

Work stress and oral health-related quality of life among Indian information technology workers: an exploratory study

Shashidhar Acharya and Kalyana C. Pentapati

Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal University, Manipal, India.

Objectives: To assess the relationships among work stress, oral health and oral health-related quality of life (OHRQoL) in information technology (IT) professionals in south India. **Methods:** The study population consisted of 134 IT industry workers in four mid-size IT companies in south India. A self-administered questionnaire consisting of the eight-item Oral Impact on Daily Performance (OIDP) scale and a 25-item modified version of the original 167-item Work Stress Questionnaire was given, following which an oral examination was carried out. **Results:** Mean \pm standard deviation scores on the Work Stress Questionnaire, the decayed, missing and filled teeth (DMFT) index and the Community Periodontal Index of Treatment Needs (CPITN) for the sample population were 53.82 ± 15.07 , 4.23 ± 3.47 and 1.81 ± 0.58 , respectively. A comparison of clinical oral health status data against respondents' work stress and OIDP scores showed that mean DMFT and CPITN scores were significantly greater among those who reported oral impact on their daily performance. However, although participants who reported oral problems had consistently higher work stress scores, the differences were statistically significant only for gingival bleeding and sensitive teeth. Multivariate analysis after controlling for age and sex showed that higher levels of work stress and periodontal disease were significant predictors for poor OHRQoL in the sample population. **Conclusions:** Work stress may be an important predictor for poor OHRQoL and hence requires to be studied in greater detail.

Key words: Work stress, oral health-related quality of life, information technology, India

Workplace stress is the harmful physical and emotional response that occurs when job demands are poorly matched with the capabilities, resources or needs of the worker¹. Stress-related disorders encompass a broad array of conditions, including psychological disorders, maladaptive behaviours and cognitive impairment. In turn, these conditions may lead to poor work performance or even injury². Job stress is also associated with various biological reactions that may lead ultimately to compromised health, causing conditions such as cardiovascular disease or, in extreme cases, death^{3,4}. Previous research has shown a relationship between work stress and oral health in which those with higher work stress had poorer oral health^{5,6}. Marcenes and Sheiham⁵ and Green *et al.*⁶ reported that increased work stress was associated with poorer oral health status and particularly with poorer periodontal status. Previous research has shown that stress can also impact on quality of life (QoL)⁷⁻⁹. A previous study by one of the present authors showed that high stress was related to poor oral health-related QoL (OHRQoL) in a sample of dental patients¹⁰.

The information technology (IT) sector is usually considered one of the fastest growing and most

competitive of industries worldwide. This is even more so in developing countries in which IT firms compete to win outsourcing contracts from big multinational corporations. India is known as the global hub of outsourcing, where thousands of IT companies employ millions of employees who perform back office work for large companies worldwide. Although competition is high, it is particularly severe among the small and medium-size software companies that make up the bottom of the IT industry pyramid (www.livemint.com/2010/02/.../small-midsize-bpo-firms-see.html). This competition leads to small profit margins and consequently to greater employee workload, which can increase levels of stress.

Working with frequent deadlines has been found to be associated with work-related musculoskeletal disorders¹¹, occupational stress and work exhaustion in IT professionals¹². It is possible that manifestations of work stress among IT professionals may impact on oral health and OHRQoL. A search of the literature revealed no studies on the impact of work stress on oral health and OHRQoL among IT professionals. Hence, the objectives of this study were to assess the

relationships among work stress, oral health and OHRQoL among IT professionals in south India.

METHODS

The study population consisted of employees working in software companies involved in outsourcing in the coastal area of the state of Karnataka. A total of 20 companies were found, four of which satisfied the criteria for a mid-size company. After obtaining permission, surveys were scheduled and employees who consented to participate in the study were given a self-administered questionnaire consisting of the eight-item Oral Impact on Daily Performance (OIDP) scale¹³ and a 25-item modified version of the original 167-item Work Stress Questionnaire¹⁴. Participants who completed the questionnaires then underwent an oral examination. The English-language versions of the questionnaires were used as an excellent knowledge of English is an essential prerequisite for employment in this industry. Responses on the Work Stress Questionnaire items were graded from 1 (Not at all) to 5 (Very frequent). Total scores ranged from 25 to 125 and higher scores indicated greater work stress. Total scores on the OIDP ranged from 8 to 40 and higher scores indicated greater impact of oral health on daily performance. The objective assessment of oral health status consisted of a caries examination using the decayed, missing and filled teeth (DMFT) index¹⁵ and an examination of periodontal health status using the Community Periodontal Index of Treatment Needs (CPITN)¹⁶. The examiner was trained and calibrated in the use of the indices by an expert over a period of 2 days. Twenty employees were re-examined after 1 week to test intra-examiner reliability. Kappa scores for the clinical indices ranged from 0.60 to 0.84. Self-reported oral health status was also assessed using questions on gingival bleeding, loose teeth, toothache, decay, food lodging and sensitive teeth. These questions were formulated by the investigators for the present study. This study was conducted in full accordance with the World Medical Association Declaration of Helsinki and permission was obtained from the ethics board of Manipal College of Dental Sciences, Manipal University. Written consent from the participants was obtained prior to the study.

The median work stress score (53) was used to dichotomise the population into those with (scores > 53) and without (scores ≤ 53) work stress. Student's test and the Mann-Whitney *U*-test (for non-parametric distribution) were used for comparisons between means. Variables that were found to be significantly associated (relaxed statistical criteria of $P \leq 0.2$) with OIDP scores in the bivariate analysis were included in the multiple logistic regression analysis. This analysis was used to assess the impact of different factors on

OHRQoL. A *P*-value of < 0.05 was considered to indicate statistical significance. All statistical analyses were performed using SPSS Version 16.0 (SPSS, Inc., Chicago, IL, USA).

RESULTS

A total of four mid-size companies (of 200–500 employees) were approached and asked to participate. Two companies agreed. The two participating companies were similar with respect to employee numbers, revenue and domain of expertise. In these two companies, a total of 215 employees were invited to participate; of these, 134 agreed, giving a participation rate of 62.3%. The mean ± standard deviation (SD) age of the participants was 25.97 ± 4.68 years; 71.6% of the sample were male and 80.6% were single. The mean ± SD length of work experience of the sample was 2.65 ± 2.15 years (range: < 1 year to 15 years). The mean ± SD daily working time was 8.85 ± 1.13 hours (range: 8–15 hours). Only nine employees (6.7%) reported a smoking habit.

Mean ± SD work stress, DMFT and CPITN scores for the sample population were 53.82 ± 15.07, 4.23 ± 3.47 and 1.81 ± 0.58, respectively. The mean ± SD OIDP score was 2.7 ± 3.2. A comparison of self-reported oral health status against work stress and OIDP scores showed that although participants who reported oral problems had consistently higher work stress scores, the differences were statistically significant only for gingival bleeding and sensitive teeth. Mean ± SD work stress scores for those who did and did not report bleeding gums were 63.16 ± 16.00 and 51.68 ± 14.08, respectively. Mean ± SD work stress scores for those who did and did not report sensitive teeth were 59.23 ± 15.99 and 52.26 ± 14.51, respectively. However, except for scores on 'tooth decay', OIDP scores were significantly higher for those who reported oral problems (*Table 1*).

A comparison of clinical oral health status against respondents' work stress and OIDP scores showed that mean DMFT and CPITN scores were significantly greater among those who reported oral impact on their daily performance. Mean ± SD DMFT and CPITN scores for those who reported an impact of oral health were 7.10 ± 4.43 and 2.30 ± 0.67, respectively, compared with 1.56 ± 1.98 and 1.77 ± 0.55, respectively, for those who did not report any such impact. Although similar differences were observed for work stress, they were not statistically significant (*Table 2*). Scores on the OIDP scale were significantly higher among those with above-average work stress scores. Mean ± SD OIDP scores were 2.06 ± 2.57 and 3.46 ± 3.59 for participants who did and did not report work stress, respectively. This difference was statistically significant ($P = 0.01$).

Table 1 Comparisons of scores on the Work Stress Questionnaire and the Oral Impact on Daily Performance (OIDP) scale against self-reported oral health status

| | Work stress score | | | OIDP score | | |
|-----------------|-------------------|-------|-------------------|------------|------|-------------------|
| | Mean | SD | P-value* | Mean | SD | P-value* |
| Bleeding gums | | | | | | |
| No (n = 109) | 51.68 | 14.08 | < 0.001 | 2.38 | 2.94 | 0.003 |
| Yes (n = 25) | 63.16 | 16.00 | | 4.48 | 3.72 | |
| Loose teeth | | | | | | |
| No (n = 125) | 53.38 | 15.07 | 0.212 | 2.58 | 3.14 | 0.012 |
| Yes (n = 9) | 59.89 | 14.63 | | 5.33 | 3.04 | |
| Toothache | | | | | | |
| No (n = 113) | 53.62 | 15.05 | 0.721 | 2.56 | 3.18 | 0.076 |
| Yes (n = 21) | 54.90 | 15.53 | | 3.90 | 3.08 | |
| Decay | | | | | | |
| No (n = 73) | 52.48 | 14.40 | 0.261 | 1.81 | 2.38 | < 0.001 |
| Yes (n = 61) | 55.43 | 15.81 | | 3.92 | 3.66 | |
| Smoking | | | | | | |
| No (n = 125) | 53.62 | 14.89 | 0.560 | 2.66 | 3.14 | 0.158 |
| Yes (n = 9) | 56.67 | 18.15 | | 4.22 | 3.80 | |
| Food lodging | | | | | | |
| No (n = 68) | 51.85 | 13.84 | 0.126 | 2.13 | 3.02 | 0.019 |
| Yes (n = 66) | 55.85 | 16.10 | | 3.42 | 3.26 | |
| Sensitive teeth | | | | | | |
| No (n = 104) | 52.26 | 14.51 | 0.025 | 2.45 | 2.92 | 0.071 |
| Yes (n = 30) | 59.23 | 15.99 | | 3.87 | 3.86 | |

*P-values in bold are significant at $P \leq 0.05$.

Those with increased work stress reported a higher prevalence of bleeding gums. Oral health-related quality of life was poorer among those with poorer self-reported oral health status.

SD, standard deviation.

Table 2 Comparisons of scores on the Work Stress Questionnaire and the Oral Impact on Daily Performance (OIDP) scale against clinical oral health status

| Variable | DT | | MT | | FT | | DMFT | | CPI | | |
|-----------------------------|-------|--------------|-------|-------|-------|-------|-------|--------------|-------|--------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Work stress | | | | | | | | | | | |
| No stress | 66 | 1.45 | 1.95 | 0.27 | 0.62 | 1.94 | 2.70 | 3.67 | 3.25 | 1.74 | 0.56 |
| Stressed | 68 | 2.07 | 2.50 | 0.32 | 0.80 | 2.43 | 2.66 | 4.78 | 3.61 | 1.88 | 0.59 |
| T-test P-value | | 0.112 | | 0.683 | | 0.294 | | 0.063 | | 0.162 | |
| Mann-Whitney U-test P-value | 0.206 | | 0.987 | | 0.246 | | 0.065 | | 0.209 | | |
| No impact | 124 | 1.56 | 1.98 | 0.30 | 0.70 | 2.16 | 2.65 | 4.00 | 3.30 | 1.77 | 0.55 |
| Impact | 10 | 4.30 | 3.77 | 0.30 | 0.95 | 2.50 | 3.10 | 7.10 | 4.43 | 2.30 | 0.67 |
| T-test P-value | | 0.048 | | 0.995 | | 0.702 | | 0.006 | | 0.005 | |
| Mann-Whitney U-test P-value | | 0.023 | | 0.519 | | 0.958 | | 0.023 | | 0.009 | |

P-values in bold are significant at $P \leq 0.05$.

There was no relationship between work stress and clinical oral health status. Oral health was poorer among those who reported impact on daily performance.

DT, decayed teeth; MT, missing teeth; FT, filled teeth; DMFT, decayed, missing and filled teeth; CPI, Community Periodontal Index; SD, standard deviation.

Multiple logistic regression was performed to study the roles of various factors in predicting self-perceived OHRQoL. The predictor variables were periodontal disease (CPITN score of 3 or 4), caries experience (DMFT score of > 0), work stress (score of > 53) self-reported oral health status and smoking prevalence. After adjusting for potential confounders such as age and sex, we found that work stress [odds ratio (OR) = 8.9, 95% confidence interval (CI) 1.0–79.5; $P = 0.05$] and periodontal disease (OR = 10.05, 95%

CI 1.92–52.4; $P = 0.006$) were significant predictors for poor OHRQoL (Table 3).

DISCUSSION

The objectives of this study were to assess the relationships among work stress, oral health and OHRQoL among IT professionals in south India. We found that periodontal disease and work stress had significant impacts on perceived OHRQoL. Although a search of

Table 3 Multiple logistic regression to study the effects of different variables on scores on the Oral Impact on Daily Performance (OIDP) scale

| | Crude OR | Adjusted OR | P-value | 95% CI |
|--------------------|----------|-------------|---------|---------------|
| Sex | 0.530 | 1.700 | 0.59 | 0.241–12.000 |
| Age | 0.100 | 1.105 | 0.9 | 0.217–5.644 |
| Caries experience | -1.201 | 0.301 | 0.42 | 0.016–5.803 |
| Periodontitis | 2.850 | 17.289 | 0.05 | 0.941–317.655 |
| Work stress | 2.999 | 20.057 | 0.03 | 1.313–306.358 |
| Gingival bleeding* | -1.550 | 0.212 | 0.31 | 0.011–4.272 |
| Loose teeth* | 0.838 | 2.313 | 0.53 | 0.162–32.967 |
| Tooth decay* | 2.085 | 8.045 | 0.08 | 0.765–84.597 |
| Smoking* | 1.827 | 6.217 | 0.17 | 0.455–84.929 |
| Tooth sensitivity* | -0.103 | 0.902 | 0.92 | 0.118–6.902 |
| Toothache* | -0.836 | 0.434 | 0.55 | 0.028–6.777 |
| Food lodging* | -0.110 | 0.896 | 0.90 | 0.146–5.486 |

*Self-reported oral health status. $P \leq 0.05$ indicates statistical significance.

Periodontal status and work stress were significantly associated with oral health-related quality of life.

Outcome: presence or absence of oral impact on daily performance; outcome adjusted for age and sex.

OR, odds ratio; 95% CI, 95% confidence interval.

the literature revealed reports on the association between work stress and QoL¹⁷, no reports on the relationship between work stress and OHRQoL were found. We found that those who reported bleeding gums, loose teeth, decayed teeth, food lodging and sensitive teeth had significantly poorer OHRQoL. However, we also found that work stress was greater only among those who reported bleeding gums and sensitive teeth.

In our study, clinical oral health status was poorer among those who reported an impact of oral health on daily performance. No such difference in oral health status was observed between the stressed and non-stressed groups. This study also showed that those with greater work stress had poorer self-reported OHRQoL. Multivariate analysis after controlling for age and sex showed that higher levels of work stress and periodontal disease were significant predictors for poor OHRQoL in the sample population. Those with work stress and periodontal disease were more likely to report an adverse impact of poor oral health on their QoL than those without.

The study did not confirm the previously reported finding that clinical oral health status was associated with work stress^{5,6}. One of the reasons for this may refer to the relatively young age (mean age: 25.92 years) of the study population, which may have had a bearing on the results. Smoking as a habit was not found to be associated with either work stress or OHRQoL. The low prevalence of smoking may explain these findings. This is in agreement with the findings of a previous study, which demonstrated a low prevalence of smoking among the well-educated population in the state of Karnataka¹⁸. A key limitation of this study concerns its design (i.e. cross-sectional), which pre-

cludes any discussion of causality. However, this study is an exploratory work and more detailed studies with larger sample sizes drawn from companies at all levels of the industry pyramid are required.

In conclusion, work stress may be an important predictor for poor OHRQoL. The IT industry needs to consider ways of reducing employees' work stress as doing so would improve the oral health status of the workforce and lessen the impact of oral health issues on work productivity.

Acknowledgement

The authors would like to express their gratitude to Professor Ray Croucher, Professor of Community Oral Health, School of Dentistry, Queen Mary University, London, UK, for his constant encouragement and guidance during the preparation of this manuscript.

Conflicts of interest

None declared.

REFERENCES

1. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occup Environ Med* 2005 62: 105–112.
2. Stavroula L, Griffiths A, Cox T. Work organisation and stress: systematic problem approaches for employers, managers and trade union representatives. Protecting Workers' Health Series; no. 3. Geneva: WHO; 2004.
3. Karasek R, Baker D, Marxer F *et al*. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. *Am J Public Health* 1981 71: 694–705.
4. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health* 1988 78: 1336–1342.
5. Marcenes WS, Sheiham A. The relationship between work stress and oral health status. *Soc Sci Med* 1992 35: 1511–1520.
6. Green LW, Tyron WW, Marks B *et al*. Periodontal disease as a function of life event stress. *J Human Stress* 1986 12: 32–36.
7. Cheng Y, Kawachi I, Coakley EH *et al*. Association between psychosocial work characteristics and health functioning in American women: prospective study. *BMJ* 2000 320: 1432–1436.
8. Lerner DJ, Levine S, Malspeis S *et al*. Job strain and health-related quality of life in a national sample. *Am J Public Health* 1994 84: 1580–1585.
9. Kudielka BM, Hanebuth D, von Kanel R *et al*. Health-related quality of life measured by the SF12 in working populations: associations with psychosocial work characteristics. *J Occup Health Psychol* 2005 10: 429–440.
10. Acharya S. Oral health-related quality of life and its associated factors in an Indian adult population. *Oral Health Prev Dent* 2008 6: 175–184.
11. Beech-Hawley LW. A multi-method approach to assessing deadlines and workload variation among newspaper workers. *J Prev Assess Rehabil* 2004 23: 43–58.
12. Rajeswari KS, Antharaman RN. Role of human computer interaction factors as moderators of occupational stress and work exhaustion. *Int J Hum Comput Int* 2005 19: 137–154.

Acharya and Pentapati

13. Adulyanon S, Sheiham A. Oral impacts on daily performances. In: Slade GD, ed. *Measuring Oral Health and Quality of Life*. Chapel Hill, NC: University of North Carolina; 1997. pp. 151–160.
14. Cooper CL, Sloan SJ, Williams S. *Occupational Stress Indicator: Management Guide*. Windsor: NFER-Nelson; 1988.
15. Klein H, Palmer C. Studies on dental caries vs. familial resemblance in the caries experience of siblings. *Public Health Rep* 1938 53: 1353–1364.
16. Cutress TW, Hunter PBV, Hoskins DIH. Comparison of the Periodontal Index (PI) and Community Periodontal Index of Treatment Needs (CPITN). *Community Dent Oral Epidemiol* 1986 14: 39–42.
17. Maruyama S, Morimoto K. Effects of long workhours on lifestyle, stress and quality of life among intermediate Japanese managers. *Scand J Work Environ Health* 1996 22: 353–359.
18. Rani M, Bonu S, Jha P *et al*. Tobacco use in India: prevalence and predictors of smoking and chewing in a national cross-sectional household survey. *Tob Control* 2003 12: e4.

Correspondence to:
Dr Shashidhar Acharya, MDS,
Professor of Public Health Dentistry,
Manipal College of Dental Sciences,
Manipal University,
Manipal 576104, India.
Email: shashidhar_acharya@yahoo.com