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Description The Form Of Head Condyle In Temporomandibular Joint Based On Gender And Age On Panoramic Radiograph

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ABSTRACT

INTRODUCTION: The appearance of the mandibular condyle varies greatly among different age groups and individuals. Morphologic changes may occur on the basis of simple developmental variability as well as remodelling of the condyle, malocclusion, trauma, disease, and other developmental abnormalities. The purpose of this study was to find the description of condyle head form in temporomandibular joint based on gender and age using panoramic radiograph.**Materials and methods**: The descriptive research design was done with purposive sampling using secondary data, so that we can obtain 169 samples of panoramic radiographs from the Installation of Oralmaxillofacial Radiology Dental Hospital Padjadjaran University. The data were recorded, collected, and presented in table form. **Result**:The result of this study shows that in growth spurt , the highest occurence of condylar head form on female's right side are round and pointed on the left side, while in male's right side are angled and pointed on the left side. In addition, it is also noted that 37.87% of the samples have an asymmetry condyle shape. **Conclusion**:The conclusion of this study is that the most occurring condylar head form on temporomandibular joint on panoramic radiograph taken from the Installation of Oralmaxillofacial Radiology Dental Hospital Padjadjaran University were round on the right side and pointed on the left side. The highest occurence of condylar head form in growth spurt on female are round, while in growth spurt on male are angled.

Keywords: Panoramic radiograph, Condyle head form, gender and age

INTRODUCTION

The appearance of the mandibular condyle varies greatly among different age groups and individuals. Morphologic changes may occur on the basis of simple developmental variability as well as remodeling of the condyle, malocclusion, trauma, disease, and

other developmental abnormalities.[1] The adaptive or degenerative changes in the temporomandibular joints appear over a long period of time, it is understandable that the condylar changes increase with advancing ages.[2] Hedge in his article was said that a study in 1980's on mandibular condyle morphology in relation to malocclusion in children revealed that the condylar size in males was greater than in females. Facial type, occlusal force, and functional load also affect condylar shape in normal variation.[3]

Oliveira in 2009 has done the research at Bauru School of Dentistry – University of Sao Paolo using panoramic radiographs of 283 subjects with asymptomatic TMJ. The research concluded that condylar shape can be divided in flat, pointed, angled, and round shapes. The research also concluded that round shape was the most frequent among the total number of condyles studied.[4] Other studies who has done by Sato, shows that flattening, erosion, osteophyte, and sclerosis shapes were the most frequent among the total number of condyles studied with TMD patients as a subjects.[2] Condylar shape variation can be seen using panoramic radiograph.

Panoramic radiograph is the most popular radiological exam used routinely in dental and oral maxillofacial practice, because it is simple, economic, and relatively low patient radiation dose imaging modality.[5] Panoramic radiograph can give images of all structure of the teeth as well as jaw and condyle. Several other studies have used panoramic radiograph to evaluate the purpose of condylar symmetry.[6]The purpose of this study was to find the description of condyle head form in temporomandibular joint based on gender and age on panoramic radiograph.

MATERIALS AND METHODS

The descriptive research design was done with purposive sampling using secondary data, so that we can obtain 169 samples of panoramic radiographs from the Installation of Oralmaxillofacial Radiology Dental Hospital Padjadjaran University on June 2015. Samples in this study were panoramic radiographs which have met the criteria that fit for this research. The criteria of purposive sampling used in this research were aiming to get the image of head condyle on the right and left sides either on TMD or non-TMD patients. The criteria mentioned below are the inclusion and exclusion criteria that used to determine the sample and population.

Inclusion criteria:1. Digital panoramic radiographs of patients from the Installation of Oralmaxillofacial Radiology Dental Hospital Padjadjaran University on June 2015; 2. Mandibular condyle can be seen clearly.

Exclusion criteria:1. Congenital disorders on condyle such as bifid condyle exist in panoramic radiograph.; 2. Fracture on head of condyle exists in panoramic radiograph; 3. Post-surgery on condyle exist in panoramic radiograph.

The tools and materials used in this study is:1. Computer unit (Toshiba NB520); 2. EazyDent and EzImplant applications; 3. Digital panoramic radiographs of patients from RSGM Unpad on June 2015 radiographs which have met the criteria that fit for this research. Panoramic radiographs was taken using CBCT-3D Picasso Trio.

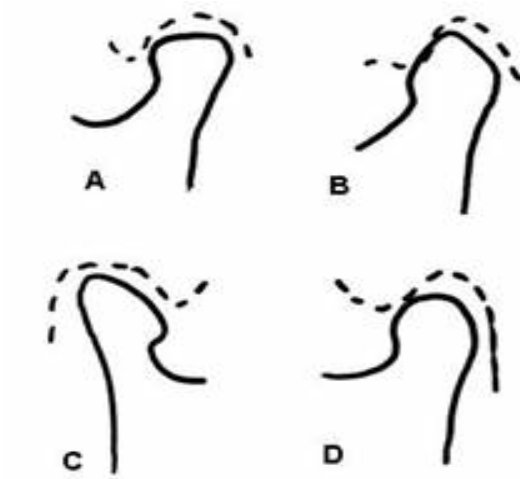

Figure 1 Condylar shape variation (A) flat, (B) pointed, (C) angled, (D) round[4]

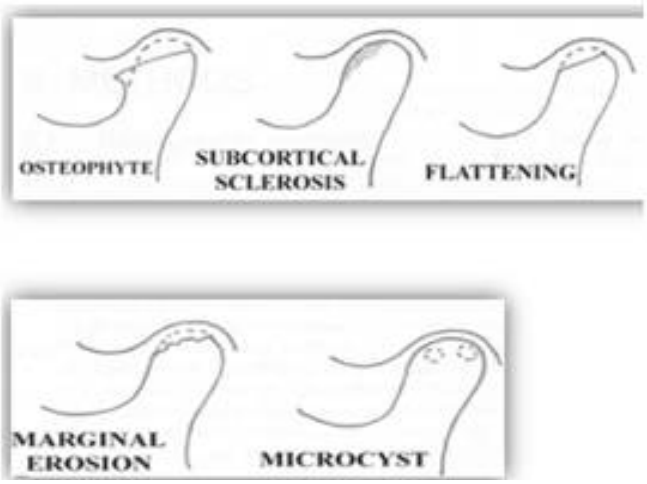

Figure 1 Condylar shape variation in TMD subjects[4]

Determining the shape was done by comparing condylar shape on panoramic radiographs with existing condyles form shown in the image above. Results then recorded and the average was calculated for each gender and age group.

RESULTS

From the 169 data that has been collected, respondent from the age as early as 5 to the maximum age of 66 could be found. The age ranges are then divided into 8 ranges based on growth spurt so that in accordance with purpose of this research which is to observe

growth and development of mandibular condyle. The result data based on aged ranges then separated from male and female due to differences in the onset of growth spurt, which is in female range between the ages of 10 and 15, while in male range between the ages of 12 and 17.[7] Distribution of age ranges after growth spurt is then adjusted. Furthermore, based on collecting data, showed that most respondents are of aged 16-33 years.

Table 1. Overall average of condylar shapes

Shape	Side	Female	Male	Total
Angled	Right	3	13	16 (4.73%)
	Left	3	11	14 (4.14%)
Flat	Right	2	1	3 (0.89%)
	Left	3	2	5 (1.48%)
Pointed	Right	36	20	56 (16.57%)
	Left	40	19	59 (17.45%)
Round	Right	45	20	65 (19.23%)
	Left	34	14	48 (14.2%)
Erosion	Right	3	2	5 (1.48%)
	Left	8	3	11 (3.25%)
Flattening	Right	14	8	22 (6.5%)
	Left	12	12	24 (7.1%)
Microcyst	Right	-	-	-
	Left	-	-	-
Osteophyte	Right	-	1	1 (0.29%)
	Left	2	4	6 (1.77%)
Sclerosis	Right	1	-	1 (0.29%)
	Left	2	-	2 (0.59%)
Total		208	130	338

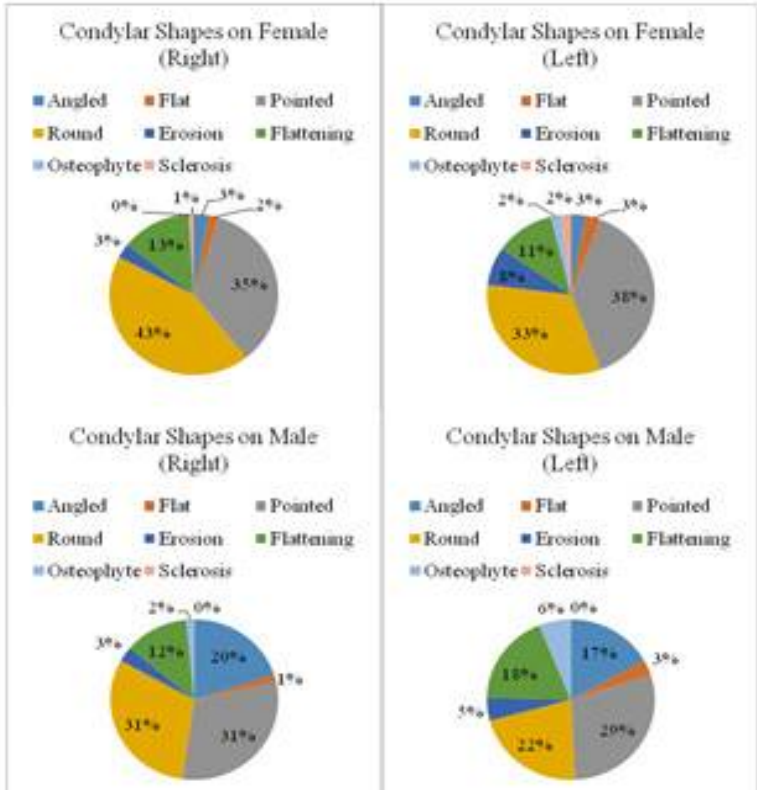

Diagram 1 Overall average of condylar shapes

Table 2Average of condylar shapes based on age ranges in female

Shapes	Side	Before growth spurt	Growth spurt	After growth spurt	Total
Angled	Right	-	-	2	2 (0.96%)
	Left	-	-	2	2 (0.96%)
Flat	Right	-	2	-	2 (0.96%)
	Left	-	2	1	3 (1.44%)
Pointed	Right	-	2	35	37 (17.79%)
	Left	1	3	37	41 (19.71%)
Round	Right	2	4	39	45 (21.63%)
	Left	1	3	30	34 (16.35%)
Erosion	Right	-	-	3	3 (1.44%)
	Left	-	-	8	8 (3.85%)
Flattening	Right	-	1	13	14 (6.73%)
	Left	-	1	11	12 (5.77%)
Microcyst	Right	-	-	-	-
	Left	-	-	-	-
Osteophyte	Right	-	-	-	-
	Left	-	-	2	2 (0.96%)
Sclerosis	Right	-	-	1	1 (0.48%)
	Left	-	-	2	2 (0.96%)
Total		4	18	186	208

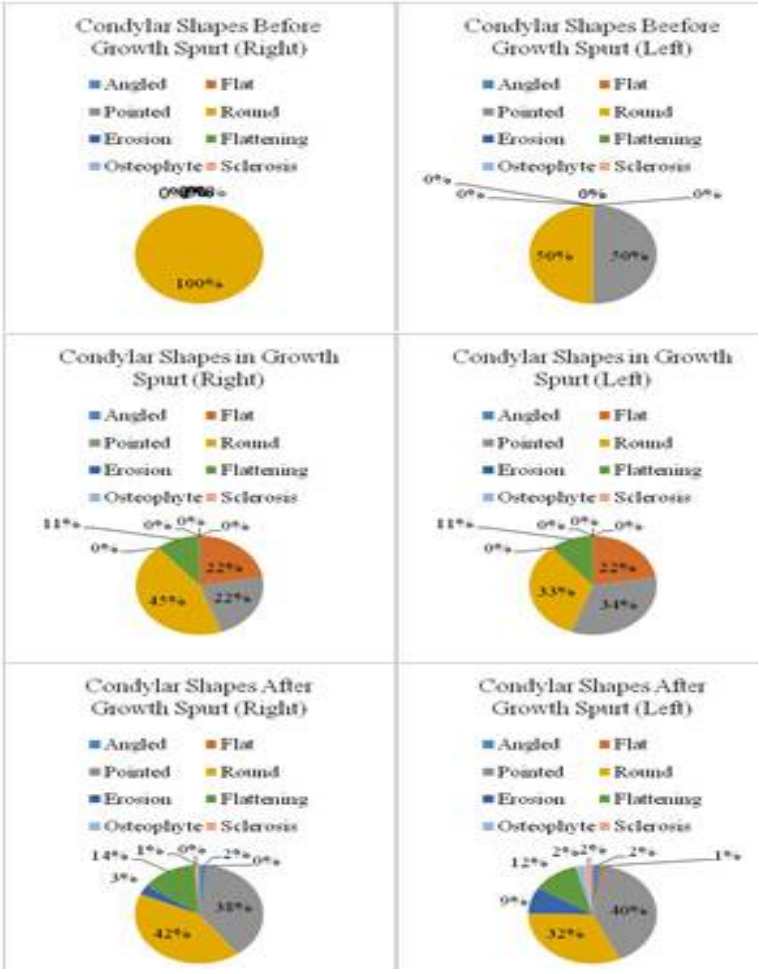

Diagram 2 Average of condylar shapes based on age ranges in female

Based on the table above, it showed that round shape was the most frequent on the right side, followed by pointed, flattening, angled, erosion, and flat shapes. Sclerosis and osteophyte shapes come in last place. While in the left side, pointed shape was the most frequent, followed by round, flattening, angled, erosion, osteophyte, flat, and sclerosis shapes. Microcyst shape is absence on this research.

Age ranges on female respondents divided based on growth spurt, which is the onset start at the age of 10 and end at the age of 15.[7] Age under 10 years then classified as ages before growth spurt, while age over 15 years classified as ages after growth spurt.

Based on the table below, it showed that round shape was the most frequent on the right side, followed by pointed, flattening, and erosion shapes. Angled and flat shapes placed on fifth place, and then followed by sclerosis shape. Osteophyte shape is absence on the right side. While in the left side, pointed shape was the most frequent, followed by round, flattening, erosion and flat shapes. Angled, osteophyte, and sclerosis shapes comes in last place.

Age ranges on female respondents divided based on growth spurt, which is the onset start at the age of 12 and end at the age of 17.[7] Age under 12 years then classified as ages before growth spurt, while age over 17 years classified as ages after growth spurt.

Based on the table above, it showed that round and pointed shapes was the most frequent on the right side, followed by angled, flattening, and erosion shapes. Flat and osteophyte shapes come in last place. Top four on the right side was the same with the left side. Flat, erosion, and flattening shapes comes after those. Sclerosis shape is absence on both sides.

Tabel 3 Average of condylar shapes based on age ranges in male

Shapes	Side	Before *growth spurt*	*Growth spurt*	After *growth spurt*	Total
Angled	Right	1	2	10	13 (10%)
	Left	-	1	10	11 (8.46%)
Flat	Right	-	-	1	1 (0.77%)
	Left	1	-	1	2 (1.54%)
Pointed	Right	-	-	20	20 (15.38%)
	Left	-	2	17	19 (14.61%)
Round	Right	3	1	16	20 (15.38%)
	Left	2	-	12	14 (10.77%)
Erosion	Right	-	-	2	2 (1.54%)
	Left	-	-	3	3 (2.31%)
Flattening	Right	-	-	8	8 (6.15%)
	Left	1	-	11	12 (9.23%)
Microcyst	Right	-	-	-	-
	Left	-	-	-	-
Osteophyte	Right	-	-	1	1 (0.77%)
	Left	-	-	4	4 (3.08%)
Sclerosis	Right	-	-	-	-
	Left	-	-	-	-
Total		8	6	116	130

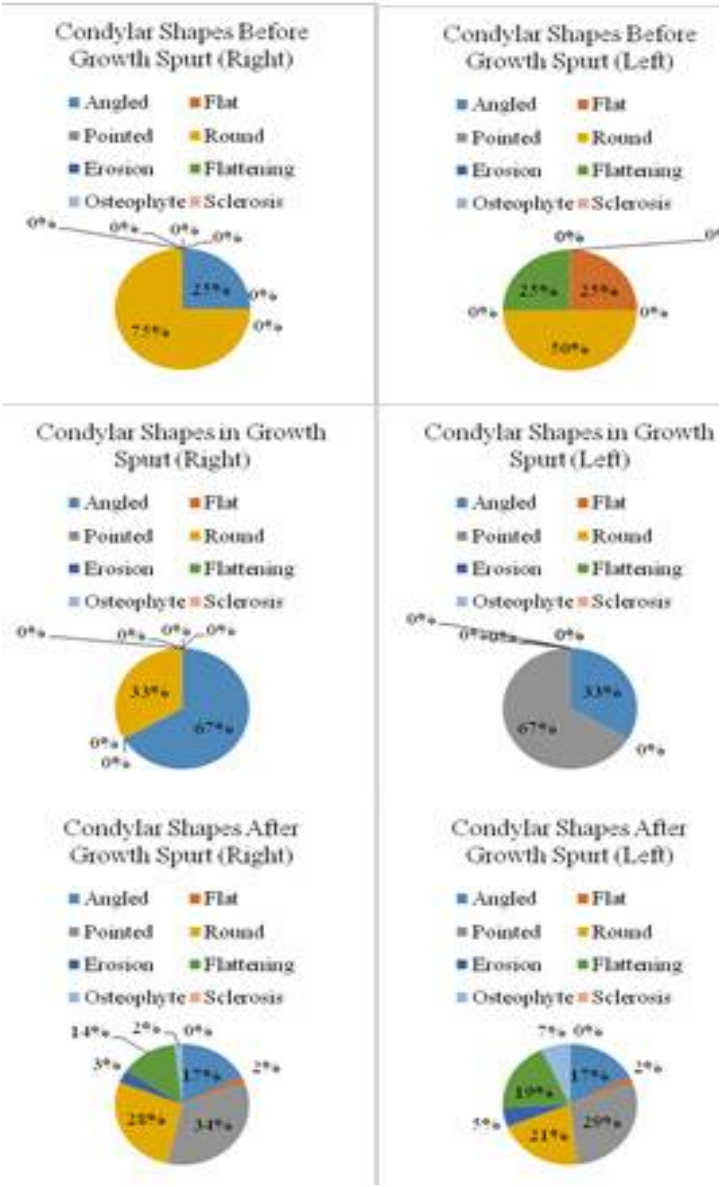

Diagram 3 Average of condylar shapes based on age ranges in male

DISCUSSION

This research shows that 21.3% respondents had an erosion, flattening, osteophyte, and sclerosis condylar shapes, so it can be estimated that 21.3% of respondents has suffered from TMD. Gross in his study said that condylar changes in TMD can be caused due to excess load on the TMJ that affects the functional relationship between the condyle,

disc, and eminence which will affect the shape of condyle. This excess load can be caused by malocclusion, parafunctional habits such as bruxism, or an orthodontic treatment.[8] An initial adaptative response, trigerred by overloading, induces structural changes in the TMJ. This is a slow but continuous process of modelling that involves all the elements of the TMJ, within tissue-specific limits. When the reserve of adaptative and compensatory responses is exhausted, the changes taking place in TMJ are known as regressive modelling.[9] At this stage, decompensated and destructive morphologic changes are usually revealed with pain and other clinically evident signs and symptoms.[9] However, additional factors like hormonal influences, hypervascularity, heredity, infection or trauma, may stimulate excess growth of condyle.[10]

Condylar shapes that most commonly found in the period before growth spurt of female on the right side is round shape and on the left side is round and pointed shapes, while in male round shape are most found on both side. Shape differences in female and male can be due to differences in value of surface area as well as volume of the condyle, which is male has a higher value[11], so that pointed shape which are most found in female in age before growth spurt, most likely to be due to the lower surface area and volume of the condyle.

Condylar shapes that most commonly found in the period of growth spurt of female on the right side is round shape and on the left side is pointed shape, while in male angled shape are most found on the right side and pointed shape on the left side. Wadhwa said on his research that both estrogen and progesterone receptors have been localized in the TMJ.[12] Orajarvi said on his research that estrogen is an important hormone in the development of human bones, which is acts as an inhibitor of bone resorption and as a regulator of bone formation[13], furthermore lack of estrogen in body can cause a decrease in the thickness of the cartilage of the condyle.[13] Lack of estrogen also increases the width of mandibular condylar head, which includes both the condylar cartilage and subchondral bone[14], so that the average head of condyle in male is wider than in female, and perhaps this is also the reason why angled shape is most common in male than in female.

Sex hormones are known to influence the differentiation, growth and development, and metabolism of connective tissue.[15] Nishioka said in his research that sex hormones may contribute to dysfunctional remodelling of the TMJ.[16] Abubaker et al suggest that sex hormones can affect the extracellular matrix of the TMJ disc in female.[17]

Majority of condylar shape in the period after growth spurt is dominated by pointed shape both in male and female. Round shape mostly found on the right side in female. This is can be caused by the degree of remodeling were determined by age. Adaptative or degenerative changes on condyle in a long period of time allow condylar changes increase with advancing ages. Karlo indicated that condylar morphology was associated with the subject's age, where subjects under 7 may exhibit rounder condyles and older subjects more oval-shaped condyles[18], so it can be understood why the shape of the condyle in this age group are mostly has a pointed shape. The prevalence of changes in the condylar morphology was found to be relatively lower in subjects who were between 20-40 years old as compared to those above 40 years old.[11]

Differences of condylar shapes on the right and left sides can be caused by differences in occlusal force that received by the right and left side. Durgha on his research has said that occlusal force is one of the important factors influencing maxillofacial development, and the high occlusal force group tended to have condyles with larger, more rounded form at the lateral and posterior side than the low occlusal force group.[11] These difference also can be caused by difference of disc position. Hasegawa reported that changes in the shape and size of the mandibular condyle vary according to the previous position of the articular disc.[19]

Differences of condylar shapes on the right and left sides indicate that there are subjects who have asymmetric condylar shape. This study get result that 64 of the 169 subjects had an asymmetric condyle, ie 39.42% in female and 35.38% in male. Condylar shape asymmetry can occur in male and female with different variations shape on the right and left sides.This may be due to anatomic variations and technique limitations.[4] This also can be caused by TMD. Buranastidporn et al found a significant association between the presence of the vertical asymmetry of the condyle and the presence of internal TMD.[20] Furthermore, condylar shape asymmetry can be caused by trauma and parafunctional habits that will lead to TMD.[21]

Condylar shape asymmetry can also be found in non-TMD subjects. This study showed that by the age before the growth spurt, 1 of 2 female subjects and 3 of 4 male subjects has an asymmetric condylar shape, while by the age of growth spurt 11.11% of female subjects and 2 of 3 male subjects also has an asymmetric condylar shape. Growth factors also influence this phenomenon. Fluctuation during growth may indicate that functional forces to the TMJ and mandibular gonial regions are not necessarily in balance, which may lead to unequal growth of the condyle and ramus heights on the right and left sides.[22] Saglam and Sanli on their research found that 6.27-8.36% non-TMD subjects has an asymmetric condyle.[23]

Level of condylar asymmetries at the age after growth spurt in this study shows those 41.94% female subjects and 31.03% male subjects has an asymmetry condylar shape. Condylar shape asymmetry also can be caused by dental occlusion relationship, so even though the growth has been completed condyle will still adapt to dental occlusion relationship by remodeling. Iturriaga on his research found that subjects with malocclusion class II have a higher prevalence of condylar asymmetry compared with subjects with malocclusion class I and III.[24] Other than that, posterior crossbite also can influence in the development of the condylar shape asymmetry. Prolongation of posterior crossbite can cause permanent changes in tooth position, in the bony support, and possibly in the growth center at the temporomandibular joint.[25]

CONCLUSION

The conclusion of this study is that the most occurring condylar head form on temporomandibular joint on panoramic radiograph taken from the Installation of Oralmaxillofacial Radiology Dental Hospital Padjadjaran University were round on the right

side and pointed on the left side. The highest occurrence of condylar head form in growth spurt on female are round, while in growth spurt on male are angled.

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Description of Microstructure in Trabecular Jaw Quality for Patient with Smoking Habits Using Panoramic Radiograph

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ABSTRACT

INTRODUCTION: According to WHO, Indonesia country profile age-standardized estimated prevalence of smoking among those aged 15 years or more in year 2013 shows that there are currently 73.3% male adults who smoke any tobacco and 63.9% of them smoke daily. Many studies have found that smoking will be a risk factor for osteoporosis and incur only negative effects on bone, however it is unsure for young to adult active smokers will have negative effects on their microstructure of trabecular jaw quality and the rate of bone turnover **Objective**: The purpose of this research is to describe the microstructure in trabecular jaw quality for patient with smoking habits using panoramic radiograph. **Material and Method**: This research is done by using *image j* software with 50x50 pixels intensity (PI) in digital panoramic radiographs. The samples of 30 smokers and 12 non-smokers of secondary data are collected to be analysed. Analysis performed in mental foramen area in both side of the jaw. **Result**: The mean for trabecular percentage of male smokers is 21.119%; of female smokers is 21.456; male non-smokers is 29.522% and female non-smokers is 30.444%. **Conclusion:** The conclusion of this reasearch, that there is lowering of trabecular percentage for regions of interest (ROI) in mandible of male and female smokers and they are indicated for osteoporosis. All dentists can be at a very important role in preventing osteoporosis by conveying this message.

Keywords: Smoking, Osteoporosis, Panoramic Radiograph, Trabecular Percentage, Image j Software

INTRODUCTION

Recently there has been some researches done that have proven that smoking seems to incur only negative effects on bone health. According to WHO, Indonesia country profile age-standardized estimated prevalence of smoking among those aged 15 years or more in year 2013 shows that there are currently 73.3% male adults who smoke any tobacco and