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Prevalence of temporomandibular disorder pain in Chinese adolescents compared to an age-matched Swedish population

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SUMMARY **This study aimed to (i) assess the prevalence and perceived need for treatment of TMD pain, and its association with socio-economic factors and gender, in adolescents in Xi'an, Shaanxi Province, China, and (ii) compare the prevalence and association with gender of TMD pain in Xi'an to an age-matched Swedish population. We surveyed Chinese adolescents aged 15 to 19 years in Xi'an, China (n = 5524), using a questionnaire with two-stage stratified sampling and the school as the sampling unit. The study included second-year students at selected high schools. It also included an age-matched Swedish population (n = 17 015) surveyed using the same diagnostic criteria for TMD pain as that used in the Chinese sample. The survey found TMD pain in 14·8% (n = 817) of the Chinese sample and 5·1% (n = 871) of the Swedish sample (P < 0·0001). Girls had significantly more TMD pain than boys in both the Chinese (P < 0·05) and Swedish (P < 0·001) samples. TMD pain increased with age in the Chinese population. Of the Chinese adolescents with TMD pain, 47% reported that they felt a need for treatment. Rural schools, low paternal education levels, poverty, living outside the home, poor general and oral health, and dissatisfaction with teeth all showed significant positive correlations with TMD pain. Prevalence of TMD pain in Chinese adolescents was significantly higher than in the Swedish sample.**

KEYWORDS: **epidemiologic studies, health, needs assessment, risk factors, socio-economic factors, temporomandibular joint disorders**

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Introduction

A systematic review found prevalence of self-reported TMD-related pain in adolescents to vary from 0·7% to 18·6% (1). Differences in methodology – such as differences in the populations investigated, examination procedures and diagnostic criteria – partly explain the variation in TMD prevalence between studies. A population-based Swedish study among 12- to 19-year-olds found a prevalence of 4·2% when participants were asked about TMD pain occurring once a week or more (2). Hirsch *et al.* found that prevalence would vary between 5% and 15% in a German population depending on the time frame used in the items (3). Other studies have assessed prevalence of TMD pain among adolescents according to the research diagnostic criteria for temporomandibular disorders (RDC/TMD) (4–7). The RDC/TMD is the most widely used TMD diagnostic criteria and provides clinical researchers with a standardised system; it has been translated into several languages and shows good reliability and validity (8). Although the RDC/TMD was not developed for children and adolescents, its use among adolescents shows good reliability (9). The RDC/TMD includes Axis I, a clinical examination of signs and symptoms of TMD, and Axis II, an assessment of psy-

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chosocial dysfunction and distress. One limitation of using RDC/TMD criteria is that they are time and personnel intensive. So, to assist epidemiological studies, researchers developed screening items for TMD pain. In an adolescent population, Nilsson *et al.* (10) used two items, validated against the RDC/TMD, that showed excellent sensitivity and specificity. Self-reported TMD pain agreed well with TMD pain diagnoses using the RDC/TMD (10).

TMD pain is relatively uncommon among children and increases with age among adolescents (1). In childhood, studies have found no significant differences in prevalence between boys and girls. Gender differences occur after puberty when TMD pain becomes more prevalent in girls than in boys (11, 12). Nilsson *et al.* found that 6% of girls and 2·7% of boys in a Swedish adolescent sample reported TMD pain occurring once a week or more (2).

In China, few epidemiological studies have investigated TMD in adults or adolescents (13–15). The Chinese database of National Knowledge Infrastructure (CNKI) contains few studies focusing on the epidemiology of TMD (16). Most of these use clinical examinations as diagnostic criteria. Their results are thus not comparable with other studies because the Chinese studies do not clearly define their diagnostic criteria or disclose operational criteria for their examination procedures. In addition, none of these studies are from Shaanxi Province, the target area for this study.

Among adolescents, LeResche (12) observed ethnic differences in the prevalence of self-reported facial pain between Black Americans and White Americans, but not between Asian and White Americans. Wu *et al.* (15) studied Chinese adolescents by comparing a group of 497 Chinese adolescents to a group of 651 German adolescents. They found prevalence of RDC/TMD pain diagnoses to be higher in China (8·2%) than in Germany (2·3%; OR = 3·3; 95% CI: 1·7–6·5). However, they found no differences in prevalence of self-reported facial pain and headache between these populations using the time frame of pain occurring in the past month (15). Pain is the most common reason for seeking treatment for TMD (17), so TMD pain is a relevant outcome measure. Few studies have evaluated adolescents' perceived need for treatment due to TMD pain. Nilsson *et al.* (18) found that 66% expressed a subjective need for treatment, although only 34% ultimately received treatment (2).

This study aimed to (i) assess the prevalence of TMD pain, its association with socio-economic factors and gender, and perceived need for treatment due to TMD pain in adolescents in Xi'an, Shaanxi Province, China; and (ii) compare the prevalence of TMD pain in Xi'an to an age-matched Swedish population. Our hypotheses were that there would be no differences in TMD pain prevalence or gender distribution between the two populations.

Methods

Study area

Our study collected data in Xi'an, Shaanxi Province, China. Shaanxi Province is a north-central province of China. In the North, desert lies along the border with Inner Mongolia, while the Loess Plateau makes up the central part of the province. The Qinling Mountains, which divide North and South China, run east to west through the south-central part of the province. Xi'an, the capital city of Shaanxi Province, lies at the foot of the Qinling Mountains. By the end of 2006, Xi'an had a population of about 8·2 million (4·2 million men and 4 million women). According to data from 2006, the 153 senior schools in the city enrolled about 65 000 students. Xi'an consists of 12 districts/counties. According to the educational rule, six districts comprise the urban part and the other six districts/counties make up the rural part.

Sample size calculation and selection procedures for the Chinese population

Assuming a population size of 100 000 adolescents aged 15–19 in Xian with an anticipated TMD pain prevalence of 5%, and based on the parameters of a Swedish study using a similar methodology and group of participants (2), we calculated the necessary sample size to be 3606 individuals. A two-stage stratified proportionate cluster sampling design was utilised with schools as the primary sampling unit, using urban versus rural schools and good quality versus normal quality schools as stratification variables. In China, senior schools are ranked according to their quality of teaching into good and normal quality schools. To obtain the estimated sample size, a total of 16 schools were randomly selected from 146 senior schools in Xi'an (Fig. 1). At the first stage, senior schools were

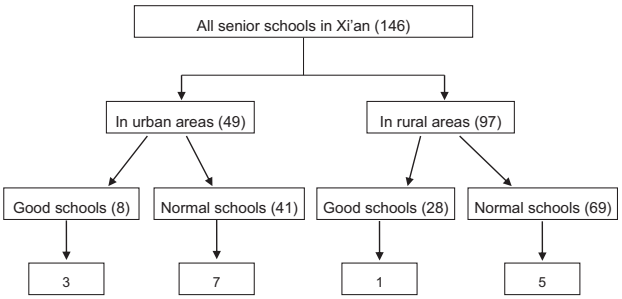

Fig. 1. Flow chart of sampling procedures.

randomly selected from 28 good quality and 69 normal quality schools in the rural area and from eight good quality and 41 normal quality schools in the urban area. Totals of three good quality and seven normal quality schools in the rural area (10 rural schools, $k = 0{\cdot}2$) and one good quality and five normal quality schools in the urban areas (six urban schools, $k = 0{\cdot}1$) were selected by systematic random sampling. The second stage included all grade two student in the selected schools, $n = 5940$ pupils.

Survey methods, prevalence and treatment need

In 2000, the population of Östergötland County in Sweden was 411 345 individuals. Of these, 39 711 were 12–19 years old. A total of 29 965 adolescents between the ages of 12 and 19 years were seen at a routine annual routine examination in 2000. All 35 Public Dental Service (PDS) clinics participated. Of the 9746 who were not examined, private dental practitioners treated 3119 (7·9%). The remaining 6627 were not seen because there were not scheduled for their examination. Of the 29 965 examined, the data for 1066 were unavailable, leaving complete data on 28 899 adolescents or 72·8% of the population. All adolescents in the ages 12–19 years were asked two questions on TMD-related pain (see items 1 and 2 below). To facilitate comprehension, the therapist pointed to the anatomic regions mentioned so that the patient would understand the question. All PDS personnel were informed via internal television about the background for this change in the procedure and were instructed how to question the patient and perform the interview and examination. These instructions were later supplemented with written information to all clinics and new oral reviews at each clinical practice. All consecutive PDS patients between the ages of 12 and 19 years who were examined during 2000 were registered for the variable TMD pain (2).

From the data set of a total of 28 899 Swedish adolescents aged 12–19 years old, we selected an age-matched subgroup aged 15–19 years of 17 015 individuals.

All participants in China responded by questionnaire to the following two items, identical to those used in the Swedish study (2):

1 Do you have pain in your temple, face, jaw joint, or jaws once a week or more often?
2 Do you have pain when you open your mouth wide or chew once a week or more often?

The Chinese questionnaire received a formal forward and backward translation to ensure accuracy of the two items. In China, if the response was positive to one or both of these items, the subject received a diagnosis of TMD pain and answered a third item:

3 Do you think you need treatment for the problems?

Socio-economic variables

The questionnaire had items to determine: school location (rural/urban), father's education (<9 years, ≥9 years), self-perceived familial economic status (poor, moderate, good, very good), accommodation (living outside home, living at home), self-perceived general health (very bad, bad, good, very good), self-perceived oral health (very bad, bad, good, very good), satisfaction with teeth (very dissatisfied, dissatisfied, satisfied, very satisfied), and satisfaction with the position of teeth (very dissatisfied, dissatisfied, satisfied, very satisfied) and smoking (never, several times, once a month, once a week, every day).

Pilot and reliability study

We performed a pilot study of the questionnaire items in Grade 2 of the eleventh school of Xi'an, Weiyang District. It included all 39 students from two classes. During this procedure, we tested reliability using a test–retest methodology with a 2-week interval, similar to Nilsson's liability test. The convenience sample ($n = 194$) came from four classes of Grade 2 students in the same school. Participants responded to the questionnaire after receiving standardised information in the classroom. For clarity, a supervisor remained to respond to the students' questions. All subjects pro-

vided informed consent, and we obtained ethical approval for the study.

Statistical analysis

We performed descriptive analyses and assessed differences between Chinese and Swedish subjects using the Mann–Whitney *U*-test. We performed a multivariate adjusted logistic regression analysis with TMD pain as the dependent variable and health and socio-economic responses as independent variables*. We selected independent variables from those health/socio-economic factors that bivariate analysis associated significantly with the presence of TMD pain (Mann–Whitney *U*-test) considering a *P*-value <0·05 as statistically significant. We also included age and gender in the regression analysis.

Results

Of the 5850 subjects initially selected in the Chinese sample, 5704 subjects agreed to participate in the study. We found missing data in 5·6% of the participants' responses. The final data set included 5524 subjects ($\bar{X}$ = 16·8 years, SD = 0·86; 2642 boys, 47·8% and 2882 girls, 52·2%) which corresponded to a participation rate of 94·4%. The Swedish sample constituted 17 015 individuals ($\bar{X}$ = 17·0 years, SD = 1·45; 8867 boys, 52·1% and 8148 girls, 47·9%). In the Chinese sample, we selected four classes for the reliability test of the questionnaire items. Kappa for the two items on TMD pain was 0·62 and Cronbach's alpha was 0·77. We found TMD pain in 14·8% of the Chinese sample (n = 817; 362 boys, 455 girls) and 5·1% of the Swedish sample (n = 871; 246 boys, 625 girls) ($P < 0·0001$). Girls had significantly more TMD pain than boys in both the Chinese ($P < 0·05$) and Swedish ($P < 0·001$) samples. Prevalence of TMD pain increased with age in Chinese adolescents (Fig. 2).

The following results refer only to the Chinese sample (Table 1):

Of the Chinese adolescents who had TMD pain, 47% reported that they needed medical treatment. There were significantly more girls (57·6%) than boys (42·4%) who expressed a perceived need for treatment ($P < 0·005$). Subjects from schools located in rural locations (n_{total} = 3032) reported significantly more TMD pain (17·2%) than students from urban schools (11·9%, n_{total} = 2486) ($P < 0·001$).

Subjects whose father's education was <9 years (n_{total} = 561) had significantly more TMD pain (18·5%) compared to subjects whose father's education was ≥9 years (14·4%, n_{total} = 3955) ($P < 0·01$). Those who estimated their familial economic status as poor (n_{total} = 645) had significantly more TMD pain

*SPSS version 20.0; IBM Corporation, Armonk, NY.

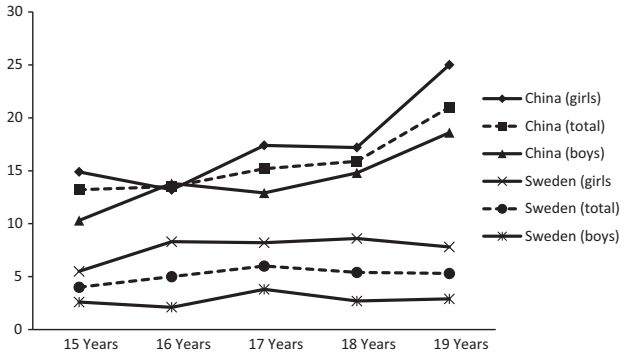

Fig. 2. Percentage distribution of TMD pain in different age groups in Chinese and Swedish samples.

Table 1. Percentage distribution of TMD pain by socio-economic and perceived health-related variables

	TMD pain (%)	*P*
Location of school		
Rural	17·2	<0·001
Urban	11·9	
Father's education		
<9 years	18·5	<0·01
≥9 years	14·4	
Self-perceived familial economic status		
Poor	19·7	<0·001
Moderate/good/very good	14·2	
Accommodation		
Living outside home	16·5	<0·001
Living at home	12·4	
Self-perceived general health		
Bad/very bad	25·5	<0·001
Good/very good	12·2	
Self-perceived oral health		
Bad/very bad	20·0	<0·001
Good/very good	12·0	
Satisfaction with teeth		
Dissatisfied/very dissatisfied	21·7	<0·001
Satisfied/very satisfied	12·3	
Satisfaction with the position of teeth		
Dissatisfied/very dissatisfied	19·1	<0·001
Satisfied/very satisfied	12·5	

(19·7%) than those with moderate/good/very good familial economic status (14·2%, n_{total} = 4859) ($P < 0·001$). Subjects who lived outside their home when in school (n_{total} = 3270) had significantly more TMD pain (16·5%) than those who lived at home (12·4%, n_{total} = 2250) ($P < 0·001$).

Those who reported very bad/bad general health (n_{total}=1080) had significantly more TMD pain (25·5%) than those who reported very good/good health (12·2%, n_{total} = 4432) ($P < 0·001$). Subjects who reported very bad/bad oral health (n_{total} = 1887) had significantly more TMD pain (20·0%) than those who had very good/good oral health (12·0%, n_{total} = 3621) ($P < 0·001$). Those who were dissatisfied/very dissatisfied with their teeth (n_{total} = 1484) had significantly more TMD pain (21·7%) compared to those who were satisfied/very satisfied with their teeth (12·3%, n_{total} = 4029) ($P < 0·001$). Those subjects who were dissatisfied/very dissatisfied with the position of their teeth (n_{total} = 1937) had significantly more TMD pain (19·1%) than those who were satisfied/very satisfied (12·5%, n_{total} = 3573) ($P < 0·001$). Regular smokers (n_{total} = 403) (smoking every day) had significantly more TMD pain (19·4%) than those who seldom smoked cigarettes (14·4%, n_{total} = 5103 ($P < 0·001$).

Logistic regression revealed that self-reported poor general health had the highest predictive value for TMD pain (OR = 2·08), while the other significant variables had lower OR values (OR range 1·20 to 1·44; Table 2).

Table 2. Logistic regression. Dependent variable: TMD pain. Included independent variables: age, gender and the variables dichotomised according to Table 1 (location of school, father's education, self-perceived familial economic status, accommodation, self-perceived general health, self-perceived oral health, satisfaction with teeth, satisfaction with position of teeth). Forward conditional method – last step in final model shown

			95·0% CI for OR	
	B	OR	Lower	Upper
Girls	0·18	1·20	1·03	1·41
Rural school location	0·31	1·36	1·15	1·60
Poor general health	0·73	2·08	1·75	2·49
Dissatisfied with teeth	0·37	1·44	1·21	1·73
Dissatisfied with position of teeth	0·31	1·36	1·15	1·61

B = regression coefficient; OR = odds ratio; CI = confidence interval.

Discussion

The main finding in this study is that prevalence of TMD pain among Chinese adolescents is significantly higher than in the Swedish adolescent population. Pain was more common among girls than boys in both populations. In the Chinese population, TMD pain associated with poor self-perceived general and oral health.

The third Chinese national oral health epidemiological survey included age groups of 5-, 12-, 35- to 44- and 65- to 74-year-olds. This national survey, conducted in 2005, collected data from 30 (of 32 total) Chinese provinces (19). Our findings regarding socioeconomic variables correspond to findings from this national survey. Thus, we consider that our study has good representativeness for the Chinese population.

We found good reliability for the screening items, although the value was somewhat lower than in a previous study in which subjects first underwent RDC/TMD examination and then immediately responded to the TMD pain questionnaire (10). This examination may have enhanced patients' pain awareness and understanding of the items, which might explain the increased reliability compared to our study. Another possible reason may be that our study was not a face-to-face interview, as in Nilsson's study (10), but surveyed a group using a written questionnaire. As our sample unit was schools, we organised the adolescents in their classrooms and explained the questionnaire to all classmates in a group. Each class included 20–70 students. With this method, some students may not have understood the items fully, which may have affected the responses.

An earlier study found good validity for the two TMD pain items (10). Studies suggest other screening items that were found to have good validity (20–22). But in contrast to our screening items, which were developed and tested among adolescents in a population-based study, these other screening items were developed among adults in a case–control study. An instrument needs to be not only reliable and valid, but also easy to use in the target population. Tests of our items found them to be understandable and easy to administer to adolescents. One limitation that we should mention is that our TMD pain items do not distinguish chronic pain from acute pain as the items do not specify a time limit.

In this study, both Swedish and Chinese girls reported more TMD pain than boys, while the preva-

lence of TMD pain increased with age among Chinese adolescents. This corresponds with the findings of other studies (4, 12). Our data from China correspond with the findings of others (1, 15), all reporting rates of TMD pain in China higher than those from Sweden. A difference between our study and the Swedish study in comparison with some others is that our study and the Swedish study asked about pain in the past week, rather than the past month as in these other studies. Hirsch *et al.* (3) found differences in pain prevalence based on the time frame of the item: 'pain in the previous month' yielded a prevalence of 15%, while 'pain more than once a week' yielded only 5%. This does not explain the differences our study found, however, as the surveys in China and Sweden used identical items with the same time frame of a week.

One possible explanation for the high prevalence of TMD pain in China could be pressure related to upcoming university entrance examinations, in which only about half of the students will gain access to higher education. Stress may increase the probability of suffering from TMD pain (23). A further factor is the 'one child policy' in China, which puts great pressure on the one and only child in the family. An additional factor, difficult to evaluate, is the earthquake that occurred in Shaanxi Province during the survey in the spring of 2008. Psychological stress might have played a role in the onset of TMD pain (24).

In this study, 47% of adolescents with TMD pain expressed a perceived need for treatment, which is in line with a study by List *et al.* who found 51% (4). Nilsson *et al.* found 66% (18). Hirsch *et al.* (3) found that 15% of adolescents with TMD pain had desired treatment at least once during the previous month. Köhler (25) found that 5–9% of 10- and 15-year-olds reported severe symptoms, while 1–2% of 15-year-olds met the criteria for treatment need (frequent headaches and moderate-to-severe clinical signs).

Adolescents who are not feeling well have more TMD pain. There is high comorbidity with illness and other pain conditions. A Swedish study found comorbidity between TMD pain and other pain conditions, including headache, depressive symptoms, somatic complaints and other issues in adolescents (18). There is an association between TMD and stress/depression (26). We have no data on stress and depression in our Chinese study, but the Swedish population shows association between TMD pain and depression and stress (27). In our study, we found an association between general health and TMD pain. The data we have indicate that the adolescents do not feel well, which might imply that they have other diseases. While we do not know the details, this might indicate depressive symptoms or other conditions. There are similar items to those used among adults adapted for use among adolescents to catch these Axis II issues. Including these items could have added valuable knowledge to our study (9, 18).

Grohult *et al.* (28) showed that, in the Nordic countries, children and adolescents with lower socio-economic status, such as lower parental educational levels or household income, had higher rates of recurrent pain. They also showed an association between pain and other forms of distress. Pain and comorbid conditions are common in adolescents in China. Siu *et al.* (29) reported that chronic pain among adolescents in Hong Kong was more frequent in girls and among adolescents with more depressive symptoms, higher perceived stress or whose father was employed only part-time. A recent study found that perceived school-related stress significantly associated with depressive symptoms in a large sample of Chinese adolescents, and this association was particularly strong in families with low socio-economic status (30).

In China, TMD pain was higher in rural areas compared to the cities. In Sweden, the opposite was true, with significantly higher prevalence of TMD pain in the cities than in the rural areas (2). One contributing factor might be that Chinese college students from a rural background show greater levels of depression than their urban counterparts (31).

Adolescents reporting bad self-perceived oral health had significantly more TMD pain. However, our study did not exclude individuals with caries as the screening items were based upon self-report and not a clinical examination. Hence, there was no item that excluded dental pain (32). The higher TMD pain prevalence we found might be due to toothache, not musculoskeletal pain. We do not know whether dental caries is more prevalent in China than in Sweden because epidemiological studies are difficult to compare. Caries prevalence numbers, though, are declining in China as they are in Sweden (32, 33). In China, dental caries is more prevalent among adolescents in urban than in rural areas.

Logistic regression (Table 2) revealed significant positive associations between TMD pain and some

variables. But these generally had low ORs, the strongest being poor general health (OR ~2). This was not an unexpected finding as studies frequently report a correlation between TMD symptoms and self-perceived impaired general health status, especially in adult populations (34–36), but also in children (25).

Conclusion

Compared with an age-matched population of Swedish adolescents, prevalence of TMD pain in Chinese adolescents was high. In Chinese adolescents, TMD pain associated with poor self-perceived general health, increased with age, and like in the Swedish population, was higher among girls than boys. Nearly half of the Chinese adolescents diagnosed with TMD pain expressed a need for treatment.

Acknowledgments

This study received ethical approval from the Health Committee of Shaanxi Province (dated: 2008·03·15), China and the Ethics Committee in Norway (Reference no: 2008/6344-ANØL). The University of Bergen funded the study. The authors declare no conflict of interests.

References

1. Drangsholt M, LeResche L. Temporomandibular Disorder Pain. In: Crombie C, Linton L, ed. Epidemiology of Pain. Seattle: IASP Press; 1999:203–233.
2. Nilsson IM, List T, Drangsholt M. Prevalence of temporomandibular pain and subsequent dental treatment in Swedish adolescents. J Orofac Pain. 2005;19:144–150.
3. Hirsch C, John MT, Schaller HG, Turp JC. Pain-related impairment and health care utilization in children and adolescents: a comparison of orofacial pain with abdominal pain, back pain, and headache. Quintessence Int. 2006;37:381–390.
4. List T, Wahlund K, Wenneberg B, Dworkin SF. TMD in children and adolescents: prevalence of pain, gender differences, and perceived treatment need. J Orofac Pain. 1999;13:9–20.
5. Pereira LJ, Pereira-Cenci T, Pereira SM, Cury AA, Ambrosano GM, Pereira AC *et al.* Psychological factors and the incidence of temporomandibular disorders in early adolescence. Braz Oral Res. 2009;23:155–160.
6. Hirsch C, Turp JC. Temporomandibular pain and depression in adolescents–a case-control study. Clin Oral Investig. 2010;14:145–151.
7. Franco AL, Fernandes G, Goncalves DA, Bonafe FS, Camparis CM. Headache associated with temporomandibular disorders among young Brazilian adolescents. Clin J Pain. 2014;30:340–345.
8. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992;6:301–355.
9. Wahlund K, List T, Dworkin SF. Temporomandibular disorders in children and adolescents: reliability of a questionnaire, clinical examination, and diagnosis. J Orofac Pain. 1998;12:42–51.
10. Nilsson IM, List T, Drangsholt M. The reliability and validity of self-reported temporomandibular disorder pain in adolescents. J Orofac Pain. 2006;20:138–144
11. Nilsson IM, Drangsholt M. Gender differences in pain behavior and psychosocial status in adolescents with TMD pain. A case-control study. In: Press I, editor. Abstracts 11th World Congress on Pain Seattle; 2005.
12. LeResche L, Mancl LA, Drangsholt MT, Huang G, Von Korff M. Predictors of onset of facial pain and temporomandibular disorders in early adolescence. Pain. 2007;129:269–278.
13. Pow EH, Leung KC, McMillan AS. Prevalence of symptoms associated with temporomandibular disorders in Hong Kong Chinese. J Orofac Pain. 2001;15:228–234.
14. McMillan AS, Wong MC, Zheng J, Lam CL. Prevalence of orofacial pain and treatment seeking in Hong Kong Chinese. J Orofac Pain. 2006;20:218–225.
15. Wu N, Hirsch C. Temporomandibular disorders in German and Chinese adolescents. J Orofac Orthop. 2010;71:187–198.
16. China National Knowledge Infrastructure. http://ckrd161.cnki.net/Grid20/Brief.aspx?ID=1&classtype=&systemno=&NaviDataBaseName=&NaviField=; 2007.
17. Rollman A, Visscher CM, Gorter RC, Naeije M. Care seeking for orofacial pain. J Orofac Pain. 2012;26:206–214.
18. Nilsson IM, Drangsholt M, List T. Impact of temporomandibular disorder pain in adolescents: differences by age and gender. J Orofac Pain. 2009;23:115–122.
19. Qi X. Report on the 3rd national oral health epidemiological survey. In: house BPsmp, editor. 1st ed; 2008.
20. Peck CC, Goulet JP, Lobbezoo F, Schiffman EL, Alstergren P, Anderson GC *et al.* Expanding the taxonomy of the diagnostic criteria for temporomandibular disorders. J Oral Rehabil. 2014;41:2–23.
21. Gonzalez YM, Schiffman E, Gordon SM, Seago B, Truelove EL, Slade G *et al.* Development of a brief and effective temporomandibular disorder pain screening questionnaire: reliability and validity. J Am Dent Assoc. 2011;142:1183–1891.
22. Ohrbach R, Bair E, Fillingim RB, Gonzalez Y, Gordon SM, Lim PF *et al.* Clinical orofacial characteristics associated with risk of first-onset TMD: the OPPERA prospective cohort study. J Pain. 2013;14(12 Suppl):T33–T50.
23. Huang GJ, LeResche L, Critchlow CW, Martin MD, Drangsholt MT. Risk factors for diagnostic subgroups of painful temporomandibular disorders (TMD). J Dent Res. 2002;81:284–288.
24. Akhter R, Hassan NM, Aida J, Kanehira T, Zaman KU, Morita M. Association between experience of stressful life events and muscle-related temporomandibular disorders in patients

seeking free treatment in a dental hospital. Eur J Med Res. 2007;12:535–540.
25. Kohler AA, Helkimo AN, Magnusson T, Hugoson A. Prevalence of symptoms and signs indicative of temporomandibular disorders in children and adolescents. A cross-sectional epidemiological investigation covering two decades. Eur Arch Paediatr Dent. 2009;10(Suppl 1):16–25.
26. Manfredini D, Landi N, Bandettini DPA, Dell'Osso L, Bosco M. A critical review on the importance of psychological factors in temporomandibular disorders. Minerva Stomatol. 2003;52:321–326, 327–330.
27. List T, Wahlund K, Larsson B. Psychosocial functioning and dental factors in adolescents with temporomandibular disorders: a case-control study. J Orofac Pain. 2001;15:218–227.
28. Groholt EK, Stigum H, Nordhagen R, Kohler L. Recurrent pain in children, socio-economic factors and accumulation in families. Eur J Epidemiol. 2003;18:965–975.
29. Siu YF, Chan S, Wong KM, Wong WS. The comorbidity of chronic pain and sleep disturbances in a community adolescent sample: prevalence and association with sociodemographic and psychosocial factors. Pain Med. 2012;13:1292–1303.
30. Guo H, Yang W, Cao Y, Li J. Siegrist J Effort-reward imbalance at school and depressive symptoms in Chinese adolescents: the role of family socioeconomic status. Int J Environ Res Public Health. 2014;11:6085–6098.
31. Meng H, Li J, Loerbroks A, Wu J, Chen H. Rural/urban background, depression and suicidal ideation in Chinese college students: a cross-sectional study. PLoS ONE. 2013;8:e71313.
32. Tang J, Yu Y, Ma Y. The epidemic tendency of dental caries prevalence of school students from 1991 to 2005 in China. J Huazhong Univ Sci Technolog Med Sci. 2010;30:132–137.
33. Socialstyrelsen Karies hos barn och ungdomar. http://www.socialstyrelsen.se/publikationer2013/karieshosbarnochungdomar-epidemiologiskauppgifterforar2011; 2011.
34. Johansson A, Unell L, Carlsson GE, Söderfeldt B, Halling A. Risk factors associated with symptoms of temporomandibular disorders in a population of 50- and 60-year-old subjects. J Oral Rehabil. 2006;33:473–481.
35. Carlsson GE, Ekbäck G, Johansson A, Ordell S, Unell L. Is there a trend of decreasing prevalence of TMD-related symptoms with ageing among the elderly? Acta Odontol Scand. 2014;72:714–720.
36. Yekkalam N, Wänman A. Associations between craniomandibular disorders, sociodemographic factors and self-perceived general and oral health in an adult population. Acta Odontol Scand. 2014;72:1054–1065.

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