Risk factors for onset of chronic oro-facial pain – Results of the North Cheshire oro-facial pain prospective population study

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Abstract
Due to the cross-sectional nature of previous studies, whether mechanical factors predict the onset of Chronic oro-facial pain remains unclear. Aims of the current study were to test the hypotheses that self-reported mechanical factors would predict onset of Chronic oro-facial pain and that any observed relationship would be independent of the confounding effects of psychosocial factors and reporting of other unexplained symptoms. About 1735 subjects who had completed a baseline questionnaire were assessed at 2 year follow-up for the presence of Chronic oro-facial pain, psychosocial factors (anxiety and depression, illness behaviour, life stressors and reporting of somatic symptoms), mechanical dysfunction (facial trauma, grinding, phantom bite and missing teeth) and reporting of other unexplained symptoms (chronic widespread pain, irritable bowel syndrome and chronic fatigue). About 1329 subjects returned completed questionnaires (adjusted response rate 87%). About 56 (5%) reported new episodes of Chronic oro-facial pain at follow-up. Univariate analyses showed that age, gender, reporting of other unexplained symptoms, psychosocial factors and two self-report mechanical factors predicted the onset of Chronic oro-facial pain. However multivariate analysis showed that mechanical factors did not independently predict onset. The strongest predictors were health anxiety (Relative Risk (RR) 2.8, 95% CI 1.3–6.2), chronic widespread pain (RR 4.0 95% C.I. 2.2–7.4) and age (RR 0.2, 95% CI 0.1–0.7). The findings from this prospective study support the hypothesis that psychosocial factors are markers for onset of Chronic oro-facial pain. The efficacy of early psychological management of Chronic oro-facial pain to address these factors should be a priority for future investigations.

1. Introduction

Chronic oro-facial pain (COFP) is common with approximately 7% of the general population reporting such symptoms which co-occur with other somatic symptoms that tend to be unexplained by known organic pathology [2]. Current management of COFP, particularly in the United Kingdom, still involves the correction of mechanical factors which are thought to be associated with symptom onset and persistence [9]. This may include the use of invasive and irreversible therapies including occlusal adjustments, stabilisation/repositioning splints and surgery [4,9,14,20] although the efficacy of these interventions is unclear [4,14,20].

We have previously shown that self-report mechanical factors were associated with reporting of COFP. These relationships were confounded in part by the reporting of psychosocial factors [3] although facial trauma and reported teeth grinding were independently associated with a twofold increased odds of reporting COFP. It was also clear from the data that these mechanical factors were also associated with other chronic unexplained pain conditions (musculoskeletal and gastro-intestinal) and with fatigue and may therefore represent a general heightened awareness of bodily symptoms.

However, due to the cross-sectional nature of this study the direction of the relationship between mechanical factors and the onset of COFP remains unclear. The aims of the current study were therefore to test the hypotheses that among subjects free of COFP self-reported mechanical factors would predict the onset of COFP and that any observed relationship would be independent of the confounding effects of psychosocial factors and other unexplained symptoms.
2. Methods

2.1. Study design and participants

The study was a population-based prospective study. The population-sampling frame was adults aged 18–75 years who were identified from a general practice in the North West of England [2]. All subjects were mailed a baseline questionnaire as described in a previous publication [2]. Subjects who had consented to future contact on the baseline questionnaire were eligible for follow-up and were requested to complete a second postal questionnaire 24 months after the baseline survey. Ethical approval for the survey was granted by the Cheshire North & West Research Ethics Committee and the study was indemnified by University of Manchester Committee on the Ethics of Research on Human Beings.

2.2. Mailing strategy

Identical mailing strategies were used for the baseline and follow-up surveys. All subjects were mailed a questionnaire. Non-responders received a post-card reminder 2 weeks after the initial mailing and if they had not responded a further follow-up questionnaire was sent 2 weeks after the post-card reminder. A further short questionnaire which inquired about pain symptoms (COFP, irritable bowel and chronic widespread pain) was sent to subjects who had still not responded. At the end of the study a random sample of subjects who had still not responded were selected for a telephone interview which collected information on COFP.

2.3. Measurement of chronic oro-facial pain and associated factors

The definition and measurement of COFP and associated factors and the validity of the same have been described in detail in the baseline survey [1–3]. Briefly, COFP was defined as pain in the face, mouth or jaws that had been present for one day or longer in the past month and that such pain had been present for three months or longer. This definition is likely to have included not only temporomandibular pain disorders but also other conditions such as burning mouth, atypical pain and atypical odontalgia that have been shown to cluster together into a single group [25]. This definition is likely to have included not only temporomandibular pain disorders but also other conditions such as burning mouth, atypical pain and atypical odontalgia that have been shown to cluster together into a single group [25]. Subjects who had consented to future contact on the baseline questionnaire were eligible for follow-up and were requested to complete a second postal questionnaire 24 months after the baseline survey. Ethical approval for the survey was granted by the Cheshire North & West Research Ethics Committee and the study was indemnified by University of Manchester Committee on the Ethics of Research on Human Beings.

2.4. Statistical analysis

2.4.1. Univariate analysis

Chi-square tests for statistical significance ($p < 0.05$) were used to compare the differences in the proportion of subjects who did and did not have new onset COFP at 2 year follow-up based on the reporting of questionnaire variables at baseline (Table 1). Logistic regression was used to determine relative risks (RRs) with 95% confidence intervals (CIs) for each of the above factors and the onset of COFP. All risks were adjusted for age and gender.

2.4.2. Multivariate analysis

Variables that were significantly associated with onset of chronic oro-facial in the univariate analyses ($p < 0.05$ chi-square test Table 1) and those that had greater than 50% increased risk for onset (RR > 1.5 Table 2) were entered into a multivariate model. A forward stepwise selection was used to construct the predictive model and each variable that satisfied inclusion from the univariate analysis was entered into the model. The model worked by selecting first the variable which accounts for maximum variation in the outcome. The next variable was chosen similarly, depending on the additional variation in the outcome that is explained by it. Variables were thus added until no significant additional variation in the prediction of new onset COFP could be explained. A significance level of $p < 0.1$ was used for retention of variables in the forward stepwise model. Age and gender were forced into the model. This forward stepwise approach provides the most parsimonious and efficient model resulting in independent predictors of COFP. Model fit was tested using the Hosmer–Lemeshow goodness of fit test [11]. The higher the $p$-value the better the fit of the model. All analyses were carried out using STATIA, version 9 [21].
3. Results

3.1. Study response rates

From 4200 persons invited to participate, 2505 returned completed questionnaires at baseline. Of these 1735 consented to further contact and were eligible for inclusion in the follow-up study. Of these 1329 (77%) of those mailed and 53% of baseline responders returned completed questionnaires (1253 full questionnaires, 36 short questionnaires and 40 telephone questionnaires). However, 205 (51%) of the non-responders (N = 406) were ineligible to take part as they had migrated (N = 4), were deceased (N = 22), were at the wrong address (N = 58) or were not on the electoral register (N = 121) and thereby unlikely to be living at the given address. This gave the study a high adjusted participation of 87% among the baseline respondents agreeing to follow-up and considered likely to have received the follow-up questionnaire (1329/1735–205) (Fig. 2).

When the data from the follow-up and baseline studies were collated, a further eight subjects were dropped due to inaccuracies in dates of birth and genders on the questionnaire when compared with the General Practice database. This gave a total sample for the analysis of 1321.

3.2. Risk factors for the onset of COFP: Univariate analysis

Of those included in the sample for analysis (N = 1321), 1221 (92%) were free of COFP at baseline while 95 (7%) had the condition. Data on COFP were missing for five subjects. Of those who were free of COFP, 56 (4.6%) went onto develop symptoms at 2 year follow-up (Fig. 1). As shown in Table 1 subjects in the 18–35 year age group were significantly more likely to report new COFP at 2 year follow-up (N = 20, 7%) when compared to those in the 64–75 year old age group (N = 3, 1%) (χ² difference p = 0.04) (RR = 2.2, 95% CI (1.2–4.0).

Of the putative risk factors measured at baseline in those who were free of COFP, reported grinding, anxiety, depression, health anxiety, reporting of other somatic symptoms and chronic widespread pain and irritable bowel syndrome were significantly (p < 0.05) associated with new onset COFP (Table 1). The proportion of subjects in the highest category for these factors was greater than those in the lowest category for those who reported COFP at 2 year follow-up (Table 1). For example, 7% of subjects who reported new onset COFP had scores of 14–59 on the Health Anxiety Questionnaire (HAQ) at baseline compared to 2% who had score of 0–3, and this difference was statistically significant (χ² p-value < 0.01).

The strength of associations estimated using risk ratios showed a similar distribution with subjects in the highest category for each of the associated factors having increased risk of reporting new episodes of COFP at 2 year follow-up (Table 2). Again using health anxiety as an example, subjects who were free of COFP at baseline and had scores of 14–59 on the HAQ had a more than 3-fold increased risk (RR 3.4 95% CI (1.6–7.4)) of reporting new COFP at 2 year follow-up compared with those who had lower scores of 0–7 at baseline (Table 2).

3.3. Multivariate model

Overall, 12 variables were selected from the univariate analysis for the forward stepwise procedure: age, gender, reported grinding,}

### Table 1

Comparison of putative risk factors in subjects with new onset COFP.

| Associated factors | Range (N = 1221) | No new COFP (N = 1105) | New onset COFP (N = 56) | p-value |
|--------------------|------------------|------------------------|-------------------------|---------|
| Age                | 64–75 (239)      | 236 (99)               | 3 (1)                   |         |
|                    | 54–63 (236)      | 225 (95)               | 11 (5)                  | 0.035   |
|                    | 45–53 (248)      | 236 (95)               | 12 (5)                  |         |
|                    | 36–44 (219)      | 209 (95)               | 10 (5)                  |         |
|                    | 18–35 (279)      | 259 (93)               | 20 (7)                  |         |
| Gender             | Male (535)       | 520 (97)               | 15 (3)                  | <0.01   |
|                    | Female (586)     | 654 (94)               | 41 (6)                  |         |
| Reported grinding  | No (995)         | 956 (96)               | 39 (4)                  |         |
|                    | Yes (222)        | 206 (93)               | 16 (7)                  | 0.033   |
|                    | Missing (4)      | 3 (75)                 | 1 (25)                  |         |
| Facial trauma      | No (1033)        | 989 (96)               | 44 (4)                  | 0.131   |
|                    | Yes (175)        | 163 (93)               | 12 (7)                  |         |
|                    | Missing (13)     | 13 (100)               | 0 (0)                   |         |
| Teeth do not fit   | No (906)         | 862 (95)               | 44 (5)                  | 0.356   |
| together           | Yes (282)        | 272 (96)               | 10 (4)                  |         |
|                    | Missing (33)     | 31 (94)                | 2 (6)                   |         |
| Missing teeth      | No (429)         | 404 (94)               | 25 (6)                  | 0.132   |
|                    | Yes (788)        | 757 (96)               | 31 (4)                  |         |
|                    | Missing (4)      | 4 (100)                | 0 (0)                   |         |
| Sleep disturbance  | 0–3 (466)        | 450 (97)               | 16 (3)                  | 0.093   |
| score              | 4–7 (340)        | 326 (96)               | 14 (4)                  |         |
|                    | 8–20 (403)       | 377 (94)               | 26 (6)                  |         |
|                    | Missing (12)     | 12 (100)               | 0 (0)                   |         |
| Somatic symptoms   | 0 (698)          | 671 (96)               | 27 (4)                  | 0.037   |
|                    | 1 (342)          | 327 (96)               | 15 (4)                  |         |
|                    | 2–5 (164)        | 150 (91)               | 14 (9)                  |         |
|                    | Missing (17)     | 17 (100)               | 0 (0)                   |         |
| Anxiety            | 0–7 (798)        | 770 (96)               | 28 (4)                  | <0.01   |
|                    | 8–10 (208)       | 200 (96)               | 8 (4)                   |         |
|                    | 11–21 (202)      | 182 (90)               | 20 (10)                 |         |
|                    | Missing (13)     | 13 (100)               | 0 (0)                   |         |
| Depression         | 0–7 (1055)       | 1016 (96)              | 39 (4)                  | <0.01   |
|                    | 8–10 (97)        | 87 (90)                | 10 (10)                 |         |
|                    | 11–21 (59)       | 52 (88)                | 7 (12)                  |         |
|                    | Missing (10)     | 10 (100)               | 0 (0)                   |         |
| Health anxiety     | 0–7 (451)        | 442 (98)               | 9 (2)                   | <0.01   |
|                    | 8–13 (391)       | 370 (95)               | 21 (5)                  |         |
|                    | 14–59 (351)      | 326 (93)               | 25 (7)                  |         |
|                    | Missing (28)     | 27 (100)               | 1 (4)                   |         |
| Life events        | 0 (518)          | 503 (97)               | 15 (3)                  | 0.054   |
|                    | 1 (358)          | 338 (94)               | 20 (6)                  |         |
|                    | 2–9 (331)        | 311 (94)               | 20 (6)                  |         |
|                    | Missing (14)     | 13 (93)                | 1 (7)                   |         |
| CWP                | No (1036)        | 1002 (97)              | 34 (3)                  | <0.01   |
|                    | Yes (179)        | 157 (88)               | 22 (12)                 |         |
|                    | Missing (6)      | 6 (100)                | 0 (0)                   |         |
| IBS                | No (1100)        | 1054 (96)              | 46 (4)                  | 0.014   |
|                    | Yes (106)        | 96 (91)                | 10 (9)                  |         |
|                    | Missing (15)     | 15 (100)               | 0 (0)                   |         |
| CF                 | No (1108)        | 1062 (96)              | 46 (4)                  | 0.260   |
|                    | Yes (90)         | 84 (93)                | 6 (7)                   |         |
|                    | Missing (21)     | 19 (83)                | 4 (17)                  |         |

COFP, chronic oro-facial pain; IBS, irritable bowel syndrome; CWP, chronic widespread pain; CF, chronic fatigue.
facial trauma, anxiety, depression, sleep disturbance, health anxiety, reporting of other somatic symptoms, adverse life events, chronic widespread pain and irritable bowel syndrome. Three factors were retained in the final model (Table 2, final column) – age, health anxiety and chronic widespread pain. According to this model, the strongest predictors of COFP at 2 year follow-up were chronic widespread pain (Relative Risk 4.0, 95% CI 2.2–7.4), and higher levels of health anxiety (Relative Risk 2.8, 95% CI 1.3–6.2). The overall \( p \)-values for both variables were significant in the final model (Table 2) and tests for trend also showed increasing association between levels of health anxiety and COFP onset (\( p < 0.01 \)).

Further, being in the oldest age group was protective (Relative Risk 0.2, 95% CI 0.1–0.7) and although the overall \( p \)-value for age was not significant in the model (Table 2 \( p = 0.09 \)), tests for trend showed a decreasing association between age and COFP onset which was significant (\( p < 0.01 \)). The final model showed a good fit (Hosmer and Lemeshow test, \( p = 0.85 \)). Because the Hosmer and Lemeshow test was non-significant (\( p = 0.85 \)), this indicates the absence of any gross model violations, such as possible interactions between variables. Of course these results may be explained by subjects having some oro-facial pain at baseline that was not chronic. However, adjusting for having some facial pain at baseline did not alter the results (data not shown).

### 4. Discussion

This study has shown that of the self-report mechanical factors examined, self-reported grinding and facial trauma were found to predict onset of COFP. However, any risks associated with these factors were confounded by the reporting of health anxiety and chronic widespread pain. These, along with younger age, were the strongest predictors of COFP onset.

The present study had several strengths. It is the first study to examine together the role of mechanical and psychosocial factors and the reporting of other unexplained symptoms in the onset of COFP. The prospective nature of the study allowed us to disentangle the temporal relationships between these factors and the onset of COFP and allowed us to control for potential confounding using a multivariate model. In addition, only symptoms in the oro-facial

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**Table 2**

Univariate and multivariate analyses for factors predicting COFP onset.

| Associated factors  | Range          | New onset Chronic OFP | Variables entered into multivariate model | OR (95% CI) | p-value |
|---------------------|----------------|------------------------|------------------------------------------|-------------|---------|
| **Demographic factors** |                |                        | Age 18–35                                | 0.09        |         |
| Age                 | 18–35          | 1                      | Age 18–35                                | 18–35       | 0.09    |
|                     | 36–44          | 0.6 (0.3–1.4)          | 36–44                                    | 0.7 (0.3–1.7)|         |
|                     | 45–53          | 0.7 (0.3–1.4)          | 45–53                                    | 0.6 (0.3–1.4)|         |
|                     | 54–63          | 0.6 (0.3–1.3)          | 54–63                                    | 0.7 (0.3–1.5)|         |
|                     | 64–75          | 0.2 (0.1–0.6)          | 64–75                                    | 0.2 (0.1–0.7)|         |
| **Gender**          | Male 1         | Gender Male            | Female                                   | 2.2 (1.2–4.0)|         |
|                     | Female         |                         | Female                                   |             |         |
| **Mechanical factors** |                |                        | Reported grinding 1                      | No          |         |
| Report grinding     | No 1           | Reported grinding      | Yes                                      | 1.7 (0.9–3.1)|         |
|                     | Yes            |                         | Yes                                      |             |         |
| **Facial trauma**   | No 1           | Facial trauma          | Yes                                      | 1.6 (0.8–3.1)|         |
|                     | Yes            |                         | Yes                                      |             |         |
| **Teeth do not fit together** | No 1         | Teeth do not fit together | Yes                                      | 0.7 (0.4–1.4)   |         |
|                     | Yes            |                         | Yes                                      |             |         |
| **Missing Teeth**   | No 1           | Missing Teeth          | Yes                                      | 0.9 (0.5–1.6)   |         |
|                     | Yes            |                         | Yes                                      |             |         |
| **Psychosocial factors** |            |                        | Sleep disturbance score 0–3 1           | Sleep disturbance score 0–3 1 |         |
| Sleep disturbance score | 0–3          | 1                      | Sleep disturbance score 0–3 1           |              |         |
|                     | 4–7            | 1.1 (0.5–2.3)          | Sleep disturbance score 0–3 1           |              |         |
|                     | 8–20           | 1.8 (0.9–3.4)          | Sleep disturbance score 0–3 1           |              |         |
| **Somatic symptoms** | 0 1           | Somatic symptoms       | Somatic symptoms 0 1                     |              |         |
|                     | 1              | 1.1 (0.6–2.0)          | Somatic symptoms 0 1                     |              |         |
|                     | 2–5            | 1.9 (1.0–3.7)          | Somatic symptoms 0 1                     |              |         |
| **Anxiety**         | 0–7            | 1                      | Anxiety 0–7                               |              |         |
|                     | 8–10           | 1.0 (0.4–2.2)          | Anxiety 8–10                              |              |         |
|                     | 11–21          | 2.5 (1.3–4.6)          | Anxiety 11–21                             |              |         |
| **Depression**      | 0–7            | 1                      | Depression 0–7                            |              |         |
|                     | 8–10           | 2.9 (1.4–6.1)          | Depression 8–10                           |              |         |
|                     | 11–21          | 3.1 (1.3–7.5)          | Depression 11–21                          |              |         |
| **Health anxiety**  | 0–7            | 1                      | Health anxiety 0–7                        |              | 0.04    |
|                     | 8–13           | 2.6 (1.2–5.7)          | Health anxiety 8–13                       |              |         |
|                     | 14–59          | 3.4 (1.6–7.4)          | Health anxiety 14–59                      |              |         |
| **Life events**     | 0–7            | 1                      | Life events 0–7                           |              |         |
|                     | 1              | 1.9 (1.0–3.8)          | Life events 1                             |              |         |
|                     | 2–9            | 2.0 (1.0–3.9)          | Life events 2–9                           |              |         |
| **Other unexplained symptoms** |        |                        | CWP 0–7                                   |              | <0.001  |
| CWP                 | No 1           | CWP                    | CWP 0–7                                   |              |         |
|                     | Yes            | 4.4 (2.5–7.9)          | CWP 0–7                                   |              |         |
| **IBS**             | No 1           | IBS                    | IBS 0–7                                   |              |         |
|                     | Yes            | 1.9 (0.9–3.9)          | IBS 0–7                                   |              |         |
| **CF**              | No 1           | CF                     | CF 0–7                                    |              |         |
|                     | Yes            | 1.5 (0.6–3.6)          | CF 0–7                                    |              |         |

COFP, chronic oro-facial pain; IBS, irritable bowel syndrome; CWP, chronic widespread pain; CF, chronic fatigue.

\( a \) Odds ratios adjusted for age and gender where appropriate.
region were included and more common conditions like headache excluded from the analysis. Previous studies [16] have often investigated headaches with COFP as is notable from the high prevalence rates obtained and any results need to be interpreted with caution. The current study was population based and it is therefore likely to have encompassed an unselected cohort of both mild and severe cases of COFP. Clinic studies on the other hand are restricted to a selectively referred sample which usually represents the most severe cases of symptoms. Further, although the current study uses self-report data, validated instruments were used to collect and measure risk factors and outcomes and therefore the possibility of mis-classification and interviewer biases are likely to have been minimised.

However, there are some methodological issues that need to be considered.

The high response rate for the current study does not mean that it is unlikely to be affected by non-response bias. To take this into account, we conducted a weighted analysis using age–sex specific strata to control for any selective sampling bias. The results of univariate and multivariate analyses remained unchanged thereby reducing the likelihood of non-response bias. A further problem in such studies is selection bias and it is plausible that non-participants were systematically different when compared to those who participated. We therefore used short and telephone questionnaires, as outlined in the methods section, to ascertain pain status amongst those who were late responders and used these subjects as a proxy for non-responders. Because of small numbers of late responders of whom only two reported new onset COFP, it was not possible to analyse the relationship between baseline predictors and outcome at follow-up on this group of late responders. The results remained unchanged when these subjects were excluded.

Another concern is that some occurrences of COFP present at follow-up (among people who did not have COFP at baseline) may not be “new (i.e. incident) onsets” but may be recurrent episodes. This is likely to be the case. The natural history of COFP shows that some symptoms fluctuate over time with individuals moving in and out of state. At baseline we assessed the pain status of subjects at a single point in time. Those who were classified as “free of COFP” may well be a mixture of those who have never had COFP and those who are currently out of state. Cases at follow-up among those free of COFP at baseline will be a mixture of incident and new prevalent cases. The strength of the current study is identifying risk factors for the onset of COFP among individuals who were free of COFP and showing that certain factors strongly predict the occurrence of a new episode. Further, some individuals at baseline had facial pain that was not chronic and may be cases that are moving in and out of a chronic pain state. When we adjusted for the presence of oro-facial pain at baseline we found that this did not alter the results.

As we have investigated 15 potential risk factors to predict COFP variables the potential for type I error is increased. We did not correct the subsequent p-values for this potential error nor reduce the p-value of the cut-off used in the multivariate model. As we would expect there to be associations between the potential risk factors as well as the outcome, the restriction of p-values would result in factors that might have some association with COFP to be removed from the final model. Another approach to overcome multiple testing would be to include all the potential risk factors in the multivariate model. We have carried out this analysis and the associations with COFP are almost identical to those seen in our final multivariate model (data not shown) and

![Fig. 2. Study response rates.](image)
this model also had a good fit (Hosmer and Lemeshow test, $p = 0.72$; overall model $p$-value $< 0.01$). However, we feel that the full multivariate model is not ideal to address the aims of the study because the resulting model depicts an output that shows how all the variables are associated with the outcome irrespective of their predictive value. This adds unnecessary variability to the model. The forward stepwise approach not only addresses the aims of our study but also provides independent predictors of COFP using the most parsimonious and efficient model that reduces variability by including only those variables that are predictors of COFP and hence is the most efficient approach.

The findings of this study have raised further questions which need to be addressed by future research. First, although irritable bowel syndrome was found to predict COFP onset in the univariate analysis, this relationship was attenuated in the multivariate model where chronic widespread pain remained as the only “unexplained” pain condition to predict COFP onset. Although these symptoms were found to co-occur at baseline [2] it appears that temporal associations do not follow a similar pattern and there is a suggestion that visceral pain does not predict the onset of COFP whilst musculoskeletal pain does. The underlying mechanisms to explain the observed temporal relationship between these pain conditions warrants further investigation. Second, the finding that younger age groups are at much higher risk of developing COFP may simply be due to socio-cultural effects of reporting different pain symptoms at different ages. A similar relationship has been found to manifest for irritable bowel syndrome [2,10] whilst the opposite has been observed for chronic widespread pain [2,18]. These relationships need further investigation in longitudinal research which also needs to explore the influence of biological and genetic risk factors in these high risk populations. Recent research [7,8] has suggested that other explanatory factors such as genetic predispositions and high pain amplifications states along with psychosocial factors may be involved in the causal mechanisms of COFP. Therefore because the aetiology of COFP is likely to be multi-factorial and there is no predefined cut-off for COFP the predictive value of our model may not be appropriate. However, we did find that at a 60% cut-off for estimated probabilities, the overall prediction of the model was 61% with 75% of COFP cases correctly predicted. Further research needs to include genetic variability and pain amplification status in such models to fully understand the causal mechanisms of COFP.

The results related to psychosocial factors as predictors of onset of COFP are supported by previous literature that has shown depression to have an increased, albeit non-significant, risk for the onset of temporomandibular pain disorder [24]. In addition, the results for chronic widespread pain as a predictor are also well supported by previous studies that have shown it to be important both in the onset [13] and persistence [17] of COFP. The findings of these studies and our study indicate that irreversible management to correct mechanical factors may not be justified for COFP and clinicians should use such techniques with caution. Rather non-invasive interventions like cognitive behaviour therapy which have the potential to produce most benefit without harm should be used. These can target psychosocial risk factors like health anxiety, which was found to predict COFP in our study. Such techniques have been shown to be effective in the management of temporomandibular pain disorders albeit in tertiary care [23] and their use in early intervention of COFP in primary care should be a priority for testing.

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