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The Extent of Awareness and Knowledge Regarding Temporomandibular Disorder among Korean College Students

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Purpose: The purpose of this study was to analyze the extent of awareness and understanding of college students on temporomandibular disorder (TMD) and to search for avenues for raising public awareness and improving knowledge about TMD.

Methods: One thousand and one hundred and twenty one college students in Gyeonggi-do completed a questionnaire related to awareness, experience and knowledge of TMD and collected data were analyzed by Pearson's chi-squared test.

Results: Women were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than men. Third graders were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than any other graders. Third graders the most frequently chose to visit department of dentistry for the treatment of TMD among three graders ($p<0.001$). Women more frequently chose to visit department of dentistry for the treatment of TMD than men ($p<0.001$). Health field subjects were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than non health field subjects. Having more frequently visited department of dentistry for the treatment of TMD than non health field subjects ($p<0.001$), health field subjects more frequently chose to visit department of dentistry for the treatment of TMD in the future ($p<0.001$).

Conclusions: The level of awareness and knowledge of TMD was higher in women college students, health field subjects and third graders than men college students, non health field subjects and the rest of two graders, respectively. The higher the level of experience and education of the subject, the more aware the subject was of TMD. Therefore publicity activities and education through various routes are required to raise public awareness and knowledge of TMD. In addition, it is necessary to inform general public of the dentistry specialized for the accurate diagnosis and standardized treatment of TMD.

Key Words: Awareness; College students; Knowledge; Temporomandibular disorder; Understanding

INTRODUCTION

Temporomandibular disorder (TMD) is defined in terms of the presence of many problems that involve the temporomandibular joint (TMJ) and muscles in head and neck region [1]. TMJ or muscle pain, difficulty in mouth opening, deviation on opening of the mandible, TMJ sounds, headache, ear symptom are the most common manifestations of TMD [2]. It is accepted that etiological factors of TMD are occlusal variables, trauma, parafunctional activities, mental factors besides a habit of unilateral chewing or hard food chewing [3]. Therapeutic approaches for TMD in medical and dental fields include TMJ surgery, occlusal appliance therapy, physical therapy, medication, habit control, Botox treatment [4].

A survey of epidemiological studies showed the

prevalence of signs and symptoms of TMD ranged from 33% to 86% [5]. It has been found that the prevalence of TMD is usually more common in young adults [6]. Health Insurance Review & Assessment Service in Korea reported that the number of 353,281 TMD patients treated by National Health Insurance in year 2015 increased to the number of 413,865 patients in year 2019 by 17.1%. The annual average rate of increase during the last 5 years was 4.0%. Also, the age distribution of TMD patients in year 2019 demonstrated a peak of 27.7% at the age group of 20 years, followed by 16.0% at the age group of 30 years and 13.9% at the age group of 10 years and younger in sequence [7].

Substantially, few people seek treatment for TMD, although the interest in prevalence, diagnosis, and therapy of TMD has increased in the past years [1,8]. It was found that despite suffering from TMD, students in Shiraz University were not aware of their disorders [9]. Kim [10] reported low level of knowledge of the publics ranging from 18 to 69 years old about TMDs in year 2000. There was a study attempting to investigate the dental patients' awareness and understanding about TMD using the questionnaires of 195 patients in year 2013 [11]. Public health efforts are required to be directed at increasing TMD awareness [12]. Hence, the present study has been performed aiming to analyze the extent of awareness and understanding of college students on TMD and to search for avenues for raising public awareness and improving knowledge about TMD.

MATERIALS AND METHODS

This study is approved by the Institutional Review Board of Shingu College (no. SIRB-2021-002).

1. Subjects

Among the total number of 1,352 college students in Gyeonggi-do who participated in this study, 1,121 college students who signed a consent form and filled in all parts of the questionnaire were selected as the subjects. According to the department which college students belonged to, they divided into health field subjects and non health field subjects. Health field subjects belonged to department of dental hygiene (227 women), dental technology (49 men and 62 women), physical therapy (73 men and 90 women) and health and medical administration (11 men and 58 women). Non health field subjects belonged to department of gardening and florist (11 men and 79 women), information and communication security (76 men and 15 women), hotel and tourism (26 men and 35 women), architecture (68 men and 46 women), fashion design (43 men and 59 women) and media design (36 men and 55 women). They consisted of three grade college students, that is, first grade college students (179 men and 240 women), second grade college students (157 men and 261 women) and third grade college students (57 men and 227 women). Mean age of the subjects was 22.2±3.5 years (Table 1).

2. Data Collection

Data were obtained from September 2021 to December

Table 1. Demographics of the subjects

Variable	Men	Women	Total
Subject	393 (35.1)	728 (64.9)	1,121 (100.0)
Age (y)	22.7±3.6	21.9±3.4	22.2±3.5
Health field subjects	133 (23.3)	439 (76.7)	572 (100.0)
Age (y)	24.3±5.4	21.8±2.5	22.4±3.6
Non health field subjects	260 (47.4)	289 (52.6)	549 (100.0)
Age (y)	21.9±1.8	22.1±4.4	22.0±3.4
1st grader	179 (42.7)	240 (57.3)	419 (100.0)
Age (y)	21.6±3.2	20.6±1.6	21.0±2.5
2nd grader	157 (37.6)	261 (62.4)	418 (100.0)
Age (y)	23.1±3.7	21.9±3.6	22.4±3.7
3rd grader	57 (20.1)	227 (79.9)	284 (100.0)
Age (y)	25±3.3	23.3±4.0	23.6±3.9

Values are presented as number (%) or mean±standard deviation.

2021. A questionnaire (Appendix 1) was composed of 13 items, among which 2 items (item number 1 and 4) indicated the source to acquire information on general health and TMD, respectively and 2 items (item number 2 and 3) related to awareness of TMD and 7 items (item number 5, 6, 8, 9. 11, 12, and 13) pointed to understanding and knowledge of TMD and 2 items (item number 7 and 10) corresponded to experience of symptom and treatment for TMD, respectively. It was formed referring to a questionnaire [11] used in the previous study. Visiting a classroom, an examiner explained each item of the questionnaire. Students signed a consent form and answered the questionnaire by self-evaluation. The completed answers were retrieved at their classroom. Collected response data were recorded in an Excel (Microsoft, Redmond, WA, USA) file.

3. Statistical Analyses

All the statistical analyses were performed by using R program (R version 4.1.2; R Foundation for Statistical Computing, Vienna, Austria, 2021; http://www.r-project.org). The Pearson's chi-squared test was employed to evaluate awareness, experience and knowledge of college students on TMD according to gender, field, and grade. Probability values of $p<0.05$ were accepted as statistically significant.

RESULTS

For the first question in questionnaire 'How do you mostly get medical information?', internet (66.1%) was the most frequent source followed by hospitals and health professionals (17.0%), family and friends (10.7%), TV, radio (4.5%)

Table 2. Sources to acquire medical information (n=1,121) and sources of awareness about jaw joint disease (n=535) according to gender, field, and grade

Source	Newspaper, magazine	Internet	TV, radio	Family & friend	Hospital & health professional
Acquirement of medical information[a]					
Subject (n=1,121)	18 (1.6)	741 (66.1)	51 (4.5)	120 (10.7)	191 (17.0)
Men (n=393)	11 (2.8)	236 (60.1)	23 (5.9)	49 (12.5)	74 (18.8)
Women (n=728)	7 (1.0)	505 (69.4)	28 (3.8)	71 (9.8)	117 (16.1)
p-value	0.037*	0.002**	0.165	0.193	0.276
Health field subject (n=572)	8 (1.4)	417 (72.9)	18 (3.1)	53 (9.3)	76 (13.3)
Non health field subject (n=549)	10 (1.8)	324 (59.0)	33 (6.0)	67 (12.2)	115 (20.9)
p-value	0.7448	<0.001***	0.031*	0.135	<0.001***
1st grader (n=419)	4 (1.0)	271 (64.7)	19 (4.5)	47 (11.2)	78 (18.6)
2nd grader (n=418)	8 (1.9)	279 (66.7)	17 (4.1)	46 (11.0)	68 (16.3)
3rd grader (n=284)	6 (2.1)	191 (67.3)	15 (5.3)	27 (9.5)	45 (15.8)
p-value	0.399	0.732	0.75	0.748	0.549
Awareness of jaw joint disease[b]					
Subject (n=535)	23 (4.3)	281 (52.5)	82 (15.3)	92 (17.2)	105 (19.6)
Men (n=132)	10 (7.6)	65 (49.2)	20 (15.2)	30 (22.7)	18 (13.6)
Women (n=403)	13 (3.2)	216 (53.6)	62 (15.4)	62 (15.4)	87 (21.6)
p-value	0.059	0.442	>0.999	0.071	0.061
Health field subjects (n=344)	15 (4.4)	186 (54.1)	45 (13.1)	53 (15.4)	74 (21.5)
Non health field subjects (n=191)	8 (4.2)	95 (49.7)	37 (19.4)	39 (20.4)	31 (16.2)
p-value	>0.999	0.384	0.07	0.176	0.174
1st grader (n=185)	10 (5.4)	94 (50.8)	35 (18.9)	33 (17.8)	34 (18.4)
2nd grader (n=183)	7 (3.8)	98 (53.6)	28 (15.3)	30 (16.4)	36 (19.7)
3rd grader (n=167)	6 (3.6)	89 (53.3)	19 (11.4)	29 (17.4)	35 (21.0)
p-value	0.653	0.846	0.146	0.933	0.831

Values are presented as number (%).

[a]From the Question no 1. 'How do you mostly get medical information?' of Appendix 1.

[b]From the Question no 4. 'If you have ever heard of the term 'jaw joint disease', where have you heard it from? (Multiple responses are allowed.)' of Appendix 1.

p-values were completed by Pearson's chi-squared test. *p<0.05, **p<0.01, ***p<0.001.

and newspapers, magazines (1.6%). Women acquired medical information more frequently through internet than men (p<0.01), while men got it more frequently through newspapers or magazines than women (p<0.05). Health field subjects acquired it more frequently through internet than non health field subjects (p<0.001), as non health field subjects got it more frequently through TV or radio (p<0.05), and through hospitals and health professionals (p<0.001) than health field subjects (Table 2).

The ratio of subjects who were aware of the term, 'temporomandibular disorder' was 36.1%. Women were more aware of the term, 'TMD' than men (p<0.001), while health field subjects were more aware of the term than non health field subjects (p<0.001). Third graders were more aware of 'TMD' than any other graders (p<0.001). The ratio of subjects who were aware of the term, 'jaw joint disease' was 47.7%. Women were more aware of the term, 'jaw joint disease' than men (p<0.001), as health field subjects were more aware of the term than non health field subjects (p<0.001). Third graders were more aware of 'jaw joint disease' than any other graders (p<0.001; Table 3).

As for the fourth question in questionnaire 'If you have ever heard of the term 'jaw joint disease', where have you heard it from? (Multiple responses are allowed.)', 535 subjects who were aware of the term, 'jaw joint disease' answered. The sequence of frequent source through which to become aware of jaw joint disease was the same as that of frequent source through which to get medical information. There was no significant difference in statistics in comparison of frequent source of awareness about jaw joint disease according to gender, field, and grade (Table 2).

To evaluate the concept about occurrence of jaw joint disease, the fifth question 'If you have ever heard of the term 'jaw joint disease', how do you know about the disease?' was asked to 535 subjects who had heard of the term 'jaw joint disease'. Overuse of the jaws (59.1%) was the most frequently responded concept about occurrence of jaw joint disease, followed by occlusal discrepancy (18.3%), unknown (15.3%), nervous origin (7.3%) in sequence. Health field subjects chose overuse of the jaws as the concept associated with occurrence of jaw joint disease more frequently than non health field subjects (p<0.01; Table 4).

To investigate the experience of symptom of TMD, the

Table 3. Awareness of 'temporomandibular disorder' and 'jaw joint disease' according to gender, field, and grade (n=1,121)

Awareness	Subject (n=1,121)	Men (n=393)	Women (n=728)	p-value	Health field subject (n=572)	Non health field subject (n=549)	p-value	1st grader (n=419)	2nd grader (n=418)	3rd grader (n=284)	p-value
Temporomandibular disorder[a]	405 (36.1)	65 (16.5)	340 (46.7)	<0.001***	360 (62.9)	45 (8.2)	<0.001***	119 (28.4)	137 (32.8)	149 (52.5)	<0.001*** 1, 2 graders: 0.194 1, 3 graders: <0.001*** 2, 3 graders: <0.001***
Jaw joint disease[b]	535 (47.7)	132 (33.6)	403 (55.4)	<0.001***	344 (60.1)	191 (34.8)	<0.001***	185 (44.2)	183 (43.8)	167 (58.8)	0.00009*** 1, 2 graders: 0.96887 1, 3 graders: <0.001*** 2, 3 graders: <0.001***

Values are presented as number (%).
[a]From the Question no 2. 'Have you ever heard of a term 'temporomandibular disorder'?' of Appendix 1.
[b]From the Question no 3. 'Have you ever heard of a term 'jaw joint disease'?' of Appendix 1.
p-values were completed by Pearson's chi-squared test. ***p<0.001.

Table 4. The concept about occurrence of jaw joint disease[a] according to gender, field, and grade (n=535)

Variable	Subject (n=535)	Men (n=132)	Women (n=403)	p-value	Health field subject (n=344)	Non health field subject (n=191)	p-value	1st grader (n=185)	2nd grader (n=183)	3rd grader (n=167)	p-value
Overuse of the jaws	316 (59.1)	75 (56.8)	241 (59.8)	0.615	222 (64.5)	94 (49.2)	0.001**	105 (56.8)	104 (56.8)	107 (64.1)	0.284
Occlusal discrepancy	98 (18.3)	25 (18.9)	73 (18.1)	0.934	55 (16.0)	43 (22.5)	0.08	32 (17.3)	41 (22.4)	25 (15.0)	0.181
Nervous origin	39 (7.3)	12 (9.1)	27 (6.7)	0.469	21 (6.1)	18 (9.4)	0.214	16 (8.6)	9 (4.9)	14 (8.4)	0.313
I don't know	82 (15.3)	20 (15.2)	62 (15.4)	1	46 (13.4)	36 (18.8)	0.119	32 (1.3)	29 (15.8)	21 (12.6)	0.457

Values are presented as number (%).
[a]From the Question no 5. 'If you have ever heard of the term 'jaw joint disease', how do you know about the disease?' of Appendix 1.
p-values were completed by Pearson's chi-squared test. **p<0.01.

seventh question 'Have you ever had any symptom below? (Multiple responses are allowed.)' was asked. Noise during mouth opening and closing (33.5%) was the most frequently chosen symptom, followed by pain on the area in front of ears (14.8%) and neck and shoulder pain (13.0%). Women more frequently experienced headache (p<0.01), neck and shoulder pain (p<0.05), noise during mouth opening and closing (p<0.05) than men. Non health field subjects got tinnitus more frequently than health field subjects (p<0.05) while third graders more frequently had pain on the area in front of ears than any other graders (p<0.01; Table 5).

To find out the experience of having been treated for TMD, the tenth question 'Have you ever visited any of places below for the treatment of jaw joit disease? (Multiple responses are allowed.)' was put. The ratio of subjects without experience of having been treated for TMD was 79.3%. The ratio of subjects who visited department of dentistry was 12.0%, followed by department of orthopedic surgery (4.0%), Chinese medicine clinic (1.8%), pharmacy and department of neurosurgery (1.2% respectively). Women more frequently visited department of dentistry than men (p<0.01), while men more frequently visited department of neurosurgery than women (p<0.05). Health field subjects more frequently visited department of dentistry than non health field subjects (p<0.001) as third graders more frequently visited pharmacy than first graders (p<0.05; Table 5).

For the ninth question in questionnaire 'What will you do if you have jaw joint disease?' the most frequent answer was visiting department of orthopedic surgery (38.3%) followed by visiting department of dentistry (30.6%), waiting until spontaneous healing (15.1%) in order. Women more frequently chose to visit department of dentistry than men (p<0.001), while men more frequently chose to visit pharmacy (p<0.05), department of orthopedic surgery (p<0.01), department of ear, nose, and throat (ENT) (p<0.01) and to wait until spontaneous healing (p<0.05) than women. Health field subjects more frequently chose to visit department of dentistry than non health field subjects (p<0.001), as non health field subjects more frequently chose to visit pharmacy (p<0.05), department of orthopedic surgery (p<0.05), ENT (p<0.05), neurosurgery (p<0.001) than health field subjects. Third graders more frequently chose to visit department of dentistry than first graders (p<0.001) and second graders (p<0.01), while first graders more frequently chose to visit department of orthopedic surgery than third graders (p<0.01; Table 6).

In answer to the eleventh question 'Which department do you think you have to visit in dental hospital to treat jaw joint disease?', 32.7% of subjects did not know it. The answer of department of oral surgery was 29.9%, followed by department of orthodontics (21.5%), department of oral medicine (12.8%) in sequence. Men more frequently did not know it than women (p<0.001), while women more frequently chose department of oral surgery than men (p<0.001). Non health field subjects more frequently did not know it than health field subjects (p<0.001), as health field subjects more frequently chose department of oral surgery

Table 5. The experience of symptom of TMD and the experience of having been treated for TMD according to gender, field, and grade (n=1,121)

Experience	Subject (n=1,121)	Men (n=393)	Women (n=728)	p-value	Health field subject (n=572)	Non health field subject (n=549)	p-value	1st grader (n=419)	2nd grader (n=418)	3rd grader (n=284)	p-value
Symptom of TMD[a]											
Limitation of mouth opening	143 (12.8)	45 (11.5)	98 (13.5)	0.67	87 (15.2)	56 (10.2)	0.075	44 (10.5)	53 (12.7)	46 (16.2)	0.519
Pain on the area in front of ears	166 (14.8)	51 (13.0)	115 (15.8)	0.81	100 (17.5)	66 (12.0)	0.072	54 (12.9)	51 (12.2)	61 (21.5)	0.022* 1, 2 graders: 0.845 2, 3 graders: 0.001** 1, 3 graders: 0.004**
Frequent headache	127 (11.3)	25 (6.4)	102 (14.0)	0.007**	76 (13.3)	51 (9.3)	0.167	49 (11.7)	49 (11.7)	29 (10.2)	0.213
Neck and shoulder pain	146 (13.0)	33 (8.4)	113 (15.5)	0.04*	80 (14.0)	66 (12.0)	0.906	51 (12.2)	62 (14.8)	33 (11.6)	0.124
Noise during mouth opening and closing	375 (33.5)	98 (24.9)	277 (38.0)	0.017*	208 (36.4)	167 (30.4)	0.404	123 (29.4)	135 (32.3)	117 (41.2)	0.258
Tinnitus	125 (11.2)	35 (8.9)	90 (12.4)	0.721	57 (10.0)	68 (12.4)	0.043*	51 (12.2)	51 (12.2)	23 (8.1)	0.013* 1, 2 graders: >0.999 2, 3 graders: 0.107 1, 3 graders: 0.109
Jaw deviation	113 (10.1)	34 (8.7)	79 (10.9)	1	63 (11.0)	50 (9.1)	0.761	30 (7.2)	44 (10.5)	39 (13.7)	0.136
Treatment for TMD[b]											
No, I haven't	889 (79.3)	319 (81.2)	570 (78.3)	0.291	442 (77.3)	447 (81.4)	0.101	336 (80.2)	326 (78.0)	227 (79.9)	0.702
Pharmacy	13 (1.2)	6 (1.5)	7 (1.0)	0.582	5 (0.9)	8 (1.5)	0.527	2 (0.5)	3 (0.7)	8 (2.8)	0.01* 1, 2 graders: 0.998 1, 3 graders: 0.025* 2, 3 graders: 0.059
Chinese medicine clinic	20 (1.8)	10 (2.5)	10 (1.4)	0.239	9 (1.6)	11 (2.0)	0.75	8 (1.9)	7 (1.7)	5 (1.8)	0.967
Dept. of orthopedic surgery	45 (4.0)	18 (4.6)	27 (3.7)	0.583	18 (3.1)	27 (4.9)	0.174	16 (3.8)	23 (5.5)	6 (2.1)	0.078
Dept. of dentistry	135 (12.0)	29 (7.4)	106 (14.6)	0.001**	91 (15.9)	44 (8.0)	0.001***	46 (11.0)	53 (12.7)	36 (12.7)	0.699
Dept. of ear, nose, and throat	5 (0.4)	2 (0.5)	3 (0.4)	>0.999	2 (0.3)	3 (0.5)	0.963	4 (1.0)	1 (0.2)	0 (0)	0.128
Dept. of neurosurgery	14 (1.2)	9 (2.3)	5 (0.7)	0.043*	5 (0.9)	9 (1.6)	0.377	7 (1.7)	5 (1.2)	2 (0.7)	0.523

TMD, temporomandibular disorder.

Values are presented as number (%).

[a]From the Question no 7. 'Have you ever had any symptom below? (Multiple responses are allowed.)' of Appendix 1.

[b]From the Question no 10. 'Have you ever visited any of places below for the treatment of jaw joint disease? (Multiple responses are allowed.)' of Appendix 1.

p-values were completed by Pearson's chi-squared test. *p<0.05, **p<0.01, ***p<0.001.

Table 6. The method to cope with TMD and the first department to treat TMD in dental hospital according to gender, field, and grade (n=1,121)

Variable	Subject (n=1,121)	Men (n=393)	Women (n=728)	p-value	Health field subjects (n=572)	Non health field subjects (n=549)	p-value	1st g rader (n=419)	2nd grader (n=418)	3rd grader (n=284)	p-value
The method to cope with TMD[a]											
Waiting until spontaneous healing	169 (15.1)	71 (18.1)	98 (13.5)	0.049*	91 (15.9)	78 (14.2)	0.476	64 (15.3)	64 (15.3)	41 (14.4)	0.941
Pharmacy	58 (5.2)	29 (7.4)	29 (4.0)	0.021*	20 (3.5)	38 (6.9)	0.014*	20 (4.8)	24 (5.7)	14 (4.9)	0.8
Chinese medicine clinic	36 (3.2)	8 (2.0)	28 (3.8)	0.143	16 (2.8)	20 (3.6)	0.526	11 (2.6)	12 (2.9)	13 (4.6)	0.313
Dept. of orthopedic surgery	429 (38.3)	172 (43.8)	257 (35.3)	0.007**	200 (35.0)	229 (41.7)	0.024*	183 (43.7)	157 (37.6)	89 (31.3)	0.004** 1, 2 graders: 0.083 1, 3 graders: 0.001** 2, 3 graders: 0.106
Dept. of dentistry	343 (30.6)	77 (19.6)	266 (36.5)	<0.001***	221 (38.6)	122 (22.2)	<0.001***	106 (25.3)	123 (29.4)	114 (40.1)	<0.001*** 1, 2 graders: 0.207 1, 3 graders: <0.001*** 2, 3 graders: 0.004**
Dept. of ear, nose, and throat	19 (1.7)	13 (3.3)	6 (0.8)	0.005**	4 (0.7)	15 (2.7)	0.016*	5 (1.2)	10 (2.4)	4 (1.4)	0.369
Dept. of neurosurgery	67 (6.0)	23 (5.9)	44 (6.0)	1	20 (3.5)	47 (8.6)	<0.001***	30 (7.2)	28 (6.7)	9 (3.2)	0.067
The first department to treat TMD in dental hospital[b]											
Dept. of prosthodontics	22 (2.0)	9 (2.3)	13 (1.8)	0.722	14 (2.4)	8 (1.5)	0.327	8 (1.9)	4 (1.0)	10 (3.5)	0.055
Dept. of oral Surgery	335 (29.9)	84 (21.4)	251 (34.5)	<0.001***	232 (40.6)	103 (18.8)	<0.001***	114 (27.2)	123 (29.4)	98 (34.5)	0.112
Dept. of oral medicine	144 (12.8)	51 (13.0)	93 (12.8)	0.998	66 (11.5)	78 (14.2)	0.213	62 (14.8)	54 (12.9)	28 (9.9)	0.158
Dept. of orthodontics	241 (21.5)	91 (23.2)	150 (20.6)	0.36	107 (18.7)	134 (24.4)	0.024	94 (22.4)	88 (21.1)	59 (20.8)	0.837
Dept. of operative dentistry	12 (1.1)	3 (0.8)	9 (1.2)	0.667	11 (1.9)	1 (0.2)	0.011	6 (1.4)	1 (0.2)	5 (1.8)	0.104
I don't know	367 (32.7)	155 (39.4)	212 (29.1)	<0.001***	142 (24.8)	225 (41.0)	<0.001***	135 (32.2)	148 (35.4)	84 (29.6)	0.26

TMD, temporomandibular disorder.

Values are presented as number (%).

[a]From the Question no 9. 'What will you do if you have jaw joint disease?' of Appendix 1.

[b]From the Question no 11. 'Which department do you think you have to visit in dental hospital to treat jaw joint disease?' of Appendix 1.

p-values were completed by Pearson's chi-squared test. *p<0.05, **p<0.01, ***p<0.001.

Table 7. Knowledge on symptom, cause, prevention method and treatment of TMD

Knowledge	Subject (n=1,121)
Symptom of TMD[a]	
Limitation of mouth opening	791 (70.6)
Pain on the area in front of ears	727 (64.9)
Frequent headache	259 (23.1)
Neck and shoulder pain	150 (13.4)
Noise during mouth opening and closing	850 (75.8)
Tinnitus	147 (13.1)
Jaw deviation	597 (53.3)
Cause of TMD[b]	
Trauma	350 (31.2)
Chewing of hard food	678 (60.5)
Occlusal discrepancy	374 (33.4)
Bruxism	596 (53.2)
Stress	264 (23.6)
Unilateral chewing	437 (39.0)
Anxiety, depression, tension	146 (13.0)
Prevention method of TMD[c]	
Avoid opening mouth wide	587 (52.4)
Avoid eating sweet things frequently	60 (5.4)
Avoid chewing gum frequently	669 (59.7)
Maintain a right posture of head and shoulder	441 (39.3)
Avoid stressful conditions	153 (13.6)
Keep brushing teeth after meal	88 (7.9)
Avoid biting nails and pencils	339 (30.2)
Recommend bilateral chewing	584 (52.1)
Use mouthpiece for severe exercise	293 (26.1)
Avoid eating hard food	518 (46.2)
Treatment of TMD[d]	
Jaw joint surgery	691 (61.6)
Medication	283 (25.2)
Spinal therapy	120 (10.7)
Physical therapy	574 (51.2)
Intraoral appliance therapy	457 (40.8)
Habit control	662 (59.1)
Botox treatment	123 (11.0)

Values are presented as number (%).
TMD, temporomandibular disorder.
[a]From the Question no 6. 'Choose item/items which you think as symptoms associated with jaw joint disease. (Multiple responses are allowed.)' of Appendix 1.
[b]From the Question no 8. 'Choose item/items which you think as causes associated with jaw joint disease. (Multiple responses are allowed.)' of Appendix 1.
[c]From the Question no 12. 'Choose item/items which you think is required for the prevention of jaw joint disease. (Multiple responses are allowed.)' of Appendix 1.
[d]From the Question no 13. 'Choose item/items which you think is required for the treatment of jaw joint disease. (Multiple responses are allowed.)' of Appendix 1.

than non health field subjects ($p<0.001$; Table 6).

The most frequently presumed symptom of TMD was noise during mouth opening and closing (75.8%), followed by limitation of mouth opening (70.6%), pain on the area in front of ears (64.9%) and jaw deviation (53.3%). As a cause of TMD, chewing of hard food (60.5%) was the most frequently answered, followed by bruxism (53.2%), unilateral chewing (39.0%), occlusal discrepancy (33.4%) in sequence. In answer to a method to prevent TMD, avoid chewing gum frequently (59.7%) was the most frequently responded, followed by avoid opening mouth wide (52.4%), recommend bilateral chewing (52.1%) and avoid eating hard food (46.2%). Jaw joint surgery (61.6%) was the most frequently chosen treatment method of TMD, followed by habit control (59.1%), physical therapy (51.2%), intraoral appliance therapy (40.8%) and medication (25.2%) (Table 7).

DISCUSSION

The most frequent source through which to get medical information in this study was internet (66.1%), followed by hospitals and health professionals (17.0%), family and friends (10.7%), TV, radio (4.5%) and newspapers, magazines (1.6%) sequentially. It was different from Kim's study [10] 21 years ago in which the sequence from the most frequent to the least was hospitals and health professionals (31.39%), TV, radio (25.21%), newspapers, magazines (20.67%), friends and relatives (16.45%), internet (6.28%) in order. The most frequent source through which to become aware of jaw joint disease in current study was internet (52.5%), followed by hospitals and health professionals (19.6%), family and friends (17.2%), TV, radio (15.3%) and newspapers, magazines (4.3%) in sequence. However, the sequence from the most frequent to the least in the previous study [11] 8 years ago was TV, radio (41.4%), family and friends (20.2%), hospitals and health professionals (18.2%), internet (15.7%) and newspapers, magazines (4.5%) in order. After all, nowadays the use of internet increased remarkably while the use of TV, radio decreased outstandingly compared to the past. Women and health field subjects acquired medical information more frequently through internet than men ($p<0.01$) and non health field subjects ($p<0.001$), respectively. Men got it more frequently through

newspapers or magazines than women ($p<0.05$), as non health field subjects got it more frequently through TV or radio ($p<0.05$), and through hospitals and health professionals ($p<0.001$) than health field subjects. Therefore publicity activities and education through various routes are likely to be effective.

The ratio (36.1%) of subjects who were aware of the term, 'TMD' was higer than that of previous studies [10,11], while the ratio (47.7%) of subjects who were aware of the term, 'jaw joint disease' was lower than that of previous studies [10,11]. This may be due to that health field subjects were more than half of the total subjects and that non health field subjects had relatively low level of awareness of TMD. Like previous studies [10,11], the number of subjects who were aware of the term, 'jaw joint disease' was greater than that of subjects aware of 'TMD' which is an unfamiliar, medical term. Third graders were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than any other graders. This result is similar to the previous study [11] indicating that the higher the level of education of the subject, the more aware the subject was of TMD. The more chance and time to be educated and to get information for TMD enabled third graders to be the most aware of TMD among three graders.

The majority (59.1%) of subjects who were aware of 'jaw joint disease' responded overuse of the jaws as the concept associated with occurrence of jaw joint disease. This finding is similar to the previous study [11] in which 50.6% of subjects answered overuse of the jaws. Among subjects who were aware of 'jaw joint disease', the ratio of subjects who did not know the concept associated with occurrence of jaw joint disease was 15.3% which was lower than that of previous studies [10,11]. This result shows that people's concept for TMD was likely to improve, compared to the past.

A relationship has been found between gender and the occurrence of TMD [9]. It was reported that TMD was significantly more prevalent in women than in men [12]. The report supports the present result that women more frequently experienced headache ($p<0.01$), neck and shoulder pain ($p<0.05$), noise during mouth opening and closing ($p<0.05$) than men. In accord with Kim's study [10] women were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than men.

The ratio of subjects without experience of having been treated for TMD was 79.3% in present study, while it was 92.31% in Kim's study 21 years ago [10]. The ratio of subjects who visited department of dentistry for the treatment of TMD in this study was 12.0% which was higher than that (4.27%) of Kim's study [10]. Both the ratio of subjects with experience of having been treated for TMD and the ratio of subjects who visited department of dentistry for the treatment of TMD seemed to increase, compared to the past.

As a method to cope with TMD, the most frequent answer was visiting department of orthopedic surgery (38.3%) followed by visiting department of dentistry (30.6%). This finding coincides with Kim's study [10] in which 41.99% of subjects chose orthopedicians and 35.26% chose dentists. On the other hand, 78.5% of the subjects chose department of dentistry as the first place to visit for treatment of jaw joint disease and 13.8% chose department of orthopedic surgery in other study [11]. Among methods to cope with TMD, waiting until spontaneous healing, that is, no treatment constituted 15.1% of answers of subjects, which explains previous study [13] reporting that only less than 10% of the population thought their TMD severe enough to call for treatment. Third graders the most frequently chose to visit department of dentistry for the treatment of TMD among three graders ($p<0.001$). Women more frequently chose to visit department of dentistry for the treatment of TMD than men ($p<0.001$), though other studies [10,11] showed no statistically significant difference in gender. Men and non health field subjects more frequently chose to visit pharmacy ($p<0.05$ respectively), department of orthopedic surgery ($p<0.05$ respectively), ENT ($p<0.05$ respectively) for the treatment of TMD than women and health field subjects, respectively. Men and non health field subjects more frequently did not know which department to visit in dental hospital for the treatment of TMD than women ($p<0.001$) and health field subjects ($p<0.001$), respectively. We can presume nearly same level of awareness and knowledge of TMD of the general public as men and non health field subjects.

As expected, health field subjects were more significantly aware of the terms, 'TMD' ($p<0.001$) and 'jaw joint disease' ($p<0.001$) than non health field subjects. Having more frequently visited department of dentistry for the treatment

of TMD than non health field subjects ($p<0.001$), health field subjects more frequently chose to visit department of dentistry for the treatment of TMD in the future ($p<0.001$). After all, health field subjects were more aware of TMD and better comprehended it than non health field subjects. By the way, even health field subjects and women with relatively high level of awareness and knowledge of TMD chose department of oral surgery as the first place to visit for the treatment of TMD in dental hospital. It is necessary to inform general public of the fact that department of oral medicine is specialized for the accurate diagnosis and standardized treatment of TMD. Publicity activities and education for department of oral medicine can be performed through various routes by the support of not only Korean Academy of Orofacial Pain and Oral Medicine but also Korean Dental Association.

The most frequently presumed symptom of TMD in this study was noise during mouth opening and closing (75.8%), followed by limitation of mouth opening (70.6%), pain on the area in front of ears (64.9%) and jaw deviation (53.3%). Similarly, the previous study [11] demonstrated that noise during mouth opening and closing (26.9%) was the most frequently responded sign and symptom of TMD, followed by mouth opening difficulty (25.1%), pain on the area in front of ears (13.7%), facial asymmetry (13.4%) in sequence. The most frequently reported presumable TMD sign and symptom were jaw pain (61.00%), followed by jaw joint sound (57.80%), difficulty with mouth opening (50.11%) and mandibular deviation (32.05%) in Kim's study [10]. In a word, major four signs and symptoms of TMD have been well known.

As a cause of TMD, chewing of hard food (60.5%) was the most frequently answered, followed by bruxism (53.2%), unilateral chewing (39.0%) and occlusal discrepancy (33.4%) in current study. Enjoying hard food chewing (19.5%) was the most frequently answered for the causes of TMD, followed by occlusal discrepancy (19.0%), chewing with one side only (18.5%) and teeth grinding, clenching (16.3%) sequentially in the previous study [11]. In other words, factors associated with parafunction have largely been regarded as the causes of TMD.

In answer to a method to prevent TMD in present study, avoid chewing gum frequently (59.7%) was the most frequently responded, followed by avoid opening mouth wide (52.4%), recommend bilateral chewing (52.1%) and avoid eating hard food (46.2%) in sequence. Avoid eating hard food (58.87%) was the most frequently responded preventive method for TMD, followed by avoid opening mouth wide (58.65%), avoid chewing gum frequently (51.07%) and simultaneous using of molar of both side when chewing food (46.27%) in order in Kim's study [10]. Keep brushing teeth after meal (7.9%) and avoid eating sweet things frequently (5.4%) which have no concern with TMD in this study constituted a small portion, namely, 15.49% and 4.91% respectively of answers of the publics also in Kim's study [10]. In short, prevention methods of TMD have been understood comparatively well.

In current study, jaw joint surgery (61.6%) was the most frequently chosen treatment method of TMD, followed by habit control (59.1%), physical therapy (51.2%), intraoral appliance therapy (40.8%) and medication (25.2%) in sequence. TMJ surgery (28.0%) was the most frequently responded method, followed by occlusal appliance therapy (23.9%), physical therapy (14.6%). medication (13.9%) and habit control (13.4%) sequentially in other study [11]. Because in common, the most subjects chose TMJ surgery as treatment method of TMD, it is necessary to let the public know the importance of conservative treatment for TMD. Most TMDs can be treated with conservative treatment, so conservative and non-invasive treatment should be a first-choice treatment [4]. As 78.5% of the subjects chose department of dentistry as the first place to visit for treatment of TMD, occlusal appliance therapy could be the second frequently chosen treatment method in other study [11]. Since department of orthopedic surgery in which physical therapy was widely conducted was the most or the second frequently responded as the first place to visit for treatment of TMD, physical therapy may be the third frequently chosen treatment method in common. The result that 10.7% of subjects chose spinal therapy as treatment method of TMD seems to be related to the fact that 1.8% of subjects visited Chinese medicine clinic for the treatment of TMD in this study.

In conclusion, the level of awareness and knowledge of TMD was higher in women college students, health field subjects and third graders than men college students, non health field subjects and the rest of two graders,

respectively. The higher the level of experience and education of the subject, the more aware the subject was of TMD. Therefore publicity activities and education through various routes are required to raise public awareness and knowledge of TMD. In addition, it is necessary to inform general public of the dentistry specialized for the accurate diagnosis and standardized treatment of TMD.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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Appendix 1. Form and contents of questionnaire

QUESTIONNAIRE

Name of College: Name of Department: Grade:
Age: Gender:

Please answer the following questions by checking.

1. How do you mostly get medical information?
   1) Newspapers, magazines 2) Internet 3) TV, radio
   4) Family & friends 5) Hospitals & health professionals

2. Have you ever heard of a term 'temporomandibular disorder'?
   1) Yes 2) No

3. Have you ever heard of a term 'jaw joint disease'?
   1) Yes (Go to number 4.) 2) No (Go to number 6.)

4. If you have ever heard of the term 'jaw joint disease', where have you heard it from? (Multiple responses are allowed.)
   1) Newspapers, magazines 2) Internet 3) TV, radio
   4) Family & friends 5) Hospitals & health professionals

5. If you have ever heard of the term 'jaw joint disease', how do you know about the disease?
   1) It is a disease caused by overuse of the jaws.
   2) It is a disease caused by occlusal discrepancy.
   3) It is a disease caused by nervous origin.
   4) I don't know.

6. Choose item/items which you think as symptoms associated with jaw joint disease. (Multiple responses are allowed.)
   1) Limitation of mouth opening 2) Pain on the area in front of ears
   3) Frequent headache 4) Neck and shoulder pain
   5) Noise during mouth opening and closing 6) Tinnitus
   7) Jaw deviation

7. Have you ever had any symptom below? (Multiple responses are allowed.)
   1) Limitation of mouth opening 2) Pain on the area in front of ears
   3) Frequent headache 4) Neck and shoulder pain
   5) Noise during mouth opening and closing 6) Tinnitus
   7) Jaw deviation

8. Choose item/items which you think as causes associated with jaw joint disease. (Multiple responses are allowed.)
   1) Trauma 2) Chewing of hard food 3) Occlusal discrepancy
   4) Bruxism 5) Stress 6) Unilateral chewing 7) Anxiety, depression, tension

9. What will you do if you have jaw joint disease?
   1) I'll wait until spontaneous healing
   2) I'll visit pharmacy
   3) I'll visit Chinese medicine clinic
   4) I'll visit department of orthopedic surgery
   5) I'll visit department of dentistry
   6) I'll visit department of ear, nose, and throat
   7) I'll visit department of neurosurgery

10. Have you ever visited any of places below for the treatment of jaw joint disease? (Multiple responses are allowed.)
   1) No, I haven't.
   2) Pharmacy
   3) Chinese medicine clinic
   4) Department of orthopedic surgery
   5) Department of dentistry
   6) Department of ear, nose, and throat
   7) Department of neurosurgery

11. Which Department do you think you have to visit in dental hospital to treat jaw joint disease?
   1) Department of prosthodontics
   2) Department of oral surgery
   3) Department of oral medicine
   4) Department of orthodontics
   5) Department of operative dentistry
   6) I don't know.

12. Choose item/items which you think is required for the prevention of jaw joint disease. (Multiple responses are allowed.)
    1) Avoid opening mouth wide
    2) Avoid eating sweet things frequently
    3) Avoid chewing gum frequently
    4) Maintain a right posture of head and shoulder
    5) Avoid stressful conditions
    6) Keep brushing teeth after meal
    7) Avoid biting nails and pencils
    8) Recommend bilateral chewing
    9) Use mouthpiece for severe exercise
    10) Avoid eating hard food

13. Choose item/items which you think is required for the treatment of jaw joint disease. (Multiple responses are allowed.)
    1) Jaw joint surgery
    2) Medication
    3) Spinal therapy
    4) Physical therapy
    5) Intraoral appliance therapy
    6) Habit control
    7) Botox treatment

Thank you for your cooperation.