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ORIGINAL ARTICLE

Trends in the prevalence of diagnosed temporomandibular disorder from 2004 to 2013 using a Nationwide health insurance database in Taiwan

Po-Yu Yang [a,b,c], Ni-Yu Su [a,b,c], Ming-Yi Lu [b], Chia-Yi Wei [a], Hui-Chieh Yu [a], Yu-Chao Chang [a,b*]

[a] School of Dentistry, Chung Shan Medical University, Taichung, Taiwan
[b] Department of Dentistry, Chung Shan Medical University Hospital, Taichung, Taiwan

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KEYWORDS
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Abstract *Background/purpose:* Temporomandibular disorder (TMD) is defined as various clinical signs and symptoms involving the masticatory muscles, the temporomandibular joint and associated structures. The aim of this study was to investigate the prevalence of diagnosed TMD in Taiwan using a National Health Insurance Research Database from 2004 to 2013.
Materials and methods: A retrospective study was conducted to analyze the registered database compiled by the National Health Insurance from 2004 to 2013. The diagnosis of TMDs was identified in accordance with the International Classification of Disease, Ninth revision (ICD-9-CM 524.6). The relative risk of TMD from 2004 to 2013 after adjusting for year, age, and gender was evaluated by logistic regression analysis.
Results: The prevalence of TMD increased significantly from 14 (per 10^4) to 26 (per 10^4) over the past 10 year period [odds ratio (OR), 1.07; 95% confidence interval (CI), 1.04–1.09]. The mean age with TMD from 2004 to 2013 was 52.31 ± 17.15 years and 45.12 ± 17.32 years, respectively. The female group had a higher risk of TMD than the male group (OR, 1.70; 95% CI, 1.49–1.94).
Conclusion: Taken together, the estimated prevalence of TMD significantly increased from 2004 to 2013 in Taiwan. In addition, the risk for TMD was higher among women than among men.

* Corresponding author. School of Dentistry, Chung Shan Medical University, 110, Section 1, Chien-Kuo North Road, Taichung, Taiwan.
E-mail address: cyc@csmu.edu.tw (Y.-C. Chang).
[c] These authors contributed equally to this work.

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Introduction

Temporomandibular disorder (TMD) is quite common among the general public. TMD is characterized by a group of clinical problems affecting the temporomandibular joint, myofascial muscles, and may also spread to adjacent structures such as teeth, ears, neck, head, and back muscles.[1] There is currently no unified standard for the classification of TMD. Previously, maximum mouth opening is one of the methods to measure the condition of temporomandibular joint and TMD.[2–4] The Research Diagnostic Criteria for Temporomandibular Disorders for TMD has gained international acceptance which has been widely used globally to estimate the prevalence of TMD.[5] However, up to now, a retrospective large nationwide population-based study involving patient samples stratified on the basis of demographic information has not been conducted.

The National Health Insurance (NHI) program in Taiwan is a compulsory and universal health insurance program that includes all inpatient and outpatient medical benefit claims. Up to 99.9 % of the inhabitants of Taiwan were enrolled by 2014.[6] Due to lack of the trends in prevalence of TMD based on nationwide population in Taiwan, we therefore performed this retrospective study of the 2004–2013 claim data from the National Health Insurance Research Database (NHIRD).

Materials and methods

Data source

After approval by the Ethics Review Board at the Chung Shan Medical University Hospital, the estimated annual prevalence rate of TMD from 2004 to 2013 was extracted from the population of Systematic Sampling CD (the data subset systematic sampling of the ambulatory care expenditures by visit)[7] for this study from the NHIRD.

Patient identification and measurement

The diagnostic coding of NHI in Taiwan is according to the International Classification of Diseases, Ninth Clinical Modification (ICD-9-CM). The TMD cases were identified with International Classification of Diseases, Ninth Clinical Modification (ICD-9-CM) code of 524.6. To increase the validity of diagnoses in the administrative data set, patients who received three or more diagnoses of TMD during the period between January 1, 2004 and December 31, 2013 were recruited. The age-specific estimates and prevalence rates by age distribution which grouped into six subgroups ($\leq$25, 26–35, 36–45, 46–55, 56–65, and $>$65) were calculated.

Statistical analysis

The relative risk of TMD from 2004 to 2013 after adjusting for year, gender, and age was evaluated by logistic regression analysis. All statistical analyses were performed with the SPSS version 22 (SPSS Inc., Chicago, IL, USA).

Results

A total of 540,860 participants were enrolled into this study. Of these, 1030 participants (343 male and 687 female, respectively) were diagnosed as TMD according the ICD-9-CM criteria in this study. As shown in Figure 1, the annual TMD prevalence increased from 14 (per 10^4) in 2004 to 26 (per 10^4) in 2013.

As shown in Figure 2, the average diagnostic age of participants suffering from TMD has shown a decreased pattern from 2004 to 2013. The mean age with TMD from 2004 to 2013 was 52.31 ± 17.15 and 45.12 ± 17.32 years old, respectively.

Prevalence categorized by age group and gender is shown in Table 1. The prevalence of TMD at age group $\leq$25, 26–35, 36–45, 46–55, 56–65, and $>$65 years old was 8.98, 26.65, 21.77, 19.53, 16.74, and 19.34 (per 10^4), respectively. It was also noted that females had significantly higher TMD prevalence rates than males in each age group.

Multivariate logistic regression for TMD in Taiwan from 2004 to 2013 adjusting for all variables is shown in Table 2. The risk of TMD was increased significantly with year from 2004 to 2013 [odds ratio (OR), 1.07; 95% confidence interval (CI), 1.04–1.09]. In addition, the female group had a higher risk of TMD than the male group (OR, 1.07; 95% CI, 1.04–1.09). Compared with the $<$25 years old age group, the age group 26–35 years old (OR, 2.89; 95% CI, 2.28–3.66) had the highest risk of TMD among other age groups.

Discussion

To the best of our knowledge, this is the first epidemiological study for the prevalence of TMD over an extended time with the same methodologies for investigation in Taiwan. The annual prevalence of TMD significantly increased from 14 (per 10^4) in 2004 to 26 (per 10^4) in 2013 in Taiwan.

The considerable variations of TMD prevalence may be attributed to differences in methodology, examination procedure, and population selection. Epidemiological surveys of TMD in Taiwan have been found in university students and dental students.[8,9] Recently, a study of the association between TMD and joint hypermobility syndrome also revealed the prevalence of TMD in Taiwan was $\sim$1.42% from NHRID.[10] The discrepancy between two studies is due to the different data subset used. The data subset used by Chang et al[10] was "Longitudinal Health Insurance Database 2005 (LHID2005)" which contained the entire original claim data of 1,000,000 beneficiaries enrolled in the year 2005 randomly sampled from the year 2005 Registry for Beneficiaries (ID) of the NHIRD.[7] The databank used in this study could demonstrate the trends of prevalence status of TMD.

Generally, epidemiological studies have documented higher prevalence and severity of TMD in females than in males.[10,11] Our findings also demonstrated that the female group has a higher prevalence of TMD than males in Taiwan. The reasons may be due to behavioral, psychosocial, and hormonal factors. However, no conclusions could be drawn for this phenomenon. Interestingly, the time trends of the average diagnostic age of participants suffering from TMD demonstrated a decreasing pattern. The reason is not quite

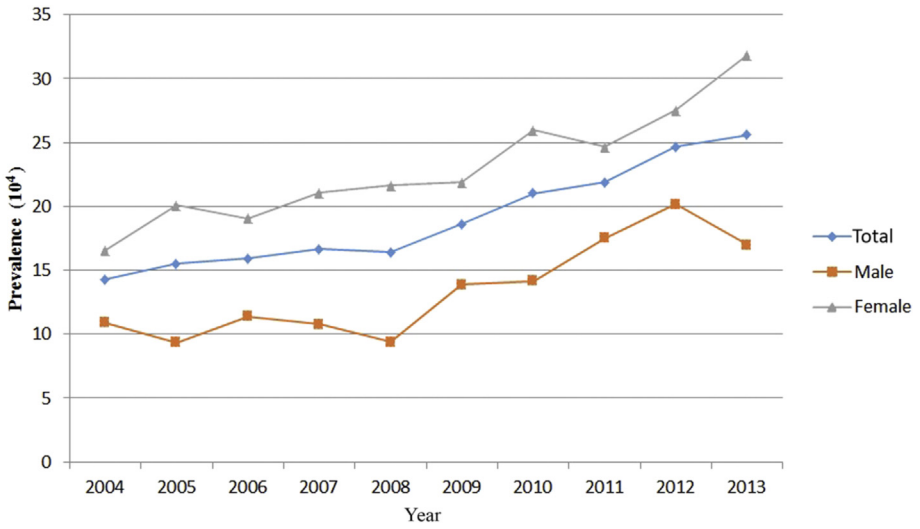

Figure 1 Time trends for the prevalence of TMD in Taiwan. The prevalence of TMD increased significantly from 14 (per 10^4) in 2004 to 26 (per 10^4) in 2013. TMD = temporomandibular disorder.

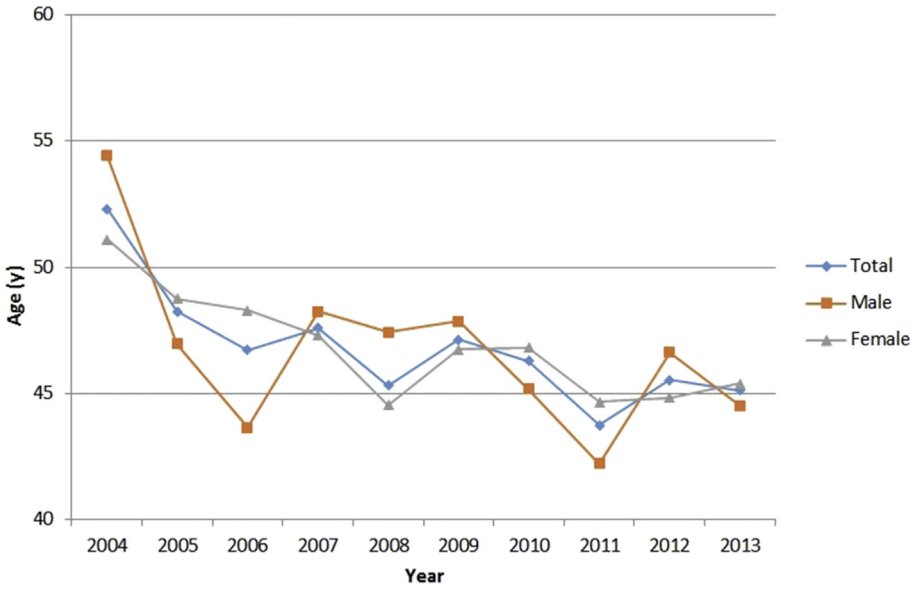

Figure 2 Mean age of patients with TMD in Taiwan. The mean age for TMD was shown in a decreased pattern from 2004 to 2013. TMD = temporomandibular disorder.

Table 1 Population and prevalence of TMD by age distribution in Taiwan from 2004–2013.

Age (y)	Extracted residents	TMD	Prevalence (10^4)	Male	Prevalence (%)	Female	Prevalence (%)
≤25	106,897	96	8.98	41	42.71	55	57.29
26–35	92,296	246	26.65	90	36.59	156	63.41
36–45	88,639	193	21.77	53	27.46	140	72.54
46–55	91,667	179	19.53	49	27.37	130	72.63
56–65	80,667	135	16.74	34	25.19	101	74.81
>65	93,583	181	19.34	76	41.99	105	58.01

TMD = temporomandibular disorder.

clear. It might be due the longtime of economic recession during the past years.

The strength of this study is the use of a nationwide population-based database that provided sufficient sample size, generalizability, and statistical power to assess the TMD status in Taiwan. However, there are some limitations which should be addressed. In this study, the collected data regarding the diagnoses of TMD from NHIRD is based on

Table 2 Risk factors for TMD analyzed by logistic regression model.

Variable	Logistic regression model		
	OR[a]	95% CI	
Year	1.07[a]	1.04	1.09
Gender			
Male	1.00	—	
Female	1.70[a]	1.49	1.94
Age groups (y)			
≤25	1.00	—	
26–35	2.89[a]	2.28	3.66
36–45	2.23[a]	1.74	2.86
46–55	1.92[a]	1.48	2.49
56–65	1.61[a]	1.23	2.13
>65	1.80[a]	1.39	2.33

CI = confidence interval; OR = odds ratio; TMD = temporomandibular disorder.
[a] Odds ratio was adjusted for year, age, and gender.

treatment needs. It may not truly indicate the severity of TMD. The TMD among individuals registered in NHIRD might be different from other surveys through the clinical examination, questionnaire, or self-report analysis. Therefore, TMD prevalence and severity of disease might be underestimated by using nationwide registration system in Taiwan. Moreover, the information retrieved from this database did not contain health related behaviors or status such as behavioral, psychosocial, number of teeth or tooth loss as well as socio-economic status. Nevertheless, possible effects due to confounding bias from above factors might be minimized by adjusting for year, gender, and age.

In conclusion, the prevalence of TMD may be underestimated from NHIRD. However, this study based on a national population could be useful for the analysis of trends in the prevalence of TMD in Taiwan. These outcomes may be valuable for estimating the burden of TMD.

Conflicts of interest

The authors have no conflicts of interest to declare.

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