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Men and Oral Health: A Review of Sex and Gender Differences

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Citation Details

Lipsky, M. S., Su, S., Crespo, C. J., & Hung, M. (2021). Men and Oral Health: A Review of Sex and Gender Differences. *American Journal of Men's Health*, *15*(3), 155798832110163. https://doi.org/10.1177/15579883211016361

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Review

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American Journal of Men's Health
May-June 1–8
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DOI: 10.1177/15579883211016361
journals.sagepub.com/home/jmh
SAGE

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Abstract

Sex and gender related health disparities in oral health remain an underappreciated and often over looked aspect of well-being. The goal of this narrative review is to identify sex and gender related oral health disparities by summarizing the current literature related to differences in oral health between men and women. The review identified that men are more likely to: ignore their oral health, have poorer oral hygiene habits, and experience higher rates of periodontal disease, oral cancer, and dental trauma. Men also visit dentists less frequently and compared to women seek oral treatment more often for an acute problem and less often for disease prevention. Women exhibit more positive attitudes about dental visits, greater oral health literacy, and demonstrate better oral health behaviors than men. Men disproportionately develop periodontal diseases due to a combination of biological and gender related reasons including immune system factors, hormone differences, poorer oral hygiene behaviors, and greater tobacco use. There is a male to female ratio of 2:1 for oral cancer, largely attributable to more tobacco use, heavier use of alcohol, and longer sun exposure. Minority men experience a disproportionate burden of oral health disparities because of both their gender and race/ethnic identities. In conclusion, this review identifies several differences between men and women related to oral health and highlights the need for further research to better understand these disparities and how to incorporate them into developing prevention, education and treatment strategies to improve oral health in men.

Keywords

men's health, healthcare disparities, oral health, epidemiology

Received March 1, 2021; revised April 14, 2021; accepted April 20, 2021

During the 1960s and 1970s, many academic centers, institutions, and hospitals developed women's health centers with the goal of improving healthcare for women. Historically, these centers stemmed from the perceived need to address inequities in medical research which frequently underrepresented women and because women traditionally faced social and economic disadvantages. However, issues related to men's health should also merit attention. Life expectancy for men in industrialized nations is lower than for women and in the United States and men experience higher death rates than women for 7 of the 10 leading causes of death (Office of Women's Health, 2017). Despite evidence that men face significant health challenges, recognition of sex and gender-related health disparities remain underappreciated.

Oral health is an over looked aspect of well-being where men might also experience disease outcomes that differ from women. Just like men are less likely than women to take care of their physical health, studies suggest they similarly pay less attention to their oral

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health (McGrath & Bedi, 2000). Identifying and understanding gender disparities related to oral health is important since poor oral health can adversely affect well-being, nutrition, speech, appearance, and impair self-confidence and socialization(General, Dental, & Research, 2000). Sometimes referred to as the gateway to health, research links good oral health to longevity and poor oral health to systemic disease including heart disease, stroke, diabetes, and respiratory disease (Hung et al., 2019). Healthy People 2030 also highlights the importance of oral health and gender by including it as a key aim and that efforts to improve oral health need to address both sexes and differences between them (Office of Disease Prevention and Health Promotion, n.d).

Most oral diseases result from complex interactions influenced by genetic, biological, socioeconomic (SES), behavioral and general health factors. This review summarizes the current literature related to differences in oral health between men and women. Specifically, this paper reviews biological and non-biological differences between men and women that contribute to their oral health. Understanding sex and gender differences related to oral health may help increase the effectiveness of preventive and therapeutic measures with the goal of improving oral health.

Review Strategy

An abundance of evidence documents the importance of oral health to overall health (Genco & Borgnakke, 2013). However, a 2010 review (Doyal & Naidoo, 2010) noted the lack of research related to the impact of gender and sex differences on oral health, and that most of this research focuses on the women's perspectives. The goal of this narrative review is to increase the awareness of men's oral health issues by synthesizing the current literature and identifying potential topics for future research. Narrative reviews provide a current review of knowledge and offer a broad perspective about a specific topic or theme (Green et al., 2006).

To generate articles for this review, the authors began by searching Medline and Google Scholar, concentrating on peer reviewed articles published in English encompassing the most recent available literature from the year 2000. Search terms included oral health, periodontal disease, caries, dental disease, oral cancer, men's health, men, and masculinity. Retrieved articles were reviewed by the study team for topic relevance. The authors also reviewed the article references and literature that cited the retrieved articles to identify additional articles and other data sources potentially relevant to this review. When appropriate, governmental websites such as the CDC, NIH were used as statistical and epidemiologic data sources.

To organize and synthesize articles related to the genetic, biological, socioeconomic (SES), behavioral and general health aspects of men and oral health, two authors (MSL, MH) identified themes that placed the retrieved articles into clinically relevant clusters. These themes included: Dental Care, Behaviors and Hygiene; Gingival and Periodontal Disease; Dental Caries; Medications and Drugs; and Dental Trauma.

Dental Care, Behaviors and Hygiene

Studies report that men visit physicians and engage in preventive care less often than women (Thompson et al., 2016). The 2007 National Ambulatory Medical Care Survey identified that men are about one-third less likely than women to seek preventive care services and almost 60% of men avoid care even when they might have a serious illness (Hsiao et al., 2010). So, it is not surprising that men are less likely than women to seek preventive dental care and often neglect their oral health (Dental, 2017). Men visit dentists less frequently compared to women and when they do, the reason is often because of an acute problem and not for disease prevention. In addition, women are more likely to adhere to recommended treatment following a dental check-up (Periodontology, 2011). Greater adherence to treatment occurs even though women report more financial barriers to care than men. When assessing access to dental care, approximately 20% of women, as opposed to 15% of men, "did not receive dental care due to cost" (Ioannidou, 2017).

Women also exhibit more positive attitudes about dental visits, greater oral health literacy and demonstrate better oral health behaviors than men (Furuta et al., 2011). An individual's health literacy influences decisions regarding health and behaviors (Macek et al., 2010). Studies support that higher oral health literacy links to more frequent brushing and better oral hygiene which may in part explain why women both brush their teeth and floss more regularly than men (Lee et al., 2012; Ueno et al., 2013). Research by the American Dental Association identified that about 8% more women brush their teeth twice a day than men and that men are about 40% less likely to brush their teeth after every meal (Dentistry, 2007). Women are also 26% more likely than men to floss on a daily basis (Fleming et al., 2018; Periodontology, 2011).

Habits, especially tobacco use, also play a significant role in oral health. Tobacco products increase the risk of oral cancer, cavities, and tooth loss. Generally, men use all tobacco products at higher rates than women (Abuse, 2020). In 2015, 16.7% of adult men compared to 13.6% of adult women smoked cigarettes and men are about 20 times more likely to use smokeless tobacco products (Abuse, 2020; Lipari & Van Horn, 2017). Smoking or

chewing tobacco significantly increase the risk for both gum disease and oral cancer (Winn, 2001). Gender differences with e-cigarettes parallel those reported with traditional cigarettes (Piñeiro et al., 2016) and roughly twice as many boys than girls use e-cigarettes (Yang et al., 2020). While few studies have examined the effects of e-cigarettes and other Electronic Nicotine Delivery Systems (ENDS) on the periodontium, the available evidence indicates that e-cigarettes contribute to the pathogenesis of periodontitis (Sultan et al., 2018).

Gingival and Periodontal Disease

Gingivitis and periodontitis represent the most common types of gum disease. Gingivitis is an inflammation of the gums and its main signs are red, swollen, and bleeding gums. Gingivitis may resolve with good oral hygiene but if unabated the inflammation may spread and damage the soft tissues and bone (periodontium) that anchor teeth (Gross et al., 2017). Inflammation of the periodontium or periodontitis is a chronic inflammation that can loosen teeth by destroying gingival fibers, ligaments, and bone surrounding teeth. It is a major cause of tooth loss among adults in the United States (Dye et al., 2015).

Sex and gender related factors including genetics, tobacco use, poor oral hygiene and conditions such as diabetes and atherosclerosis increase the risk of periodontal disease. Periodontitis is one of the most common chronic diseases with nearly half of Americans exhibiting some form of periodontal disease (Eke et al., 2015). Epidemiology data derived from the National Health and Nutrition Examination Survey indicated that men disproportionately develop periodontal diseases compared to women (56.4% vs. 38.4%). Other studies also consistently support a higher prevalence in men (Shiau & Reynolds, 2010).

Caused by bacterial inflammation in gingival pockets, the impact of periodontal disease extends beyond the oral cavity. Several systemic illnesses including cardiovascular disease, diabetes, stroke, respiratory disease, and dementia are associated with periodontal disease. These diseases rank among the leading causes of morbidity and mortality in the United States.

In addition to local inflammation, inflammatory mediators from periodontal inflammation released into the blood stream are thought to account for the association of gum disease and systemic disease. The role that inflammation and infection play in periodontitis suggests that differences in immune response between men and women contribute to differences in periodontal disease. Sex hormones and X-linked genes are the main mechanisms believed to account for immune function differences between sexes (Klein & Flanagan, 2016). Sex chromosomes influence the immune response, with X-linked genes modulating the immune response. In addition, sex hormones, for example, estrogens, progesterone, and testosterone affect immunity. In general, testosterone suppresses the immune response while estrogen enhances the immune response (Roved et al., 2017). These differences in immune function also affect the oral microbiome. Together sex-related differences in microbial communities and immune functions likely account for some dissimilarities in the prevalence of periodontal disease between men and women (Ioannidou, 2017; Sultan et al., 2018).

Gender related factors play an important role in the prevalence of periodontal disease. While sex refers to biological factors related to genetics, physiology, and anatomy, gender relates to social roles, behaviors, attitudes, and identities. Women consistently demonstrate better oral hygiene habits than men, brushing and flossing more often and smoking less. Tobacco use aggravates periodontal disease by promoting the invasion of pathogenic bacteria, inhibiting immune defense mechanisms and triggering inflammation that augments tissue and alveolar bone damage. According to current epidemiologic evidence, tobacco significantly aggravates the development and progression of periodontal disease (Zhang et al., 2019). Consistently applying appropriate hygiene measures combined with smoking cessation significantly reduces the incidence and severity of periodontal disease (Scannapieco & Gershovich, 2020).

More women than men also connect poor oral health to overall health and exhibit more positive attitudes about dental care which enhances adherence to treatment recommendations. Even though women may face greater financial barriers when accessing dental care, with approximately 20% of women as opposed to 15% of men delaying dental care due to cost, women still visit the dentist more often.

Dental Caries

Dental caries or tooth decay is one of the most prevalent chronic diseases of people worldwide. In daily practice, dental providers and patients commonly refer to an established caries lesion as a tooth cavity. Dental caries form through an interaction between the bacterial biofilm on the tooth and fermentable carbohydrates that produce acids which damage the tooth. Risk factors include bacterial burden, insufficient fluoride exposure, poor oral hygiene, and poverty. Biological factors involved in caries include saliva, sex-linked genetic susceptibility, and hormonal influences.

Saliva protects teeth from dental caries through several mechanisms including its cleansing effects, providing the minerals necessary for remineralization, providing proteins and glycoproteins as nutrients, and buffering acid produced by dental plaque. The balance between

pathological processes and protective factors influences the initiation and progression of caries (Pitts et al., 2017). Primary caries prevention includes addressing risk factors while caries treatment focuses on decay reducing strategies and using the least invasive yet tissue-preserving treatment approaches.

Women generally develop more dental caries than men (Ferraro & Vieira, 2010). Suggested explanations for a higher prevalence among women include an earlier eruption of teeth in girls which increases the exposure to a potentially cariogenic oral environment, hormonal influences and genetic predisposition such as variations in the X-linked amelogenin gene. Approximately 90% of amelogenin is expressed by the X-chromosome and research suggests that deficiencies in amelogenin can disrupt the hard enamel tooth surface (Yamakoshi, 2014), thereby increasing caries susceptibility (Chi & Shyue, 2014). Fluctuating hormone levels related to menstruation and pregnancy affect the periodontium and the biochemical composition and overall flow rate of saliva resulting in a more cariogenic oral environment for women than for men (Bouchard et al., 2006; Galvao-Moreira et al., 2018). On the other hand, men are at greater risk of gingival recession (Satheesh, 2012) which can expose the root surface making men more vulnerable to root cavities than women.

Gender related behaviors also likely contribute to differences in caries. Fluoride is an important protective factor and the daily use of fluoride toothpaste is seen as a main reason for the overall decline of caries worldwide (Pitts et al., 2017). Failing to use fluoride toothpaste daily along with aggressive toothbrushing and poor technique are linked to caries. Men are more likely to use harder toothbrushes, less likely to choose a recommended fluoride toothpaste and have less knowledgeable about proper oral proper brushing techniques. Men also tend to brush harder which may induce gingival damage and recession contributing to root caries (Hanasaki, 2018).

Individuals with fewer dental visits experience higher prevalence of dental decay (Peres et al., 2020). Since tooth loss can result from caries, the predisposition for women to be more affected than men suggests that women should experience a greater loss of teeth. While earlier epidemiologic data align with this supposition, recent studies fail to identify differences in tooth loss between men and women highlighting that gender differences in attitude, knowledge, oral hygiene practices and regular dental care can moderate predisposing genetic and biologic factors (Dye et al., 2015).

Medications and Drugs

Saliva disrupts cavity formation by inhibiting bacterial growth, washing away food particles and neutralizing acids formed by plaque. Xerostomia or dry mouth is a common side effect of over 500 medications including such widely used agents as antihistamines and antidepressants. These medications can reduce salivary flow and increase an individual's vulnerability to caries and gum disease. Some drugs such as phenytoin and nifedipine can also induce gum growth which can make it difficult to remove dental plaque. (Nazir, 2017).

Men experience a higher prevalence of cardiovascular disease than women until age 75 years and cardiovascular medications with dry mouth as a common adverse effect include frequently used cardiovascular drugs such as beta-blockers, diuretics and calcium channel blockers. These side effects make it especially important for men taking these medications to maintain a healthy oral regimen and routine dental visits. Alpha-blockers prescribed for prostatic hypertrophy have dry mouth as a frequent side effect. More selective alpha-blockers such as tamsulosin cause significantly less dry mouth than a less selective alpha antagonist such as terazosin.

Alcohol can harm the oral mucosa, teeth, and salivary glands by both the direct damaging action of ethanol and the indirect effects of its metabolites (Khan et al., 2014). Many over-the-counter mouthwashes contain alcohol because of its antiseptic properties and its ability to penetrate the dental plaque biofilm (Boyle et al., 2014). Surprisingly, alcohol in mouthwashes impart negligible benefit in terms of gingivitis and plaque control (Werner & Seymour, 2009). The risk of oral carcinoma in smokers who use alcohol-containing mouthwashes is theoretically enhanced as alcohol facilitates the penetration of tobacco-based carcinogens into oral mucosal tissues. While epidemiologic data fail to establish a definite link between oral cancer and alcohol mouthwashes (Gandini et al., 2012), since alcohol mouthwashes offer little benefit and pose a hypothetical risk, men, especially those who smoke (Ustrell-Borràs et al., 2020), should consider using safer alternatives(Werner & Seymour, 2009).

Marijuana use is more prevalent in males and smoking marijuana adversely affects oral health (Rechthand & Bashirelahi, 2016). Smoking marijuana inhibits saliva flow and by stimulating appetite can lead to consuming more sugary snack foods. Evidence indicates that regular marijuana users develop more caries and periodontal disease than non-users (Joshi & Ashley, 2016; Smit & Crespo, 2001). Marijuana's immunosuppressive effect may also increase the risk of oral cancer. Dry mouth is also commonly reported with E-cigarette use (King et al., 2019).

Dental Trauma

Men experience more dental trauma than women by roughly a 2:1 ratio (Lam, 2016). This disparity is

attributed to more men participating in contact sports and risky behaviors, and are at a greater risk for both intentional and unintentional physical injuries. The chance of incurring traumatic damage is exacerbated by men being less likely to wear mouthguards or other protective gears. While some experts believe mouthguards can also cushion head trauma, no convincing evidence supports protection against concussion (McCrory, 2001).

Oral Cancer

Oral cancer or oral cavity squamous cell carcinoma includes cancers of the oral cavity and can develop on the tongue, gums, floor of the mouth, inner lining of the cheeks, and lips. Risk factors for oral cancer include tobacco, alcohol, sun exposure, and the human papillomavirus (HPV) along with gender, poor oral hygiene, poor diet, and a weakened immune system. Oral cancer is the sixth most common cancer in the United States with about 53,000 new cases annually, comprising roughly 3% of all new cancer cases (Research, 2018). There are 2,75,000 new cases of oral cancer seen each year worldwide and up to 50% of patients living with oral cancer die within five years (van Zyl & Marnewick, 2012). Despite efforts to reduce the morbidity and mortality of oral cancer, the five-year survival rate still remains low and has not been improved (Jitender et al., 2016).

Studies demonstrate sex differences in oral cancer incidence with a male to female ratio of 2:1 (Neville & Day, 2002). This difference is largely attributable to more tobacco use, heavier use of alcohol and longer sun exposure related to men disproportionately engaging in outdoor occupations (Warnakulasuriya, 2010). Smoking increases the risk of oral cancer by five to nine times while smokeless tobacco increases risk by four-fold (Neville et al., 2015). The male/female discrepancy in tobacco use is likely due to a combination of physiological and behavioral factors. For example, studies suggest that smoking activates men's reward pathways more than women's, suggesting that men smoke for its rewarding effects while women find it less rewarding and more often smoke to regulate their mood (Cosgrove et al., 2014). However, due to increased smoking habits of women in recent years, the oral cancer gender gap is declining (Kruse et al., 2011).

Biological influences may also contribute to the greater prevalence of oral cancer in men. One study suggested that endocrine factors influence oral cancer and contribute to sex differences in oral cancer (Suba, 2007). For example, elevated fasting glucose levels did not link oral cancer in men but did for women along with estrogen deficiency.

With a survival rate of 50%, early diagnosis of oral cancer is an important factor that can increase cure rates by 80% (Silverman Jr, 1988). Men experience a significantly greater delay in diagnosis compared to women (Jafari et al., 2013). This might be in part due to fewer dental visits by men, resulting in fewer oral exams. Additionally, studies report that men do not have as much knowledge about the risks of oral cancer and importance of screening compared to women (Al-Maweri et al., 2015). Thus, the disparity among gender in oral cancer rates and mortality is likely a result of a combination of factors, including habits, biological factors, diagnosis delay, and oral cancer awareness.

Minority Men

Despite improvements in the oral health of the U.S. population, racial and ethnic disparities persist with minority men experiencing poorer access and oral health outcomes (Association, 2013). Minority men are therefore at a disproportionate burden of oral health disparities because of both their gender and race/ethnic composition. Black men are less likely to visit the dentist, are twice as likely to experience tooth decay, have greater tooth loss, and have a significantly worse 5-year oral cancer survival rate when compared to White men (Akintobi et al., 2018). They are also almost twice more likely to have untreated dental problems than White men (Satcher & Nottingham, 2017). Outcomes related to oral cancer are particularly disturbing since the overall prevalence of oral cancer is decreasing (Bunnell et al., 2010; Howlader et al., 2011).

Disparities in oral health among minority men likely relate to several issues including SES factors, access to care, dental attitudes, and knowledge. Affordability of dental care and low SES are considered independent risk factors for poorer oral health. Minority males are less likely to have dental insurance coverage and individuals without dental benefits are less likely to visit the dentist and to have restorative care or treatment for gum disease. As one consequence, minority men are more likely to have extractions and dentures. Similarly, the number of dental professionals willing to accept patients with dental insurance plans that are less lucrative or on Medicaid can be a barrier for minority men seeking care (Dental Benefits and Medicaid, 2021).

Education and income levels correlate with oral health, and while adjusting for income and education narrows the gap in oral health among minority men, disparities remain suggesting multifaceted causes of racial disparities in oral health (Kertesz et al., 2013). For example, men from tribal communities or in Alaska can be geographically and socially distanced from oral health care providers. For Hispanic men, acculturation can be a factor in determining whether to seek care (Stewart et al., 2002). Other proposed reasons for these differences include: (1) physical (e.g., rural, geographic isolation,

fewer stores to buy oral health paraphernalia, fewer school nurses, lunches and breakfasts at schools, less awareness about how behaviors such as smoking/alcohol use, sugar/sweets consumption affect oral health, and lack of knowledge about proper dental hygiene and technique, lower health literacy about the need and importance of oral health); (2) medical (e.g., inadequate health systems access, workforce, health insurance); (3) social (e.g., cultural, attitudes, cost, priority, valuing, belief); and (4) behavioral (e.g., flossing, brushing, diet, smoking, vaping, negative attitudes toward dental care, fatalism about tooth loss) (Akintobi et al., 2018).

Implications

Allukian noted the importance of "reconnecting the mouth to the rest of the body in health policies and programs" and the direct connection of oral health and overall health (Allukian Jr, 2008). Despite its importance and that most common dental diseases are potentially preventable, oral health has been referred to as a neglected epidemic (Allukian Jr, 2008).

One critical aspect to improve the oral health is understanding the most vulnerable groups in our society. Men and particularly minority men face oral health disparities suggesting the need to develop strategies and programs addressing these disparities. Improving oral health in men aligns with two key goals of Healthy People 2030; to improve quality of life and to eliminate disparities in health outcomes (Office of Disease Prevention and Health Promotion, n.d). This review identified several modifiable behaviors to target including expanded knowledge about oral health and its importance, improved oral health literacy, early preventive dental care and better oral hygiene habits. Policies that integrate oral health into primary care to increase accessibility and highlight its contribution to men's overall health and programs that educate men represent other potential strategies. Further research is needed to develop, to test, and to evaluate male targeted strategies and outreach programs activate men around oral health issues.

Conclusion

Many men take their oral health for granted and remain unaware of its connection to overall health (IOM). In addition, untreated dental caries and gum disease can cause pain, impact nutrition, affect appearance and self-esteem and increase absenteeism from school or work. Men are more likely to ignore their oral health and have poorer oral hygiene habits. They experience higher rates of periodontal disease, oral cancer and dental trauma resulting from a combination of biologic, social and gender related factors. This review suggests that research is needed to better understand these differences and how to incorporate them into developing prevention, education and treatment strategies to improve oral health in men.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no external financial support for the research, authorship, and/or publication of this article.

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