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ORIGINAL ARTICLE

The association between dental and periodontal diseases and sickle cell disease. A pilot case-control study

Haidar Al-Alawi *, Abdulfatah Al-Jawad, Mahdi Al-Shayeb, Ali Al-Ali, Khalifa Al-Khalifa

College of Dentistry, University of Dammam, Dammam, Saudi Arabia

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KEYWORDS

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Abstract *Objective:* This is a pilot case-control study conducted to investigate the prevalence of dental caries and periodontal disease and examine the possible association between oral health deterioration and SCD severity in a sample of Saudi SCD patients residing in the city of Al-Qatif, Eastern Province, Saudi Arabia.

Materials and methods: Dental examination to determine the Decayed, Missing and Filled Teeth index (DMFT), Community Periodontal Index (CPI), and plaque index system were recorded for 33 SCD patients and 33 age and sex-matched controls in the Al-Qatif Central Hospital, Qatif, Saudi Arabia. Self-administered surveys used to assess socio-economic status; oral health behaviors for both SCD patients and controls were recorded. In addition, the disease severity index was established for all patients with SCD. SPSS data analysis software package version 18.0 was used for statistical analysis. Numerical variables were described as mean with a standard deviation.

Results: Decayed teeth were significantly more in individuals with ages ranging from 18 to 38 years with SCD compared to the control group ($p = 0.036$) due to oral hygiene negligence. The mean number of filled teeth was significantly lower in individuals with SCD when compared to the control group ($p = 0.015$) due to the lack of appropriate and timely treatment reflected in the survey responses of SCD patients as 15.2% only taking oral care during hospitalization. There were differences between the cases and controls in the known caries risk factors such as income level, flossing, and brushing habit. The DMFT, CPI, and plaque index systems did not differ significantly between the SCD patients and the control group.

* Corresponding author. Tel.: +966 13 8574928.
E-mail address: haalalawi@ud.edu.sa (H. Al-Alawi).
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Conclusion: Data suggest that patients with SCD have increased susceptibility to dental caries, with a higher prevalence of tooth decay and lower prevalence of filled teeth. Known caries risk factors influenced oral health more markedly than did factors related to SCD.

1. Introduction

Sickle cell disease (SCD) is a common inherited disease characterized by morphologic changes in erythrocytes, caused by abnormal hemoglobin polymerization. SCD has spread worldwide and has been described in the United States (Creary et al., 2007), Africa, and the Middle East (Makani et al., 2007). The Eastern Province of Saudi Arabia is known to have one of the highest prevalence rates of SCD worldwide (Alhamdan et al., 2007; Nasserullah et al., 2003). Signs and symptoms of systemic involvement and SCD severity differ among patients. A main feature of SCD is vaso-occlusive crisis of the microcirculation, which leads to limited blood supply to tissues and tissue necrosis (Steinberg, 1998). Patients with SCD usually report subjective pain in the form of acute pain crisis, which is considered to be one of the earliest clinical manifestations of this disease (Serjeant 1993). Bone marrow hyperplasia and osteomyelitis of the jaw are general manifestations of SCD (Javed et al., 2013). Numerous oral manifestations of SCD that affect the oral mucosa, gingival tissue, mandible, nerve supply, and tooth enamel and pulp have been reported (Andrews et al., 1983; Bishop et al., 1995; Borle et al., 2001; Demirbas Kaya et al., 2004; Kelleher et al., 1996; Okafor et al., 1986; Patton et al., 1990; Ramakrishna, 2007; Scipio et al., 2001; Singh et al., 2013; Taylor et al., 1995).

Few studies have examined the relationship between SCD and oral health, and results have been contradictory (Arowojolu, 1999; Arowojolu and Savage, 1997; Crawford, 1988; Fukuda et al., 2005; Laurence et al., 2002, 2006; Okafor et al., 1986; Sanger and Bystrom, 1977). Thus, this study was conducted to investigate the prevalence of dental caries and periodontal disease and examine the possible association between oral health deterioration and SCD severity in a sample of Saudi patients with SCD residing in the city of Al-Qatif, Eastern Province, Saudi Arabia.

2. Materials and methods

2.1. Study design and subjects

This prospective case-control study included 66 Saudi men (33 patients with SCD attending Al-Qatif Central Hospital and 33 apparently healthy male individuals selected from the general population). The two groups had similar socioeconomic backgrounds and were age matched. The Ethics Committee of the College of Dentistry, University of Dammam, approved the study and all subjects provided written informed consent.

2.2. Inclusion and exclusion criteria

Candidates were selected according to the following criteria: Saudi man aged $\geqslant$18 years, clinical diagnosis of SCD, and (for the control group) a healthy individual attending a dental clinic for routine examination. Patients with any other systemic diseases, such as hypertension or epilepsy, were excluded from the study.

2.3. Dental examination

A single examiner performed oral examinations that included assessment of dental caries and periodontal status at patients' bedsides for the case group at the Center of Inherited Blood Diseases or the Internal Medicine Department of the Al-Qatif Central Hospital and examination of the control group in outpatient dental clinics in the hospital. All dental examinations were standardized according to the World Health Organization (WHO) standardized index and the decayed, missing, and filled teeth (DMFT) index (Klien and Knutson, 1938), including the use of mouth mirrors, explorers, periodontal probes, and a portable dental LED light.

Teeth that were missing for any reason other than dental caries, according to subjects' self-reports were excluded. Gingival bleeding, calculus, and periodontal pocket depth were measured with a Williams periodontal probe according to the community periodontal index (CPI) (WHO, 1982). Ten index teeth (#11, #16, #17, #26, #27, #31, #36, #37, #46, and #47) were probed at six sites (mesiobuccal, mid-buccal, distobuccal, and corresponding lingual sites) each, and the highest score was recorded for each sextant. Possible CPI scores were: 0 (healthy), 1 (bleeding after probing, observed directly or by mouth mirror), 2 (calculus detected during probing, but the entire black band of the probe remained visible), 3 (4–5-mm periodontal pocket depth), and 4 ($\geqslant$6-mm periodontal pocket depth).

The Silness–Löe plaque index (Silness and Loe, 1964) was also used to measure oral hygiene status. Dental plaque was recorded for all surfaces of teeth #12, #16, #24, #32, #36, and #44 using a scale ranging from 0 to 3: 0 = no plaque; 1 = film of plaque adhering to the free gingival margin and adjacent area of the tooth, observed in situ only after application of disclosing solution or by using a probe on the tooth surface; 2 = moderate accumulation of soft deposits within the gingival pocket or tooth and gingival margin, visible with the naked eye; and 3 = abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin. The plaque index was calculated by averaging scores from four surfaces of each tooth.

2.4. Self-administered survey

Patients in both groups were asked to complete a self-administered survey developed specifically for this study. The survey was pilot tested and consisted of 15 questions for cases and control individuals and 6 questions specific for SCD patients. The survey solicited demographic information, such as age, sex, education level, income, and marital status. It assessed