Abstract

Objective: Temporomandibular Joint disorders are relatively frequent in different societies. The purpose of the present study was to determine Temporomandibular Joint radiographic abnormal findings in patients referred to Dental School, Shahid Beheshti University.

Methods: This descriptive cross-sectional study was done on 400 patients with no marked symptoms of temporomandibular joint disorders who met criteria of the study. Mean age of patient was 38.38. The data was collected by taking patients history, clinical evaluation while the panoramic radiographies were taken in standard conditions viewing by means of black-colored sheets. For statistical evaluation, data was analyzed by chi-square and exact fisher tests.

Results: Flattening was the most observed abnormal finding with 16.3% prevalence. Erosion, condylar hyperplasia, concavity, bifid condyle, condylar hypoplasia and sclerosis respectively were the most common abnormal findings in this study. There were no significant differences in the prevalence of abnormal findings regarding the patient’s gender, dental status and occlusion, but the prevalence of abnormal radiographic findings was significantly uprising as the age of the patients increased (P<0.002).

Conclusion: The results demonstrated the prevalence of abnormal radiographic findings to be 34.4% of the patients referring to the studied center which shows a relatively high prevalence.

Key words: Temporomandibular joint disorders, condyle, panoramic radiography

Introduction:

Mechanical forces are one of the important The mean prevalence of temporomandibular disorders (TMD) in different societies has been reported to vary between 28% and 86%. Based on reports, these disorders are more frequent in women and their incidence increases with age (1-4). Symptoms and signs related to these disorders include muscular or articular pain either spontaneous or on touch, joint sounds and jaw movement limitations (5, 6). Okeson et al in 1998 showed that 50% to 60% of people have one of the symptoms of TMD, but severity symptoms are only encountered in limited people (7). Carlsson and Magnusson also reported in 1999 that 1/2 to 1/3 of adults had at least one of the symptoms of TMD and that more than half of them had at least one clinical sign, which was mainly related to muscular sensitivity (8). Also different percentages of prevalence of TMD with various clinical or non clinical signs have been reported in the Iranian and Non Iranian societies (9-11). Considering
the high prevalence of TMD and that chronic disorders can ultimately cause pain, discomfort and or impair the masticating function and mouth opening, evaluation of the condition of the temporomandibular joint of patients referring to dental centers seems logic. In most cases, clinical evaluation of the patients alone has little value to reach a definitive diagnosis concerning TMD (12). Therefore, evaluation of patient’s history and clinical assessment is important, but sometimes obtaining radiography is necessary to reach a final diagnosis, for example, if the patient is suffering from pain or complains of presence of symptoms in the joint, radiography can be helpful (13).

Diagnostic imaging modalities of temporomandibular joint include simple radiography, arteriography, CT scan, MRI and Cone beam computed tomography (CBCT), but their routine use in joint disorders are not usual and have only applications in special cases (14). In this domain, use of panoramic radiographies, although not the gold standard in diagnosis of TMD, present some advantages comprising low dose radiation in exposure, image of both temporomandibular joints and observation of both condyles in a cliché, simplicity, acceptable durability as well as beneficial diagnostic information on teeth and other jaw regions. Generally, panoramic radiography provides an image of condyles, ramus and body of mandible in a single cliché. This imaging has complete visibility for evaluation of bone significant changes in condyles like asymmetry, large erosions, large osteophytes and or fractures. Also condyles morphologic abnormal changes in adulthood without taking into account the condition of teeth or presence of TMD are observable in this radiography. Though, there is the possibility of condyle distortion in panoramic radiography (15,16,17). Panoramic radiography can provide the clinician with some acceptable diagnostic information concerning temporomandibular joint morphologic abnormal findings, of course since during this imaging the patient bites the bite block, condyles are not in their normal location in the temporomandibular joint (18).

The present study was performed with the purpose to determine the amount of temporomandibular joint abnormal findings in patients without signs referring to the department of Oral and Maxillofacial Medicine of Shahid Beheshti University of Medical Sciences.

**Methods:**

In this descriptive cross-sectional study, 400 patients without signs in temporomandibular joint, who were put under x rays for other examinations, were chosen from the patients who referred to the Dental School in 2008, and filled the following criteria:

1. All patients had more than 20 years
2. Patients were healthy from systemic point of view
3. Didn’t report long use of steroidal and anti-inflammatory drugs
4. In the clinical examination and medical history, had no biologic symptom or sign related to temporomandibular joint.

This examination was performed by a specialist of oral medicine, and in case of temporomandibular disorders including pain, deviation from midline, bruxism, subluxation, limitation, luxation, clenching, crepitus and click or clinical symptoms in other structures related to the joint such as masticating muscles, the patients were excluded.

After completion of examinations, panoramic radiographies were obtained from the patients. Information obtained from observation and interpretation of the radiographic clichés were collected and recorded in the data form. All the panoramic radiographies were obtained under standard conditions with the Planmeca 2002 CC device. The type of film used was Kodak with 30x15cm size. Radiographies were obtained
under the following conditions; the time for radiography was 18 seconds, voltage maximum 80kW and maximum 12mA. The radiographies obtained were assessed by a radiologist through a black plate in which only an opening to show the temporomandibular joint region was created, and using a negatoscope in a darkroom (3). The temporomandibular bone changes searched in radiographies were as follows: Condylar hyperplasia, Condylar hypoplasia, Erosion, Osteophyte, Sclerosis, Bifid condyle, Subcortical cyst, Concavity, Flattening (Figures 1-3).

Figure 1- Condylar Flattening

Figure 2- Condylar Hypoplasia

Figure 3- Osteophyte

Data obtained from patients were entered in statistical software, SPSS v15. Statistical comparison of abnormal findings observed based on gender and age group was performed using Chi-square test and if conditions were not suitable, Fisher test was used. Comparison of patients’ age in two groups of male and female and also comparison of mean number of abnormal findings in these two groups were achieved with student t test.

Result:

The subjects were divided by gender in two groups male and female, and by age in three groups 25 years and less, 25-49 years and 50 years and more. There was no significant difference in age between female and male groups (P=0/07). Therefore the two groups were matched in terms of age.

Also, there was no significant difference based on frequency of edentulous and dentulous people between two groups of female and male (P=0/3) but with the increase of age, frequency of edentulism increased and this difference was statistically significant (P<0/0001).

The results of the study showed that 263 people (65/8%) had no radiographic findings and 137 people (34/3%) had abnormal radiographic findings. From this number of abnormal findings, 63 (46%) females and 74 (54%) males were recorded. There was a significant difference in prevalence of abnormal radiologic findings in patients without signs referring based on the gender of these people (P=0/009). There was an increase in the amount of prevalence of abnormal findings in patients with increased age, with a significant statistic difference (P<0/002).

No significant difference has been found based on prevalence of normal and abnormal radiographic findings in patients according to the type of malocclusion or condition of their teeth (Respectively P=0/52, P=0/8).

The assessment of the radiographic abnormal findings of the temporomandibular joint based on gender and age groups (Tables 1 and 2) showed that prevalence of Erosion based on age groups was statistically different (P<0/05). In such a way that 16/7% of the 25 years and less group, 36/7% of 25-49 years group and 46/7 of 50 years and more had this finding in at least condyle of one side. Also prevalence of Sclerosis significantly increased with augmentation of age (P<0/05). Concerning the other items, no significant different was obtained based on prevalence of no one of the
radiographic abnormal findings between two genders as well as between three age groups.

Table 1 - Distribution of radiographic findings based on gender in patients who referred to Department of Oral & Maxillofacial Radiology of Dental School of Shahid Beheshti University of Medical Sciences in 2008

<table>
<thead>
<tr>
<th>Radiographic findings</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattening</td>
<td>34 (52.3%)</td>
<td>31 (47.7%)</td>
<td>65 (100%)</td>
<td>0.63</td>
</tr>
<tr>
<td>flattening</td>
<td>2 (25%)</td>
<td>6 (75%)</td>
<td>8 (100%)</td>
<td>0.15</td>
</tr>
<tr>
<td>Eminence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td>12 (40%)</td>
<td>18 (60%)</td>
<td>30 (100%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Sclerosis</td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>5 (100%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Osteophyte</td>
<td>4 (100%)</td>
<td>0 (0%)</td>
<td>4 (100%)</td>
<td>0.13</td>
</tr>
<tr>
<td>Concavity</td>
<td>5 (71.4%)</td>
<td>2 (28.6%)</td>
<td>7 (100%)</td>
<td>0.47</td>
</tr>
<tr>
<td>Subcortical Cyst</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
<td>3 (100%)</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Table 2: Distribution of radiographic findings based on age groups in patients who referred to Department of Oral & Maxillofacial Radiology of Dental School of Shahid Beheshti University of Medical Sciences in 2008

<table>
<thead>
<tr>
<th>Radiographic findings</th>
<th>25 years and less</th>
<th>26-39 years</th>
<th>50 years and more</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattening</td>
<td>19 (29.2%)</td>
<td>21 (32.3%)</td>
<td>25 (38.5%)</td>
<td>65 (100%)</td>
<td>0.29</td>
</tr>
<tr>
<td>Flattening</td>
<td>1 (12.5%)</td>
<td>3 (37.5%)</td>
<td>4 (50%)</td>
<td>8 (100%)</td>
<td>0.32</td>
</tr>
<tr>
<td>Eminence</td>
<td></td>
<td></td>
<td></td>
<td>30 (100%)</td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td>5 (16.7%)</td>
<td>11 (36.7%)</td>
<td>14 (46.7%)</td>
<td>30 (100%)</td>
<td>0.05</td>
</tr>
<tr>
<td>Sclerosis</td>
<td>0 (0%)</td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>5 (100%)</td>
<td>0.05</td>
</tr>
<tr>
<td>Osteophyte</td>
<td>1 (25%)</td>
<td>3 (75%)</td>
<td>0 (0%)</td>
<td>4 (100%)</td>
<td>0.17</td>
</tr>
<tr>
<td>Concavity</td>
<td>3 (42.9%)</td>
<td>2 (28.6%)</td>
<td>2 (28.6%)</td>
<td>7 (100%)</td>
<td>0.93</td>
</tr>
<tr>
<td>Subcortical Cyst</td>
<td>2 (66.7%)</td>
<td>0 (0%)</td>
<td>1 (33.3%)</td>
<td>3 (100%)</td>
<td>0.41</td>
</tr>
</tbody>
</table>
The results of radiographic abnormal findings in the subjects investigated in the present research are presented in Graph 1.

```plaintext
<table>
<thead>
<tr>
<th>Abnormal Finding</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattening</td>
<td>16.3</td>
</tr>
<tr>
<td>Erosion</td>
<td>7.5</td>
</tr>
<tr>
<td>Condylar Hyperplasia</td>
<td>4.3</td>
</tr>
<tr>
<td>Concavity</td>
<td>1.7</td>
</tr>
<tr>
<td>Bifid Condyle</td>
<td>1.5</td>
</tr>
<tr>
<td>Sclerosis</td>
<td>1.3</td>
</tr>
<tr>
<td>Condylar Hyperplasia</td>
<td>1.3</td>
</tr>
<tr>
<td>Osteophyte</td>
<td>1</td>
</tr>
<tr>
<td>Subcortical Cyst</td>
<td>0.8</td>
</tr>
</tbody>
</table>
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Graph 1- Relative frequency of radiographic abnormal findings in condyles of patients referring to Department of Oral & Maxillofacial Radiology of Dental School of Shahid Beheshti University of Medical Sciences

**Discussion:**

Results of the skeletal and histologic studies showed that prevalence of radiographic abnormal findings in temporomandibular joints of individuals without signs is relatively high (19-21). The study of Petrikowski and Grace showed that in the 9-15 years age group there was more than one abnormal finding in each of the people studied (20). In the assessment of radiographic abnormal findings in patients evaluated in the present study a range of 0 to 4 lesions was seen in people with a mean of 0/49 abnormal findings in the patients studied. The mean of lesions in females was 0/4 and 0/61 in males which is statistically significant. In the study of Mure and Goss, Flattening and Sclerosis in the cortical plate were the most common bone changes observed (19). Ardakani and Momenzade in their study in the city of Yazd reported that Flattening and Osteophyte and are the most common temporomandibular joint abnormal findings in people of 20 to 50 years without signs (21). Submentovertex imaging, tomography and MRI showed in Brooks et al study that in 35% of people there was evidence of Flattening (22). In Rahbari and Pangnush study, Flattening was seen in 52% of patients of 20-69 years, which was the most common abnormal finding in condyles (23). In the studies of Dahlstrom and Lindval, in the evaluation of temporomandibular joint diseases using panoramic imaging in comparison with tomography, as well as in Peltola study, in condyles of young people under orthodontic treatments, Flattening was the most frequent finding, in a way that in the second study Flattening of condyle was observed in half of the case group and in a third of the control group (16, 26). Results of the present study showed that prevalence of radiologic abnormal findings of temporomandibular joint of patients without signs is relatively high, in a way that at least one abnormal finding was found in 34/4% of people under study, which correlates with existing findings in other studies (19- 21).

In Rahbari and Pangnush study, Sclerosis, Concavity, Osteophyte, Erosion and Cyst were respectively the most common mandibular disorders after Flattening (23). While Ardakani
and Momenzade study found the prevalence of mandibular disorders to be higher compared to the study above and reported the prevalence to be respectively, Flattening, Osteophyte, Sclerosis, Concavity, Erosion and Cyst (21).

In the present study, the most common radiographic abnormal finding was Flattening with 16/3%, which correlates with the other studies mentioned. Also findings found in the present study showed that other joint disorders were respectively by prevalence Erosion, Condylar hyperplasia, Concavity, Bifid Condyle, Condylar hypoplasia, Sclerosis, Osteophyte and Subcortical Cyst. The differences seen in terms of amount of prevalence of radiographic abnormal findings can be explained by the differences in numbers of subjects studied, differences in societies evaluated, differences in radiographic techniques and different interpretations. For example the sample size in this study was 400 people which when compared to the 50 cases evaluated in the study of Rahbari and Pangnush, and the 80 samples of Ardakani and Momenzade, increased considerably. Also the age range of the patients in this study was 20-95 years and in the two studies above respectively 20-69 years and 20-50 years, which can be one of the reasons for the difference in the results of the studies.

In Petrikowski and Grace study despite absence of significant differences between the two age groups, the prevalence of radiographic abnormal findings in patients candidates for orthodontia slightly augmented with the increase in age (20). Other studies also reported the augmentation of the amount of TMD with the increase of age in patients (25, 26). Peltola et al as well found that condylar findings increased with the age of the patients for orthodontia (24). In Ardakani and Momenzade study, condylar head morphologic changes showed significant augmentation with the increase in patients’ age (21). On the other hand results of Zasshi study showed that occurrence of Flattening and Erosion disorders had no relation with increase in age (27). In the present study, the prevalence of radiographic abnormal findings significantly augmented with age, and increased from 34 subjects in the 25 years and less age group, to 49 in the 26-49 years age group and to reach 54 in the 50 years and more age group. The difference in the results of these studies can be due to racial, genetic differences, or in the selection of age range of patients studied.

Many studies showed that prevalence of TMD is higher in females compared to males (28, 29). A number of other studies like the present study have shown no statistic significant difference in radiographic abnormal findings of TMD between the two groups of females and males (30, 31). In Motegi study as well, no difference was observed between boys and girls regarding TMD, and he believes that if there is a difference in gender, it is because of higher visits to clinicians by women (30). The present study was realized on people without clinical signs, thus considering higher clinician visits by women seen in another study, this study is logic, and perhaps it is possible to explain the results obtained from this point of view (25, 31).

**Conclusion:**

This study showed that prevalence of abnormal findings in temporomandibular joint of patients without signs is relatively high. Flattening was the most common radiographic abnormal finding. It seems that prevalence of radiographic abnormal findings augments with increase in age of patients. But there is no difference in prevalence of these disorders in women and men. Also occlusion has no impact on the prevalence of normal and abnormal radiographic findings in patients.

**Acknowledgment:**

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