ABSTRACT

Background: Methamphetamine: a highly addictive drug commonly used in South Africa. Users often present with poor oral hygiene, grossly decayed teeth and complain of a dry mouth. The prevalence of dental caries among users is high.

Methods: A cross-sectional study design was used with a convenience sample of 308 self-reported methamphetamine users who were part of an in- or out-patient rehabilitation programme at one of 22 specialised substance addiction treatment centres in the Western Cape.

Results: The majority were in their late twenties, unemployed and not satisfied with the appearance of their teeth. A dry mouth and a bad taste were the most common symptoms reported. More than three quarters reported ‘stiff’ facial muscles and more than half, grinding of their teeth. The most common reason for the last dental visit was toothache and the most common treatment at that visit was dental extraction.

Conclusion: Lower levels of education were associated with increased numbers of extractions and a higher probability of poor oral health. Xerostomia, a bad taste and ‘stiff’ facial muscles were the most common symptoms reported.

Practical Implications: A thorough intra-oral examination together with comprehensive note taking is crucial for the management of patients abusing methamphetamine.

Key words: Methamphetamine, xerostomia, dental caries.

BACKGROUND

The United Nations Office of Drugs and Crimes (UNODC) have estimated that about 33.8 million of the global population aged between 15 – 64 years use amphetamine-type stimulants (ATS).1 In 2011, 71% of all ATS-related seizures occurring globally involved methamphetamine. This is a highly addictive drug, commonly used in South Africa.2 The South African Community Epidemiology on Drug Use (SACEDU) is a sentinel surveillance project active in all nine provinces and is monitoring alcohol and drug use on a six-monthly basis. In the Western Cape, a third of all patients in treatment rehabilitation centres reported using methamphetamine as the primary substance of abuse.3

INTRODUCTION

Methamphetamine can be smoked, swallowed, snorted and injected during drug use. It is a potent central nervous system stimulant.4,5 The South African National HIV Prevalence, Incidence, Behaviour and Communication Survey (NCS) in 2008 reported that the overall number of treatment admissions for methamphetamine-related abuse significantly increased between 1996 and 2005. However, the prevalence of drug abuse in South Africa is low when compared with that of the United States and Australia.6

Methamphetamine is highly addictive, cheap and readily available when compared with other illicit drugs. It causes a combination of adverse physiological, behavioural and...
psychological effects that need to be taken into consider-
lation when treating chronic methamphetamine users.

The general effects of the drug on the user include in-
creased energy levels, a sense of enhanced physical
power, mental alertness, euphoria and mood elevation
which may last for days. An elevated metabolism and in-
creased physical activity often lead to dehydration whilst
the drug also acts as an appetite suppressor.4

Physiological effects
Methamphetamine stimulates the central nervous system
by causing the release of neurotransmitters into the synaptic
cleft. It has a similar chemical structure to that of dopamine
and norepinephrine6,9 and it’s duration of action is usually
8-12 hours but this can extend up to 24 hours if associated
with intoxication.9 In addition, there is an increase in sympa-
thetic activity causing the stimulation of inhibitory alpha-2
receptors and resulting in vasoconstriction of the capillar-
ies of the salivary glands, leading to a reduction of salivary
secretion and consequently a dry mouth.6

Lung disorders, kidney damage, hyperthermia, stroke and
cardiac arrest are some of the consequences that may follow
drug abuse.4 Skin lesions, unexplained motor activity,10 as well
as an anorexic effect are common associated afflictions.4,6

Behavioural effects
Users are often paranoid and display violent or aggressive
behaviour during times of usage4,10 and they neglect their
personal hygiene.4 Methamphetamine users also have a
tendency to consume large amounts of alcohol and ciga-
rettes when compared with non-users.11

Effects on the oral cavity
Methamphetamine users have higher DMFT scores with
significantly more decayed and missing teeth compared
with non-users.11 In most cases, users present with poor
oral hygiene, grossly decayed teeth and complain of a dry
mouth. The destruction of hard tissues can be explained
by an increased intake of sweetened, carbonated drinks
and foods containing high levels of sugar. Unhealthy diet
preferences combined with a chronic dry mouth result in
catastrophic effects on oral health due to the absence of
protective saliva.4,6,7,12

Bruxism during drug use as a result of hyperactive fa-
cial muscles leads to accelerated tooth wear8 and other
muscless such as temporomandibular joint (TMJ) disor-
ders, myofacial pain and trismus.13

The classical caries pattern observed in methamphet-
amine users is referred to as “Meth Mouth” and it affects
the interproximal and buccal smooth surfaces of teeth.
Teeth are often darkly stained and have a crumbling ap-
pearance.4,13 Demineralisation of tooth structure usually
starts at the CEJ since cementum is less resistant than
enamel. Initially the cavities are V-shaped13 at the cervical
area of the teeth and eventually progress to frank coronal
involvement.6

Methamphetamine mouth symptoms
The most common oral symptom experienced by
methamphetamine users is xerostomia.4,6,14 The decreased
salivary secretion is caused by vasoconstriction of the
blood vessels in salivary glands7 and results in an
increased risk for dental caries.15 A dry mouth contributes
further to difficulties in speaking, swallowing, unpleasant
taste sensations and burning mouth symptoms.16 It also
leads to a sore mouth that makes food intake difficult.15 In
addition, xerostomia may contribute to the inflammation of
soft tissues and other fungal infections such as candidiasis,
cheilitis and glossitis.13

Prolonged neglect of oral hygiene causes gross accumu-
lation of plaque which is colonised by acidogenic bacteria that
continue to metabolize the sugar into acids leading to low pH
levels in the mouth.13 The cariogenic properties of soft drinks
can be explained by the high levels of sugar which are bro-
den down by bacteria and cause demineralisation.12 During
periods of high intake of soft drinks and sweet foods, the oral
pH level drops below the critical oral pH point and erosion
deafy of tooth structure usually follows.25

This paper reports on the oral and dental symptoms as well
as the dental treatment needs of methamphetamine users.

MATERIAL AND METHODS
A cross-sectional study design was used with a convenience
sample of 308 self-reported methamphetamine users who
were attending in- or out-patient rehabilitation programmes
at one of 22 specialised substance addiction treatment cen-
tres in the Western Cape. Most of the sites were located in
the City of Cape Town, a health district within the Western
Cape Province. The area is bordered by Atlantis, Worcester,
Helderberg and the Cape Point sub-districts.

Ethical approval was obtained from the Senate Research
Ethics Committee of the University of the Western Cape
on the 23rd of July 2010 (ID number: 10/05/17), the De-
partment of Social Development on the 30th November
2012 (ID number: 9/2/114/3/2/4) and the City of Cape
Town on the 12th of December 2012 (ID number: 10331).
Participation was anonymous and voluntary. After in-
formed consent was obtained, researcher-administered
questionnaires were used to collect oral health status
data. If photographs were taken, a separate consent form
was completed. An oral examination was performed to
measure DMFT and to determine dental needs. The WHO
Oral Health Survey guidelines and criteria for determining
DMFT were used.17 The oral examination was carried out
using a plane mirror and dental curved probe, and no ra-
diographic examinations were performed. All oral exami-
nations and interviews were conducted by the calibrated
principal investigator (inter-examiner = 0.873). Data was
captured on Microsoft Excel 2010® and statistical analysis
was completed using Epi Info™ 7 and R®.

RESULTS
Twenty two substance abuse treatment centres were vis-
ited and 308 participants who were using methamphetamine
were included in the study. The majority (69%) of par-
ticipants were male and almost three quarters (72%) were
unemployed. The mean age was 28 years and half were
aged between 21-25 years. Most of the participants re-
sided in Cape Town. Slightly more than a quarter (27.27%)
reported visiting a dentist in the last six months and about
40% mentioned that their last visit had been in the past
two years (Table 1). The majority (56.17%), however,
recorded that their last dental appointment was more than
a year ago. Eleven patients indicated that they had never
been to a dentist. The most common reason for going to
the dentist was a toothache (67.5%). Other reasons for
attending a dentist were a check-up, chipped teeth or a cleaning. Only 7.58% mentioned that they required fillings and about five per cent had attended for a cleaning or because of chipped teeth. Less common reasons for going to a dentist were for dentures, bad breath or crooked teeth. The least common reasons were to remove wisdom teeth or having loose teeth.

The last dental treatment received was also investigated. The most common treatment received during their last dental visit was a tooth extraction (72.47%). Other procedures such as restorations (fillings) (9.76%) and cleaning (8.71%) were much less common. Only 5.95% indicated that a check-up was the only treatment they received at their last visit (Figure 1). More patients received fillings (9.76%) compared with the proportion that initially visited for fillings (7.58%). Almost double the number who attended for a cleaning (4.33%) actually received a cleaning (8.01%). These contrasts indicated that participants had a skewed perception of their own oral health status.

Almost two thirds (63.31%) were not satisfied with the appearance of their teeth and 73.31% indicated that their teeth had changed since they have started using methamphetamine. More than half (53.57%) of the sample was satisfied with the functioning of their teeth at the time of the interview.

**Oral health symptoms experienced while using methamphetamine**

A dry mouth (93.51%) and a bad taste (91.23%) were the most common symptoms experienced during times of methamphetamine use (Figure 2). Almost three quarter (73.98%) reported stiff facial muscles and more than half (59.74%) were grinding their teeth during usage. There was an association between grinding teeth and stiff facial muscles (p = 0.00024; OR=2.6; 95% CI: 1.54 – 4.36). Those who experienced grinding were 2.6 times more likely to experience stiff facial muscles compared to those who were not grinding their teeth.

The majority (93.52%) indicated that the duration from the time they started using methamphetamine until they experienced a dry mouth was less than an hour (Figure 3). Almost a third reported that their mouth was dry within five minutes. Some participants reported that a dry mouth was an indication that they had reached the point of “being high”.

The duration of time that occurred for the mouth to return to ‘normal’ was also determined and three quarters...
of the respondents indicated that recovery of the mouth required between one and 24 hours after the last usage of methamphetamine (Table 3). About 15% indicated that their mouth remained dry for more than a day.

Perception on aesthetic appearance and functionality of teeth

The majority (82.74%) of the participants indicated that their teeth had changed in some way since the start of their drug addiction. Nearly a third (30.80%) reported that their teeth had ‘broken down’ and 17.54% said: “their teeth had become rotten”. A few users reported that their teeth had become ‘weaker’ (3.79%) or/and chipped (3.79%). Almost a third (29.38%) reported a change in tooth colour. Actual discolouration of teeth was reported by slightly more than a quarter (26.83%), two thirds of whom (67.44%) considered that their teeth had stained yellow and 13.95% identified a brown discolouration. Other colours of discolouration which were less common were black, blue, off-white and white spots.

Dental treatment required after clinical examination

The most common dental treatment required was dental extractions. One fifth of the sample required at least one extraction while 13% required at least two. The mean number of extractions required per user was two teeth. One participant, who had been using methamphetamine for 13 years, had multiple severely carious teeth. He required 19 extractions.

The highest levels of education received by participants were categorised into primary school, high school and tertiary institution. Those who attended tertiary education were associated with the least number of required extractions (p = 0.003). The number of extractions that were required for the different education groups was significantly different (p = 0.005517). Figure 4 is a plot of the data fitted the line of regression (R² = 0.9987).

DISCUSSION

The demographic information of participants reflected similar results reported by SACENDU for 2013 in that the majority of users are male and in the age group 25-29 years.

A dry mouth makes speaking, swallowing and eating very difficult and results in users consuming large amounts of carbonated sugary drinks to quench their thirst. A dry mouth was the most common symptom experienced by users and this concurs with the literature.6,14,18 The most likely cause of a dry mouth is the activation of alpha-adrenergic receptors which lead to vasoconstriction of the vasculature of salivary glands and a decreased saliva secretion.19 Other contributing factors can be an increased metabolism and physical activity.4,6

There is strong documented evidence to support the association between saliva and the risk for dental caries due to a decreased buffering effect.20 Users often present with high caries experience and excessive tooth wear that worsened with the increasing duration of addiction. The severe destruction of dentine and enamel can be explained by a chronic dry mouth, constant grinding of teeth and an increased consumption of sweetened, carbonated soft drinks, snacks containing high levels of sugar and a poor appetite.21

A dry mouth and a bad taste were the most common symptoms and, together with other symptoms such as the grinding of teeth, this finding is consistent with other studies reported in the literature.6,22 It was interesting to note that participants regarded a dry mouth as an indication of having reached a “high”. Most users reported that the time that elapsed from the last use of the drug until experiencing a ‘normal’ mouth was about 24 hours.23

The classical “meth mouth” caries pattern on buccal smooth surfaces and interproximal areas of anterior teeth can be explained by the chronic dry mouth.24,25 This caries pattern is similar to that described in Sjogren’s syndrome26 and irregular periods of oral hygiene are common among methamphetamine users.14

Lower levels of education were associated with increased numbers of extractions and a higher probability of poor oral health.

Users often presented for dental care with advanced stages of tooth decay and severe dental pain. This was the reason that extractions were the most common treatment provided. Complex restorative and surgical management was mostly required to ensure complete oral rehabilitation after prolonged periods of substance abuse.

Methamphetamine users are difficult to manage, the challenge being how to reduce the consumption of carbonated drinks and high sugar diet. Furthermore, users often have financial constraints making it difficult to afford the complex dental treatment that may be required.12,26 Patients are notoriously non-compliant, resulting in frustration with failure to keep follow-up visits planned for rehabilitative
treatment, oral health promotion and education initiatives. Psychosis and paranoia are adverse effects of chronic methamphetamine abuse that can last for years even after the drug abuse habit has been overcome.27

Although dental pain was not always prominent during times of methamphetamine usage, participants did indicate they often had episodes of tooth ache during abstinence. Very severe pain resulted in a relapse to drug dependence when the patient used methamphetamine to bring pain relief.

CONCLUSION

Methamphetamine abuse remains a serious public health problem in South Africa and in the rest of the world. It causes numerous dental problems and reduces the oral health quality of life. Dental caries is very common among users but in many cases the seeking of dental treatment is delayed for a year or even longer due to a number of reasons. Xerostomia and other symptoms such as a bad taste, grinding of teeth and stiff facial muscles are the most common symptoms experienced. A chronic dry mouth combined with high-sugar and carbonated drinks intake causes rampant caries that has a classical pattern known as “Meth Mouth”.

A dental extraction is still the most common treatment option for methamphetamine users. However, consideration should be given to a more preventive approach that includes oral health instructions, education on good dietary and brushing habits while users are in treatment programmes. It is recommended that there should be more public awareness of the deleterious effects of sugar and carbonated sugar-sweetened drinks and the destructive nature of methamphetamine abuse on oral health. A thorough intra-oral examination together with comprehensive record keeping is crucial when attending to dental patients who are methamphetamine users. The likelihood of detecting a patient with a drug addiction habit will be increased if dentists are better informed on the signs and symptoms of substance abuse. The rationale for increased professional and public awareness will lead to early detection which will facilitate appropriate management.

References