

Narghile smoking and its adverse health consequences: a literature review

N. S. Dar-Odeh¹ and O. A. Abu-Hammad²

VERIFIABLE CPD PAPER

IN BRIEF

- Allows readers to appreciate the widespread use of narghile in different communities.
- Provides evidence that narghile use has adverse effects on oral health such as periodontal bone loss and dry socket.
- Emphasises the need for further research on the effect of narghile use on the oral cavity.

PRACTICE

Oral squamous cell carcinoma (OSCC) is a world health problem with approximately 50% of patients having a 5-year survival rate. A change in the demographics of the disease is now being recognised, particularly in Europe, where it is increasingly being seen in young males. While a variety of risk factors are important in OSCC, it is tobacco that plays a central part in the pathogenesis of the disease. Narghile is an old form of tobacco use but in the past decade, there has been a resurgence in this form of smoking. The practice is particularly common in young males and females from the Middle East but with the advent of immigration and globalisation, its use is becoming more widespread. It is now not uncommon to see narghile smoking in western countries such as the UK and USA. Studies describing the oral effects of narghile are unfortunately scarce. While adverse effects such as periodontal bone loss and dry socket have been described, its association with OSCC cannot be excluded. Variation in the type of narghile, the type of tobacco and the presence of co-factors such as cigarette smoking may all influence clinical outcome. In the present study, the practice of narghile smoking is reviewed in terms of its effect on health, particularly oral health. The association of narghile smoking and adverse effects on the orofacial region will be outlined, namely, periodontal disease, potentially malignant lesions and oral cancer.

INTRODUCTION

Although cigarettes are the most common type of tobacco smoking worldwide, the centuries-old habit of narghile use has witnessed a resurrection not only in the Middle East, but also in other culturally-different parts of the world. There exist different types of narghile pipes with variation in material, size and shape. In the main, narghile pipes consist of a body, a bowl and a tube (Fig. 1). The body is made of glass or steel, is shaped like a decanter and is filled with water. The bowl is positioned within the body and is the site where tobacco is placed before being covered with a conical cap to protect the flame from extinction when smoked in an open space. The tube, being one or several, conveys the tobacco smoke from the

bowl to the mouth.¹ To smoke the narghile, tumbac (moistened raw tobacco) is covered with burning charcoal and placed on a tray on top of the pipe which, in turn, is connected to a glass bottle of water.² On sucking, tobacco is drawn through the water and into the oral cavity either to be inhaled or blown away. More recent variations on this theme include the use of tobacco flavoured with molasses. This mixture is called tobamel (tobacco plus 'mel' for 'honey' in Latin) or mu'essel ('honeyed', in Arabic).³

A number of synonyms have been used to describe narghile including water pipe, hookah, shisha, hubble bubble, argileh, sheesha, nargila, nargileh, mada'a and goza. In the present review, we shall refer only to the word narghile.

Narghile smoking has been practised for many centuries in Asia and Africa and the habit remains extremely popular today. The practice has a particularly high prevalence in the Middle East and some would argue that it has reached epidemic proportions.⁴⁻⁷

Interestingly, narghile smoking in the Middle East is more prevalent than cigarettes in both males and females,⁸ and it is



Fig. 1 A typical narghile pipe

thought that it may either precede the use of cigarettes, or be a substitute for cigarettes, because of cost savings.⁹ The habit appears to be common in females because they are currently being targeted as potential narghile users with advertising that emphasises the benefits of independence,

¹Associate Professor in Oral Medicine, Department of Oral Surgery, Oral Medicine and Periodontics, Faculty of Dentistry, University of Jordan; ²Professor in Prosthodontics, Head of Department of Prosthetic Dentistry, Faculty of Dentistry, University of Jordan
*Correspondence to: Najla Saeed Dar-Odeh
Email: najla_dar_odeh@yahoo.com

Refereed Paper

Accepted 1 May 2009

DOI: 10.1038/sj.bdj.2009.475

©British Dental Journal 2009; 206: 571-573

stylishness, weight control, sophistication and power.⁵ In recent years, however, narghile smoking has become more common in western countries such as the UK and USA,^{7,9-16} a trend that most probably reflects the influx of immigrants to these countries together with globalisation.

ADVERSE HEALTH EFFECTS

Narghile smoking has a variety of adverse health effects. Aldehyde compounds found in narghile smoke are known to be toxic, carcinogenic and hazardous.¹⁷ By contrast to cigarette smoking, one session of narghile smoking is thought to release greater amounts of formaldehyde, acetaldehyde, acrolein propionaldehyde and methacrolein.¹⁷

Systemically, narghile smoking is associated with decreased pulmonary function leading to increased risk of chronic obstructive airway disease.^{18,19} Further, there have been reports of an association with certain types of cancer including bronchogenic carcinoma,²⁰ oesophageal carcinoma,²¹ bladder cancer²² and pancreatic cancer.²³

Significantly few studies have reported the effects of narghile smoking in the oral cavity.²⁴ The habit is known to promote periodontal bone loss,²⁵ and increase the possibility of acute osteitis (dry socket) after exodontias.^{26,27} Interestingly, no studies have reported an association between narghile smoking and oral candidiasis despite there being a positive correlation between tobacco smoking in general and increased oral carriage of *Candida* species.²⁸⁻³¹ The association between narghile smoking and oral leukoplakia is tenuous at best and where it has been reported, there are obvious co-factors such as cigarette smoking and betel quid chewing that are present.³²

NARGHILE AND ORAL CANCER

Oral squamous cell carcinoma (OSCC) is a world health problem and accounts for some 250,000 new cases each year worldwide, with the Indian subcontinent accounting for one third of the global burden. The 5-year survival for patients with OSCC is approximately 50% - a statistic that has changed little over the past 40 years.³³ Primarily, the disease occurs in males in their sixth and seventh decades,³⁴ but the demographics are changing, particularly in

Europe, such that it is increasingly common in a younger cohort of patients.³⁵⁻³⁸ Between 1990 and 1999, the incidence of OSCC increased in males of all ages from 6.5 to 8.3 per 100,000 and in females from 2.6 to 3.6 per 100,000.³⁹ Current thinking suggests that the increase in incidence of OSCC reflects changes in the pattern of exposure to certain risk factors.

OSCC is associated with many risk factors including tobacco and alcohol use, viral and candidal infections, immune suppression, genetic susceptibility, occupational hazards, dental health, diet and socioeconomic status.⁴⁰ Primarily, however, the disease is associated with tobacco and alcohol,^{40,41} which act together in a synergistic way.⁴²

Tobacco use occurs in many different forms. Smoking is the most common method of tobacco intake and occurs via the use of cigarettes, cigars, pipes, kreteks, bidis, and narghile. The habit of pipe smoking is becoming less common,⁴³ but cigar smoking is increasingly popular and it is cautionary to note that cigars contain significantly higher concentrations of toxic and carcinogenic compounds than cigarettes.⁴⁴ Bidis are small, brown, hand-rolled tobacco cigarettes rolled in tendu or temburni leaves and usually tied with a string at one end; they are primarily used in India and South East Asia.⁴³ Kreteks are cigarettes with a blend of tobacco and cloves/oil of cloves; they contain approximately 60% tobacco and 40% ground clove buds and have a distinctive scent.^{43,45}

The risks of smoking tobacco, however, are significantly compounded by 'reverse' smoking whereby the lighted end of a cigarette is placed within the oral cavity, a habit that is popular in South America.⁴⁰

Smokeless tobacco (ST) refers to tobacco that is typically consumed orally but is not burned and includes chewing cut tobacco leaves, betel quids (tobacco, areca nut, lime and spices wrapped in the leaf of the betel vine), snus and snuff (moist ground tobacco).⁴³

Non-combusted tobacco products are thought to carry lower disease risks compared with combusted tobacco products,⁴⁶ but this is obviously dependent on the level of tobacco intake and the presence of other risk factors. Invariably, chewing tobacco leads to OSCC at the site where the tobacco is in contact with the oral mucosa (buccal

and buccal mucosa) and contrasts with OSCC in smokers which is predominantly localised to the floor of the mouth, lateral border of the tongue and lingual aspect of the lower alveolus. A few cases of OSCC have been reported in users of narghile.⁴⁷ It is thought that the development of oral cancers in narghile smokers is attributed to exposure to carcinogenic chemicals (described above), mechanical trauma (irritation by the bamboo or plastic tubes used in the mouth piece), the heat generated from the smoke and chronic infection that would be associated with the use of one narghile by several individuals.⁴⁷ The link between narghile smoking and OSCC is interesting because there is a popular belief that the filtration of the tobacco smoke through water removes potential carcinogens. However, while water filtration removes water soluble aldehydes, it has little or no effect in removing the water insoluble constituents of tar. Current data show that there are greater concentrations of tar and its constituents in narghile smoke than cigarette smoke.^{48,49} Recent studies have shown that as little as three narghile smoking sessions exposes individuals to large quantities of carcinogenic polycyclic aromatic hydrocarbons,⁵⁰ and a single narghile smoking session is equivalent to the formaldehyde released from 17 cigarettes and acetaldehyde from five cigarettes.¹⁷ Furthermore, narghile smokers appear to have a greater lifetime exposure to tobacco than ordinary smokers; for example, in Iran the average age to start cigarette smoking compared to narghile smoking is 14.5 ± 2.4 years versus 11.2 ± 1.5 years, respectively.⁵¹

CONCLUSION

In this review, we describe the adverse effects of narghile smoking. This is a growing habit particularly in the Middle East and is likely to have adverse consequences to western countries. Unfortunately, neither the oral side effects of the habit or the relationship of the practice to OSCC are well documented and warrant further study. We suggest that both medical and dental personnel should be alerted as to the potential dangers of the habit and appropriate preventative measures are introduced at government level to limit the consequences of this practice.

The authors are grateful to Professor S. S. Prime, University of Bristol, for critical review of the manuscript.

- Wolfram R M, Chehne F, Oguogho A, Sinzinger H. Narghile (water pipe) smoking influences platelet function and (iso-)Jeicosanoids. *Life Sci* 2003; **74**: 47–53.
- Tamim H, Musharrafieh U, El Roueihb Z, Yunis K, Almawi W. Exposure of children to environmental tobacco smoke (ETS) and its association with respiratory ailments. *J Asthma* 2003; **40**: 571–576.
- Chaouachi K T. Qat chewing and water pipe (mada'a) smoking in Yemen: a necessary clarification when studying health effects on oral mucosa. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; **104**: 731–733.
- Shihadeh A, Saleh R. Polycyclic aromatic hydrocarbons, carbon monoxide, 'tar', and nicotine in the mainstream smoke aerosol of the narghile water pipe. *Food Chem Toxicol* 2005; **43**: 655–661.
- Mokdad A H, Warren C W. As if cigarettes were not enough, here comes the narghile. A commentary on an article by Yunis *et al.* In *IJPH* 52/4. *Int J Public Health* 2007; **52**: 263–264.
- Labib N, Radwan G, Mikhail N, Mohamed M K *et al.* Comparison of cigarette and water pipe smoking among female university students in Egypt. *Nicotine Tob Res* 2007; **9**: 591–596.
- Baker O G, Rice V. Predictors of narghile (water-pipe) smoking in a sample of American Arab Yemeni adolescents. *J Transcult Nurs* 2008; **19**: 24–32.
- Moh'd Al-Mulla A, Abdou Helmy S, Al-Lawati J, Al Nasser S *et al.* Prevalence of tobacco use among students aged 13–15 years in health ministers' council/gulf cooperation council member states, 2001–2004. *J Sch Health* 2008; **78**: 337–343.
- Jamil H, Templin T, Fakhouri M, Rice V H *et al.* Comparison of personal characteristics, tobacco use, and health states in Chaldean, Arab American, and non-Middle Eastern white adults. *J Immigr Minor Health* 2008; Mar 3 [Epub ahead of print].
- Rice V H, Weglicki L S, Templin T, Hammad A, Jamil H, Kulwicki A. Predictors of Arab-American adolescent tobacco use. *Merrill Palmer Q* 2006; **52**: 327–342.
- Gatead R, Gatead A, Sheikh A. Hookah smoking. *Br Med J* 2007; **335**: 20.
- Weglicki L S, Templin T, Hammad A, Abou-Medienne S *et al.* Health issues in the Arab American community. Tobacco use patterns among high school students: do Arab American youth differ? *Ethn Dis* 2007; **17**: S3–22–S3–24.
- Grekin E R, Ayna D. Argileh use among college students in the United States: an emerging trend. *J Stud Alcohol Drugs* 2008; **69**: 472–475.
- Lyon L. The hazard in hookah smoke. Water pipes seem safer than cigarettes—but may be worse. *US News World Rep* 2008; **144**: 60–61.
- Jackson D, Aveyard P. Waterpipe smoking in students: prevalence, risk factors, symptoms of addiction, and smoke intake. Evidence from one British university. *BMC Public Health* 2008; **22**: 174.
- Prignon J J, Sasco A J, Poulet E, Gupta P C, Aditama T Y. Alternative forms of tobacco use. *Int J Tuberc Lung Dis* 2008; **12**: 718–727.
- Al Rashidi M, Shihadeh A, Saliba N A. Volatile aldehydes in the mainstream smoke of the narghile waterpipe. *Food Chem Toxicol* 2008; **46**: 3546–3549.
- Al-Fayez S F, Salleh M, Ardawi M, Zahran F M. Effects of sheesha and cigarette smoking on pulmonary function of Saudi males and females. *Trop Geogr Med* 1988; **40**: 115–123.
- Zahran F, Yousef A A, Baig M H. A study of carboxyhaemoglobin levels of cigarette and sheesha smokers in Saudi Arabia. *Am J Public Health* 1982; **72**: 722–724.
- Nafea A, Misra S P, Dhar S N, Shah S N. Bronchogenic carcinoma in Kashmir valley. *Indian J Chest Dis* 1973; **15**: 285–295.
- Gunaid A A, Sumairi A A, Shidrawi R G, al-Hanaki A *et al.* Oesophageal and gastric carcinoma in the Republic of Yemen. *Br J Cancer* 1995; **71**: 409–410.
- Bedwani R, el-Khwsy F, Renganathan E, Braga C, Abu Seif H H. Epidemiology of bladder cancer in Alexandria, Egypt: tobacco smoking. *Int J Cancer* 1997; **73**: 64–67.
- Lo A C, Soliman A S, El-Ghawalby N, Abdel-Wahab M, Fathy O. Lifestyle, occupational, and reproductive factors in relation to pancreatic cancer risk. *Pancreas* 2007; **35**: 120–129.
- Ali A A. Histopathologic changes in oral mucosa of Yemenis addicted to water-pipe and cigarette smoking in addition to takheen al-qat. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; **103**: e55–59.
- Natto S, Baljoun M, Bergström J. Tobacco smoking and periodontal bone height in a Saudi Arabian population. *J Clin Periodontol* 2005; **32**: 1000–1006.
- Al-Belasy F A. The relationship of 'shisha' (water pipe) smoking to postextraction dry socket. *J Oral Maxillofac Surg* 2004; **62**: 10–14.
- Tomar S. Smoking 'shisha' (water pipe) or cigarettes may increase the risk for dry socket following extraction of mandibular third molars. *J Evid Based Dent Pract* 2005; **5**: 47–49.
- Arendorf T M, Walker D M. The prevalence and intra-oral distribution of *Candida albicans* in man. *Arch Oral Biol* 1980; **25**: 1–10.
- Arendorf T M, Walker D M, Kingdom R J, Roll J R, Newcombe R G. Tobacco smoking and denture wearing in oral candidal leukoplakia. *Br Dent J* 1983; **19**: 340–343.
- Fongsmut T, Deerochanawong C, Prachyabrued W. Intraoral *Candida* in Thai diabetes patients. *J Med Assoc Thai* 1998; **81**: 449–453.
- Shin E S, Chung S C, Kim Y K, Lee S W, Kho H S. The relationship between oral *Candida* carriage and the secretor status of blood group antigens in saliva. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; **96**: 48–53.
- Pindborg J J, Zheng K H, Kong C R, Lin F X. Pilot survey of oral mucosa in areca (betel) nut chewers on Hainan Island of the People's Republic of China. *Community Dent Oral Epidemiol* 1984; **12**: 195–196.
- Tilstone C. Dentists: a crucial part to play in oral cancer. *Lancet Oncol* 2007; **8**: 575.
- Warnakulasuriya S, Mak V, Möller H. Oral cancer survival in young people in South East England. *Oral Oncol* 2007; **43**: 982–986.
- Atula S, Grénman R, Laippala P, Syrjänen S. Cancer of the tongue in patients younger than 40 years. A distinct entity? *Arch Otolaryngol Head Neck Surg* 1996; **122**: 1313–1319.
- Mackenzie J, Ah-See K, Thakker N, Sloan P, Maran A G *et al.* Increasing incidence of oral cancer among young persons: what is the aetiology? *Oral Oncol* 2000; **36**: 387–389.
- Llewellyn C D, Johnson N W, Warnakulasuriya K A. Risk factors for squamous cell carcinoma of the oral cavity in young people – a comprehensive literature review. *Oral Oncol* 2001; **37**: 401–418.
- Llewellyn C D, Johnson N W, Warnakulasuriya K A. Risk factors for oral cancer in newly diagnosed patients aged 45 years and younger: a case-control study in Southern England. *J Oral Pathol Med* 2004; **33**: 525–532.
- Conway D I, Stockton D L, Warnakulasuriya K A, Ogden G, Macpherson L M. Incidence of oral and oropharyngeal cancer in United Kingdom (1990–1999) – recent trends and regional variation. *Oral Oncol* 2006; **42**: 586–592.
- McDowell J D. An overview of epidemiology and common risk factors for oral squamous cell carcinoma. *Otolaryngol Clin North Am* 2006; **39**: 277–294.
- Kingsley K, O'Malley S, Ditmyer M, Chino M. Analysis of oral cancer epidemiology in the US reveals state-specific trends: implications for oral cancer prevention. *BMC Public Health* 2008; **8**: 87.
- Ko Y C, Huang Y L, Lee C H, Chen M J, Lin L M *et al.* Betel quid chewing, cigarette smoking and alcohol consumption related to oral cancer in Taiwan. *J Oral Pathol Med* 1995; **24**: 450–453.
- Vander Weg M W, Peterson A L, Ebbert J O, Debon M, Klesges R C *et al.* Prevalence of alternative forms of tobacco use in a population of young adult military recruits. *Addict Behav* 2008; **33**: 69–82.
- Baker F, Ainsworth S R, Dye J T, Crammer C, Thun M J *et al.* Health risks associated with cigar smoking. *J Am Med Assoc* 2000; **284**: 735–740.
- Lawrence S, Collin J. Competing with kreteks: transnational tobacco companies, globalisation, and Indonesia. *Tob Control* 2004; **13**: ii96–103.
- O'Connor R J, McNeill A, Borland R, Hammond D, King B *et al.* Smokers' beliefs about the relative safety of other tobacco products: findings from the ITC collaboration. *Nicotine Tob Res* 2007; **9**: 1033–1042.
- El-Hakim I E, Uthman M A. Squamous cell carcinoma and keratoacanthoma of the lower lip associated with 'Goza' and 'Shisha' smoking. *Int J Dermatol* 1999; **38**: 108–110.
- Shihadeh A. Investigation of mainstream smoke aerosol of the argileh water pipe. *Food Chem Toxicol* 2003; **41**: 143–152.
- Chaaya M, El Roueihb Z, Chemaitelly H, El Azar G, Nasr J *et al.* Argileh smoking among university students: a new tobacco epidemic. *Nicotine Tob Res* 2004; **6**: 457–463.
- Sepetdjian E, Shihadeh A, Saliba N A. Measurement of 16 polycyclic aromatic hydrocarbons in narghile waterpipe tobacco smoke. *Food Chem Toxicol* 2008; **46**: 1582–1590.
- Kelishadi R, Mokhtari M R, Tavasoli A A, Khosravi A, Ahangar-Nazari I *et al.* Determinants of tobacco use among youths in Isfahan, Iran. *Int J Public Health* 2007; **52**: 173–179.

Useful websites

www.oralcancerfoundation.org/news/news.asp?offset=1350
www.innovatorsawards.org/media/file/WHO%20Tobacco%20deadly%20in%20any%20form%20or%20disguise.pdf
www.rdhmag.com/display_article/318,082/56/none/none/Feat/Smoking-the-Hookah