).

Table 1. Sample distribution according to clinical variables.

Variables	N	%
TMD		
No	24	15.8
Yes	128	84.2

Bruxism		
No	66	43.4
Yes	86	56.6
Oral Habits		
No	60	39.5
Yes	92	60.5
Tooth Wear		
No	42	27.6
Yes	110	72.4
Duration of Amphetamine Use		
≤ 3 Years	35	23.0
> 3 − ≤ 5 Years	38	25.0
> 5 Years	79	52.0
Duration of Rehabilitation		
≤3 Months	86	56.6
>3 Months	66	43.4
Muscle Pain		
No	139	91.4
Yes	13	8.6
TMJ Pain		
No	146	96.1
Yes	6	3.9
Joint Clicking		
No	45	29.6
Yes	107	70.4
Mouth Limited Opening		
No	142	93.4
Yes	10	6.6

It was found a statistically significant association between TMD and tooth wear, bruxism, and oral habits (p<0.001). However, there was no statistically significant association observed between TMD and the duration of amphetamine used or the duration of rehabilitation (Table 2).

Table 2. Associations between TMD and risk factors.

Variables	Non-TMD N (%)	TMD N (%)	p-value
Bruxism			
No	20 (30.3)	46 (69.0)	<0.001*
Yes	4 (4.7)	82 (95.3)	
Oral Habits			
No	20 (33.3)	40 (66.7)	<0.001*
Yes	4 (4.3)	88 (95.7)	
Tooth Wear			
No	18 (42.9)	24 (57.1)	<0.001*
Yes	6 (5.5)	104 (94.5)	
Duration of Amphetamine Use			
≤ 3 Years	7 (20.0)	28 (80.0)	0.526**
>3 − ≤5	4 (10.5)	36 (89.5)	
> 5 Years	13 (16.5)	66 (83.5)	
Duration of Rehabilitation			
≤ 3 Months	15 (17.4)	71 (82.6)	0.679*
> 3 Months	9 (13.6)	57 (86.4)	

*Continuity Correction test; **Pearson Chi-square test.

Multivariate analysis was performed using the enter method of logistic regression to determine the odds ratio (OR) of possible risk factors for TMD among amphetamine users in Indonesia. The variables included bruxism, tooth wear, and oral habits (p<0.25). This model had a value of Hosmer and Lemeshow test (p = 0.395), indicating that the model was supported by empirical data (fit model). The OR produced by this analysis for tooth wear, oral habits, and bruxism were 6.573, 6.2, and 1.649, respectively (Table 3).

Table 3. Logistic regression analysis.

Variables	B	Exp(B)	p-value
Bruxism	0.500	1.649	0.499
Tooth Wear	1.883	6.573	0.003
Oral Habits	1.825	6.200	0.003

Discussion

This was the first investigation regarding the development of TMD among amphetamine users in Indonesia. A high prevalence of TMD was found among subjects, and an association was detected between TMD and bruxism [11]. These findings are consistent with those of a previous study, showing a high prevalence of TMD signs and symptoms, nocturnal clenching, and diurnal clenching in an addicted population compared with those reported in control subjects [11]. It is reported in the literature that amphetamine use results in bruxism [12]. Jaw tension and tooth grinding are two of the ten most frequently reported side effects of ecstasy use [13].

Moreover, another study showed an association between bruxism and methamphetamine use [14]. Amphetamine increases the release of dopamine in the brain. The central dopaminergic system plays a role in the pathophysiology of sleep bruxism [15]. The detection of sleep bruxism in this study was achieved through the use of a questionnaire. Direct detection of bruxing activity through the use of polysomnography may reach a more accurate diagnosis; however, this type of investigation was not applicable in the present study.

An association between TMD and tooth wear was also found in this study. This result was consistent with those of a previous study showing a higher prevalence of tooth wear among ecstasy users than that reported among nonusers. The investigators concluded that the combination of ecstasy induced-bruxism, dry mouth, and the erosive effects of carbonated drinks consumed while using ecstasy resulted in more advanced tooth wear [16]. Another variable shown to be significantly associated with TMD in the present study was oral habits. Oral habits, including parafunction activity, is one of the etiologies of TMD [2]. Some authors reported a significant association between signs and/or symptoms of TMD and harmful oral habits (nail-biting, lip/object biting, and grinding of the teeth) among adolescents [17]. Moreover, it was found a significant association between the duration of addiction and habits of jaw play, gum chewing, and daytime clenching among drug addicts.

Logistic regression analysis showed that tooth wear, oral habits, and bruxism were associated with the occurrence of TMD among amphetamine users in Indonesia. Based on the OR, it

may be concluded that subjects with tooth wear had a 6.57-fold higher risk of developing TMD than those without tooth wear. In addition, subjects with oral habits had a 6.20-fold higher risk of developing TMD than those without oral habits. Moreover, subjects with bruxism had a 1.65-fold higher risk of developing TMD than those without bruxism.

In the present study, bruxism was the weakest risk factor for TMD. The assessment of bruxism was based only on the relevant questionnaire. Thus, the present results may not represent bruxism as a direct effect while under the influence of amphetamines. However, tooth wear − the strongest risk factor reported in this study − is a specific marker of bruxism. A study involving amphetamine users and a similar design to the present investigation showed that regular users of amphetamines exhibit significantly greater tooth wear than nonusers. The matching of the two study groups suggests that tooth wear may be attributed to drug use rather than other causes [18]. The extent of tooth wear may also be influenced by the density of enamel, quality of saliva, or efficacy of lubrication [19]. Dry mouth is another common side effect of amphetamine use [16], which may be an exacerbating factor for tooth wear among amphetamine users. The combination of bruxism and dry mouth may explain the importance of tooth wear as a risk factor for TMD among amphetamine users.

This study was conducted in subjects who were undergoing rehabilitation for ≥1 month. Therefore, the presence and the cause (i.e., drug abuse or other more recent factors) of TMD must be interpreted cautiously. Drug abuse is an illegal and taboo activity in Indonesia. Thus, it is difficult to conduct a study involving active users. However, considering the lack of association between TMD and the duration of rehabilitation, it is hypothesized that the rehabilitation period may not influence the outcome of this study.

Conclusion

Tooth wear, oral habits, and bruxism were identified as risk factors for the development of TMD among amphetamine users in Indonesia. Amphetamine users with tooth wear had a 6.57-fold higher risk of developing TMD than those without tooth wear. In addition, subjects with oral habits had a 6.20-fold higher risk of developing TMD than those without oral habits. Moreover, subjects with bruxism had a 1.65-fold higher risk of developing TMD than those without bruxism.

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