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Tooth wear and quality of life among adults in the United Kingdom

Mary H.M. Li, Eduardo Bernabé*

King's College London Dental Institute at Guy's, King's College and St. Thomas' Hospitals, Division of Population and Patient Health, London, United Kingdom

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ABSTRACT

Objective: To explore the association between tooth wear and quality of life among adults in the United Kingdom, independently of sociodemographic factors and other common oral conditions.
Methods: We used data from 5654 dentate adults who participated in the 2009 Adult Dental Health Survey. Tooth wear was assessed during clinical examination and classified as none, mild, moderate and severe based on the worst affected tooth recorded. The numbers of teeth with mild, moderate and severe tooth wear were used as alternative measures. Oral impacts on quality of life were measured using the short form of the Oral Health Impact Profile (OHIP-14). The associations between tooth wear measures and OHIP-14 total and domain scores were tested in negative binomial regression models adjusting for sociodemographic and clinical factors.
Results: Overall, 62% of participants had mild, 13% moderate and 2% severe tooth wear. Adults with severe tooth wear had a crude OHIP-14 total score higher than those without tooth wear (Rate Ratio: 1.90; 95% Confidence Interval: 1.32–2.75). This association was attenuated after adjustment for confounders, particularly for other oral conditions (1.25; 95% CI: 0.90–1.73). Moreover, adults with severe tooth wear reported higher OHIP-14 domain scores in psychological discomfort (1.15; 95% CI: 1.06–1.25) and psychological disability (1.18; 95% CI: 1.10–1.30) than those without such condition. There was also evidence of a dose-response relationship; with higher OHIP-14 domain scores according to the number of teeth with severe tooth wear.
Conclusion: This nationwide study among UK adults shows that severe tooth wear was negatively associated with psychological impacts on people's life.
Clinical significance: Dentist should consider not only the patients' clinical characteristics, but also their impacts on quality of life and provide preventive or restorative management accordingly.
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1. Introduction

Tooth wear is the loss of dental hard tissues resulting of the interaction between teeth and other materials (abrasion), tooth-to-tooth contact (attrition) or dissolution of hard tissues by acidic substances (erosion) [1,2]. Tooth wear is a relatively common condition [3–5] and its prevalence increases with age [3,6]. Patients with a worn dentition often complain of tooth sensitivity associated with dentine exposure; dental pain due to involvement of the pulp; poor aesthetics owing to shortened clinical crown and loss of vertical dimension; and/or functional impairment for difficulties with chewing due to occlusal alterations and dental tissue loss [7–9]. Despite this knowledge, only few studies have formally assessed the impact of tooth wear on people's quality of life.

The first of those studies compared 76 tooth wear patients (classified as mild, 42 as moderate and 32 as severe according to the Smith and Knight index) with 76 controls matched by age, sex and education. Total satisfaction and domain scores (appearance, pain, oral comfort, general performance and eating capacity) in the Dental Impact on Daily Living questionnaire were significantly lower in tooth wear patients than controls [10]. In the second study, a convenience sample of 1010 university students were clinically examined using the Smith and Knight index and completed the Oral Health Impact Profile (OHIP-49). No differences in OHIP-49 total scores were found between participants with none/mild, moderate and severe tooth wear. However, the group with severe tooth wear had a higher domain score in functional limitation than the other two groups. Only bivariate results were reported [11]. In the most recent study, 51 adult patients with visible wear (dentin exposure and at least one third of loss of clinical crown height in three or more sextants) were

* Corresponding author at: Division of Population and Patient Health, King's College London Dental Institute, Denmark Hill Campus, Bessemer Road, London SE5 9RS, United Kingdom.
E-mail address: eduardo.bernabe@kcl.ac.uk (E. Bernabé).

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compared with 58 healthy controls. Tooth wear patients had significantly higher total and domain scores in the Dutch version of the OHIP-49 than healthy controls. However, only unadjusted scores were presented [12]. In all, previous studies were based on patients or convenience samples, which precludes any generalisation to the wider population. In addition, they did not control for potential covariates. As sociodemographic factors are closely related to both tooth wear [3,4,13] and quality of life [14–16], they may confound the association between tooth wear and quality of life.

All previous studies used generic oral health-related quality of life (OHRQoL) measures, which not only captured the impacts caused by tooth wear but also those related to other oral conditions [17–20]. As many people with tooth wear may also have dental caries, tooth loss or even wear partial dentures, not considering the impact of the latter conditions can seriously affect the estimates of the association between tooth wear and quality of life. Therefore, the problem arises not because of using a generic OHRQoL measure *per se* but because of failing to recognise that other conditions occurring simultaneously in the mouth also explain variations in the levels of the OHRQoL measure [21]. Population-based studies controlling for multiple oral conditions are therefore required to address the above mentioned limitations. The aim of this study was to investigate the association between tooth wear and oral impacts on quality of life among adults in the UK, independently of sociodemographic factors and other common oral conditions.

2. Materials and methods

2.1. Data source

Data are from the 2009 Adult Dental Health Survey. This national survey was based on a representative sample of adults, aged 16 and over, living in England, Wales and Northern Ireland. The sample size for the survey was 13,400 households, including 1150 in each English Strategic Health Authority and Wales, and 750 households in Northern Ireland. Participants were selected using a two-stage cluster sampling comprising of 268 primary sampling units (PSU) across the UK. Each PSU included two postcode sectors with 25 addresses sampled from each. A total of 13,509 adults were invited to participate in the home interview and 11,380 (84%) agreed. Of them, 813 (7%) were not eligible for the examination because they were edentate. From the remaining 10,567 eligible respondents, a total of 6469 (61%) individuals were clinically examined [22].

2.2. Variables selection

OHRQoL was measured using the short-form Oral Health Impact Profile (OHIP-14), which contains 14 questions on the frequency of adverse impacts caused by oral conditions during the preceding 12 months. OHIP-14 items are grouped into 7 dimensions: functional limitation (trouble pronouncing words and worsened taste), physical pain (aching in mouth and discomfort eating foods), psychological discomfort (feeling self-conscious and feeling tense), physical disability (interrupted meals and unsatisfactory diet), psychological disability (difficulty relaxing and embarrassment), social disability (irritability and difficulty in doing usual jobs) and handicap (life less satisfying and inability to function). The response to each question was coded from 0 to 4 (never, hardly ever, occasionally, fairly often and very often). Domain scores were calculated as the sum of responses to the two corresponding items (ranging from 0 to 8) and the total score as the sum of responses to all 14 times (ranging from 0 to 56). Higher scores indicated worse OHRQoL [23].

An assessment of tooth wear was included during clinical examinations, which were conducted with participants seated on a chair and using artificial light, a mirror and a CPITN-C probe. Only anterior teeth were included in the tooth wear assessment. Tooth wear was assessed at three surfaces (buccal, incisal and lingual) per tooth and recorded as restricted to enamel, enamel loss just exposing dentine, more extensive dentine exposure (more than one-third of the buccal or palatal surface) or loss of dentine (exposed dentine facets with a bucco-lingual dimension 2 mm or greater at the widest point in incisal surface), and complete enamel loss with exposure of dental pulp or secondary dentine [22,24]. Tooth wear was classified as no, mild, moderate or severe based on the worst affected tooth recorded per participant. We also estimated the numbers of teeth with mild, moderate and severe tooth wear.

A number of sociodemographic and clinical factors were included as potential covariates. Participants provided information on their demographic factors (sex, age and country of residence), socioeconomic position (education and household income) and use of prosthesis. Education was assessed as the highest level of qualification received (no qualifications, below degree level and degree level and above). Weekly household income, from all sources and before deductions, was derived from responses to several questions. Clinical factors included the number of teeth, denture use, dental caries and periodontal disease, which were obtained through clinical examinations [22]. Dental caries were recorded at the surface level using the caries into dentine threshold (cavitated lesion) and defined as having one or more teeth with untreated decay [25]. The periodontal examination included the assessment of pocket depth at two sites (mesial and distal) on each tooth (buccally on upper arch and lingually on lower arch). The worst score in each sextant was recorded. Periodontal disease was defined as having one or more sextants with pocketing $\geq$4 mm [25].

2.3. Statistical analysis

All analyses were weighted to take account of the survey design and possible non-response bias [22]. Negative binomial regression models were fitted as the OHIP-14 total and domain scores were count variables with over-dispersion [26]. Rate ratio (RR) with 95% confidence intervals (CI) were thus reported. As for covariates, age and number of teeth were analysed in their continuous forms whereas household income was divided into quintiles.

The association between the severity of tooth wear and the OHIP-14 score was assessed in unadjusted, partially and fully adjusted models (labelled as Models 1–3, respectively). Partially adjusted models controlled for sociodemographic factors (sex, age, country of residence, education and income) whereas the fully adjusted model additionally controlled for clinical factors (number of teeth, partial denture use, dental caries and periodontal disease). Therefore, the fully adjusted model provided an assessment of the association between severity of tooth wear and OHIP-14 scores independent of other oral conditions occurring simultaneously.

Furthermore, the associations of the numbers of teeth with mild, moderate and severe tooth wear with OHIP-14 scores were assessed in unadjusted, partially and fully adjusted models, as described above. The fully adjusted model included the numbers of teeth with mild, moderate and severe tooth wear simultaneously as explanatory variables in the model in addition to other clinical factors.

3. Results

There were 5654 dentate adults in the study sample, representing 87.4% of the full sample of dentate participants

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