Association between Orofacial Pain and other Symptoms: a Population-based Study

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Purpose: The aim of the study was to determine the relationship between orofacial pain (OFP) in the community and other symptoms.

Materials and Methods: This cross-sectional population-based study was conducted in a general medical practice in South East Cheshire, UK. Questionnaires were mailed to a random sample of 4,000 adults aged 18-65 years, of whom 2,504 responded (adjusted participation rate 74%).

Results: The current study showed an association between self-reported OFP and all the other symptoms measured. The strongest association was found for a high level of sleep disturbance (relative risk (RR) 3.7; 95% Confidence Interval (CI) 2.9-4.9), tenderness of jaw muscles in the morning (RR 3.7; 95% CI 3.3-4.1), persons with frequent headaches (RR 3.1; 95% CI 2.7-3.5), and tiredness or stiffness of jaw muscles (RR 2.6; 95% CI 2.3-3.0). Having pain in the body other than the head was associated with a relative risk of OFP of 1.6 (95% CI 1.4-1.9), and increased risk persisted when individual body locations were considered (back, abdominal, forearm, shoulder and knee pain). Those who took medication for bowels had a higher risk of OFP (RR 1.4; 95% CI 1.1-1.8). Problems with micturition were associated with an elevated risk of 1.5 (95% CI 1.0-2.0). None of these results changed significantly after adjustment for age and gender.

Conclusions: This cross-sectional community-based study contributes additional information on the relationship between other symptoms and OFP. It suggests that future research should adopt a multidisciplinary approach to OFP, however further longitudinal studies are required establishing the association between other symptoms and the onset of OFP.

Key words: orofacial pain, general population, pain, sleep disturbance

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INTRODUCTION

Studies of orofacial pain (OFP) have suggested that OFP is co-morbid with other changes in patients' general state of health (Agerberg and Carlsson, 1973; Tickle et al, 1997). In addition, it has been shown that OFP is associated with other types of pain in clinical populations (Turp et al, 1997; Turp et al, 1998; Turp et al, 2000). In the general population, the prevalence of OFP was more than double among individuals who reported headaches (Helkimo, 1974; Wanman and Agerberg,1987; Tervonen and Knuuttila, 1988; Wanman, 1995; Hakeberg et al, 1997). Population studies also reported the relationship of OFP with pain in the neck, shoulder or arm (Helkimo, 1974; Tervonen and Knuuttila, 1988; Andersson et al, 1996; Vimpari et al, 1995) and with general joint and muscle symptoms (Agerberg and Carlsson, 1973; Helkimo, 1974; Molin et al, 1976). A prospective cohort study in a general population showed that people with at least one pain condition other than temporomandibular disorder (TMD) (but no TMD at baseline) were almost four times more likely to develop TMD in three years time (Von Korff et al, 1993). Some forms of OFP have specific symptoms without widespread pain, e.g. maxillary sinusitis.

This study aims to investigate the relationship between a variety of other symptoms such as sleep disturbance, headache and pain in the body other than the head, and self-reported OFP in the general population. We hypothesise that participants with other symptoms are more likely to report OFP.

MATERIALS AND METHODS

A simple random sample of 4,000 people aged 18-65 years was selected from a General Medical Prac-

tice in South East Cheshire (Borough of Congleton, North West England, UK) (Macfarlane et al, 2002). Information on OFP and other symptoms was collected using a postal questionnaire. The advantages of this type of information gathering are: low cost, little inconvenience to the participants and the ability to obtain information on sensitive issues. In addition, it was possible to use visual prompts (e.g. body manikins) in order to indicate the anatomical position of pain. Other studies of pain, e.g. Blyth et al (2003), used a telephone interview technique. The main advantage of the telephone method over the mail survey is the ease and speed of administration, greater control over who is interviewed and the order in which items are answered, therefore reducing item non-response and contamination by other people. However, in our study a telephone interview would limit the amount of information collected. The adjusted participation rate was 74%, which was calculated after exclusion of those in the sample who had moved, died or who were not able to complete the questionnaire due to disability or did not understand English (2,504 responded to the postal questionnaire). The majority of excluded participants (97%) had moved; only 2 people were excluded due to language difficulties. This participation rate was achieved after contacting the non-respondents successively with a postcard reminder, a further postal questionnaire, and a short-version of the questionnaire. Those who had still not returned a completed questionnaire and had not declined to participate were offered interviews over the telephone. The study commenced in October 1997 and ended in July 1998. Ethical approval for the study was granted by the Local Research Ethics Committee, and the study was registered under the UK Data Protection Act.

OFP was defined as present if the respondent indicated that any of the following was present during the past month: pain in the jaw joint/s, pain in the area just in front of the ear/s, pain in or around the eyes, pain when opening the mouth wide, shooting pains in the face or cheeks, pain in the jaw joint when chewing food, pain in and around the temples, tenderness of the muscles at the side of the face, a prolonged burning sensation in the tongue or other parts of the mouth (Locker and Slade, 1988).

Participants were asked whether they had frequent headaches, tenderness of the jaw muscles in the morning and whether the jaw muscles felt tired or stiff. In addition, a sleep questionnaire, which consisted of four questions (Jenkins et al, 1988) with answers on a 6-point Lickert scale, was used to measure sleep disturbance.

The question concerning pain in the body was phrased: "During the past month have you had any ache or pain in your body which has lasted for one day or longer?" If the answer was "yes" then the participants were asked whether the pain began more than three months ago. Those reporting pain were also asked to shade in the anatomical position of their aches or pains on an accompanying full body chart (Macfarlane et al, 1996), with the front, back, left and right views labelled (Appendix 1). The main purpose of collecting information on a full body chart was to record the presence of pain in multiple body sites, which could be demarcated into precise anatomical areas. In comparison to data collection methods that rely on subjects' perceptions of what is, e.g. the low back area, which can vary from subject to subject, pain charts allow for standard definitions to be applied. A standardised method, utilising a transparent template placed over each chart, was used to record the presence of pain in 24 defined body areas other than the head. The body areas were defined *a priori* to represent the body areas in which musculoskeletal pain was most commonly reported. This definition was used as standard in other population-based studies. Neck and sternum pain were combined as one definition, as we believe that cardiac pain very rarely lasts for one day, so the vast majority of reports will be neck pain.

Participants were also asked about problems with micturition and whether they needed to take medication for their bowels.

The magnitude of association between other symptoms and OFP was described by the relative risk (RR). Continuous variables were categorised using percentiles of the overall distribution. Cox regression (Cox, 1972; Lee, 1994) was used to estimate the relative risk adjusted for age and gender. A backwardstepwise Cox regression model was used to identify a group of independent factors predicting OFP. The performance of the Cox regression model, or how well factors retained in the model described the occurrence of OFP, was assessed by calculating the proportion of individuals with OFP exposed to 0 to the total number of factors retained in the model. The chi-square test was used to compare acute and chronic OFP.

In order to assess the reliability of the questionnaire, 51 participants completed the questionnaire a second time. Kappa statistic (Fleiss, 1981), Cronbach's alpha (Cronbach, 1947) and reliability coefficient (Dunn and Everitt, 1995) were used to assess the reliability of the questionnaire.

Table 1 Age-gender distribution of the study population

Age (years)	Gender		
	Male N (%)	Female N (%)	Total N (%)
18–25	122 (10.9)	155 (11.2)	277 (11.1)
26–35	213 (19.0)	291 (21.0)	504 (20.1)
36–45	223 (19.9)	294 (21.2)	517 (20.6)
46–55	333 (29.8)	399 (28.8)	732 (29.2)
56–65	228 (20.4)	246 (17.8)	474 (18.9)
Total	1119 (100.0)	1385 (100.0)	2504 (100.0)

RESULTS

Description of Study Participants

The age-gender distribution of the participants is presented in Table 1. The mean age of the participants was 44 (SD 13) years, of whom 55% were women.

The prevalence of self-reported OFP was 26%. Among those who indicated when their OFP started (467, 72% of total with OFP), the majority (306, 66%) reported that their OFP started more than 3 months ago and 161 (34%) reported that their OFP started less than 3 months ago. Other participants did not answer this question.

Relationship between OFP and other Symptoms

Persons with frequent headaches had a three-fold increase in risk of having OFP (Table 2). A similar result was found for tenderness of jaw muscles in the morning, with a crude risk of 3.7 (95% CI 3.3-4.1). Constantly feeling tired or having stiffness in the jaw muscles was associated with a risk of OFP (2.6; 95% CI 2.3-3.0). None of these results changed much after adjustment for age and gender (Table 2).

OFP was associated with sleep disturbance, with a statistically significant trend of an increase in risk with an increase in total sleep disturbance score. In the highest category the relative risk was 3.7 (95% CI 2.9-4.9) and was little changed after adjustment for age and gender (Table 2). Those who took medication for

Table 2 Association of other health symptoms with OFP

Symptom	% with OFP	Total number in group*	Crude RR (95% CI)	Adjusted for age and sex RR (95% CI)
Frequent headaches				
No	17.8	1664	1.00	1.00
Yes	54.4	504	3.06 (2.68–3.48)	2.95 (2.49–3.50)
Muscles tender in the morning				
No	23.9	2083	1.00	1.00
Yes	88.6	79	3.71 (3.32–4.14)	3.43 (2.66–4.43)
Jaw muscles ever feel tired or stiff				
No	21.6	1868	1.00	1.00
Yes	56.4	289	2.61 (2.28–2.98)	2.52 (2.09–3.04)
Total sleep score				
0–1	12.1	455	1.00#	1.00
2–4	20.9	506	1.73 (1.28–2.34)	1.66 (1.20–2.30)
5–8	29.6	487	2.45 (1.84–3.25)	2.35 (1.72–3.20)
9–20	44.9	492	3.72 (2.85–4.85)	3.54 (2.62–4.77)
Medication for bowels				
No	25.6	2023	1.00	1.00
Yes	35.7	143	1.39 (1.10–1.76)	1.33 (1.00–1.78)
Problems with micturition				
No	26.1	2126	1.00	1.00
Yes	37.7	61	1.45 (1.04–2.01)	1.57 (1.03–2.39)

* Numbers do not add up to total because of missing values

Test for trend $P<0.001$

bowels had a higher risk of OFP (1.4; 95% CI 1.1-1.8). Problems with micturition were associated with an elevated risk (1.5; 95% CI 1.04-2.0), but only 14 (23%) indicated taking medication for it.

Having pain in the body other than the head was associated with a RR of OFP of 1.6 (95% CI 1.4-1.9) (Table 3). The RR was higher for persons who had a pain in the body for more than three months (RR 1.7; 95% CI 1.5-2.0), than in those who had it for less than three months (1.4; 95% CI 1.1-1.7) (test for trend, $P<0.0001$). A significant trend in RRs was also observed for the number of coding areas shaded on the body manikins ($P<0.001$).

Thirteen specific pain locations were also identified using body charts (shoulder, neck/sternum, elbow, forearm, hand/wrist, anterior chest, posterior chest, back, abdomen, hip/upper leg, knee, lower leg and foot/ankle) (Table 3). The lowest risk of OFP was observed for elbow pain (1.3; 95% CI 1.1-1.7) and knee pain (1.3; 95% CI 1.1-1.6), while the highest risk was observed for participants with neck/sternum (RR 1.8; 95% CI 1.4-2.5) and abdominal (RR 1.8; 95% CI 1.5-2.1) pain. When asked whether such abdominal pain was associated with anything, the most common answer for men was tension; the next most common was eating. Among women the majority (69%) reported that abdominal pain was associated with menstruation. Other symptoms included lower and upper gastrointestinal problems, gynaecological problems in women and psychological symptoms for both genders. However there was no significant difference in the risk of OFP between men and women reporting abdominal pain (test for heterogeneity $P=0.55$).

A cause for abdominal pain was reported by 229 (32.5%) participants. The most common cause both in men and women was 'gastro-intestinal' (50% in men and 66% in women), followed by 'upper gastro-intestinal' in men and 'gynaecological' in women.

In order to identify a group of independent best predictors of OFP, a backwardstepwise Cox regression model was firstly applied to factors other than body pain. The best parsimonious models contained the following variables: sleep score, headache, tenderness of jaw muscles in the morning and tiredness or stiffness of the muscles. Secondly, a backwardstepwise Cox regression model, applied to body pain, identified the best model that included: abdominal pain, body pain (other than head) of duration for 3 months or longer, and four or more areas of the shaded body manikin. Persons with OFP increased monotonically with the number of factors reported to be positive, with 100% of those reporting exposure to all four factors having OFP. For the second model, 20% of people who reported being exposed to none of the three factors had OFP, while 51% of participants reporting all three factors had OFP (Table 5).

Finally, seven variables chosen by the two models, and age and gender were available for, the final model. Only four of the above mentioned symptoms were selected in the final step: sleep score, frequent headache, tenderness of jaw muscles in the morning and tiredness or stiffness of the muscles. None of the body pains were selected at the final stage.

Comparison between Chronic and Acute OFP

Health symptoms were compared between chronic (pain duration for 3 months or more) and acute OFP (Table 4). The following symptoms were more prevalent in chronic OFP than acute: frequent headaches ($P=0.005$), tenderness of muscles around the jaws in the mornings ($P<0.001$), feeling of stiffness in the jaw muscles ($P=0.008$), chronic body pain (pain duration for 3 months or more) ($P=0.031$), shoulder pain ($P=0.04$), hand/wrist pain ($P=0.036$), and knee pain ($P=0.01$).

Reliability

Fifty one pairs of questionnaires were available for analysis. The median time between the first and second questionnaire was two and a half months. More women completed the second questionnaire (80%) than men (20%). The minimum age was 18 years, maximum age was 65 years, and the median age 50 years.

Kappa value for OFP was moderate (0.50). For the questions on other symptoms the minimum kappa value was 0.38 (fair agreement) and the maximum value 0.73 (substantial agreement). The reliability coefficient for the number of shaded areas on the body manikin (other than the head) was 0.73. For the total sleep score the reliability coefficient was 0.70 while Cronbach's alpha for the sleep questionnaire was 0.84.

DISCUSSION

The current study is the first population-based cross-sectional study of OFP conducted in the UK, which considered a variety of other symptoms. It achieved a satisfactory participation rate and showed an association between self-reported OFP and all the other symptoms measured, with an overall moderate level of reliability. Such a moderate level of reliability may be explained by a real change in time due to a delay of

Table 3 Association of other pain symptoms with OFP

Symptom	% with OFP	Total number in group*	Crude RR (95% CI)	Adjusted for age and sex RR (95% CI)
Pain in the body (other than head)				
No	20.6	1086	1.00	1.00
Yes	33.1	1021	1.60 (1.39–1.86)	1.63 (1.37–1.93)
Pain in the body (other than head)				
No	20.6	1086	1.00#	1.00
Yes, less than 3 months	28.6	301	1.39 (1.12–1.71)	1.36 (1.06–1.74)
Yes, 3 months+	35.1	709	1.70 (1.46–1.99)	1.75 (1.46–2.10)
Number of shaded areas on chart (other than head)				
No pain	20.6	1086	1.00	1.00
1	28.0	207	1.36 (1.06–1.74)	1.36 (1.02–1.82)
2–3	29.7	394	1.44 (1.19–1.74)	1.48 (1.18–1.85)
4–24	39.3	402	1.91 (1.61–2.26)	1.92 (1.56–2.35)
Shoulder pain				
No	24.3	1740	1.00	1.00
Yes	38.0	358	1.57 (1.34–1.83)	1.58 (1.30–1.91)
Neck/sternum pain				
No	26.1	2048	1.00	1.00
Yes	48.0	50	1.84 (1.37–2.48)	1.86 (1.24–2.81)
Elbow pain				
No	26.0	1951	1.00	1.00
Yes	34.7	147	1.34 (1.06–1.69)	1.40 (1.04–1.86)
Forearm pain				
No	25.9	2000	1.00	1.00
Yes	41.8	98	1.62 (1.27–2.07)	1.61 (1.17–2.22)
Hand/wrist pain				
No	25.8	1968	1.00	1.00
Yes	39.2	130	1.52 (1.21–1.91)	1.56 (1.17–2.09)
Anterior chest pain				
No	25.9	1994	1.00	1.00
Yes	40.4	104	1.56 (1.22–1.99)	1.57 (1.14–2.15)
Posterior chest pain				
No	25.2	1933	1.00	1.00
Yes	43.0	165	1.71 (1.41–2.07)	1.63 (1.27–2.10)
Back pain				
No	32.1	1539	1.00	1.00
Yes	36.3	559	1.57 (1.36–1.82)	1.56 (1.31–1.85)
Abdominal pain				
No	24.5	1875	1.00	1.00
Yes	44.4	223	1.81 (1.53–2.14)	1.73 (1.39–2.15)
Hip/upper leg pain				
No	24.3	1560	1.00	1.00
Yes	33.3	538	1.37 (1.18–1.59)	1.38 (1.15–1.65)
Knee pain				
No	25.4	1798	1.00	1.00
Yes	34.0	300	1.34 (1.12–1.60)	1.41 (1.14–1.75)
Lower leg pain				
No	25.6	1960	1.00	1.00
Yes	40.6	138	1.58 (1.28–1.97)	1.62 (1.22–2.13)
Foot/ankle pain				
No	25.4	1948	1.00	1.00
Yes	42.0	150	1.65 (1.35–2.02)	1.72 (1.32–2.24)

* Numbers do not add up to total because of missing values

Test for trend $P<0.001$

Table 4 Comparison of health symptoms between chronic and acute OFP

Symptom	OFP <3 months (n=161)* N (%)	OFP 3 months or longer (n=306)* N (%)	χ^2 test P-value
Frequent headaches	54 (39.4)	151 (53.9)	P=0.005
Muscles tender in the morning	7 (5.1)	49 (17.7)	P<0.001
Jaw muscles ever feel tired or stiff	29 (21.3)	95 (34.1)	P=0.008
Total sleep score			
0–1	14 (11.4)	20 (7.6)	
2–4	27 (22.0)	55 (20.8)	
5–8	34 (27.6)	72 (27.3)	
9–20	48 (39.0)	117 (44.3)	P=0.575
Medication for bowels	12 (8.8)	24 (8.5)	P=0.941
Problems with micturition	6 (4.3)	11 (3.8)	P=0.805
Pain in the body (other than head)	82 (61.2)	184 (68.4)	P=0.150
Pain in the body (other than head)			
No	52 (39.1)	85 (31.6)	
Yes, less than 3 months	26 (19.6)	36 (13.4)	
Yes, 3 months+	55 (41.4)	148 (55.0)	P=0.031
Number of shaded areas on chart (other than head)			
No pain	52 (38.8)	85 (31.6)	
1	16 (11.9)	25 (9.3)	
2–3	23 (17.2)	43 (16.0)	
4–24	43 (32.1)	116 (43.1)	P=0.186
Shoulder pain	29 (21.6)	86 (31.4)	P=0.040
Neck/sternum pain	6 (4.5)	12 (4.4)	P=0.964
Elbow pain	13 (9.7)	31 (11.3)	P=0.622
Forearm pain	9 (6.7)	27 (9.9)	P=0.294
Hand/wrist pain	8 (6.0)	35 (12.8)	P=0.036
Anterior chest pain	8 (6.0)	29 (10.6)	P=0.127
Posterior chest pain	18 (13.4)	45 (16.4)	P=0.432
Back pain	47 (35.1)	110 (40.1)	P=0.323
Abdominal pain	21 (15.7)	53 (19.3)	P=0.366
Hip/upper leg pain	46 (34.3)	97 (35.4)	P=0.831
Knee pain	18 (13.4)	67 (24.5)	P=0.010
Lower leg pain	10 (7.5)	38 (13.9)	P=0.059
Foot/ankle pain	14 (10.5)	36 (13.1)	P=0.436

* Numbers do not add up to total because of missing values

2.5 months, e.g. improvement following treatment, or may indicate the fluctuating nature of pain.

For reporting headaches, the study confirms the results of other cross-sectional (Agerberg, 1973; Helkimo, 1974; Wanman, 1995; Hekeberg et al, 1997) and case-control studies (Molina et al, 1997; Magnusson and Carlsson, 1978; De Leeuw et al, 1994; Macfarlane et al, 2001). It may be hypothesised (i) that headache

is part of the OFP syndrome, or (ii) that OFP and headache share the same aetiological factors. However, there are different types of headache, according to the classification by the International Association for the study of Pain (IASP) (Merskey and Bogduk, 1994), and their mechanisms of causation is different. For example, tension headache and temporomandibular joint disorder are classified in group 3: craniofacial pain of musculoskeletal origin. However migraine and cluster headache are classified in group 5: primary headache syndromes, vascular disorders, and cerebrospinal fluid syndromes. According to this classification, headache and TMD differ in site (headache pain mostly begins in the fronto-temporal area), while TMD pain is usually located in temporomandibular, intra-articlular and temporal regions.

Temporomandibular pain may be continuous or brief and often worse on waking; classic migraine has a usual pattern of frequency of 1-3 times a month, while for a cluster headache the attacks are grouped in cluster periods of several weeks or months duration. However, the current study was not designed to distinguish between types of headaches, which would require specialist clinical diagnosis.

Our study also indicated a strong dose-response relationship between increasing total sleep disturbance score and OFP. Hagberg et al (1994) and Macfarlane et al (2001) showed more sleep disturbance in TMD cases than controls. Goulet and colleagues (1995) reported that participants with sleep problems were twice as likely to report jaw pain. The current and previously conducted studies are unable to establish the temporal relationship with sleep disturbance. It could precede or be a consequence of pain. However Smythe and Moldofsky (1977) provided some evidence from experimental studies that disturbance of sleep itself increased the likelihood of subsequently reporting pain symptoms. The symptoms disappeared with subsequent uninterrupted sleep.

The current cross-sectional study found an increased risk of OFP in individuals who needed to take medication for bowels (however the confidence interval included one post-adjustment for age and gender), and an association for problems with micturition and abdominal pain. Other studies found similar results for gastro-intestinal symptoms (Tervonen and Knuuttila, 1988; De Leeuw et al, 1994; McGregor et al, 1996; Shimshak and Ashrafi, 1998; Macfarlane et al, 2001). Croft et al (1993) reported that people with chronic widespread pain are more likely to report disturbances of bowel function. Irritable bowel syndrome in the general population was found to be associated with other somatic symptoms (Jones and Lydeard, 1992). However, due to lack of cohort studies the temporal relationship between these factors and the onset of OFP symptoms cannot be determined.

The reporting of other bodily pain, such as shoulder, knee, back pain, etc., was also associated with the reporting of OFP. This finding confirms the results of other cross-sectional studies (Helkimo, 1974; Andersson et al, 1996; Vimpari et al, 1995; Molin et al, 1976) and one cohort study (Von Korff et al, 1993). It is likely that there are some areas of shared risk exposure for all these pain conditions. This suggests that the face may be just one body region involved in a more widespread musculoskeletal syndrome occurring as a consequence of common etiological factors. It may also be one feature in a wider process of somatization (Hunt et al, 1999). A prospective study of pain-free women aged 18-34 who were followed for thirty months reported that those that developed TMD had significantly higher baseline anxiety and somatization than non-TMD participants (Bhalang et al, 2002).

Some methodological aspects of the study need to be considered when discussing the study results. Firstly,

Table 5 Percentage of participants with OFP by the number of factors in the multivariate models

Number of factors	% with OFP	Total number in group[c]
Model 1[a]		
0 factors	8.4	392
1 factor	17.8	959
2 factors	49.6	417
3 factors	72.0	100
4 factors	100.0	28
Model 2[b]		
0 factors	20.2	1213
1 factor	30.3	363
2 factors	36.1	407
3 factors	51.0	102

[a] high sleep score, frequent headache, tenderness of jaw muscles in the morning, tiredness or stiffness of the muscles

[b] abdominal pain, body pain (other than head) of duration for 3 months or longer, four or more areas of the shaded body manikin

[c] numbers do not add up to total because of missing values

while the participation rate was typical of population studies, it is important to bear in mind the possible influence of non-respondents on the results. In order to influence the results, non-responders would need to demonstrate different relationships between health symptoms considered in this paper and OFP. This seems very unlikely.

Secondly, we conducted a study of OFP syndrome as a single entity – rather than individual clinical entities. One of the reasons for this was that there is currently no validated questionnaire suitable for use in large-scale population studies, which can distinguish between these conditions and little evidence, on aetiological grounds, for their separate consideration. However, OFP considered in this study was primarily chronic (duration of three months or longer).

Thirdly, the final multivariate model included only four factors (sleep score, frequent headache, muscle tenderness and stiffness). This result, however, does not lessen the possible important role of other factors in the aetiology of OFP; it is likely that factors excluded during the modelling procedure are highly correlated with those remaining in the model. The multivariate models are derived from statistical decision rules with the inclusion/exclusion of factors offered to the model based solely on the factor's significance level within the model. The modelling procedure can be affected both by the group of factors offered, and by subjects included in the model.

Finally, the study is a cross-sectional study and therefore the associations we report are not necessarily risk factors.

In conclusion, from the results of this current study and the available evidence it seems inappropriate to consider OFP in isolation from other pain syndromes, and future research should adopt a multidisciplinary approach to OFP in combination with other syndromes that appear to share a common aetiology. Only longitudinal studies are able to establish factors that predict the future onset of symptoms. They can also establish factors leading to chronicity amongst persons presenting for healthcare. It is these latter factors that are potentially most suitable for intervention (i.e. secondary prevention). This parallels the approach that has been proposed for low back pain (Thomas et al, 1999). This study also shows that the scope of pain (and associated other symptoms) requires a treatment and management approach that is multidisciplinary. In the clinical setting, in addition to a comprehensive dental assessment, chronic OFP patients warrant appropriate medical assessments.

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APPENDIX 1

Part of the questionnaire related to body pain

During the **past month** have you had any ache or pain in your body which has lasted for one day or longer? ☐ Yes ☐ No

If *no*, go to the question on the next page.

Did this pain begin more than **three months** ago? ☐ Yes ☐ No

These are diagrams of the body. PLEASE SHADE WHERE YOU FEEL OR HAVE FELT THE ACHES AND PAINS