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REVIEW ARTICLE

Screening and early detection of oral cancer: current controversies

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ABSTRACT

Some evidence suggests that the early detection of oral cancer (OC) during surveillance might improve survival rates. In addition to this, interventions aimed at enhancing public awareness and knowledge of signs, symptoms and risk factors of OC are thought to decrease the burden of disease. Nevertheless, there is much controversy with regard to the cost-effectiveness of population-based strategies for OC screening. Here, we present and briefly discuss timely findings that have put under scrutiny the applicability of approaches targeted at the early identification of patients with OC.

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Introduction

Head and neck cancer (HNC) is a term that encompasses several malignancies that affect the oral and nasal cavities, pharynx, larynx and paranasal sinuses [1]. Noteworthy, because it remains unclear whether some anatomical sites (i.e. base of the tongue, soft palate) belong to the oral cavity or to the oropharynx, there is no standard definition of oral cancer (OC) [2]. The oral cavity is generally described as including the mucosal lip, anterior 2/3 of the tongue, floor of the mouth, gingiva, retromolar trigone, buccal mucosa and hard-palate subsites [3,4].

Nearly 90% of OCs are squamous cell carcinomas, affecting approximately 300,000 patients each year worldwide [5,6]. Interestingly, the global incidence, burden of disability, clinical management and mortality rates of OC have not experienced markedly changes over the past decades [3,7]. In 2012, the global age-standardized rate of OC was estimated at 2.7/100,000, substantially varying according to sex, age and region [8]. In the US, for example, the cumulative age-standardized incidence rate was 4.3/100,000 in the past decade, showing a decreasing trend [4].

Cancers detected at early stages are more likely to be cured using standard treatment protocols; however, delayed diagnosis, particularly in low- and middle-income countries, can dramatically affect OC outcomes [9]. Therefore, one might hypothesize that the prevention and early detection of OC are not being directly targeted by public health policies. Still, approaches for OC screening have been a well-known source of controversy.

Briefly, early detection programs aim to identify individuals with cancer before the disease develops into advanced stages, whereas screening interventions are more focused strategies in which asymptomatic patients are tested for cancer [9]. The goal of both screening and early clinical diagnosis is to detect cancers early enough to provide less toxic and less expensive treatments [10]. In this way, we sought to discuss the current comprehension regarding the impact of screening and early detection of OC on disease-related outcomes, towards improving ongoing and future proposals.

Modifiable factors that affect survival rates

Although the oral cavity is a privileged site in terms of cancer diagnosis due to its location that allows easy clinical assessment, one in four patients is believed to experience treatment delay, the reasons of which are just beginning to be understood [11–13]. Tumour staging is fundamental for prognostication and determination of the treatment outcomes [3,11,12], and lower stage at diagnosis as well as lower tumour size were associated with increased survival in OC patients [14].

In addition, a time to HNC treatment initiation of 61–90 days was shown to increase mortality risk in comparison to <30 days (hazard ratio [HR] = 1.13; 95% confidence interval [CI]: 1.08–1.19) [11]. Importantly, lower educational level has been connected to decreased 10-year survival rates in OC patients [14]. Thus, it is reasonable to assume that survival rates are being affected by several factors related to delayed diagnosis [3,11,12].

Early and late-stage diagnosis of OC

The delay in OC diagnosis has been linked to the lack of awareness among health care providers and the public,

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barriers in the health care system that prevent patients from seeking medical or dental care, and the low incidence of OC [15]. Additionally, age (odds ratio [OR] = 1.02; 95% CI: 1.00–1.04) and male sex (OR = 1.7; 95% CI: 1.1–2.6) have been associated with late-stage diagnosis. In contrast, early-stage diagnosis was related to previous consultation to a specialist physician (OR = 0.5; 95% CI: 0.4–0.8), facilitated access to this specialist (OR = 0.6; 95% CI: 0.4–0.9), and close contact with a health professional (OR = 0.6; 95% CI: 0.4–0.8) [12].

Socioeconomic status has been implicated in late-stage diagnosis of OC. In a Canadian population, an increasing number of late-stage diagnosis was found among residents of deprived as compared to affluent neighbourhoods, particularly in recent years [16]. The educational level has also been related to late-stage diagnosis. Illiterate patients and those with an incomplete or complete primary school level presented with higher proportion of T4 tumours, while stage IV tumours were less prevalent in a group of higher education [14].

A population-based study showed social marginalization, advanced age, separated, divorced or widowed status, and tobacco/alcohol use to be associated with late-stage diagnosis of OC. Conversely, having a pre-cancerous lesion or a regular dentist were related to early-stage diagnosis [17]. Personal experience of cancer (OR = 0.33; 95% CI: 0.11–0.99), unawareness (OR = 4.96; 95% CI: 2.16–11.37) and denial (OR = 6.84; 95% CI: 2.31–20.24) have also been linked to delayed diagnosis of OC. This indicates that educational interventions are necessary to increase patients' awareness [18].

On the other hand, individuals at low-risk for OC include non-smokers, non-drinkers or low-consumption social drinkers, no personal history of OC or precancerous lesion, no family history of HNC, no other known risk factors for HNC, and age (<40 years). These individuals are expected to annually receive an oral cavity examination by trained general dentists [19].

Mouth self-examination

The oral cavity is known to be an easily accessible site for visual inspection by health workers as part of routine care, but the mouth self-examination (MSE) has also been suggested to detect OC at early stages [10]. A study conducted in a large high-risk population compared the efficacy of MSE as OC screening tool to health care workers/specialists evaluation, showing a low sensitivity (0.18) [20]. In another investigation, MSE effectiveness was tested using a self-reported questionnaire, mucosal visualization and retracting ability in adults with Fanconi anemia. The results were then compared to the clinical findings of a specialist, demonstrating the low sensitivity (0.43), specificity (0.44) and accuracy (0.43) of MSE to detect OC as 75% of patients showed insufficient performance [21].

Notably, a systematic review that estimated the diagnostic accuracy of MSE for early detection of OC or potentially malignant disorders found sensitivity to range from 0.18 (95% CI: 0.13–0.24) to 0.33 (95% CI: 0.10–0.65), and specificity from 0.54 (95% CI: 0.37–0.69) to 1.00 (95% CI: 1.00–1.00) [22]. Hence, the current evidence does not support the use of MSE as a strategy for OC screening, but further investigation is required towards comparing its efficacy among low and high-risk populations.

Screening interventions for the early detection of OC

The effectiveness and validity of OC prevention campaigns that aim to educate high-risk populations and diagnose lesions at early stage have been extensively challenged with regard to the representativeness of individuals assessed [23]. In addition, the U.S. Preventive Services Task Force has concluded that there is a lack of evidence regarding the benefits and harms of screening for OC in asymptomatic adults [24].

No significant difference in OC mortality rates was found between screened and non-screened populations (relative risk [RR] = 0.88; 95% CI: 0.69–1.12), according to a Cochrane systematic review. Nevertheless, for tobacco/alcohol users, mortality was reduced by 24% in the screening group compared to controls (RR = 0.76; 95% CI: 0.60–0.97). Screened individuals were also less likely to show advanced stage at diagnosis (RR = 0.81; 95% CI: 0.70–0.93), suggesting that population-based screening programs that include visual examination can reduce mortality rates of OC in high-risk individuals [25].

Another systematic review estimated the diagnostic accuracy of conventional oral examination for the early detection of OC. Most findings presented with a prevalence of 10% or lower; sensitivity ranged from 0.50 to 0.99, while specificity ranged from 0.98 to 0.99. For one study with prevalence of 22%, sensitivity was 0.95 and specificity was 0.81, and in another study with prevalence of 51%, 0.97 and 0.75, respectively [22].

India has a high incidence and low 5-year survival rates of OC. A screening intervention developed by Rajaraman et al. [9] targeting adults (30–60 years) and high-risk populations (e.g. tobacco/alcohol users) once every 3 years included the oral visual examination by trained health workers, counselling, and tobacco/alcohol reduction as primary strategies. Yet, it would be mandatory to increase OC awareness through context-specific communication approaches, implement tobacco/alcohol control policies, and provide high-quality health services, training for health workers and easy access to dental care.

Another screening model developed to identify high-risk individuals in an Indian population presented with satisfactory predictive ability (high sensitivity [0.92] and negative predictive value [0.92]; low specificity [0.60] and positive predictive value [0.60]). The predictors included smoking, chewing quid and/or tobacco, alcohol, family history of upper aero-digestive tract cancer, diet and oral hygiene behaviour [26].

A screening approach for OC lesions in a low-income population that utilized interviews, questionnaires and oral mucosal examination found the highest disadvantaged group to be more susceptible to tobacco use, showing higher prevalence of suspicious oral lesions. Despite the difficulty participant recruitment, population-based screening for OC was effective in identifying people at risk of developing oral lesions [27].

A population-based screening program for OC was conducted in Taiwan and included more than 2 million high-risk individuals with habits of betel quid chewing and/or cigarette smoking. The risk of death from OC (adjusted RR = 0.74; 95% CI: 0.72–0.77) and the risk of stage III or IV OC (adjusted RR = 0.79; 95% CI: 0.76–0.82) were lower for the screened population compared to the non-screened group [28]. Overall, these findings support the visual screening for reducing OC mortality among high-risk individuals in areas with a high incidence of OC.

Health education

In a survey carried out in the US, 66% of participants reported being not familiar with HNC information and only 15.3% correctly detected OC. Still, they classified persistent red/white sores (14.9%), sore throat (5.2%), throat swelling/lump (1.3%), and mouth or throat bleeding (0.5%) as potential signs and symptoms. Tobacco consumption and HPV infection were seen as risk factors for OC, respectively, by 54.5% and 0.8% of respondents [29]. When a group of healthy individuals examined images of oral lesions, higher risk lesions were less likely to be perceived as OC or to make patients seek professional advice. High-risk patients were less aware about OC appearance and less likely to take action if they notice an oral lesion [30].

In another survey, patients attending university hospitals recognized cigarette smoking (87.8%) and heavy alcohol consumption (58.6%) as risk factors for OC, knew the clinical signs of OC (65–79%) and reported that early detection was related to better prognosis of OC (94%). Individuals with a family history of OC were more likely to identify the risk factors correctly, and less than 15% of patients reported having received OC counselling by a dentist or physician [31].

A recent study found non-smokers to be likely to report 'good oral health'. Compared to non-smokers, smokers were more likely to perceive poor oral health (OR = 1.77; CI: 1.42–2.20), and to attend the dentist symptomatically, either independently of the socioeconomic status (OR = 2.27; CI: 2.02–2.55) or in the most socioeconomically deprived group (OR = 1.99; CI: 1.57–2.52) [32].

Smoking results in poorer clinical outcomes for OC patients, considering that current smokers show higher death rate (HR = 1.35; 95% CI: 1.09–1.67) than former smokers (HR = 1.14; 95% CI: 0.87–1.50) when compared to never smokers [33]. Nonetheless, in a group of current smokers, only 23% of individuals with premalignant lesions and 15% with OC identified a correlation between such lesions and the smoking habit. Patients with malignant diseases were more likely to aim at smoking cessation than those diagnosed with benign lesions [34]. Collectively, this indicates the low awareness regarding risk factors and common signs symptoms of OC among the general population.

Knowledge and attitudes of health care providers

Patients at high-risk for OC (e.g. tobacco/alcohol users, elderly) are likely to present to their general practitioner (GP) or dentist, which emphasizes the role of both health professionals in OC surveillance [35]. However, in a study conducted with primary care physicians, they affirmed to not inquire the patients about the amount of tobacco (29.9%) and alcohol (45.7%) consumed or past alcohol consumption (45.7%). Additionally, 69.5% believed to have received inadequate smoking cessation training, whereas 79.9% reported no alcohol cessation training [36].

A cross-sectional survey demonstrated that the majority of UK GP training programs did not provide to GP trainees any structured training in relation to oral health care and OC detection. Barriers to improving training included time constraints, competing priorities and reluctance to taking on the workload of dentists. It was highlighted that oral health training and OC identification could be improved by addressing these gaps and providing access to specialist tutors, e-learning and problem-based-learning sessions [37].

Moreover, most of lawsuits from OC patients against health care providers involve a delay in diagnosis, a negative clinical outcome, or a failure to recognize or biopsy lesions [13]. Impressively, 74% of primary care dentists evaluated in a large study felt incapable of performing biopsies, 57% had never performed one, and only part of them were able to recognize potential malignant lesions [38]. This demonstrates that might exist a lack of training and/or continuing education programs focusing on OC for general dentists.

A lack of information from both health professionals and patients is thought to play a role in delayed diagnosis [13]. Hertrampf et al. [39] showed that one-year educational intervention improved dentists' performance in oral cavity examinations, confirming that continuing education programs may enhance dentists' knowledge of OC. Hence, increasing the awareness among dentists, physicians, oral hygienists and nurse practitioners should be considered by public health managers [15].

Furthermore, the feasibility of incorporating OC screening in private dental clinics was recently investigated in Malaysia, where 26 trained dentists conducted opportunistic screening on 2603 patients. Even though the private sector represent 40% of all dental services in the country, dentists with higher patient load were less likely to conduct screening as the early detection of OC is not seen as a priority in the private clinics [40]. It is worth mentioning that the detection of OC during a nonsymptom-driven screening examination has been associated with lower likelihood of litigation [15].

Lastly, the format and content of teaching, time allocated, and specialties involved in health education regularly do not promote evidence-based learning of risk factors, symptoms and clinical examination of OC, requiring an integrated approach between clinicians, educationalists and health care providers [35].

Conclusions

The early detection of OC requires the collaboration of health care providers that are frequently untrained for this type of

diagnosis. Although it is essential to enhance the awareness of OC among the general population, especially high-risk groups, MSE is currently not indicated as a screening tool. Finally, screening strategies for OC targeting populations at greater risk in areas with high incidence of OC and that include visual examination by trained health workers or specialists might decrease the burden of disease.

Disclosure statement

No potential conflict of interest was reported by the authors.

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