

## Temporomandibular disorder among metamphetamine user

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### ABSTRACT

Crystalline metamphetamine or often called "shabu shabu" is a type of amphetamine which is the most often abused in Indonesia. Clinical symptoms of temporomandibular disorder (TMD) were found in 84.2% of 152 among amphetamine users. This case analysis aims to evaluate the treatment of TMD of muscular origin, with myofascial pain diagnosis. The chosen treatments are maximizing etiology-related education and supportive care that aims to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analgesics to reduce pain that patients often experience.

**Keywords:** temporomandibular disorder, metamphetamine, muscle

### INTRODUCTION

Temporomandibular disorder (TMD) is a combination of joint and muscle dysfunction in the cranio-orofacial region, with clinical characteristics such as joints with or without muscle pain, sounds in the temporomandibular joints (TMJ), and limited motion of the mandibular jaw.<sup>1</sup> The etiology of TMD is multifactorial and complex, such as disharmony of occlusion, parafunction, trauma, deep pain input and stress. Activities that increase and give continuous pressure on the TMJ and masticatory muscles can cause TMD. Drug users are prone to this condition so that they have a higher prevalence of TMD than nonusers<sup>2</sup>

Crystalline metamphetamine or often called "shabu shabu" is a type of amphetamine which is the most often abused in Indonesia, other than 3,4-methylenedioxymethamphetamine (MDMA) or ecstasy. Based on Indonesian national data, 2.18% of the population aged 10-59 years are narcotics users. It is estimated that there were 1.2 million individual users of *crystalline methamphetamine* and 950,000 individuals using ecstasy during 2014 in Indonesia.<sup>3</sup>

Crystalline metamphetamine can be consumed by the way of per oral, intranasal, inhaled, or injected. The direct effect of using metamphetamine is increasing energy, a sense of euphoria; increasing attention and alertness; being more talkative; increasing heart rate, respiration and body temperature; decreasing appetite; tooth clenching and grinding; nausea, vomiting, dry mouth, nervousness, anxiety, and paranoia.<sup>4</sup>

Oral health is one of the most common problems (41.3%) among methamphetamine users.<sup>5</sup> Based on research conducted by Paramitha et al 2019, TMD was found in 84.2% of 152 amphetamine

users in Indonesia with range of age 18-45 years. Clinical symptoms that founded among the users were clicking joints sound (74.2%), tooth wear (72.4%), bad habits such as biting foreign objects, nails, lips, grinding and clenching (60.5%), and bruxism (56.6%). It was also found that there was a significant relationship between duration of use, jaw play, chewing gum habit, and clenching during the day among narcotics users.<sup>5</sup>

'Met mouth' is the term used for the clinical characteristic of the oral cavity that is often seen among metamphetamine users, such as caries lesions, xerostomia, widespread attrition, and trismus.<sup>7</sup> Shetty et al evaluated that 301 adult users of metamphetamine had lost one or more teeth (60%), tooth erosion (22.3%), carious lesions (30.9%), complaints in the TMJ (8%), and oral mucosal lesions (4.3%).<sup>8</sup> In addition, Rommel et al found that metamphetamine users also experienced xerostomia (72%) and jaw clenching (68%), and pain around the TMJ (47%).<sup>6</sup> When consuming metamphetamine the endocrine glands will release chemicals such as serotonin, dopamine, and norepinephrine which cause episodes of jaw clenching. These chemicals cause muscle spasm so that the user will clench his teeth unconsciously. This clenching results in pain to the jaw joint, caries, pain in the tongue and lesions of the cheek mucosa.<sup>7</sup>

Shetty et al also compared the dental and oral health conditions of metamphetamine users both by intravenous, intranasal and smoking. Where the results showed that intravenous use of metamphetamine has a higher risk of having oral and dental disease compared to intranasal or cigarette use.<sup>8</sup> Research by Robbins states that intranasal metamphetamine use increases the risk of tooth

wear on maxillary anterior teeth, compared to intravenous metamphetamine users or cigarettes.<sup>9</sup>

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This case analysis aims to evaluate the treatment of TMD of muscular origin, with myofascial pain diagnosis with maximizing etiology-related education and supportive care that aims to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analgesics to reduce pain that patients often experience.

**CASE**

A 37-year-old male patient came to RSKGM UI and complained the discomfort he had suffered since 1 year ago. The patient is difficult to open the mouth wide, hears the ringing in the ears, feels the discomfort in the temples, cheeks, in front of the ears and when trying to open the mouth wide, the right neck area feels tense and uncomfortable which causes headache.

The patient was a former drug addict since 5 years ago, but has not consumed it as of August 2019. When consuming narcotics, the patient will unconsciously bring his upper and lower teeth together. Patients often feel discomfort in the area of the temples, cheeks, in front of the ears. In addition, patients often experience headaches that cause vertigo since May 2019, which then undergo physiotherapy treatment. The patient said that after physiotherapy (TENS), the vertigo got better but until now he still experiences ringing in his ears and difficulty opening his mouth wide.

**Extra oral examination**

Facial shape is oval. Convex profile, pupils are not level, and nose is symmetrical. Exhalation

through the nose is smoothly. Upper lip normal is thin, symmetrical, short. Lower lip is normal, thick, symmetrical. All lymph nodes are painless and cannot be felt. The jaw joint sounds when opening the mouth and painful. Mouth opening does not deviate.

**Intra oral examination**

Oral hygiene is moderate. Abrasion of the maxillary anterior tooth 13-23. There's calculus and stain. Radix teeth 33 and 34. Tongue is normal in size, wright class I position, normal mobility. High gag reflex. Healthy oral mucosa. Occlusion is stable. Overlapping 5 mm and a bite distance of 4 mm. There are no open bites and cross bites. Orthognathic jaw relationships. Premature articulation and contacts cannot be checked. Moderate occlusal wear. No slide in centric. There are bad habits such as often bringing the upper and lower teeth together during the day, especially when working, and chewing on one side.

**Clinical examination**

The left and right joint is painful during palpation. Joint sound (+) when opening the mouth on the left and right. No crepitus. Joint movement is limited. There are no subluxations or locks. Palpation is on the right and left temporal muscle (+). Palpation is on right and left Masetter (+). Palpation is on the right and left of lateral pterygoid muscle (+). Palpation is on the tongue (-). Open a maximum of 30 mm with pain (+), accompanied by pain and stiffness in the right sternocleidomastoid muscle which causes a headache. Maximum 1 mm right and left lateral is accompanied by pain (+). Cannot perform protrusive motion. Overlapping 5 mm and a bite distance of 4 mm. There are no open or cross bites. There is no deviation during mouth opening and closing.

**The indexes**

According to the Helkimo Index, it is classified as Ai1 which is mild symptoms like clicking sound, catching and weary sensation on joint. Clinical Dysfunction Index classified him as Di3 which severe dysfunction. Occlusal Dysfunction Index clas-



**Figure 1** Intraoral views

sified the patient as Oi1 which is moderate disfunction, while according the ID-TMD, score  $\geq 3$ , total score 12.

### Bad habit questioner

Patient often does certain bad habit such as, chewing gums, sleep on one side, jaw play, breathing through his mouth, snoring while sleeping, clenching at day and night, and grinding. This bad habit answered with score "2".

Other habits such as bite on one side of the mouth, and feel sleepy during the day is answered with score "1" which means it is rarely be done by the patient. The total score of bad habit questioner is 16.

### Emotional stress questioner

Patient often feels sad, weak and imbalanced, excessive worry, is lack of energy and deteriorating nervous, confused, depressed, mad, self-worthless which answered the question with score 2. Patient rarely blames himself, feels lonely and unattracted with anything else, feels not having future, feels like unable to control the important thing in life, feels emptiness, finds himself can't overcome things, feels ill and guilty, and answered those question with score 1. The total score of emotional stress questioner are 24.

### Diagnostic criteria for TMD symptom questionnaire

Patient ever had feel pain in jaw, temple, ear, and in front of ear in both sides since 2 years ago (since 2017). In the last 30 days, those pain felt come and go. Activity such as opening mouth, moving jar forward and to other side, clenching, grinding, chewing gum, and yawning increase level of pain. In the last 30 days, patient felt headache on the temple area which began 2 years ago. Activities such as opening mouth, moving jar forward and to other side, clenching, grinding, chewing gum, and yawning increase level of headache. In the last 30 days, patient had joint noises when using his jaw at left and right joint. Patient had no history of close and open lock.

### Diagnostic criteria for TMD examination form

In the last 30 days, patient felt pain on right and left temporalis, TMJ, and master muscle. Patient also felt pain headache on the right and left temporal. Patient overbite 4 mm dan overjet 5 mm. Pain free mouth was opening 23 mm. Maximum unassisted mouth opening 30 mm with pain on right side of temporalis, TMJ, masseter, other

mastication muscle, and non-mastication muscle; also felt familiar pain on right side of temporalis, TMJ, masseter, other mastication muscle, and non-mastication muscle with familiar headache. Maximum assisted was opening 30 mm with pain on left side of temporalis, TMJ, and masseter; also felt familiar pain on right side of temporalis, TMJ, and masseter with familiar headache. Right lateral jaw movement was 1 mm; Left lateral jaw movement was 1 mm; and cannot do protrusion motion.

Clicking during open movement was noticed by examiner and patient on both sides of TMJ with no paint and no familiar pain. There was no clicking during close movement, and no crepitus. Also there was no TMJ noises during lateral and protrusive movement. There was no history of joint locking.

Patient felt pain, familiar pain with familiar headache during muscle palpation, on both sides temporalis middle, masseter origin, masseter body. Patient felt familiar pain with no referred pain on both side lateral pole and around lateral pole of TMJ. Other familiar pain was felt on lateral pterygoid area, and temporalis tendon on both side.

### Radiograph examination

Interpretation of the panoramic is radix teeth 33 dan 34 with periapical radiolucency. Radiopacity with well define border is at mesial root teeth 37.

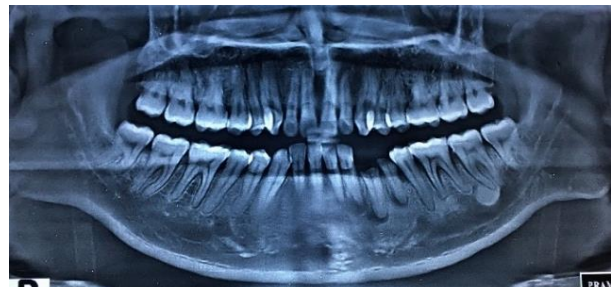


Figure 2 Panoramic image

Interpretation of transcranial right joint examination are 1) open position shows grade 1 which means limited mobility of the condyles; 2) rilex position - the condyle is in the inferior posteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4; 3) bite position - the condyle is in the inferior posteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4.

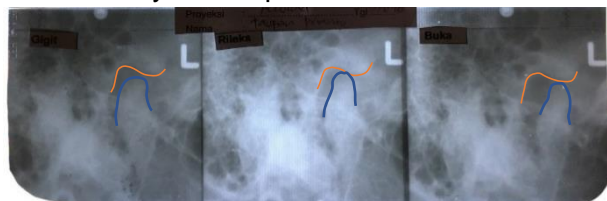


Figure 3 Transcranial image of right joint

**Table 1** Temporomandibular disorder and muscle diagnosis

	Left	Right
Diagnosis		
TMJ	<ul style="list-style-type: none"> <li>• Disc displacement with reduction</li> <li>• Arthralgia</li> </ul>	<ul style="list-style-type: none"> <li>• Disc displacement with reduction</li> <li>• Arthralgia</li> </ul>
MUSCLE	<ul style="list-style-type: none"> <li>• Myofacial pain</li> </ul>	<ul style="list-style-type: none"> <li>• Myofacial pain</li> </ul>
Differential Diagnosis		
MUSCLE	<ul style="list-style-type: none"> <li>• Local myalgia</li> </ul>	<ul style="list-style-type: none"> <li>• Local myalgia</li> </ul>

Interpretation of transcranial left joint examination are 1) open position shows grade 1, which means limited mobility of the condyles; 2) riles position - the condyle is in the inferior anteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4; 3) bite position - the condyle is in the inferior anteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4.



**Figure 4** Transcranial image of left joint

**Summary of subjective and objective findings**

The summary of TMJ are the left and right joints are painful during palpation, clicking during opening on both joints.

Muscles are palpated on the right and left temporal muscle (+). Palpation on right and left masseter (+). Palpation on the right and left of lateral pterygoid muscle (+). Palpation on the right sternocleidomastoid (+).

Jaw movement are maximum mouth opening is 30 with pain, maximum mouth opening is 23 without pain.

There are parafunctions, including the chewing on one side, clench while working or in an emotional stress.

Psychosocial state is in an emotional stress.

**Diagnose and differential diagnose**

Based on DC/TMD: decision tree, pain-retalted TMD and headache, the diagnosis of muscle is myofacial pain with spreading, and the diagnosis of TMJ is arthralgia with headache attributed to TMD.

Based on DC/TMD: decision tree, intra-articular joint disorder. We need to investigate other diagnosis for both intra-articular joint disorders and degenerative joint disorder.

Diagnoses of this case is showed in Table 1.

**MANAGEMENT**

After decide the treatment plan, the dentists gave some education including side effect of metamphetamine abused, total rehabilitation related to drug addiction, management of oral hygiene, soft diet, and management of bad habit; clenching, jaw play, chewing and sleeping on one side.

The action as supportive treatments to eliminate the limited mouth opening are physical self-regulation, assisted muscle stretching, moist heat, analgesic, paracetamol for 10 days, and transcutaneous electrical nerve simulations (TENS).

**Pre-prosthetic procedures**

The procedures including extraction radix teeth 33 and 34, and conservative treatment of anterior maxilla teeth.

The pre-prosthetic procedure was performed one month after the patient followed the educational advice and supportive treatment. If there are improvements such as normal openings, no tinnitus, no clicking and no pain reported, then a pre-prosthetic treatment is performed without making stabilisation appliance. If there is improvement in the form of mouth opening that has reached normal openings, but one of the complaints such as tinnitus, clicking, and pain is still reported by the patient, then the only pre-prosthetic treatment that is performed is conservative treatment in the cervical area of the anterior teeth which is then followed by making stablising appliance. It is not recommended to perform the extraction if the patient still complains of pain during functional movements. If there is no improvement, a stabilization appliance (SA) is made followed by a pre-prosthetic procedure.

**Stabilization appliance**

Stabilization appliance will be made at the maxilla, and used at night and during the day (because patients often complained of clenching during the day and cause pain). In addition, SA is also expected to be a therapy for the patient's tinnitus condition. First control appointment was performed 3 weeks after insertion. If there is an improve-

ment stabilization appliance will only be used at night. If there is no improvement, it is necessary to re-evaluate the patient's bad habits. After SA treatment, denture is made for teeth 33 and 34.

## DISCUSSION

Methamphetamine is a central nervous system stimulant that became popular in the 1990s. Originally used as a nasal decongestant and bronchial inhaler, methamphetamine has the same effects as amphetamine such as increasing activity and speech, decreasing appetite, and stimulating self-confidence. However, when compared with the use of the same dose of amphetamine, methamphetamine is a stronger stimulant, provides a longer effect, and is more dangerous to the central nervous system. Methamphetamine works by changing the levels of neurotransmitters in the central nervous system, stimulates the endocrine glands to release chemicals such as serotonin, dopamine, and norepinephrine.<sup>9</sup>

Serotonin is a neurotransmitter that stimulates feelings of happiness. Users will feel euphoric and tend to talk more. Meanwhile, norepinephrine causes an increase in neuromuscular activity so that users will unknowingly bring their teeth together or often called as a clenching episode. Continuous clenching can result painful jaw joint, caries, pain in the tongue and lesions on the cheek mucosa. However, there are many methamphetamine users who do not experience clenching episodes, this is related to the dose and duration of use of this type of narcotic.<sup>7</sup>

Meth mouth is a general term used to describe the clinical characteristic of the teeth of methamphetamine users where the clinical picture is similar to the rampant caries that occurs in children under five. The lesions were localized on all cervical surfaces of the buccal and proximal anterior teeth of both the maxilla and the mandible. Methamphetamine users also often experience xerostomia, periodontal disease, clenching and bruxism which contribute to tooth wear and caries. The increase of caries lesion is exacerbated by poor oral hygiene and the habit of consuming high-carbohydrate drinks. This occurs due to metamphetamine changing levels of other neurotransmitter in the central nervous system such as serotonin, acetylcholine and glutamate, which results in an increase of the need for ATP, hence to compensate this user need more carbohydrate.<sup>6,10</sup>

In this case the patient consumed metamphetamina intranasally and also there was abfraction in all of his maxillary anterior teeth. Robbins

et al. explained that there was a relationship between intranasal metamphetamine and tooth wear on the maxillary anterior teeth. This is related to the circulatory anatomy system in which the blood vessels in the anterior maxillary teeth originate from the anterior superior alveolar branch of the infraorbital artery, which is a branch of the external carotid artery that also circulates blood to the nasal mucosa. Vasoconstriction of blood vessels in these arteries is due to intranasal ingestion of metamphetamine can cause ischemia in maxillary anterior tooth bleeding. This can continuously weaken the tooth structure and cause tooth wear.<sup>9</sup>

Winocur et al reported the high prevalence of TMD symptoms such as nocturnal clenching and diurnal clenching among metamphetamine users.<sup>2</sup> As we know that the patient has been using metamphetamine for 5 years, and the anamnesis tells us that the patients often experience clenching episodes after taking metamphetamina. Other parafunctions such as such as chewing gum and chewing only on one side result in the hyperactivity of the masticatory muscles. If this condition occurs continuously, it can be called as deep pain input so that it is one of the etiological factor of TMD. In addition, other etiologies that contribute is emotional stress experienced by patients, in which increasing emotional stress can affect the function of the hypothalamus, reticular system, and in particular the limbic system which plays an important role in the emotional state of an individual. These centers influence muscle activity in many ways, one of them is via the efferent gamma pathway. Stress affects the body by activating the hypothalamus-pituitary-adrenal (HPA), which in turn prepares the body to respond (via the autonomic nervous system). HPA, via complex neural pathways, increases efferent gamma activity, which causes the muscle spindles to contract.<sup>11</sup>

The diagnosis of TMD in this case is myofascial pain or also known as myofascial triggers point pain, characterized by hypersensitivity of muscle tissue with localized pain. In this case, the sternocleidomastoid muscle trigger headache in the temporalis area. The etiology that causes myofascial pain in patients is the presence of deep pain input due to clenching, increased emotional stress and other bad habits such as jaw play, chewing gum, chewing and sleeping on one side. As a result, the patient is difficult to open the mouth wide, complains tinnitus and pain in the temporalis, masseter muscles, the area around the TMJ, and the right side of the neck which then caused headaches.



Based on the DC/TMD diagnostic chart for intra-articular joint disorders starts on the SQ9 chart where the patient does not have history of locking the jaw in the closed mouth position, then the chart continues on statements SQ8, E6, and E7 where the patient has a history of joint sounds i.e. clicking and clicking can be felt by the patient at clinical examination. The chart continues in statements E6 and E7 where clicking on the patient only occurs when opening the mouth and does not occur when clicking on eccentric movements. It can be concluded that the diagnosis of joint disorders based on DC/TMD is absent, whereas based on Okeson the diagnosis of joint disorders is disc displacement with reduction. This difference in diagnosis is due to differences in clicking characteristics, where in DC/TMD single clicking must be found together with clicking during eccentric movements to get a diagnosis of disc displacement with reduction, and based on Okeson's characteristics, clicking on disc displacement with reduction can be single or reciprocal clicking.

Tinnitus can be described as a subjective sound in the ear or head without an external sound source, some patients may complain of hearing changes as a result of a protective co-contraction of the tensor tympani. When this muscle contracts, the eardrum flexes and tightens. The tympani tensor, like the tensor palati, is innervated by the trigeminal nerve, so that the pain that occurs in the structures that are innervated by the trigeminal nerve can affect ear function and cause a buzzing sensation.<sup>11</sup> Tullberg et al reported that diurnal bruxism and pain in the jaw may be associated with fluctuations in tinnitus, vertigo, and hyperacusis, whereas the prevalence of tinnitus and vertigo was more common in TMD patients than in controls who were healthy subjects.<sup>12</sup>

In this case the treatment plan is to optimize education and supportive therapy, because the primary problem that occurs in this patient is a disorder of the mastication muscle. The education provided was to explain that the complaints he suffered were the result of disturbances in the mastication muscles. One of the causes of muscle mastication disorders is the side effect of using metamphetamine for 5 years. Metamphetamine stimulates the nervous system to release a chemical that causes the muscles to contract involuntarily. In addition, bad habits such as chewing and sleeping on one side, frequent chewing gum, clenching while working or being in an emotional state result in hyperactivity of the masticatory mus-

cles. The supportive therapy such as PSR and training to open and close the mouth slowly and warm compresses have been suggested. Decreased blood flow to muscle tissue causes local myalgia, while warm compresses cause vasodilation of muscle tissue which can reduce muscle stiffness and pain. In addition, TENS (transcutaneous electrical nerve stimulation) supportive therapy can be done because this treatment has been carried out by the patient before and has proven to be effective in reducing patient complaints. TENS is used by utilizing electrical activities to reduce pain perception. If the electrical intensity is increased, TENS can cause muscle relaxation.

Education and supportive therapy will be carried out for approximately 1 month after which a re-evaluation will be carried out. If there is no improvement, a stabilization appliance (SA) is made followed by a pre-prosthetic procedure. However, if there is an improvement in the form of mouth opening that has reached normal openings, no tinnitus, no clicking and no pain, then the treatment is continued with pre-prosthetic action without using stabilization appliance. If there is an improvement in the form of mouth opening that has reached normal openings, but tinnitus, clicking, or pain is still complained by the patient when opening the mouth, then a pre-prosthetic treatment is carried out in the form of filling in the maxillary anterior teeth which is then carried out making stabilization appliance. It is not recommended to perform the extraction if the patient still complains of pain during functional movements.

Stabilization appliance is an appliance that can be used to treat muscle pain relief, the use of stabilization appliance has been shown to reduce parafunctional activities accompanied by emotional stress. Patients with a diagnosis of myofascial pain can be treated with stabilization appliance which will help minimize pressure that can damage muscle tissue so that the healing process can occur.<sup>11</sup> In addition, the stabilization appliance is also expected to reduce other complaints of patients such as tinnitus, where the stabilization appliance plays a role in reducing the hyperactivity of the masticatory muscles around the tensor tympani and tensor veli palatine.<sup>12</sup>

It was concluded that the side effects of using methamphetamine that occurred in this case were clenching and meth mouth, which are the etiology of myofascial pain. In addition, other etiologies that contribute to this case are the existence of other bad habits such as chewing and sleeping on one side, frequent chewing gum, clenching while work-

ing or when the patient is in an emotional state, and emotional stress that is being experienced. The chosen treatments are maximizing etiology-related education and supportive care that aim to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analge-

sics to reduce pain that patients often experience. Definitive treatment by making stabilization appliance will be carried out if after 1 month of education and supportive care does patient complaints do not reduce, or if there has been improvement but one of the complaints such as tinnitus, clicking, or pain is still complained.

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