Smoking status and oral health-related quality of life among adults in the United Kingdom

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Key points

- Shows that the smoking status was independently associated with worse oral health-related quality life after adjusting with a range of social demographic predictors, clinical status and self-reported general health.
- Provides evidence based argument in promoting health and oral health to public.
- Encourages future studies on this area of interest.

Objective The primary objective of this study was to examine the association between smoking and oral health-related quality of life (OHRQoL) among dentate people aged 16 years and above in England. **Methods** Cross-sectional study, based on the Adult Dental Health Survey (ADHS) 2009. ADHS 2009 involved data collection from 11,380 face-to-face interviews and 6,469 dental examinations from England, Wales and Northern Ireland. This study focuses on the dentate sample from England, consisting of 5,622 individuals who underwent dental examination. OHRQoL was measured by two indices; Oral Health Impact Profile-14 (OHIP-14) and Oral Impacts on Daily Performance (OIDP). Unadjusted and adjusted zero-inflated regression models were used. Adjustment was sequentially done for socio-demographics, clinical oral conditions and self-reported general health. **Results** Prevalence of those who had never smoked, past smokers and current smokers were 45.6%, 35.3% and 19.2% respectively. Current smokers had considerably higher mean OHIP-14 and OIDP scores than non-smokers. There was a statistically significant association between smoking and OHRQoL (both OHIP-14 and OIDP) even in the fully adjusted models. Current smokers were more likely to report worse OHRQoL compared to those who had never smoked in both OHIP-14 and OIDP score. There was no statistically significant difference between past smokers with those who had never smoked in reporting OHIP-14 and OIDP. Among those reporting OHRQoL, there was a stepwise gradient risk of reporting no oral impact, where the probability was higher among those who had never smoked, followed by past smokers and current smokers both in OHIP-14 and OIDP. **Conclusion** Smoking was independently associated with worse OHRQoL, even after adjusting for a range of socio-demographic factors, clinical oral conditions and self-reported general health.

Introduction

Many studies have shown the harmful effect of smoking behaviour in relation to oral cancer,[1–3] periodontal disease incidence and tooth loss,[4–8] precancerous lesions,[9] dental caries[10–12] and teeth staining.[13,14] These oral conditions may affect the physical, psychological and social well-being of an individual.[15] For instance, caries cause pain and discomfort from acute and chronic infection, which may disturb eating and sleeping. Coping with oral pain is one of the reasons for children's absence from school and this affects their school performance.[16] Moreover, tooth loss affects chewing abilities, limits food choice and reduces the enjoyment of food intake.[17] The impacts of smoking-related diseases have been felt at individual, societal and national level and the costs of treating these diseases are high worldwide.[18,19]

Oral health-related quality of life (OHRQoL) is the self-perceived impact of the oral conditions on the social, functional and psychological well-being of individuals. OHRQoL measures are used to capture the impact of oral conditions on the well-being of individuals.[20] In addition, OHRQoL measures together with clinical measures and indicators of behavioural propensity, can be used to access the oral care need of individuals and populations in general.[21,22]

In the past three decades, researchers have been trying to comprehend which factors influence the subjective perception of quality of life. Many studies have successfully addressed the relationship between OHRQoL and health determinants including clinical conditions, socio-demographic and behavioural factors.[23–26]

As a common behavioural cause of preventable illness and death worldwide, many studies have observed on the role of smoking behaviour on quality of life among patients with general health problems such as cardiovascular diseases, respiratory problems and cancers.[27] However, despite the harmful effects of smoking to oral health, the role of smoking on OHRQoL is not well-researched.

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Few studies have examined the effect of smoking on OHRQoL from various countries. Maida *et al.*[25] and Sanders[28] examined the US national survey, Astrom *et al.*[29] examined people aged 50 years in Sweden using a longitudinal study, Mbawalla *et al.*[30] examined school children from Tanzania, Christensen *et al.*[31] examined schoolchildren in Denmark, Yiengprugsawan *et al.*[32] examined people in a national cohort study and Espinoza *et al.*[33] examined a nationally representative sample in Chili. One randomised experimental study among adults with human immune deficiency virus (HIV) looked at the impacts of HIV severity on OHRQoL. The study concluded that smoking has a strong correlation with OHRQoL among HIV patients.[34] All three studies that looked directly on the association between smoking and OHRQoL found that smokers reported poorer OHRQoL compared to those who never smoked.[25,29,30] Moreover, studies that looked indirectly on the association between smoking and OHRQoL did also support the association between smoking and poorer OHRQoL,[28,31,32,34] with the exception of only one study.[33]

These studies employed different methodological designs, and also varied in the age of respondents and the chosen OHRQoL measure. With different methodology design, age of respondents, and OHRQoL measure used, it is difficult to make a direct comparison between these studies. Moreover, some of these studies used a validated OHRQoL measure while other studies used modified versions of OHRQoL measure, therefore they are not directly comparable with other studies. In addition, all previous studies relied on one indicator to measure OHRQoL. None examined OHRQoL using more than one indicator, thereby allowing for comparisons between the different OHRQoL measures. Therefore, the aim of this study is to examine the relationship between smoking behaviour and OHRQoL among dentate people aged 16 years and above in England.

Methodology

This study examined data from the Adult Dental Health Survey (ADHS) 2009, taken from the UK data archives. ADHS 2009 has obtained the ethical approval from the Oxfordshire Research Ethics Committee. Secondary data analysis does not require further ethical approval as no personal or small area level identifiers were used in these analyses.

Table 1 Description of sample and associations with the outcomes (OHIP-14 and OIDP) in 5,534 dentate participants

Variable	Categories	n (%)	Mean OHIP (se)	Mean OIDP (se)
Smoking	Never	2,523 (45.6)	2.9 (0.1)	4.0 (0.2)
	Past	1,951 (35.3)	3.3 (0.1)	4.0 (0.2)
	Current	1,060 (19.2)	6.4 (0.3)	8.7 (0.5)
Age group	16 to 34	1,335 (24.1)	3.6 (0.2)	5.4 (0.3)
	35 to 54	2,110 (38.1)	4.0 (0.1)	5.3 (0.3)
	55 and over	2,089 (37.8)	3.5 (0.1)	4.1 (0.2)
Sex	Male	2,529 (45.7)	3.5 (0.1)	4.5 (0.2)
	Female	3,005 (54.3)	4.0 (0.1)	5.2 (0.2)
Marital status	Married /civil partner	3,096 (56.0)	3.4 (0.1)	4.2 (0.2)
	Divorced/separated/widowed	964 (17.4)	4.6 (0.2)	6.0 (0.4)
	Single	1,474 (26.6)	3.9 (0.2)	5.6 (0.3)
Education	Degree or superior	1,477 (26.7)	3.0 (0.1)	4.0 (0.3)
	Below degree	3,248 (58.7)	3.9 (0.1)	5.1 (0.2)
	No qualifications	809 (14.6)	4.4 (0.3)	5.7 (0.4)
Number of teeth	25-32	3,835 (69.3)	3.1 (0.1)	4.2 (0.2)
	17-24	1,213 (21.9)	4.6 (0.2)	5.8 (0.4)
	9-16	341 (6.2)	6.2 (0.5)	7.7 (0.8)
	1-8	145 (2.6)	6.1 (0.7)	7.6 (1.1)
Active decay	No	3,904 (70.6)	3.1 (0.1)	4.1 (0.2)
	Yes	1,630 (29.5)	5.1 (0.2)	6.8 (0.3)
At least one PUFA	No	5,180 (93.6)	3.4 (0.1)	4.4 (0.1)
	Yes	354 (6.4)	8.3 (0.5)	11.9 (1.0)
At least one bleeding site	No	2,481 (44.8)	3.3 (0.1)	4.3 (0.2)
	Yes	3,053 (55.2)	4.1 (0.1)	5.4 (0.2)
At least one pocket ≥4 mm	No	2,895 (52.3)	3.2 (0.1)	4.4 (0.2)
	Yes	2,639 (47.7)	4.3 (0.1)	5.4 (0.2)
Self-reported general health	Very good/good	4,521 (81.7)	3.1 (0.1)	4.0 (0.2)
	Fair	796 (14.4)	6.0 (0.3)	8.0 (0.5)
	Very bad/ bad	217 (3.9)	8.0 (0.7)	11.6 (1.2)

PUFA = pulpal involvement, ulceration, fistula and abscess
OHIP-14 = Oral Health Impact Profile-14
OIDP = Oral Impacts Daily on Performances
se = standard error
n = number of participants

ADHS 2009 involves a collection of data from 11,380 face to face interviews and 6,469 dental examinations. This study focuses on England thus leaving the original sample of 9,663. Among the 8,017 dentate participants, 5,622 underwent a clinical dental examination and hence were eligible for inclusion in this analysis. Cases with missing value (n = 88, 1.6%) on any of the variables were excluded from the analysis.

The outcome variable was OHRQoL. Two validated measures were used: the Oral Health Impact Profile (OHIP-14) and the Oral Impacts on Daily Performances (OIDP).

The OHIP-14 is a shortened version of OHIP-49 developed using a conceptual model of oral health by Locker.[35] The OHIP-14 measures the frequency of oral impacts in seven dimensions, two questions for each dimension, namely; functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap.[35] For each question, answering options were 'Never' = 0, 'Hardly ever' = 1, 'Occasionally' = 2, 'Fairly often' = 3 and 'Very often' = 4. The OHIP-14 score was calculated by adding the score of the 14 questions with the range from zero to 56. The higher score indicates higher levels of impacts on the quality of life.

The OIDP measures the frequency and severity of oral impacts on the abilities to carry out nine daily activities; eating, speaking, cleaning teeth or dentures, going out, relaxing, smiling, carrying out major role or work,

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Table 2 Distribution of sample characteristics by smoking in 5,534 dentate participants

Variable	Categories	Smoking (%)		
		Never	Past	Current
Age group	16 to 34	47.8	25.2	27.0
	35 to 54	48.4	30.4	21.2
	55 and over	41.3	46.6	12.1
Sex	Male	38.2	42.0	19.8
	Female	51.8	29.6	18.6
Marital status	Married/civil partner	47.3	39.7	13.1
	Divorced/separated/widowed	40.3	36.2	23.6
	Single	45.6	25.3	29.1
Education	Degree or superior	54.1	36.0	9.9
	Below degree	43.4	34.6	22.0
	No qualifications	38.8	36.6	24.6
Number of teeth	25-32	49.9	31.7	18.4
	17-24	38.6	41.0	20.5
	9-16	30.8	46.6	22.6
	1-8	24.8	55.2	20.0
Active decay	No	47.6	37.0	15.4
	Yes	40.8	31.1	28.1
At least one PUFA	No	46.2	35.7	18.1
	Yes	36.7	28.8	34.5
At least one bleeding site	No	45.4	37.5	17.1
	Yes	45.7	33.4	20.9
At least one pocket depth ≥4 mm	No	48.8	34.8	16.4
	Yes	42.1	35.7	22.2
Self-reported general health	Very good/good	48.0	35.0	17.0
	Fair	36.6	35.6	27.9
	Very bad/bad	28.1	40.1	31.8

PUFA = pulpal involvement, ulceration, fistula and abscess

maintaining emotional state and enjoying contact with people.[36] Severity of the oral impacts was assessed through a Likert scale ranging from 0 (no effect) to 5 (very severe effect). The OIDP score was calculated by adding the scores from the nine items, then dividing this by the maximum score (45) and multiplying it by 100 to get a percentage score. Higher OIDP indicates more severe oral impacts.

Exposure variable was smoking status, used as a categorical variable. To assess current smoking status, the specific questions was asked: 'Have you ever smoked a cigarette, a cigar, or a pipe?' Individuals who answered 'Yes' were further asked 'And do you smoke cigarettes at all nowadays?' Answer for both questions were either 'Yes' or 'No'. Individuals who answered 'No' in the first question were categorised as 'never smoke', individuals who answered 'Yes' for the first and 'No' for the second question were categorised as 'past smoker' and individuals who answered 'Yes' for both questions were categorised as 'current smoker'.

The socio-demographic covariates considered were age (16–34, 35–54, 55 and over.), sex (male or female), marital status (married/ civil partnership, separated/divorced/ widowed and single) and education level (degree or superior, below degree and no qualification).

The oral clinical covariates considered were number of natural teeth, dental caries, PUFA (pulpal involvement, ulceration, fistula and abscess), bleeding on probing (BOP) and pocket depth. The number of natural teeth was categorised as (i)25-32, (ii) 17-24, (iii) 9-16 and (iv)1-8. Dental caries was categorised as 'Yes' (at least one tooth decayed including roots) or 'No'. PUFA (pulpal involvement, ulceration, fistula and abscess) (Monse *et al.* 2010) was categorised as 'Yes' (at least one PUFA) or 'No'. Bleeding on probing (BOP) was categorised as 'Yes' (at least one BOP site) and 'No'. Pocket depth ≥4 mm was categorised as 'Yes' (at least one pocket depth ≥4 mm) or 'No'. Self-reported general health was categorised as Very Good/ Good, Fair and Bad/Very Bad.

Statistical analyses were performed using software: STATA version 12. The examination survey weight was used to account for unequal probability being sampled and geographical clustering of the data. Due to high prevalence of zero values in both outcome measures, zero inflated Poisson regression (ZIP) was used in bivariate and multi-variable regression models. A series of sequential multi-variable ZIP models were used, by calculating incidence rate ratios (IRR) for the non-zero OHRQoL scores and odds ratios (OR) of having no event (score of zero in the outcome).

Results

Data from 5,534 individuals was analysed in this study. Overall, 45.6% of the sample had never smoked, 35.3% were past smokers and 19.2% were current smokers. The mean (standard error) OHIP scores was 2.9 (0.1) among those that had never smoked, 3.3 (0.1) among past smokers, and 6.4 (0.3) among current smokers, while the respective means (standard error) for the OIDP score were 4.0 (0.2), 4.0 (0.2) and 8.7 (0.5) (Table 1). Table 2 shows the distribution of smoking status with other covariates.

Results for the associations between smoking and the OHIP14 score are presented in two different parts of the OHIP-14 score: a) as incidence rate ratios (IRR) for the OHIP-14 score among those with oral impacts (OHIP-14 >0), and b) as odds ratios for having no oral impact (OHIP-14 = 0).

Model 1 shows the crude (unadjusted) association of each variable with OHIP-14. The incidence rate (IRR) of having oral impacts (OHIP-14 >0) in current smokers was 1.6 (95% CI: 1.4, 1.8) when compared to those who had never smoked. However, past smokers had no difference in OHIP-14 score with those who had never smoked (IRR: 1.0; 95% CI 0.9, 1.1). In terms of the zero-inflated part of the model (OHIP-14 = 0), current smokers and past smokers had lower odds (OR: 0.5; 95% CI: 0.4, 0.6 for current smokers and OR: 0.7; 95% CI: 0.7, 0.9 for past smokers) for having no oral impacts compared to those who had never smoked.

The aforementioned IRR for current smokers attenuated slightly but remained statistically significant in Model 2 (adjusted for socio-demographic factors) and Model 3 (adjusted for socio-demographic factors and clinical oral conditions). In the zero-inflated part of the model (OHIP-14 = 0), the respective

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estimates were unchanged in Model 2 and attenuated slightly while remaining statistically significant in Model 3.

Model 4 presents the fully adjusted model for the association between smoking and OHIP-14 that accounted for socio-demographic factors, clinical oral conditions and self-reported general health. Compared to those who never smoked, current smokers had 1.3 (1.2, 1.5) times higher OHIP-14 score among those with oral impacts. Again, there was no such difference for past smokers (IRR: 1.0; 95% CI 0.9, 1.1). In terms of the zero-inflated part of the model (OHIP-14 = 0), current smokers and past smokers had lower odds (OR: 0.6–95% CI: 0.5, 0.7; and OR: 0.7; 95% CI: 0.7, 0.9 respectively) for having no oral impacts when compared to those who had never smoked.

Table 4 presents the associations between smoking and the OIDP score. Model 1 shows the crude (unadjusted) associations of each variable with OIDP. Among those with oral impacts (OIDP>0), current smokers had 1.4 (95% CI: 1.2, 1.6) times higher OIDP score than those who had never smoked. The respective difference between past smokers and those who never smoked was not statistically significant (IRR: 0.9; 95% CI 0.8, 1.0). In terms of the zero-inflated part of the model (OIDP = 0), current smokers had lower odds (OR: 0.5; 95% CI: 0.4, 0.6) for having no oral impacts when compared to those who never smoked, while the respective estimate for past smokers was in the same direction but statistically non-significant (OR: 0.8; 95% CI: 0.7, 1.0).

Similar to OHIP-14, the estimate for current smokers among those with oral impacts (OIDP >0) attenuated slightly but remained statistically significant in Model 2 (adjusted for socio-demographic factors) and Model 3 (adjusted for socio-demographic factors and clinical oral conditions). In the zero-inflated part of the model (OIDP = 0), the respective estimates were unchanged in Models 2 and 3.

Model 4 presents the fully adjusted model of the association between smoking and OIDP after accounting for socio-demographic factors, clinical variables and self-reported general health. For the Poisson part of the model (OIDP >0), current smokers had 1.2 (1.1, 1.3) times higher OIDP score than those who never smoked, while there was no difference for past smokers. For the zero-inflated part of the model (OIDP = 0), current smokers had lower odds (OR: 0.6–95% CI: 0.5, 0.7) for having no oral impacts when compared to those who had never smoked. The OR of past smokers was not changed from the unadjusted model (Model 1) and remained the same throughout all models (OR: 0.8; 95%CI: 0.7, 1.0), showing a statistically non-significant association.

Table 3 Association between smoking and OHIP-14 in 5,534 dentate participants: zero inflated Poisson regression models

Variables	Categories		Model 1	Model 2	Model 3	Model 4
Smoking	Never	Poisson: IRR (95%CI)	1.0	1.0	1.0	1.0
	Past		1.0 (0.9,1.1)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	1.0 (0.9,1.1)
	Current		1.6 (1.4,1.8)*	1.5 (1.4,1.7)*	1.4 (1.2,1.5)*	1.3 (1.2,1.5)*
	Never	Zero inflated: OR (95%CI)	1.0	1.0	1.0	1.0
	Past		0.7 (0.7,0.9)*	0.7 (0.7,0.9)*	0.7 (0.7,0.9)*	0.7 (0.7,0.9)*
	Current		0.5 (0.4,0.6)*	0.5 (0.4,0.6)*	0.6 (0.5,0.7)*	0.6 (0.5,0.7)*

Model 1: Crude association
Model 2: Adjusted for socio-demographic
Model 3: Adjusted for socio-demographic, clinical oral conditions
Model 4: Adjusted for socio-demographic, clinical oral conditions and self-reported general health
*Statistically significant at $p < 0.05$

Table 4 Association between smoking and OIDP in 5,534 dentate participants: zero inflated Poisson regression models

Variables	Categories		Model 1	Model 2	Model 3	Model 4
Smoking	Never	Poisson: IRR (95%CI)	1.0	1.0	1.0	1.0
	Past		0.9 (0.8,1.0)	0.9 (0.8,1.0)	0.9 (0.8,1.0)	0.9 (0.8,1.0)
	Current		1.4 (1.2,1.6)*	1.3 (1.1, 1.5)*	1.2 (1.0,1.4)	1.2 (1.1,1.3)*
	Never	Zero inflated: OR (95%CI)	1.0	1.0	1.0	1.0
	Past		0.8 (0.7,1.0)	0.8 (0.7,1.0)	0.8 (0.7,1.0)	0.8 (0.7,1.0)
	Current		0.5 (0.4,0.6)*	0.5 (0.4,0.6)*	0.5 (0.4,0.7)*	0.6 (0.5,0.7)*

Model 1: Crude association
Model 2: Adjusted for socio-demographic
Model 3: Adjusted for socio-demographic, clinical oral conditions
Model 4: Adjusted for socio-demographic, clinical oral conditions and self-reported general health
*Statistically significant at $p < 0.05$

Discussion

This study has shown that smoking was statistically significant associated with oral OHRQoL and the results were very similar for both the OHIP-14 and the OIDP. Among those reporting oral impacts, current smokers were more likely to report worse OHRQoL scores compared to those who had never smoked. However, there was no such difference between past smokers and those who had never smoked. Furthermore, there was a stepwise gradient risk of reporting no oral impact, with current smokers having the lowest probability of no oral impacts, followed by the past smokers when compared to those who had never smoked.

The statistically significant association between smoking and OHRQoL from this study was supported by three previous studies[25,29,30] though only the last study used a potentially comparable age group to our study. In line with our results, Maida *et al.*[25] found that current smokers have worse OHRQoL and there was no difference in reporting OHRQoL among past smokers and those who had never smoked. Astrøm *et al.*[29] found that males who quit smoking at the age of 50 had higher risk of reporting oral impacts (OHRQoL) after 15 years compared to stable smokers. The findings from another study supported that smoking is associated with worse OHRQoL among secondary school children, but the study did not differentiate between past smokers and never smokers.[30]

Unlike previous studies, it also showed a stepwise association for the zero-inflated part of the Poisson regressions, whereby there was lower prevalence of participants without oral impacts for every group with less favourable smoking behaviour. Our study went further

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than the previous literature by looking at three groups of smoking and also by separating the associations into two different parts through the use of appropriate statistical techniques. Indeed, the zero-inflated regressions allowed us to examine the association between smoking and OHRQoL scores for those that reported oral impacts and separately look at the odds of having no oral impacts between the three groups of smoking behaviour. Moreover, all previous studies used one OHRQoL measure, while we used the two most widely used and internationally comparable measures. This allowed us to compare our results across different OHRQoL measures and hence facilitate comprehensive assessment of the research question.

The main finding from this study suggests that smoking has an independent negative association towards OHRQoL. Therefore, public health action should focus on health promotion interventions against smoking, as non-smokers are healthier and have better quality of life than smokers. It is well-known that smoking is harmful to oral and general health. Despite the preventive program, efforts and legislation that have been put against this behaviour, the prevalence of smoking both in men and women is still high in England. Our study has shown that people who smoked have worse OHRQoL compared to those who had never smoked and the risk of having poor OHRQoL in past smokers was the same as those who never smoke. The findings from this study may be used to emphasise the importance of smoking cessation programmes and can be used as arguments about worse quality of life. For instances, it may be used to encourage people to stop smoking after being a smoker for a longer period. Rewards from not smoking goes beyond gaining better oral health, it also contributes to a superior quality of life.

A possible explanation is that people who do not smoke have a better life and feel happier, thus reported better OHRQoL, though this may be unrelated to their smoking experience. There is no direct evidence found to support this argument. However, previous studies have found that smoking is associated with depression,[37–39] while ex-smokers reported that they were happier now than when they were smokers.[40] Another explanation may relate to the association whereby people with better OHRQoL enjoy their life more and are happy, thus less likely to engage with unhealthy behaviours including smoking.[41]

ADHS followed a robust methodology in order to achieve a sample that was a national representation of adults in England, Wales and Northern Ireland. We analysed the dentate adult sample for England, which due to the nature of the study was quite large. In addition, all analyses in this study used survey weights to compensate for possible bias due to the nature of the sampling and the response rate. Therefore, the findings of our analyses, which only focus on the data for England, are generalisable to the dentate adult population in England.

This ADHS is a cross-sectional study. Therefore, we cannot assess changes in smoking behaviour and cannot infer causality from our findings. All secondary data analysis projects are limited by the data available. Therefore, we were not able to gather more information on smoking. For instance, there is no further information on how long respondents have quit smoking, which may give an idea if that person is a stable past smoker and can be categorised accordingly. Another example is that we were not able to have information on the amount of cigarettes smoked per day.

In addition to that, the question asked to classify past or former smokers is very broad, which cover someone who smokes one cigarette in his lifetime to someone who just quit smoking a few days ago. This might overestimate the past smoker group and the impact towards their oral health-related quality of life. A further recommendation for future oral health surveys is to include the relevant questions to categorise smoking status more appropriately. The definition of past smoker and current smoker should be standardised to allow robust analysis and comparison.

Smoking statuses are more prone to reporting bias.[42] There are objective ways to measure smoking status through carbon monoxide concentration in expired air and serum concentration of cotinine in blood.[43] However, such methods were beyond the scope of the national epidemiological oral health survey. Information on the number of cigarettes smoked per day, or the length of time since past smokers have quit smoking would have allowed for a more comprehensive assessment of the association.

Another limitation of this study is selection bias of the data included in this study. We included 5,622 dentate participants who underwent dental examination and excluded 2,395 dentate participants who did not have dental examination and 1,646 edentulous participants. They were excluded in the analysis as they are missing data in oral clinical conditions which is needed for multi-variable regression analysis. Those excluded might have different characteristics for example, smoking rates and socio-demographic background. The findings from this study should be read with the understanding of the mentioned potential bias.

Conclusion

This study has shown that smoking has a significant independent association with OHRQoL after accounting for the effect of socio-demographic background, clinical conditions and self-reported general health. Among those reporting oral impacts, current smokers were more likely to report worse OHRQoL scores compared to those who had never smoked, but the same was not the case for past smokers. Smoking cessation should be encouraged for smokers as past smokers have equal chance to gain better OHRQoL as those who never smoked.

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