



Evaluation of methamphetamine-associated socioeconomic status and addictive behaviors, and their impact on oral health



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HIGHLIGHTS

- MA abuse is connected with a higher risk for intraoral health damaging.
- We found lower socioeconomic status in MA abusers compared with non-abusers.
- MA abuse is strongly associated with the consumption of other addictive substances.
- We detected an absence of dental care among chronic MA abusers.

ARTICLE INFO

Article history:

Received 14 January 2015

Received in revised form 12 April 2015

Accepted 16 June 2015

Available online 26 June 2015

Keywords:

Methamphetamine
Socioeconomic status
Consumption behavior
Dental care
Oral health

ABSTRACT

Background: Chronic methamphetamine abuse can lead to multiple health hazards. In particular, the substance is associated with devastating effects on oral health including symptoms such as rampant caries, gingiva inflammation, and xerostomia, whereby the term “Meth Mouth” occurs in the current literature. However, “Meth Mouth” pathology is primarily described on the basis of individual cases or has been evaluated without consideration of the mass of potential influencing factors. Therefore, we have conducted a systematic study to investigate the effects of accompanying factors and circumstances on oral health in cases of chronic methamphetamine abuse. **Methods:** In cooperation with two centers for addiction medicine, we assessed the data of 100 chronic methamphetamine users and 100 matched-pair controls between March 2012 and November 2013. We investigated their socioeconomic status, details of methamphetamine consumption behavior, collateral consumption of sugar beverages, nicotine alcohol, and other addictive substances including cannabis, opioids, other stimulants, and hallucinogens, and dental care. **Results:** We found considerably greater unstable social circumstances, a high collateral consumption of substances with pathogenic potential for the stomatognathic system, and significantly poorer dental care in the methamphetamine-user group. **Conclusions:** Various factors have to be considered with regard to methamphetamine use and its influence on oral health. These factors can trigger potential damage by the drug methamphetamine possibly leading to the symptoms of “Meth Mouth”, and should be considered in prevention and therapy strategies.

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1. Introduction

1.1. The prevalence of the substance methamphetamine

The highly-addictive substance methamphetamine is a widespread and serious problem in many countries (Turkyilmaz, 2010). Currently, the prevalence of methamphetamine abuse is estimated at 10 million

people in the United States and 35 million people worldwide (Talloczy et al., 2008). Methamphetamine is illegally traded and widely abused under the scene name “crystal” or “crystal methamphetamine”. Particularly in Europe, the abuse of crystal methamphetamine is rapidly spreading. The police seized 3198.41 g crystal methamphetamine in German border areas to the Czech Republic within the year 2012; this represents an increase of almost 200% in a two-year comparison with 2010 (Police Crime Statistics for Upper Franconia, 2013). Furthermore, in the UK, the abuse of methamphetamine is currently on a large rise in London's Gay Scene and, consequently, puts men at a higher risk of infections (Kirby & Thornber-Dunwell, 2013).

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1.2. Consequences of chronic methamphetamine abuse

The chronic use of methamphetamine involves a wide range of potential health hazards including massive weight loss, chronic skin irritations, cardiovascular diseases, structural brain damage, paranoia, or depression (Hamamoto & Rhodus, 2009). Recently, however, the severe consequences of chronic methamphetamine abuse has been described and, in particular, those on the stomatognathic system, which consists of the mouth, teeth, intraoral tissue, and jaws (Curtis, 2006; Donaldson & Goodchild, 2006; Hamamoto & Rhodus, 2009). The term “Meth Mouth” first appeared in the professional literature in 2005 based on findings in the United States (Rhodus & Little, 2005). From that moment to the present date, many authors have drawn attention to the probability of “Meth Mouth” occurrence after chronic methamphetamine abuse (Ravenel et al., 2012; Shaner, Kimmes, Saini, & Edwards, 2006; Turkyilmaz, 2010) including symptoms of rampant caries (Hamamoto & Rhodus, 2009) and extensive gingiva inflammation and parodontitis (Rhodus & Little, 2008; Tipton, Legan, & Dabbous, 2010). These symptoms lead to further health consequences if they are not treated timely and adequately. Progressive caries and oral tissue inflammation can result in massive pain and in complete tooth loss, both of which will influence nutrition behavior significantly. Especially in cases of chronic methamphetamine abuse, this is alarming. Sympathomimetic effects of the drug cause appetite suppression, sleep deprivation, and sensations of intense energy that lead to weight loss (Padilla & Ritter, 2008; Vearrier, Greenberg, Miller, Okaneku, & Haggerty, 2012). In combination with the severe consequences on oral health described above, weight loss will be triggered significantly with life-threatening potential. Furthermore, chronic and progressive caries lesions and inflammation of the oral tissue can spread into other regions of the body and result in dangerous infections such as endocarditis (Verhaaren et al., 1989) or osteomyelitis of the jaws (Ramesh & Ganguly, 2011). At the very least, severe oral conditions are often associated with prejudice and make the social rehabilitation process more difficult for the ex-abuser.

1.3. Potential causes of the “Meth Mouth” phenomenon

Various hypotheses for the “Meth Mouth” phenomenon and its symptoms have been suggested. The pharmacologic effects of the drug seem to be one explanation. Methamphetamine blocks the re-uptake of norepinephrine and dopamine and subsequently stimulates the sympathetic nervous system (Donaldson & Goodchild, 2006; Hamamoto & Rhodus, 2009). With regard to the oral region, the consequences are dry mouth (Donaldson & Goodchild, 2006) or extensive grinding of the teeth (Curtis, 2006). Dry mouth is associated with the loss of important protective properties of saliva such as the neutralization of plaque-induced acids and the remineralization of dental enamel, and therefore, dry mouth substantially increases the risk of caries (Fox, 2008). A massive decline of saliva production is considered to play a crucial role in methamphetamine-associated tooth decay (Shaner et al., 2006). In this context, the intake of high-sugar beverages is also considered to be responsible for the excessive tooth wear in methamphetamine abusers (Rhodus & Little, 2005). However, no systematic study designs exist determining whether methamphetamine abusers drink more high-sugar beverages than non-abusers. Additionally, we do not know whether other potential influencing factors on oral health, such as social status or the co-consumption of nicotine, alcohol, or other addictive substances, contribute to these described oral health hazards in a methamphetamine abuser. A lack of dental care and the non-recognition of the oral health damage might also play a significant role in “Meth Mouth” and have not as yet been evaluated in cases of chronic methamphetamine abuse. Nevertheless, differences in the pathogenic potential of the substance have been described as being dependent on the individual form of methamphetamine consumed (Rawson, Gonzales, Marinelli-Casey, & Ang, 2007).

Therefore, the aim of the study has been to evaluate these various possible influencing factors on oral health in cases of chronic methamphetamine abuse. First, the social status of a typical methamphetamine abuser should be considered. Second, the addictive behavior with respect to the substance methamphetamine, high-sugar beverages, other addictive substances, nicotine, and alcohol should be investigated. Third, the dental care of a typical methamphetamine abuser should be screened. Subsequently, an evaluation should be made as to whether these factors contribute to the “Meth Mouth” phenomenon. To gain an indication of whether a “Meth Mouth” syndrome even exists, we have questioned methamphetamine abusers about oral conspicuities from start of their methamphetamine abuse and requested that abusers should assess their current oral health status. The “Meth Mouth” has primarily been evaluated on the basis of individual case reports, with a lack of conclusive relationships being shown between chronic methamphetamine abuse and oral diseases. Systematic study designs in this field are rare, not least because of the difficult access to a large number of methamphetamine abusers. We have established a collaboration between specialty institutions for addiction medicine and oral medicine in order to conduct a systematic and extensive questionnaire and patient interview including a sufficient number of methamphetamine participants. Furthermore, for optimal comparability of data, we have recruited a matched-pair control participant for each methamphetamine abuser and carried out the complete data analysis in cooperation with a university statistical institute.

2. Methods

The study collaboration consisted of the two specialty clinics for addiction medicine in Bayreuth, Germany and Hochstadt/Main, Germany, the Department of Oral and Maxillofacial Surgery of the Munich University of Technology, Germany and the Institute for Medical Biometry, Epidemiology and Medical Informatics of the University of Saarland, Germany.

2.1. Participants

In order to attain sufficient statistical power and to be able to present data directly in percent, 200 participants consisting of 100 methamphetamine abusers and 100 matched-pair non-users were selected and examined between March 2012 and November 2013. The selection and data acquisition of the methamphetamine abusers took place at the addiction clinics, with the individuals in separate rooms in a quiet atmosphere. First, the executive psychotherapist in each addiction clinic checked the eligibility criteria for this study for the methamphetamine group in a short patient interview. The criteria included constant methamphetamine abuse of 1 g/week for more than a minimum period of 12 months without any withdrawal periods. Additionally, a potential participant had to have reached the 18th year of age, and each methamphetamine abuser was informed that study participation would be absolutely voluntary. If a methamphetamine abuser did not fulfill the eligibility criteria or did not consent to study participation, then he or she was selected out by the executive psychotherapist. All methamphetamine abusers who fulfilled all eligibility criteria and gave written consent to study participation received a detailed questionnaire including three different sections (see 2.2. Data collection); this questionnaire was filled out by the participant. Subsequently, a personal conversation between the methamphetamine abuser, a physician, and a psychotherapist was conducted in order to clarify any existing ambiguities in the questions. The complete data collection including selection, the question and answer section, and the personal conversation took 100 min, on average. The average age of the participants was 29.5 years ($SD \pm 7.0$) with a gender distribution of 17 females and 83 males. For the control group, we defined the matched-pair criteria of gender and age (± 1 a) and recruited its participants from resident patients at the University Hospital in Munich and from patients of two residential

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