

## Effect of Alcoholism on Oral Health: A Review

Mahesh R Khairnar<sup>\*</sup>, Umesh Wadgave and Sonam M Khairnar

Department of Public Health Dentistry, Bharati Vidyapeeth Deemed University Dental College and Hospital, Sangli, India

**Corresponding author:** Mahesh R Khairnar, Department of Public Health Dentistry, Bharati Vidyapeeth Deemed University Dental College and Hospital, Sangli, India, Tel: +91-7045653288; Email: kmahesh222@gmail.com

**Received date:** April 26, 2017; **Accepted date:** May 09, 2017; **Published date:** May 12, 2017

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### Abstract

In many parts of the world, consuming alcohol is a common feature of social meetings. However, the drinking alcohol is associated with a risk of adverse health and social effects related to its intoxicating, toxic and dependence-producing properties. In addition to the chronic diseases that may develop in those who drink large quantity of alcohol over a number of years, alcohol use also results in development of various dental diseases. Alcohol may adversely affect salivary glands which in turn may lead to tooth decay. Alcohol can cause irritation and inflammation of oral soft tissues including gingiva, tongue, etc. Non-carious destructions of teeth like dental erosion are also related to regular alcohol drinking. Hence, a review has been attempted regarding effect of alcohol on oral health.

**Keywords:** Alcoholism; Dental caries; Oral health; Tooth erosion

### Introduction

Alcoholism has been defined by World Health Organization as “a term of long-standing use and variable meaning, generally taken to refer to chronic continual drinking or periodic consumption of alcohol which is characterized by impaired control over drinking, frequent episodes of intoxication, and preoccupation with alcohol and the use of alcohol despite adverse consequences” [1]. The consequences faced may be physical, psychological, social or economic. An alcoholic is an individual who is obsessed with alcohol and cannot control how much he/she consumes. An alcoholic consumes alcohol for a longer period of time which leads to development of addiction. This addiction can lead to development of behavioral disorders and may have detrimental effect on mental and physical health. Alcoholism can be both a habitual (psychological) and a chemical (physical) addiction. Psychological addicts drink to aid themselves to overcome routine problems; particularly sufferings of life. Psychological dependence is drinking in order to function “normally” and feel good. While physical alcoholics are those who feel metabolic conditioned desires for alcohol which drives them daily towards alcohol. As in drug addicts, alcoholics also suffer from recognizable withdrawal symptoms.

Alcohol addiction can have serious impact on health of an individual. Physical effects include:

- **Gastro-intestinal system:** Nausea, vomiting, esophagitis and oesophageal cancer; can also cause gastritis, hepatitis, liver cirrhosis and pancreatitis; impact on teeth, gingivae and oral mucosa can also be seen [2].
- **Central nervous system:** Brain cells death, harm to cerebellum and peripheral nerves; problems with cognition and memory; injury to optic nerve, neuropathies etc. [3].
- **Cardiovascular system:** Light-to-moderate drinking can be beneficial, but heavy alcohol drinkers suffer from Cardiovascular System (CVS) damage such as cardiac muscle disorders, irregular heart rhythms, hypertension and strokes [4].

- **Skin:** Bluish colour of the face skin lesions like pellagra, psoriasis, discoid eczema and superficial infections are more common in heavy drinkers [5].
- **Respiratory system:** Alcohol abuse causes significant derangements in the lung and predisposes individuals to the development of pneumonia and acute lung injury; increased risk of tuberculosis [6,7].
- **Reproductive system:** Impotence, infertility, and reduced male secondary sexual characteristics in males; the reduction in fertility, difficulties in pregnancy and during childbirth or spontaneous abortion [8].
- Mental disorders like depression, violence, psychosis, memory loss, and illusions.
- Alcoholics normally live 10-12 years less than non-alcoholics. Further, the death rate among alcoholics is 2.5 times higher than normal.

### Effect of Alcohol on Inflammation and Anti-oxidants

Moderate drinking can be beneficial in terms of reduced cardiovascular event rates. Light to moderate drinking (up to one drink or 15 g alcohol a day for women and up to two drinks or 30 g alcohol a day for men) can result in low risk of CVS diseases because reduced blood levels of the inflammation markers interleukin-6 (IL-6) and C-reactive Protein (CRP) than non-drinkers and heavy drinkers [9]. Alcohol consumption is associated with increased circulating levels of high density lipoprotein cholesterol, Apo lipoprotein A1, and adiponectin and decreased fibrinogen levels, all changes reported to be cardio protective. However moderate alcohol consumption is associated with reduced levels of  $\alpha$ -tocopherols, ascorbic acid in moderate to heavy drinkers [10,11].

### Effect of Alcoholism on Oral Health

Alcohol addiction not only affects health of the entire body but also the oral health of an individual. Alcoholics are at high risk of developing dental caries, gingival diseases and may suffer from oro-

pharyngeal cancers. The risk of oral cancer further increases when alcohol is consumed along with cigarette.

### **Alcohol and salivary glands and dental caries (tooth decay)**

The salivary glands, notably parotid glands, may become swollen in long term alcohol drinkers. This condition is known as sialadenosis [12] and it is associated with ethanol induced peripheral neuropathy [13]. This condition results in disturbances in the metabolism and excretion of the salivary glands [14]. Reduced salivary secretion along with diminished buffering capacity and less attention to oral hygiene may lead to increased risk of dental caries and gingival disease. Other detrimental factors consist of consumption of sugared drinks and cariogenic food along with alcohol. Acidic nature of alcoholic beverages and consumption of carbohydrate rich food leads to production of acids upon metabolism and it leads to decrease in salivary pH below critical level. Ultimately it may lead to development of dental caries. Also, Alcohol consumption increases Blood Lead Levels (BLLs) in humans and BLLs have been correlated with caries [15].

Alcoholics generally have a high incidence of decayed teeth which leads to either extraction of teeth (missing) or restoration (filling) of teeth. In particular, alcoholics suffer from more number of missing teeth as compared to non-alcoholics [16]. A study showed significantly fewer teeth and more active carious lesions among alcoholics and alcoholics had more number of endodontically treated teeth as compared to non-alcoholics. These patients had a permanent tooth loss three times higher than the national average for corresponding ages [17]. Another study conducted by Marc Niquille et al. on alcoholic and non-alcoholic subjects showed positive association between alcoholism and dental caries (crude odds ratio, 2.24; 95% CI, 1.15-4.31) [18].

### **Alcohols and gingival/periodontal diseases**

Periodontitis is regularly described as having a systemic host-mediated element [19]. Literature search reveals many studies have tried to recognize and appreciate associations between periodontitis and potential systemic conditions such as genetic disorders, diabetes, osteoporosis and alcoholism [20]. Prolonged alcohol drinking is associated with multiple systemic effects with the likelihood of altering the host-mediated response and affecting risk [21].

Alcohol abuse can lead to periodontal disease for a number of reasons including: irritation to gingival tissue; poor oral hygiene habits among chronic alcohol drinkers; poor eating habits resulting in nutritional deficiencies among chronic alcoholics leading to poor immunity; poor immune response to penetrating harmful chemicals; dehydration from alcohol consumption causes bacteria and plaque build-up as they are not washed away by saliva; ignorance of early symptoms of gingival diseases resulting in progression of diseases to more serious condition leading to periodontal diseases. Alcoholics have severe risk of developing chronic generalized periodontitis associated with gingival inflammation, blunting of the interdental papillae and deep pockets with related bone loss [22-26]. Alcoholic men more frequently suffer from horizontal bone loss and calculus as compared to women [27]. One study assessed effect of binge pattern ethanol 20% exposure on orthodontic tooth movement in male Wistar rats. Binge-pattern 20% ethanol promoted less bone resorption at the end of tooth movement, thereby suggesting delay in tooth movement [28].

### **Effect of Alcohol on Tongue**

Alcoholics taking disulfiram may have changed taste sensation, most commonly a metallic taste. Besides direct harmful effects on oral health, alcoholics suffer from a number of indirect effects which manifest as a result of lack of adequate nutrition. The most common effects are tongue inflammation (glossitis) [29], inflammation of the gingiva (gingivitis) and sometimes, inflammation of corner of mouth (angular cheilitis). Early stages of glossitis show painful and smooth tongue, but sometimes show swollen fungiform papillae. In later stages, tongue suffers from burning sensation and becomes intensely red followed by atrophy of filiform and fungiform papillae. Angular cheilitis results in development of painful cracks at the corners of the mouth; while gingivitis establishes as necrotic areas on the top of interdental papillae.

### **Alcohol and wasting diseases, mainly dental erosion**

People addicted to alcohol are at increased risk of developing dental erosion. This is because alcohol consumption has the potential for increasing the degradation rate mechanisms and by the direct and indirect ethanol effects in the organic systems [23]. Regular and prolonged consumption of acidic drinks such as wine makes oral cavity as well as the teeth surface acidic in nature. This acidification dissolves surface enamel and makes teeth surfaces more vulnerable to mechanical damage due to tooth-brushing, teeth clenching, etc. Lower esophageal sphincter relaxes under influence of alcohol and this result in frequent vomiting. Acidic content of stomach enters mouth because of vomiting and results in erosion of the enamel. This acidification is further assisted by reduced salivary secretion and ultimately reduced buffering capacity which increases the risk of enamel erosion [30,31]. Most commonly affected tooth surfaces due to erosion are palatal surfaces of upper teeth followed by occlusal surfaces of posterior teeth. The lower teeth and buccal surfaces of the upper teeth are least affected by erosion [32].

The acidic nature of the wine causes discomfort to the teeth of the people who make and taste the wine. Wine merchants, wine tasters and winemakers most commonly suffer from dental erosion. This is because they keep wine in their mouth for longer time, which is considered to be an occupational hazard [32]. Several epidemiological studies have reported a time-dependent association between alcoholism and enamel erosion, with prevalence values as high as 50%. Alcoholic patients show more wearing of teeth than age and sex-matched controls. Males continuously drinking alcohol are most commonly affected by tooth-wear [32].

### **Alcohol and oral cancer**

Indeed, alcohol drinking is considered as a potential risk factor for Oral cancer, but when it is consumed along with tobacco increases the risk because of synergistic interaction [33,34]. However precise role of alcohol in the development of oral cancer is not completely understood. Not all the people who drink alcoholic beverages develop oral cancer, while not all the oral cancer patients consume alcohol. Role of alcohol in oral cancer causation is challenging to understand, mainly because alcohol consumption histories are difficult to confirm, vary over time, both with respect to type and amount of beverage and are frequently consumed along with tobacco.

However, certain mechanisms have been proposed which explain carcinogenic effects of alcohol in pathogenesis of oral cancer, which are [35]:

- Dehydrating effect of alcohol on cell walls enhances mucosal permeability to other toxins and carcinogens.
- Change in mucosal morphology with a reduction in epithelial thickness.
- Metabolism of ethanol produces acetaldehyde which causes damages DNA of oral epithelial cells and oncogene expression of oral keratinocytes.
- Ethanol disrupts salivary gland function by reducing secretion of epidermal growth factor which protects oral mucosa from injuries caused due to acids which results in increase in the risk of oral mucosal ulcerations.
- Nutritional deficiencies associated with heavy drinking can lower the body's natural ability to use antioxidants to prevent the formation of cancers.

### Use of alcohol containing mouthrinses

Mouthrinses are mainly employed in the treatment of various oral infections. Alcohol used in mouthwashes mainly acts as a solvent for other ingredients. It also acts as a preservative, antiseptic and caustic agent at 10-12% concentrations [36]. A possible harmful effect of alcohol containing mouthrinses on oral mucosa has been proposed, because mouthrinses are kept in oral cavity in direct contact with oral mucosa for a considerable period of time. In addition to the above mentioned effects, available literature shows that high concentration of alcohol in mouthrinses is responsible for adverse effects on oral mucosa such as epithelial detachment, keratosis, mucosal ulceration, gingivitis, petechiae and oral pain [37]. Some of the suggested adverse effects include an increased risk of developing oral cancer, as well as causing a burning sensation in the mouth, drying of the oral mucosa and softening effects on composite filling materials. However, literature search reveals contrasting findings regarding relationship between alcohol containing mouthwashes and oral cancer. Evidence regarding the carcinogenic effect of alcohol-containing mouthrinses is inconsistent, and a link between the use of alcohol containing mouthrinses and the development of oral cancer has not yet been definitely established [38,39]. Nevertheless, considering what is known about the local effects of ethanol on the oral mucosa, it may be prudent to limit their use, particularly in high-risk patients such as smokers.

It is believed that dentists can play a vital role in addressing the issue of alcoholism since they have an on-going relationship with individuals and some people may see a dentist more often. In addition, unhealthy alcohol intake may co-occur with other substance use that is known to affect oral health such as tobacco, marijuana and illicit drugs. Dentists can play an important role in the prevention and intervention of costly and deadly diseases. Dentist can grab the opportunity to counsel the patient whenever an alcoholic patient visits for dental treatment. Screening for alcoholism is an extremely simple procedure. Brief counselling can be as simple as interpreting the screening result for the patient so they are aware of what constitutes moderate drinking and giving advice to cut back or abstain. Screening and brief counselling can reduce alcohol consumption by as much as 25%. The earlier dentists intervene to address drinking above moderate levels, the more likely they are to prevent progression to a substance use disorder, prevent and improve other chronic general as well as oral health conditions, and prevent violence and injuries.

### Conclusion

High consumption of alcohol manifests in severe impact on oral health. Some of the systemic diseases associated with alcohol consumption may indirectly affect oral health. Some of them are cases of missing teeth due to periodontitis associated with alcohol consumption, tooth erosion due to gastric reflux, stomatitis caused by deficiency of several micro-nutrients, etc. Harmful impact of alcohol on oral cavity includes formation of dental caries, oral cancer, etc. The high concentration of organic and inorganic acids in alcohol and the practice of keeping the alcohol in the mouth can result in chronic inflammations of the soft tissues and can increase the negative side effects from metals of crowns, bridges, orthodontic devices and various metal restorations.

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