

# Determinants of perceived need for dental pain medication

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Abstract - Objectives: To describe the perceived inability to cope (PIC) and impact on quality of life (QOL) in dental pain patients, and investigate their effect on perceived need for pain medication. Methods: Fully structured self-complete questionnaire survey of a sample of patients with current experience of dental pain/discomfort and sensitivity. Subjects were recruited from a dental teaching hospital's emergency and restorative clinics. Questions were asked on pain intensity, PIC, impact on QOL and perceived need for pain medication. Results: Of 318 subjects approached, 199 (63%) completed usable questionnaires. In expressing PIC, 48.2% of the sample reported that they felt dependent on somebody else doing something about the pain, whereas 69.3% reported feeling helpless in their effort to try and do something about the pain. The prevalence of impact on QOL ranged from 55.8% reporting feeling like isolating oneself from other people to 77.9% for feeling grumpy, irritable, bad-tempered or miserable. Logistic regression analysis identified impact on QOL (OR = 1.17, 95% CI = 1.06–1.30), PIC (OR = 1.10, 95% CI = 1.01–1.21) and pain intensity (OR = 1.26, 95% CI = 1.05–1.50) as independent significant predictors of perceived need for pain medication. Conclusions: Pain intensity and PIC can enhance the ability of QOL measures in differentiating population groups into those who perceive the need for pain medication and those who do not.

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There has been increasing recognition that impact on quality of life (QOL) is a valid and important indicator of service need and intervention outcomes in contemporary public health research and practice (1). Research in this area has developed from reporting the social impacts of oral health in community samples (2-8) to documenting the impact on QOL in samples with specific oral conditions, examples of which include pericoronitis (9, 10), periodontitis (11, 12), malocclusion (13) and temporomandibular disorders (14). Impact on QOL measures may be used in epidemiological surveys to differentiate population groups according to their perceived need for treatment or studies to evaluate treatment effectiveness (15-18). Examples include the use of self-reported impact on QOL measures in recent national surveys in the UK and Australia (19).

A consistent finding of research in this area has been the strong association between dental pain or toothache and impact on QOL, suggesting that impact on QOL measures in relation to oral health are especially sensitive to dental pain. The high prevalence estimates reported for dental pain in different populations (20) indicate that impact on QOL in relation to oral health is considerable. However, the presence of pain, its duration, acuteness, intensity and meaning are not synonymous with poor QOL, but constitute only one important factor determining QOL (21). Other determinants might include beliefs about pain and perceptions of inability to cope (PIC) (22), which may also have an impact on perceived need for pain relief. It has also been argued that perceived treatment need is not just associated with how much pain is experienced (18, 23), but also with the PIC (24, 25). The

association between pain intensity and PIC has been identified in qualitative interviews with dental pain patients (26). PIC may be conceptualized as a psychological response or belief system constructed to make sense of the threat that the pain experience poses. In dental pain patients, PIC is expressed in terms of feeling helpless to try and do something, dependent on somebody else doing something about the pain, a sense of loss of control and a sense of despair over the pain.

It may therefore be hypothesized that measurements of pain intensity and PIC that complement assessment of the impact on QOL may improve the ability of standard QOL measures to discriminate between various patient populations, such as those who require pain medication and those who do not. The aim of this paper was to report on the expression of PIC and impact on QOL in dental pain patients, and explore their associations with perceived need for pain medication.

# Methods

### Participants

This study was carried out at the dental emergency and restorative clinics at Barts and the London dental teaching hospital, Queen Mary's School of Medicine and Dentistry. Patients attending the dental emergency clinic are usually self-referred with complaints of acute oral pain, whereas patients attending the restorative clinics are usually referred by their general dental practitioners. The teaching hospital is located in East London, which is a multiethnic and socially deprived part of London. It is also on the edge of the city of London, which is the commercial and financial part of London. The dental teaching hospital therefore serves a socioeconomically and culturally diverse population.

Patients were eligible for inclusion in the study if they were aged 18 years and over, complaining of pain, discomfort or sensitivity in the teeth or gums, and were fluent in English. Patients who had a terminal disease and psychiatric patients detained under the Mental Health Act were excluded as it was not clinically justified to include them in the study. However, patients with a psychiatric or psychological disorder but not detained under the Act were eligible for inclusion. Learning disabled patients, who were unable to give informed consent, were also excluded. The selection guidelines as advised by the local health authority's research ethics committee were followed. Patients who reported pain, discomfort and sensitivity were invited to take part in the study. They were approached at the chair-side by one researcher (AP) when they attended for treatment at the hospital, who informed them that the purpose of the study was to understand better how people describe their dental pain. They were also told that participation would involve completing a questionnaire. It was emphasized that they would not be treated differently if they did not take part in this study. Patients were assured that any information they offered would be treated confidentially. Those who agreed to take part were asked to sign a written consent form and complete the questionnaires whilst they were waiting for radiographs or treatment or before they were discharged. Completed questionnaires were collected by the researcher.

Apart from the research team, nobody had access to the information offered by the patients. Responses to the questionnaires were entered into an SPSS database for analysis (SPSS Inc., Chicago, IL, USA). Questionnaires were stored away in a locked cupboard in the researcher's office.

Demographic data were collected on the sex, age and marital status of the sample. Socioeconomic data were collected on education and employment status. Pain intensity was measured on a 10-point linear visual analogue scale. Perceived inability to cope with their dental pain was assessed by asking each subject the extent to which they felt helpless in their effort to try and do something about the pain, dependent on somebody else doing something, a sense of loss of control and a sense of despair. Each subject was also asked for their perception of the extent to which they had difficulties performing their routine daily activities, difficulties with sleeping, difficulties concentrating, felt grumpy, irritable, bad-tempered or miserable and felt like isolating themselves from other people. Each item was rated on a five-point Likert-like scale from '0 – not at all' to '4 - completely'. The items assessing PIC and impact on QOL were derived from qualitative interviews with dental pain patients (26). The perceived need for pain medication was determined by asking participants, 'to what extent have you felt the need for any painkillers or medication so that you can function in your daily life', an adaptation from the 'Dependence on medication or treatments' facet of the WHOQOL-100 questionnaire (27). The scale for responding to this question was a five-point Likert scale from 'not at all slightly - moderately - largely - completely'.

#### Data analysis

Frequency distributions for each of the questions of the PIC and impact on QOL scales are presented. The composite scores for PIC and impact on QOL were derived by summing the responses on the Likert scales to each of the individual questions. Possible PIC scores ranged from 0 to 16, whereas those for impact on QOL ranged from 0 to 20. The reliability of the two scales was determined by calculating Cronbach's alpha. The mean pain intensity, PIC and impact on QOL scores according to the demographic and socioeconomic variables are presented. The responses to perceived need for pain medication were dichotomized into 'not at all slightly' = no perceived need for pain medication and 'moderate - completely' = perceived need for pain medication. The association between perceived need for pain medication and the sociodemographic variables of gender, age, marital status, education and employment were evaluated by using the chi-squared test. Variations in mean scores and 95% confidence intervals for pain intensity, PIC and impact on QOL between those with and without perceived need for painkillers were calculated and t-tests were carried out to test for statistically significant differences. Logistic regression analysis was carried out to identify predictors of perceived need for pain medication, after adjustment for possible confounding factors. Data were analysed using the statistical package SPSS 12.0. The level of significance was set at 0.05 for all tests.

## Results

Of the 318 patients who were approached, 314 volunteered to participate by completing the questionnaires. One hundred and ninety-nine questionnaires returned were usable, representing a response rate of 62.6%.

Responses to the questions on PIC and impact on QOL are presented in Table 1. The proportion of subjects who reported PIC from a small to complete extent ranged from 48.2% for feeling dependent on somebody else doing something about the pain to 69.3% feeling helpless in their effort to try and do something about the pain. The proportion of dental pain patients who reported impact on QOL from a small to complete extent ranged from 55.8% for feeling like isolating oneself from other people to 77.9% for feeling grumpy, irritable, badtempered or miserable. The mean scores and internal consistency for the PIC and impact on QOL scales are shown in Table 2. Cronbach's alpha value was 0.86 for the PIC scale and 0.80 for impact on QOL scale.

Table 3 presents the mean pain intensity, PIC and impact on QOL scores, as well as perceived need for painkillers according to the sociodemographic and socioeconomic variables of gender, age, marital status, education and employment status. Those in the 18–44 years age group had significantly higher mean scores for pain intensity (P = 0.001) and impact on QOL (P = 0.001) when

Table 1. Distribution of responses according to the questions on PIC and impact on QOL

	Not at all	A small extent	Moderate extent	A large extent	Completely
Ways in which PIC with dental pain was expressed: $n$ (%)					
Feeling helpless in your effort to try and do something about the pain	61 (30.7)	30 (15.1)	23 (11.6)	52 (26.1)	33 (16.6)
Feeling dependent on somebody else doing something about the pain	103 (51.8)	21 (10.6)	22 (11.1)	20 (10.1)	33 (16.6)
Feeling a sense of loss of control over the pain	76 (38.2)	35 (17.6)	25 (12.6)	33 (16.6)	30 (15.1)
Feeling a sense of despair over the pain Ways in which impact on QOL was	69 (34.7)	42 (21.1)	22 (11.1)	37 (18.6)	29 (14.6)
Difficulties performing your routine daily activities.	74 (37.2)	36 (18.1)	47 (23.6)	21 (10.6)	21 (10.6)
Difficulties with sleeping	53 (26.6)	35 (17.6)	33 (16.6)	46 (23.1)	32 (16.1)
Difficulties concentrating	45 (22.6)	44 (22.1)	44 (22.1)	42 (21.1)	24 (12.1)
Feeling grumpy, irritable, bad-tempered or miserable	44 (22.1)	36 (18.1)	36 (18.1)	54 (27.1)	29 (14.6)
Feeling like isolating yourself from other people	88 (44.2)	36 (18.1)	30 (15.1)	21 (10.6)	24 (12.1)

PIC, perceived inability to cope; QOL, impact on quality of life.

	Mean score (SD)	Range	Internal consistency (Cronbach's alpha)
Pain intensity PIC Impact on QOL	5.98 (2.69) 6.22 (5.12) 8.24 (5.18)	1–10 0–16 0–20	0.87 0.80

Table 2. Mean scores and internal consistency for PIC and impact on QOL

PIC, perceived inability to cope; QOL, impact on quality of life.

compared with those in the 45 years and older age group. Younger subjects were also significantly more likely to report perceived need for painkillers (P = 0.001).

Significant differences in mean scores for pain intensity, PIC and impact on QOL between those with and without perceived need for pain medication were detected (Table 4). A forward Likelihood Ratio (LR) stepwise regression analysis was carried out to determine the relative usefulness of the significant predictors, including age, for perceived need for pain medication. The first step selected QOL as the most useful predictor with  $R^2 = 0.387$ (OR = 1.33,95% CI = 1.22 - 1.44, P = 0.001), and the second step selected OOL (OR = 1.24, 95% CI = 1.13-1.36, P = 0.001) and pain intensity (OR = 1.35, 95% CI = 1.14–1.59, P = 0.001) with  $R^2 = 0.448$ . By entering PIC and age into the model,  $R^2$  increased to 0.478, and (OR = 1.17, 95% CI = 1.06-1.30),OOL PIC

Table 3. Mean pain intensity, PIC and impact on QOL scores, and subjects who perceived need for pain medication (n = 83) according to demographic and socioeconomic variables

	Pain intensity: mean (95% CI)	PIC: mean composite score (95% CI)	Impact on QOL: mean composite score (95% CI)	Perceived need for pain medication, $n$ (%)
Sex				
Male	5.71 (5.19-6.23)	5.65 (4.72-6.58)	7.79 (6.81-8.78)	39 (36.4)
Female	6.30 (5.76-6.85)	6.88 (5.77-7.99)	8.75 (6.67–9.83)	44 (47.8)
Age				
18–44 years	6.40 (5.96-6.81)*	6.48 (5.67–7.28)	8.91 (8.10-9.73)*	73 (48.3)*
45 years and older	4.69 (3.91-5.47)	5.42 (3.83-7.01)	6.10 (4.65-7.56)	10 (20.8)
Marital status				
Single	6.13 (5.67-6.60)	6.21 (5.32-7.10)	8.70 (7.81–9.59)	55 (46.2)
Married	5.84 (5.10-6.58)	6.29 (4.89–7.69)	7.66 (6.24–9.08)	22 (35.5)
Widowed	4.25 (1.73-6.77)	5.88 (0.97-10.78)	5.38 (0.61-10.14)	2 (25.0)
Divorced/separated	6.50 (4.71-8.29)	6.20 (2.30-10.10)	8.60 (5.17-12.06)	4 (40.0)
Employment status				
Full time	5.92 (5.43-6.40)	6.08 (5.14-7.03)	8.82 (7.88–9.75)	53 (44.5)
Part time	5.82 (4.81-6.83)	5.86 (4.13-7.58)	7.96 (6.05–9.88)	10 (35.7)
Retired	5.09 (3.64-6.55)	5.45 (2.44-8.46)	3.91 (1.61-6.21)	1 (9.1)
Not employed	6.54 (5.63-7.45)	7.07 (5.33-8.82)	7.90 (6.23–9.58)	19 (46.3)
Education status				
None-secondary	6.07 (5.59-6.56)	6.06 (5.14-6.99)	8.28 (7.36-9.21)	56 (45.0)
Tertiary	5.84 (5.23-6.45)	6.48 (5.33–7.63)	8.16 (6.97–9.35)	27 (36.0)

\*P = 0.001; PIC, perceived inability to cope; QOL, impact on quality of life.

Table 4. Variations in mean scores and 95% confidence intervals for pain intensity, PIC and impact on QOL between those with and without perceived need for pain medication, and odds ratios from logistic regression analysis

	Perceived need for painkillers		Unadjusted OR		Adjusted OR	
	No: 116 (58.3%)	Yes: 83 (41.7%)	(95% CI)	<i>P</i> -value	(95% CI)	P-value
Age						
18–44 years	78 (51.7%)	73 (48.3%)	3.56 (1.65-7.65)	0.001	2.41 (0.90-6.42)	0.079
45 years and older	38 (79.2%)	10 (20.8%)	1			
Pain intensity	4.85 (4.39-5.32)	7.57 (7.12-8.01)	1.61 (1.39–1.87)	0.001	1.26 (1.05-1.50)	0.009
PIC	4.12 (3.30-4.94)	9.16 (8.17-10.14)	1.25 (1.65–1.34)	0.001	1.10 (1.01-1.21)	0.033
Impact on QOL	5.85 (4.98-6.72)	11.57 (10.75–12.39)	1.33 (1.22–1.44)	0.001	1.17 (1.06–1.30)	0.002

PIC, perceived inability to cope; QOL, impact on quality of life

(OR = 1.10, 95% CI = 1.01-1.21) and pain intensity (OR = 1.26, 95% CI = 1.05-1.50) were selected as independent significant predictors of perceived need for pain medication.

#### Discussion

The present study investigated how PIC and impact on QOL in subjects with varying degrees of dental pain intensity affect their perceived need for pain medication. The key finding is that pain intensity, PIC and impact on QOL are independent significant predictors of perceived need for pain medication. Results of logistic regression analysis suggest that impact on QOL was relatively more useful as a predictor of perceived need for pain medication, followed by pain intensity and PIC. The implication of this finding is that measures of pain intensity and PIC in addition to QOL can improve prediction of perceived need for pain medication. The final model with PIC and age entered, produced an  $R^2$ of 0.478, an increase in 3% of explained variance. It may be argued that PIC contributes a small degree to the explained variance and therefore it is debatable as to whether it should be included in the assessment for pain medication need. A compromise may have to be made between the resources required to administer the PIC scale and the precision desired in predicting need when considering whether or not to measure PIC.

Perceived inability to cope was reported by a substantial proportion of the sample in the present study. Most expressed helplessness in their effort to try and do something about the pain, followed by a sense of despair over the pain. The sample also reported dependency on others to relieve the pain and a sense of loss of control. In the context of the present study, PIC is considered to be a psychological response that patients construct to make sense of their pain experience. Psychological responses to pain may be related to (i) poor adjustment to pain such as pain catastrophizing, pain related anxiety or fear and helplessness, and is associated with increased pain, psychological distress and physical disability, or (ii) improved adjustment to pain such as self-efficacy, pain coping strategies, readiness to change and acceptance, and is associated with decreased pain, psychological distress and physical disability (28). The statements used to measure PIC reflected items that are contained within scales measuring poor adjustment to persistent pain, such as the Pain Catastrophizing Scale (29), and arthritis pain, such as the Arthritis Helplessness Index (30). The PIC statements may therefore be considered a measure of poor adjustment to dental pain that incorporated pain catastrophizing and helplessness. As the scales for measuring poor adjustment to pain are generally long, testing the four-item PIC scale's validity in differentiating dental patients into those with different degrees of perceived need for pain medication was considered a justified objective. Given that the PIC scale has not been previously validated, the association between PIC and the perceived need for pain medication should be interpreted with caution. However, results of the present study provide some measure of validity for the PIC items. The results suggest that they were capable of differentiating patients into those with and without perceived need for pain medication, thus providing some support for their discriminant validity. The results of this study also suggest that the items have good reliability as indicated by Cronbach's alpha. To confirm the validity of the PIC scale, further research is needed in different populations and settings.

The results of the present study demonstrated an association between PIC and perceived need for pain medication, a finding not previously reported for dental pain patients. Previous research has reported that PIC is associated with medical care seeking (24) and need for pain relief in postoperative patients (25). Normative need for care is usually measured by clinical examination, whereas perceived need is assessed by expressions of pain or impact on QOL (31-33). The finding in the present study that pain intensity is associated with perceived need is consistent with reports in the literature (34, 35). Treatment need is also related to factors that predispose and enable individuals to express this need (36), which has been described as propensity-related need (37). The belief that an individual has of their ability to cope with adversity, including pain, may impact on their propensity to seek treatment . Thus, a dental pain individual reporting low pain intensity may perceive high inability to cope and therefore high propensity to seek treatment. The finding that PIC is predictive of need for pain medication means that its incorporation into standard QOL measures can improve their ability to differentiate between population groups, such that those reporting strong perceptions of inability to cope with their pain and impact on QOL would be identified as those with greater need for medication and treatment.

The prevalence of impact on QOL in dental pain patients was considerable. Feeling grumpy, irritable, bad-tempered or miserable, difficulties concentrating and difficulties sleeping affected nearly three quarters of the sample, whereas difficulties performing daily activities and feeling like isolating from others affected over half the sample. Although impact on QOL has been reported for specific patient groups (9, 14, 38), its experience in dental pain patients has not been previously described. A limitation of the present study is that a standard impact on QOL measure was not used, as this has made it difficult to compare impact on QOL between different patient groups reported in the literature. However, most current measures of impact on QOL have been developed for use in ageing populations to assess the impact of impaired oral health such as tooth loss on QOL (4, 39)and do not necessarily measure the same impact. For example, difficulties sleeping is a significant consequence of dental pain, but is not measured by the OHIP-14 (40), whereas difficulties concentrating is not measured by the OHQoL-UK (7). In addition, the data collected in the present study demonstrated that Cronbach's alpha value was high, indicating good internal consistency. The discriminant validity of the QOL items used in the present study in differentiating between those participants with and without perceived need for pain medication was also established. As this has been an initial study to use these QOL items, future research is recommended to confirm their validity in different settings.

A statistically significant association was identified between age and pain intensity, impact on QOL and perceived need for painkillers. This may reflect the clinical diagnoses of the sample's conditions as younger adults are more likely to present with more intensely painful conditions compared with older adults (41). As there are variations in experiences of oral health between different age groups, such as dental pain in younger adults and sensitivity in older adults, the present study was divided into adults (19-44 years) and middle-aged adults (45 years and above) according to Medline Indexing to allow assessment of the impact on QOL in participants from different age groups. The 45 years cut-off point is also consistent with most dental pain prevalence studies in adults. By dividing the sample at 45 years rather than a lower age, the likelihood of separating those with more and less intense pain, and higher and lower perceived need for pain medication is increased, and therefore demonstrating an association is increased. The finding that age is associated with pain intensity and impact on QOL is consistent with reports that impact on QOL in young adults is usually attributed to pain and discomfort (6), whereas functional limitation is the more common cause in older people (8). As certain oral conditions are more likely to affect certain age groups, and can have condition-specific impact on QOL, emphasis should be placed on developing condition-specific measures of impact on QOL (14, 42, 43).

The findings of this study should be considered in the context of its methodological limitations. Around one-third of the questionnaires returned were incomplete. One reason for this may be that the questionnaires used were too long to sustain interest as they also included a range of questions on the pain characteristics and quality. Noncompletion of the questionnaires may also suggest that some of the questions were difficult to interpret for the subjects. It may also be possible that participants who were experiencing more intense pain found it more difficult to concentrate on completing the questionnaires fully. This may have the effect of compromising the proportion of those participants reporting more intense pain, and therefore underestimating the strength of the association between the predictor and outcome variables. Although the findings reported here relate to responses from 62.6% of the sample, which may be considered a reasonable response rate, future research is needed to explore the face validity of the questionnaires used. A further limitation is that the present study has been carried out on a sample of dental pain patients recruited in a hospital setting. Generalizability of the results to other population groups in different settings should be cautioned. Future research is needed to provide further evidence for the utility of the PIC and QOL scales used in the present study, and to explore further the effect of PIC and QOL on perceived need for pain medication. The relative importance of people's perception of their inability to cope with their pain experience and impact on QOL in predicting treatment need should be explored in different populations and settings.

In conclusion, the prevalence of PIC and impact on QOL in dental pain patients are considerable. Pain intensity, PIC and impact on QOL have been identified as independent significant predictors of perceived need for pain medication. Whilst perceived need may be expressed by pain intensity and impact on QOL, the propensity to actually seek care and medication may be a function of PIC.

#### References

- Buck D, Newton JT. Non-clinical outcome measures in dentistry: publishing trends 1988–98. Community Dent Oral Epidemiol 2001;29:2–8.
- 2. Cushing AM, Sheiham A, Maizels J. Developing sociodental indicators the social impact of dental disease. Community Dent Health 1986;3:3–17.
- 3. Locker D, Slade G. Association between clinical and subjective indicators of oral health status in an older adult population. Gerodontology 1994;11:108–14.
- 4. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health 1994;11:3–11.
- Leao A, Sheiham A. The development of a sociodental measure of dental impacts on daily living. Community Dent Health 1996;13:22–6.
- Adulyanon S, Vourapukjaru J, Sheiham A. Oral impacts affecting daily performance in a low dental disease Thai population. Community Dent Oral Epidemiol 1996;24:385–9.
- McGrath C, Bedi R. An evaluation of a new measure of oral health related quality of life – OHQoL-UK(W). Community Dent Health 2001;18:138–43.
- 8. Srisilapanan P, Sheiham A. The prevalence of dental impacts on daily performances in older people in Northern Thailand. Gerodontology 2001;18:102–8.
- Slade GD, Foy SP, Shugars DA, Phillips C, White JRP. The impact of third molar symptoms, pain, and swelling on oral health-related quality of life. J Oral Maxillofac Surg 2004;62:1118–24.
- Fernandes MJ, Ruta DA, Ogden GR, Pitts NB, Ogston SA. Assessing oral health-related quality of life in general dental practice in Scotland: validation of the OHIP-14. Community Dent Oral Epidemiol 2006;34:53–62.
- 11. Needleman I, McGrath C, Floyd P, Biddle A. Impact of oral health on the life quality of periodontal patients. J Clin Periodontol 2004;31:454–7.
- Ng SKS, Leung WK. Oral health-related quality of life and periodontal status. Community Dent Oral Epidemiol 2006;34:114–22.
- 13. Traebert ES, Peres MA. Prevalence of malocclusions and their impact on the quality of life of 18-year-old young male adults of Florianopolis, Brazil. Oral Health Prev Dent 2005;3:217–24.
- 14. Sugisaki M, Kino K, Yoshida N, Ishikawa T, Amagasa T, Haketa T. Development of a new questionnaire to assess pain-related limitations of daily functions in Japanese patients with temporomandibular disorders. Community Dent Oral Epidemiol 2005;33:384–95.
- 15. Reisine ST, Fertig J, Weber J, Leder S. Impact of dental conditions on patients' quality of life. Community Dent Oral Epidemiol 1989;17:7–10.
- 16. Allen PF. Assessment of oral health-related quality of life. Health Qual Life Outcomes 2003;1:40–8.
- McGrath C, Comfort MB, Lo ECM, Luo Y. Can third molar surgery improve quality of life? A 6-month cohort study J Oral Maxillofac Surg 2003;61:759–63.

- Ekanayake L, Perera I. Perceived need for dental care among dentate older individuals in Sri Lanka. Spec Care Dentist 2005;25:199–205.
- Slade GD, Nuttall N, Sanders AE, Steele JG, Allen PF, Lahti S. Impacts of oral disorders in the United Kingdom and Australia. Br Dent J 2005;198:489–93.
- 20. Pau AK, Croucher R, Marcenes W. Prevalence estimates and associated factors for dental pain: a review. Oral Health Prev Dent 2003;1:209–20.
- 21. Niv D, Kreitler S. Pain and quality of life. Pain Pract 2001;1:150–61.
- Jensen MP, Keefe FJ, Lefebvre JC, Romano JM, Turner JA. One- and two-item measures of pain beliefs and coping strategies. Pain 2003;104:453–69.
- 23. Duncan RP, Gilbert GH, Peek CW, Heft MW. The dynamics of toothache pain and dental services utilization: 24-month incidence. J Public Health Dent 2003;63:227–34.
- 24. Cameron L, Leventhal EA, Leventhal H. Symptom representations and affect as determinants of care seeking in a community-dwelling, adult sample population. Health Psychol 1993;12:171–9.
- 25. Salmon P, Manyande A. Good patients cope with their pain: postoperative analgesia and nurses' perceptions of their patients' pain. Pain 1996;68:63–8.
- 26. Pau AK, Croucher R, Marcenes W. Perceived inability to cope and care-seeking in patients with toothache: a qualitative study. Br Dent J 2000;189:503–6.
- 27. WHOQOL. The World Health Organization quality of life assessment (WHOQOL): development and general psychometric properties. Soc Sci Med 1998;46:1569–85.
- Keefe FJ, Rumble ME, Scipio CD, Giordano LA, Perri LM. Psychological aspects of persistent pain: current state of the science. J Pain 2004;5:195–211.
- Osman A, Barrios FX, Kopper BA, Hauptmann W, Jones J, O'Neill E. Factor structure, reliability, and validity of the Pain Catastrophizing Scale. J Behav Med 1997;20:589–605.
- Nicassio PM, Schuman C, Radojevic V, Weisman MH. Helplessness as a mediator of health status in fibromyalgia. Cognit Ther Res 1999;23:181–96.
- 31. Locker D, Jokovic A. Using subjective oral health status indicators to screen for dental care needs in older adults. Community Dent Oral Epidemiol 1996;24:398–402.
- 32. Srisilapanan P, Korwanich N, Sheiham A. Assessing prosthodontic dental treatment needs in older adults in Thailand: normative vs. sociodental approaches. Spec Care Dentist 2003;23:131–4.
- 33. Gherunpong S, Sheiham A, Tsakos G. A sociodental approach to assessing children's oral health needs: integrating an oral health-related quality of life (OHRQoL) measure into oral health service planning. Bull World Health Organ 2006;84:36–42.
- 34. Riley JL III, Gilbert GH. Childhood dental history and adult dental attitudes and beliefs. Int Dent J 2005;55:142–50.
- 35. Anderson R, Thomas DW. 'Toothache stories': a qualitative investigation of why and how people seek emergency dental care. Community Dent Health 2003;20:106–11.
- Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? J Health Soc Behav 1995;36:1–10.

- 37. Gherunpong S, Tsakos G, Sheiham A. A sociodental approach to assessing dental needs of children: concept and models. Int J Paediatr Dent 2006;16: 81–8.
- John MT, Dworkin SF, Mancl LA. Reliability of clinical temporomandibular disorder diagnoses. Pain 2005;118:61–9.
- 39. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ 1990;54:680–7.
- 40. Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997;25:284–90.
- 41. Ringland C, Taylor L, Bell J, Lim K. Demographic and socioeconomic factors associated with dental health among older people in NSW. Aust N Z J Public Health 2004;28:53–61.
- 42. Cunningham SJ, Garratt AM, Hunt NP. Development of a condition-specific quality of life measure for patients with dentofacial deformity: I. Reliability of the instrument. Community Dent Oral Epidemiol 2000;28:195–201.
- 43. Aggarwal VR, Lunt M, Zakrzewska JM, Macfarlane GJ, Macfarlane TV. Development and validation of the Manchester orofacial pain disability scale. Community Dent Oral Epidemiol 2005;33:141–9.

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