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PERSATUAN DOKTER GIGI INDONESIA

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History Accreditation

2018 2019 2020 2021 2022

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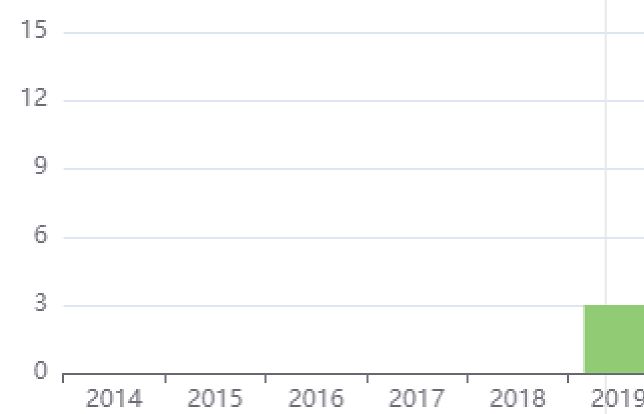

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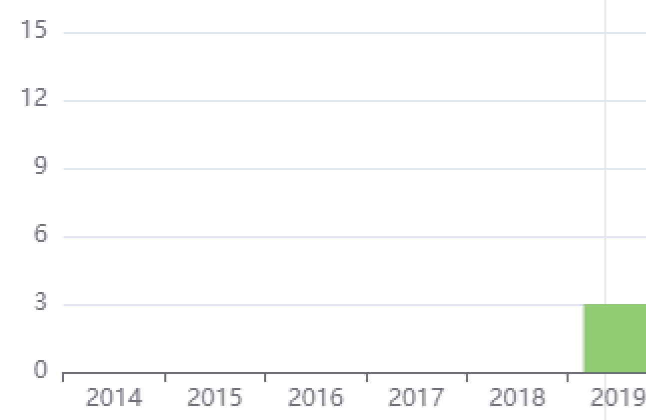

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Journal of Indonesian Dental Association

Current Issue

Vol 3 No 2 (2020): October

Published: 2020-10-30

Research Article

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Journal of Indonesian Dental Association

http://jurnal.pdgi.or.id/index.php/jida
ISSN: 2621-6183 (Print); ISSN: 2621-6175 (Online)

Research Article

The Correlation between Mandibular Condyle Shape and Temporomandibular Joint Conditions in Adult Females

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Received date: February 21, 2020. **Accepted date:** June 18, 2020. **Published date:** October 30, 2020.

KEYWORDS

condyle shapes;
female adults;
panoramic radiograph;
temporomandibular joint;
temporomandibular joint condition

ABSTRACT

Introduction: Conditions of the temporomandibular joint (TMJ) are affected by changes in movement and load during the joint's function, which can cause morphological changes in hard tissues, such as the condyle. Panoramic radiographs can provide an indication of changes in hard tissues in TMJ. **Objectives:** The aim of this study was to determine whether there was any correlation between mandibular condyle shapes as seen on panoramic radiographs and TMJ conditions in adult female participants. **Methods:** The participants of this study were 75 adult female patients who underwent a panoramic radiograph examination conducted at the Maranatha Dental Hospital Radiology Unit. The patients were clinically examined based on the Research Diagnostic Criteria for Clinical Temporomandibular Disorder (RDC/TMD) questionnaire and also their panoramic radiographs. The data from the patients were categorized into four groups according to the RDC/TMD: normal, muscle disorders, disc displacement, and other joint diseases. Next, the radiographs were analyzed by two observers to determine the condyle shapes. Condyle shapes were classified into four groups: ovoid, flat, erosion, and osteophyte. **Result:** This study showed that of 75 patients, the right TMJ was normal in 34 patients, 2 patients had muscle disorders, 24 demonstrated disc displacement, and 15 had other joint diseases. For the left side of the TMJ, 22 radiographs were normal, 2 revealed muscle disorders, 35 identified disc displacement, and 16 showed other joint diseases. There was a strong agreement between the two observers in determining the right (κ=0.681) and left condyle shapes (κ=0.652). All participants' findings indicated that condyle shapes and TMJ conditions are highly correlated for both the right (η^2=0.889) and left condyle (η^2=0.762). **Conclusion:** This study concluded that mandibular condyle shapes seen on panoramic radiographs and TMJ conditions in adult female participants were highly correlated.

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DOI: 10.32793/jida.v3i2.597

INTRODUCTION

The temporomandibular joint (TMJ) is an articular system located in the mandible and temporal bone that allows the mandible to function with a balanced dynamic mechanism.[1] TMJ disorders are influenced by many factors. These conditions can be symptomized by pain, masticatory muscle dysfunction, and bone changes.[2] TMJ disorders are community health problems that affect about 5–12% of the population, with the highest incidence in people from 20–40 years of age and the lowest prevalence rate in young and elderly patients.[3,4]

One of the supporting modalities that is commonly used to diagnose TMJ disorders is radiological examination. TMJ disorders can be investigated using transcranial radiography, arthrography, computed tomography (CT), cone-beam computed tomography (CBCT), and magnetic resonance imaging (MRI).[5] In Indonesia, the use of MRI to confirm the diagnose of TMJ disorders is rare since it is not widely available and the cost is considerably high. Instead, clinicians commonly rely on a panoramic radiographic examination to diagnose TMJ disorders.

Panoramic radiography has the advantages of greater availability, a lower cost, and the ability to image the entire lower one-third of the face. Due to these advantages, this modality is the most frequently used type of radiography for preliminary diagnosis purposes. Many studies have investigated TMJ disorders. Honda, Yoshiko, and Sasaki used panoramic radiography in 1994 to classify condyle head shapes. Their study showed that flattening has the highest rate of incidence in symptomatic TMJ disorders and also in patients with missing molars and premolars.[6]

In 2016, Borahan et al. reported that in a Turkish population, the normal shape of the mandibular condyle was oval.[7] Another study that carried out panoramic radiograph examinations in patients with TMJ disorders both with and without clicking showed that there was no significant difference between with and without clicking groups.[8] Obamiyi et al. investigated five racial groups and noted the frequent occurrence of condyle anomalies in Chinese patients compared to those from other races.[9]

These previous studies emphasized the need to know how condyle shapes affect TMJ disorders. Therefore, this study aimed to determine whether there was any correlation between the mandibular condyle shapes identified on panoramic radiographs and the incidence of TMJ conditions in adult female participants. This information will be important in supporting radiological interpretation, the prevention of diseases, and clinical care decisions.

MATERIAL AND METHODS

This study was an observational analytic study with a cross-sectional design. The study was conducted at the Maranatha Dental Hospital Radiology Unit. The ethical aspect of this research has been reviewed and approved by the Trisakti University Faculty of Dentistry Ethics Committee (Ethical Clearance No. 248/S2/KEPK/FKG/3/2019).

The study population included patients who came to the Maranatha Dental Hospital Radiology Unit for consultation and panoramic radiography. Samples were taken consecutively with inclusion criteria as follows: female patients $\geq$ 20 years of age; no prior history of trauma to the jaws, head, or neck; panoramic radiographs with complete imaging of the condyle, eminentia articularis, glenoid fossa, and meatus acusticus internus bilaterally.

The condition of the TMJ system was evaluated during a clinical examination and recorded according to the Research Diagnostic Criteria for Clinical Temporomandibular Disorder (RDC/TMD) questionnaire. The conditions of TMJ disorders were categorized as follows: Group 0: normal; Group 1: muscle disorders; Group 2: disc displacement; Group 3: arthralgia/arthritis/arthrosis.

Condyle shape data were collected by tracing the outer edge of the condyle on panoramic radiographs using Morita Veraviewpocs 3D R100 software (J. Morita Corp, Japan). The condyles were then categorized into ovoid, flat, erosion, or osteophyte shapes (Fig. 1).

The measurement of the mouth opening was carried out using a zero-pointed ruler (0) placed at the distance between the incisal maxillary incisors and the lower jaw. The patient was asked to make lateral biting movements to the right and left, and then the difference between the maxillary and mandibular labio-incisal embrasure was measured. The patient was asked to state the level of pain when the jaw was palpated in the upper back region of the ear, the lateral border of the eyebrows, above the cheekbones, under the cheekbones up to the mandibular angle, and the neck. These data were used to determine the TMJ condition along with the RDC/TMD algorithm.

If a patient reported having pain in the past month, then the level of pain in the extraoral and intraoral muscles was summed. If the muscle pain felt by the patient was present in three or more muscles and was located unilaterally, the vertical range of motion distance that could be achieved without pain and overlapping was added. In addition, results $\geq$ 40 mm were categorized as myofascial pain. A sum of $<$ 40 mm was reached by

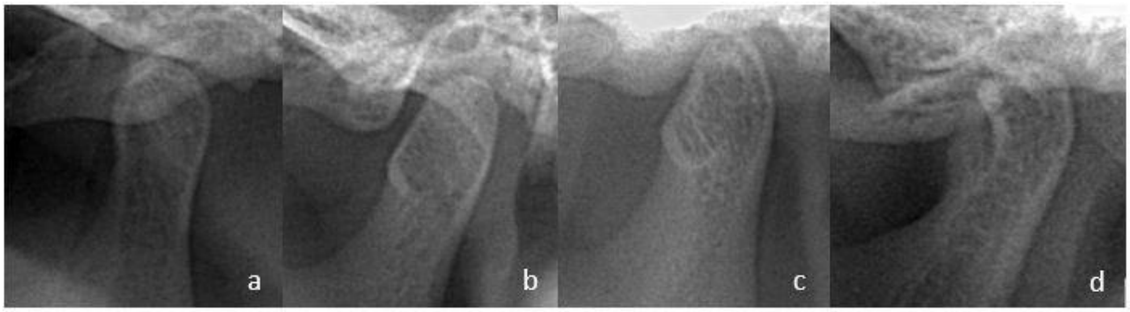

Figure 1. Condyle shape category. a. Ovoid. The condyle has convexity on its anterior, posterior, and superior aspects. b. Flat. The condyle has a flat contour that deviates from the convexity of the condyle's anterior/superior/posterior parts. c. Erosion. The condyle has a radiolucent appearance at the cortical (radiopaque) edge of the condyle head. d. Osteophyte. The condyle has a sharp radiopaque image resembling a notch on its outer edge.

calculating the vertical range of motion with the help of the operator minus the vertical range of motion without pain. Any results with a difference of < 5 mm were categorized as myofascial pain, while a > 5 mm difference was classified as myofascial pain with limited opening. Participants with myofascial pain and myofascial pain with limited opening were placed in Group 1.

Group 2 was distinguished by the presence or absence of clicking in the vertical range of motion. If clicking was found, then it was necessary to identify whether it occurred only when opening or closing the mouth or during both actions. If clicking occurred when opening and closing the mouth, then the difference between the distance of the clicking sound when opening or closing the mouth was calculated. In addition, any difference between the opening and closing of the mouth with clicking ≥ 5 mm with a loss of clicking when opening with protrusive movement or a difference between the opening and closing of the mouth with clicking and closing that was < 5 mm and was accompanied by clicking with lateral movement was included in the disc displacement. If no clicking was found when opening or closing the mouth, but a history of limited mouth opening was present, the patient was included in the disc displacement category except when no deviation or deflection and joint sounds were found. Patients who reported pain during palpation or complained of pain were included in Group 3 unless crepitus was not found during joint movement. Any patients who did not fit in with the Group 1 algorithm proceeded to the Group 2 and Group 3 algorithms for assessment.

Two dental radiology specialists who agreed on the landmarks of the radioanatomy section from the panoramic radiographs determined the condyle shape by tracing the condyle exactly on the radiopaque line of the edge of the condyle. The two observers' validity and reliability in determining the condyle shape were tested using a double-blinded procedure for the first 30 samples. A Kappa test was carried out to verify the validity and reliability. In addition, an Eta-squared test was conducted to determine the relationship between TMJ conditions and condyle shapes. (SPSS, Chicago, IL).

RESULTS

The Kappa test results showed strong agreement between the observers with κ = 0.681 for right condyle shapes and κ = 0.652 for left condyle shapes. The number of participants in each TMJ condition can be seen in Table 1. The distribution of right and left TMJ disorders based on the condylar shape shown on the panoramic radiographs can be seen in Table 2.

The Eta-squared value between condylar shape and right-sided TMJ conditions was η^2=0.889. The F count (187,326) was larger than the F table, which indicated a very strong relationship between condylar shapes and right-sided TMJ conditions. The Eta-squared value between condylar shape and left-sided TMJ conditions was η^2=0.762. The F count (44,846) was larger than the F table, which suggested that there was a very strong relationship between condyle shapes and left-sided TMJ conditions.

Table 1. Participants' right and left TMJ conditions grouped by RDC/TMD criteria.

TMJ condition	Number of Patients	
	Right TMJ	Left TMJ
Group 0	34	22
Group 1	2	2
Group 2	24	35
Group 3	15	16

Group 0: Normal; Group 1: Muscle Disorders; Group 2: Disc Displacement; Group 3: Athralgia/athritis/arthrosis

Table 2. The distribution of right- and left-side TMJ conditions grouped by condyle shapes.

TMJ Condition	Condyle Shape							
	Ovoid		Flat		Erosion		Osteophyte	
	R	Left	Right	Left	Right	Left	Right	Left
Group 0	34	21	-	-	-	-	-	1
Group 1	-	-	2	2	-	-	-	-
Group 2	4	16	20	19	-	-	-	-
Group 3	-	-	4	4	7	8	4	4

Group 0: Normal; Group 1: Muscle Disorders; Group 2: Disc Displacement; Group 3: Athralgia/athritis/arthrosis

DISCUSSION

Panoramic radiography is a radiological technique that provides an overview of the jaw and its surrounding tissues and allows dentists to see a large area, including the maxilla and mandible, in just one radiograph.[10] Panoramic radiography is useful for the early detection of defects before proceeding to further radiological examination. In temporomandibular cases, panoramic radiography may reveal a picture of advanced bone changes and is indicated in patients who have minimal mouth opening.[11]

In this study, all female patients were over the age of 20 years. Previous studies have shown many TMJ disorders in women of reproductive age.[12] Hormonal, social, and cultural factors, along with stress levels, are thought to be the triggers for TMJ disorders.[13] Levels of estrogen and prolactin hormones are influenced by changes in a woman’s quality of life, which also affects stress levels, especially in women from 24–33 years.[14] Increased levels of estrogen can reduce pain in TMJ disorders, while decreases in estrogen will increase pain.[15] Estrogen and prolactin stimulate chondrogenesis and maintain chondrocytes against apoptosis. If there is a decrease in the levels of both hormones, degradation of cartilage and articular bones may occur.[16] All of these conditions were identified in our patients’ age group.

The results of our examination of TMJ conditions using the RDC/TMD questionnaire indicated that most of the right-sided TMJs were normal, while the left TMJ side was more likely to show conditions associated with disc displacement. These results indicate the possibility that TMJ disorders that only affect one side have a higher prevalence than TMJ disorders that affect both sides.[17] One explanation for this finding is that some patients have a habit of chewing only on one side. Usually, the side that makes broader movements is more lubricated and therefore has a better metabolic exchange than the immobile side.[18] The associated joint overload causes the condyle to change shape by increasing the condyle surface area that is in contact with the articular surface so that the load received is lighter.[19]

Anatomically, the TMJ has several components including joint capsules, extracapsular ligaments, articular eminence, glenoid fossa, condyle, disc, ligamentous discs, and synovial membranes.[20] The mandibular condyle is part of the mandible, which is located in the glenoid fossa and affects the opening and closing movements of the mouth. In patients with TMJ disorders, there is a translation movement when first opening the mouth and then again at the end of the motion when closing the mouth. Sudden changes in movement that allow the condyle to return to its normal position cause a clicking sound when the mouth is opening or closing. If this condition persists, there will be an increase in joint dysfunction, which causes changes in disc morphology and produces secondary clicking sounds.[21] The change in disc morphology will be followed by a biomechanical reaction in the TMJ.[22]

Based on the distribution of condyle shapes in this study, most patients with normal TMJ conditions had an ovoid condyle shape. However, one of the research participants in Group 2 had an osteophyte condyle shape on the left side and a right side with a TMJ condition. This finding indicates that these disorders possibly cause a long-term change in joint movements, so the body begins to adapt to improve the joint. Osteophytes are formed as an expansion of the joint surface to stabilize the power load.[23] Subsequently, the patient showed facial skeleton remodeling, deviation of the affected area, unstable malocclusion, and occlusal discrepancy.[24]

All condyle shapes in Group 1 were flat, while in Group 2, the condyle shapes found were flat and ovoid. In Group 3, three kinds of condyle shapes were identified: erosion, flat, and osteophyte. Sclerosis and pseudocyst condyle shapes were not present in any participants. The pseudocyst shape was thought to be an advanced form of erosion distinct from the osteophyte shape.[25] Previous investigations into disc displacement and osteoarthritis suggest that osteoarthritis is a continuation of disc displacement.[26] Flat and sclerosis shapes on the surface of condyles are a sign of remodeling and increased load. Erosion is the early stage of a degenerative change.[23] Previous studies using CBCT have reported that flat and osteophyte condyle shapes are commonly found in cases of degenerative joint disorders.[27] Degenerative joint disorders are also caused by inflammatory processes. In addition, mechanical and metabolic factors play a role in the initial damage to the cartilage. These factors will initiate biomechanical changes in hard and soft tissues in the joint, which provoke an immune response that leads to the secretion of inflammatory mediators.[23] Chondrocytes will release mechanical responsive mechanisms, so metabolic mechanisms and pathological activation will increase and result in irreversible cartilage degradation.[22]

This study showed that there was a relationship between condyle shapes and TMJ disorders. This conclusion is different from those of previous studies that have identified a poor correlation between condyle changes, pain, and other clinical symptoms in TMJ osteoarthritis.[28] This difference likely occurred because condyle shapes in this study were grouped based on the presence of any TMJ condition without dividing them into groups by factors of TMJ disorder symptoms. Different relationships between the right and left TMJ show that conditions that may produce clinical findings are not directly reflected in the radiograph.[29] The duration of TMJ disorders and factors involved with the contralateral side may also affect the radiograph's appearance. Symptoms may be detected only on one side, but the radiograph may indicate involvement on the other side.[25]

CONCLUSION

This study found that mandibular condylar shapes revealed by panoramic radiography and the presence of TMJ conditions in adult female patients were highly correlated. In future studies, it will be necessary to investigate etiological factors that may indicate the existence of other TMJ disorders. It is also important to use other modalities, such as panoramic radiography specially developed for TMJ or CBCT, which will be more accurate in supporting the diagnosis of TMJ disorders.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

ACKNOWLEDGMENT

The authors would like to thank the Department of Dentomaxillofacial Radiology Maranatha Christian University Dental Hospital and Faculty of Dentistry for their continuous support.

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by Joko Kusnoto

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JOURNAL OF INDONESIAN
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Journal of Indonesian Dental Association

Current Issue

Vol 3 No 2 (2020): October

Published: 2020-10-30

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Indonesian Dental Association

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http://jurnal.pdgi.or.id/index.php/jida
ISSN: 2621-6183 (Print); ISSN: 2621-6175 (Online)

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Received date: February 21, 2020. **Accepted date:** June 18, 2020. **Published date:** October 30, 2020.

KEYWORDS

condyle shapes;
female adults;
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temporomandibular joint condition

ABSTRACT

Introduction: Conditions of the temporomandibular joint (TMJ) are affected by changes in movement and load during the joint's function, which can cause morphological changes in hard tissues, such as the condyle. Panoramic radiographs can provide an indication of changes in hard tissues in TMJ. **Objectives:** The aim of this study was to determine whether there was any correlation between mandibular condyle shapes as seen on panoramic radiographs and TMJ conditions in adult female participants. **Methods:** The participants of this study were 75 adult female patients who underwent a panoramic radiograph examination conducted at the Maranatha Dental Hospital Radiology Unit. The patients were clinically examined based on the Research Diagnostic Criteria for Clinical Temporomandibular Disorder (RDC/TMD) questionnaire and also their panoramic radiographs. The data from the patients were categorized into four groups according to the RDC/TMD: normal, muscle disorders, disc displacement, and other joint diseases. Next, the radiographs were analyzed by two observers to determine the condyle shapes. Condyle shapes were classified into four groups: ovoid, flat, erosion, and osteophyte. **Result:** This study showed that of 75 patients, the right TMJ was normal in 34 patients, 2 patients had muscle disorders, 24 demonstrated disc displacement, and 15 had other joint diseases. For the left side of the TMJ, 22 radiographs were normal, 2 revealed muscle disorders, 35 identified disc displacement, and 16 showed other joint diseases. There was a strong agreement between the two observers in determining the right (κ=0.681) and left condyle shapes (κ=0.652). All participants' findings indicated that condyle shapes and TMJ conditions are highly correlated for both the right (η^2=0.889) and left condyle (η^2=0.762). **Conclusion:** This study concluded that mandibular condyle shapes seen on panoramic radiographs and TMJ conditions in adult female participants were highly correlated.

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DOI: 10.32793/jida.v3i2.597

INTRODUCTION

The temporomandibular joint (TMJ) is an articular system located in the mandible and temporal bone that allows the mandible to function with a balanced dynamic mechanism.[1] TMJ disorders are influenced by many factors. These conditions can be symptomized by pain, masticatory muscle dysfunction, and bone changes.[2] TMJ disorders are community health problems that affect about 5–12% of the population, with the highest incidence in people from 20–40 years of age and the lowest prevalence rate in young and elderly patients.[3,4]

One of the supporting modalities that is commonly used to diagnose TMJ disorders is radiological examination. TMJ disorders can be investigated using transcranial radiography, arthrography, computed tomography (CT), cone-beam computed tomography (CBCT), and magnetic resonance imaging (MRI).[5] In Indonesia, the use of MRI to confirm the diagnose of TMJ disorders is rare since it is not widely available and the cost is considerably high. Instead, clinicians commonly rely on a panoramic radiographic examination to diagnose TMJ disorders.

Panoramic radiography has the advantages of greater availability, a lower cost, and the ability to image the entire lower one-third of the face. Due to these advantages, this modality is the most frequently used type of radiography for preliminary diagnosis purposes. Many studies have investigated TMJ disorders. Honda, Yoshiko, and Sasaki used panoramic radiography in 1994 to classify condyle head shapes. Their study showed that flattening has the highest rate of incidence in symptomatic TMJ disorders and also in patients with missing molars and premolars.[6]

In 2016, Borahan et al. reported that in a Turkish population, the normal shape of the mandibular condyle was oval.[7] Another study that carried out panoramic radiograph examinations in patients with TMJ disorders both with and without clicking showed that there was no significant difference between with and without clicking groups.[8] Obamiyi et al. investigated five racial groups and noted the frequent occurrence of condyle anomalies in Chinese patients compared to those from other races.[9]

These previous studies emphasized the need to know how condyle shapes affect TMJ disorders. Therefore, this study aimed to determine whether there was any correlation between the mandibular condyle shapes identified on panoramic radiographs and the incidence of TMJ conditions in adult female participants. This information will be important in supporting radiological interpretation, the prevention of diseases, and clinical care decisions.

MATERIAL AND METHODS

This study was an observational analytic study with a cross-sectional design. The study was conducted at the Maranatha Dental Hospital Radiology Unit. The ethical aspect of this research has been reviewed and approved by the Trisakti University Faculty of Dentistry Ethics Committee (Ethical Clearance No. 248/S2/KEPK/FKG/3/2019).

The study population included patients who came to the Maranatha Dental Hospital Radiology Unit for consultation and panoramic radiography. Samples were taken consecutively with inclusion criteria as follows: female patients ≥ 20 years of age; no prior history of trauma to the jaws, head, or neck; panoramic radiographs with complete imaging of the condyle, eminentia articularis, glenoid fossa, and meatus acusticus internus bilaterally.

The condition of the TMJ system was evaluated during a clinical examination and recorded according to the Research Diagnostic Criteria for Clinical Temporomandibular Disorder (RDC/TMD) questionnaire. The conditions of TMJ disorders were categorized as follows: Group 0: normal; Group 1: muscle disorders; Group 2: disc displacement; Group 3: arthralgia/arthritis/arthrosis.

Condyle shape data were collected by tracing the outer edge of the condyle on panoramic radiographs using Morita Veraviewpocs 3D R100 software (J. Morita Corp, Japan). The condyles were then categorized into ovoid, flat, erosion, or osteophyte shapes (Fig. 1).

The measurement of the mouth opening was carried out using a zero-pointed ruler (0) placed at the distance between the incisal maxillary incisors and the lower jaw. The patient was asked to make lateral biting movements to the right and left, and then the difference between the maxillary and mandibular labio-incisal embrasure was measured. The patient was asked to state the level of pain when the jaw was palpated in the upper back region of the ear, the lateral border of the eyebrows, above the cheekbones, under the cheekbones up to the mandibular angle, and the neck. These data were used to determine the TMJ condition along with the RDC/TMD algorithm.

If a patient reported having pain in the past month, then the level of pain in the extraoral and intraoral muscles was summed. If the muscle pain felt by the patient was present in three or more muscles and was located unilaterally, the vertical range of motion distance that could be achieved without pain and overlapping was added. In addition, results ≥ 40 mm were categorized as myofascial pain. A sum of < 40 mm was reached by

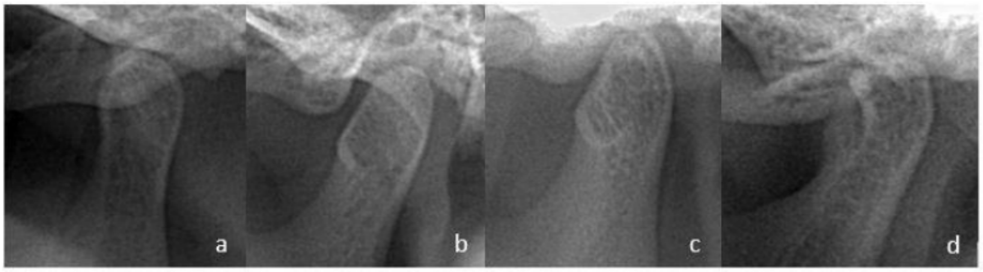

Figure 1. Condyle shape category. a. Ovoid. The condyle has convexity on its anterior, posterior, and superior aspects. b. Flat. The condyle has a flat contour that deviates from the convexity of the condyle's anterior/superior/posterior parts. c. Erosion. The condyle has a radiolucent appearance at the cortical (radiopaque) edge of the condyle head. d. Osteophyte. The condyle has a sharp radiopaque image resembling a notch on its outer edge.

calculating the vertical range of motion with the help of the operator minus the vertical range of motion without pain. Any results with a difference of < 5 mm were categorized as myofascial pain, while a > 5 mm difference was classified as myofascial pain with limited opening. Participants with myofascial pain and myofascial pain with limited opening were placed in Group 1.

Group 2 was distinguished by the presence or absence of clicking in the vertical range of motion. If clicking was found, then it was necessary to identify whether it occurred only when opening or closing the mouth or during both actions. If clicking occurred when opening and closing the mouth, then the difference between the distance of the clicking sound when opening or closing the mouth was calculated. In addition, any difference between the opening and closing of the mouth with clicking ≥ 5 mm with a loss of clicking when opening with protrusive movement or a difference between the opening and closing of the mouth with clicking and closing that was < 5 mm and was accompanied by clicking with lateral movement was included in the disc displacement. If no clicking was found when opening or closing the mouth, but a history of limited mouth opening was present, the patient was included in the disc displacement category except when no deviation or deflection and joint sounds were found. Patients who reported pain during palpation or complained of pain were included in Group 3 unless crepitus was not found during joint movement. Any patients who did not fit in with the Group 1 algorithm proceeded to the Group 2 and Group 3 algorithms for assessment.

Two dental radiology specialists who agreed on the landmarks of the radioanatomy section from the panoramic radiographs determined the condyle shape by tracing the condyle exactly on the radiopaque line of the edge of the condyle. The two observers' validity and reliability in determining the condyle shape were tested using a double-blinded procedure for the first 30 samples. A Kappa test was carried out to verify the validity and reliability. In addition, an Eta-squared test was conducted to determine the relationship between TMJ conditions and condyle shapes. (SPSS, Chicago, IL).

RESULTS

The Kappa test results showed strong agreement between the observers with $\kappa = 0.681$ for right condyle shapes and $\kappa = 0.652$ for left condyle shapes. The number of participants in each TMJ condition can be seen in Table 1. The distribution of right and left TMJ disorders based on the condylar shape shown on the panoramic radiographs can be seen in Table 2.

The Eta-squared value between condylar shape and right-sided TMJ conditions was $\eta^2=0.889$. The F count (187,326) was larger than the F table, which indicated a very strong relationship between condylar shapes and right-sided TMJ conditions. The Eta-squared value between condylar shape and left-sided TMJ conditions was $\eta^2=0.762$. The F count (44,846) was larger than the F table, which suggested that there was a very strong relationship between condyle shapes and left-sided TMJ conditions.

Table 1. Participants' right and left TMJ conditions grouped by RDC/TMD criteria.

TMJ condition	Number of Patients	
	Right TMJ	Left TMJ
Group 0	34	22
Group 1	2	2
Group 2	24	35
Group 3	15	16

Group 0: Normal; Group 1: Muscle Disorders; Group 2: Disc Displacement; Group 3: Athralgia/athritis/arthrosis

Table 2. The distribution of right- and left-side TMJ conditions grouped by condyle shapes.

TMJ Condition	Condyle Shape							
	Ovoid		Flat		Erosion		Osteophyte	
	R	Left	Right	Left	Right	Left	Right	Left
Group 0	34	21	-	-	-	-	-	1
Group 1	-	-	2	2	-	-	-	-
Group 2	4	16	20	19	-	-	-	-
Group 3	-	-	4	4	7	8	4	4

Group 0: Normal; Group 1: Muscle Disorders; Group 2: Disc Displacement; Group 3: Athralgia/athritis/arthrosis

DISCUSSION

Panoramic radiography is a radiological technique that provides an overview of the jaw and its surrounding tissues and allows dentists to see a large area, including the maxilla and mandible, in just one radiograph.[10] Panoramic radiography is useful for the early detection of defects before proceeding to further radiological examination. In temporomandibular cases, panoramic radiography may reveal a picture of advanced bone changes and is indicated in patients who have minimal mouth opening.[11]

In this study, all female patients were over the age of 20 years. Previous studies have shown many TMJ disorders in women of reproductive age.[12] Hormonal, social, and cultural factors, along with stress levels, are thought to be the triggers for TMJ disorders.[13] Levels of estrogen and prolactin hormones are influenced by changes in a woman's quality of life, which also affects stress levels, especially in women from 24–33 years.[14] Increased levels of estrogen can reduce pain in TMJ disorders, while decreases in estrogen will increase pain.[15] Estrogen and prolactin stimulate chondrogenesis and maintain chondrocytes against apoptosis. If there is a decrease in the levels of both hormones, degradation of cartilage and articular bones may occur.[16] All of these conditions were identified in our patients' age group.

The results of our examination of TMJ conditions using the RDC/TMD questionnaire indicated that most of the right-sided TMJs were normal, while the left TMJ side was more likely to show conditions associated with disc displacement. These results indicate the possibility that TMJ disorders that only affect one side have a higher prevalence than TMJ disorders that affect both sides.[17] One explanation for this finding is that some patients have a habit of chewing only on one side. Usually, the side that makes broader movements is more lubricated and therefore has a better metabolic exchange than the immobile side.[18] The associated joint overload causes the condyle to change shape by increasing the condyle surface area that is in contact with the articular surface so that the load received is lighter.[19]

Anatomically, the TMJ has several components including joint capsules, extracapsular ligaments, articular eminence, glenoid fossa, condyle, disc, ligamentous discs, and synovial membranes.[20] The mandibular condyle is part of the mandible, which is located in the glenoid fossa and affects the opening and closing movements of the mouth. In patients with TMJ disorders, there is a translation movement when first opening the mouth and then again at the end of the motion when closing the mouth. Sudden changes in movement that allow the condyle to return to its normal position cause a clicking sound when the mouth is opening or closing. If this condition persists, there will be an increase in joint dysfunction, which causes changes in disc morphology and produces secondary clicking sounds.[21] The change in disc morphology will be followed by a biomechanical reaction in the TMJ.[22]

Based on the distribution of condyle shapes in this study, most patients with normal TMJ conditions had an ovoid condyle shape. However, one of the research participants in Group 2 had an osteophyte condyle shape on the left side and a right side with a TMJ condition. This finding indicates that these disorders possibly cause a long-term change in joint movements, so the body begins to adapt to improve the joint. Osteophytes are formed as an expansion of the joint surface to stabilize the power load.[23] Subsequently, the patient showed facial skeleton remodeling, deviation of the affected area, unstable malocclusion, and occlusal discrepancy.[24]

All condyle shapes in Group 1 were flat, while in Group 2, the condyle shapes found were flat and ovoid. In Group 3, three kinds of condyle shapes were identified: erosion, flat, and osteophyte. Sclerosis and pseudocyst condyle shapes were not present in any participants. The pseudocyst shape was thought to be an advanced form of erosion distinct from the osteophyte shape.[25] Previous investigations into disc displacement and osteoarthritis suggest that osteoarthritis is a continuation of disc displacement.[26] Flat and sclerosis shapes on the surface of condyles are a sign of remodeling and increased load. Erosion is the early stage of a degenerative change.[23] Previous studies using CBCT have reported that flat and osteophyte condyle shapes are commonly found in cases of degenerative joint disorders.[27] Degenerative joint disorders are also caused by inflammatory processes. In addition, mechanical and metabolic factors play a role in the initial damage to the cartilage. These factors will initiate biomechanical changes in hard and soft tissues in the joint, which provoke an immune response that leads to the secretion of inflammatory mediators.[23] Chondrocytes will release mechanical responsive mechanisms, so metabolic mechanisms and pathological activation will increase and result in irreversible cartilage degradation.[22]

This study showed that there was a relationship between condyle shapes and TMJ disorders. This conclusion is different from those of previous studies that have identified a poor correlation between condyle changes, pain, and other clinical symptoms in TMJ osteoarthritis.[28] This difference likely occurred because condyle shapes in this study were grouped based on the presence of any TMJ condition without dividing them into groups by factors of TMJ disorder symptoms. Different relationships between the right and left TMJ show that conditions that may produce clinical findings are not directly reflected in the radiograph.[29] The duration of TMJ disorders and factors involved with the contralateral side may also affect the radiograph's appearance. Symptoms may be detected only on one side, but the radiograph may indicate involvement on the other side.[25]

CONCLUSION

This study found that mandibular condylar shapes revealed by panoramic radiography and the presence of TMJ conditions in adult female patients were highly correlated. In future studies, it will be necessary to investigate etiological factors that may indicate the existence of other TMJ disorders. It is also important to use other modalities, such as panoramic radiography specially developed for TMJ or CBCT, which will be more accurate in supporting the diagnosis of TMJ disorders.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

ACKNOWLEDGMENT

The authors would like to thank the Department of Dentomaxillofacial Radiology Maranatha Christian University Dental Hospital and Faculty of Dentistry for their continuous support.

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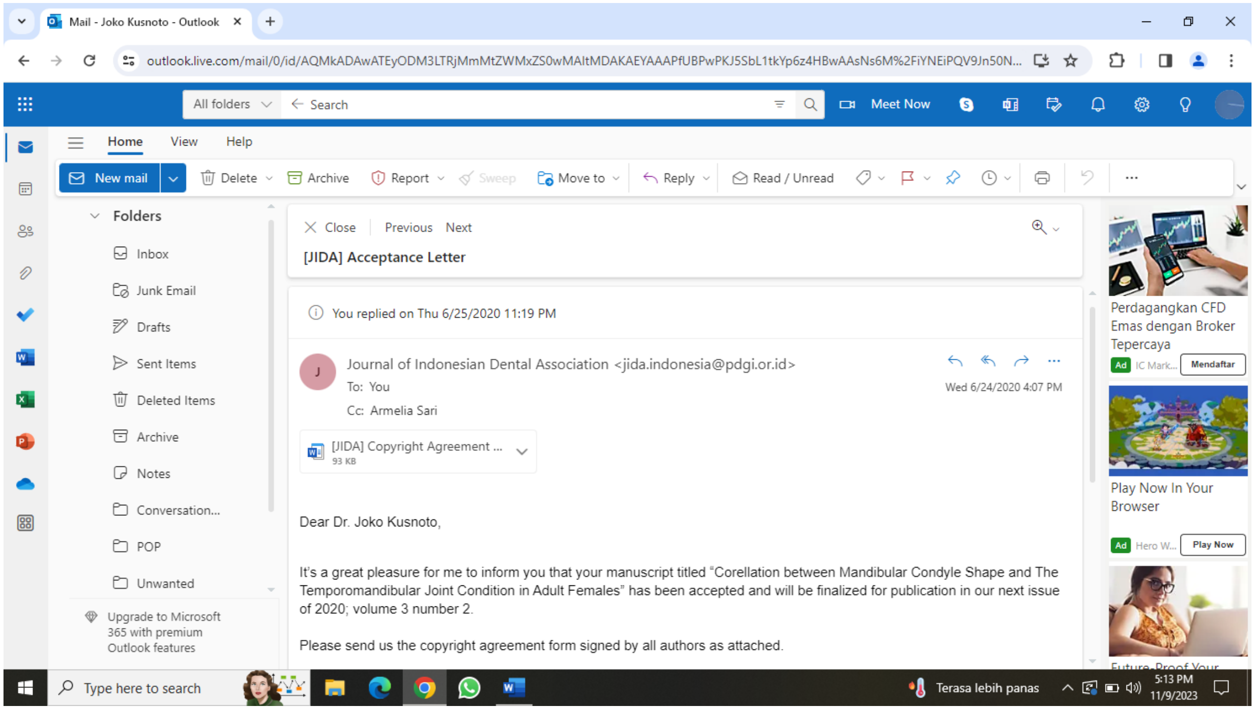
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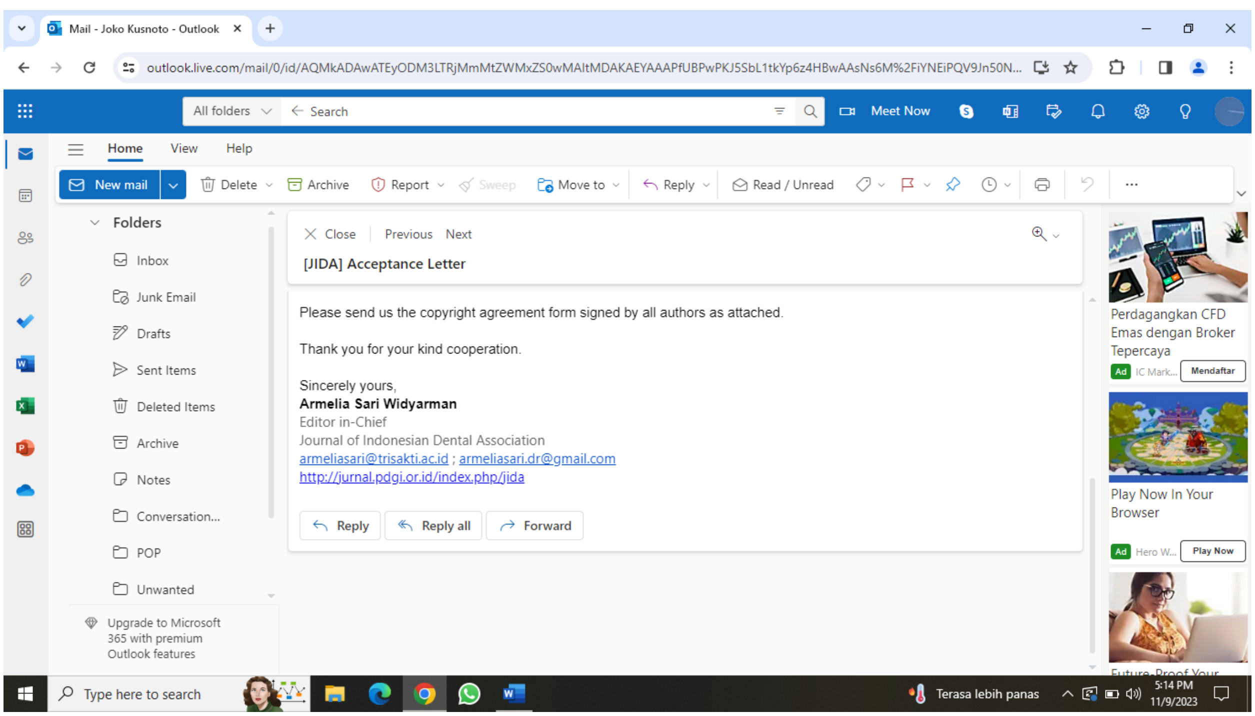
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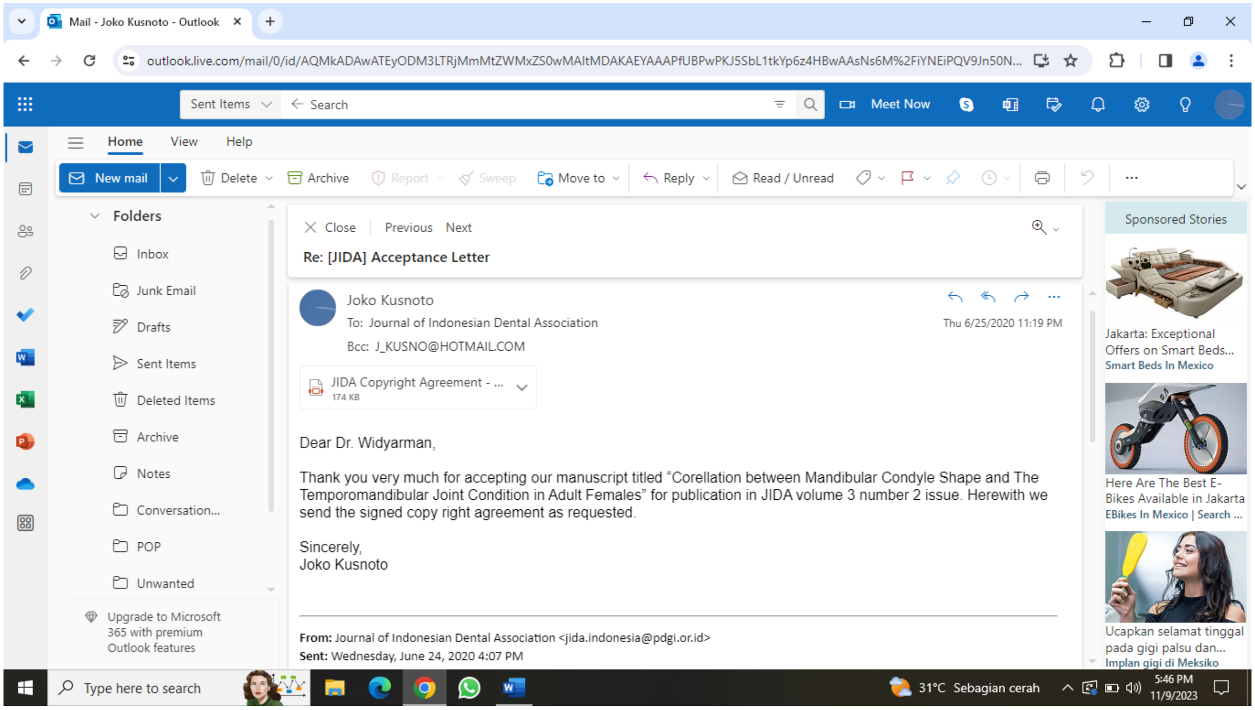

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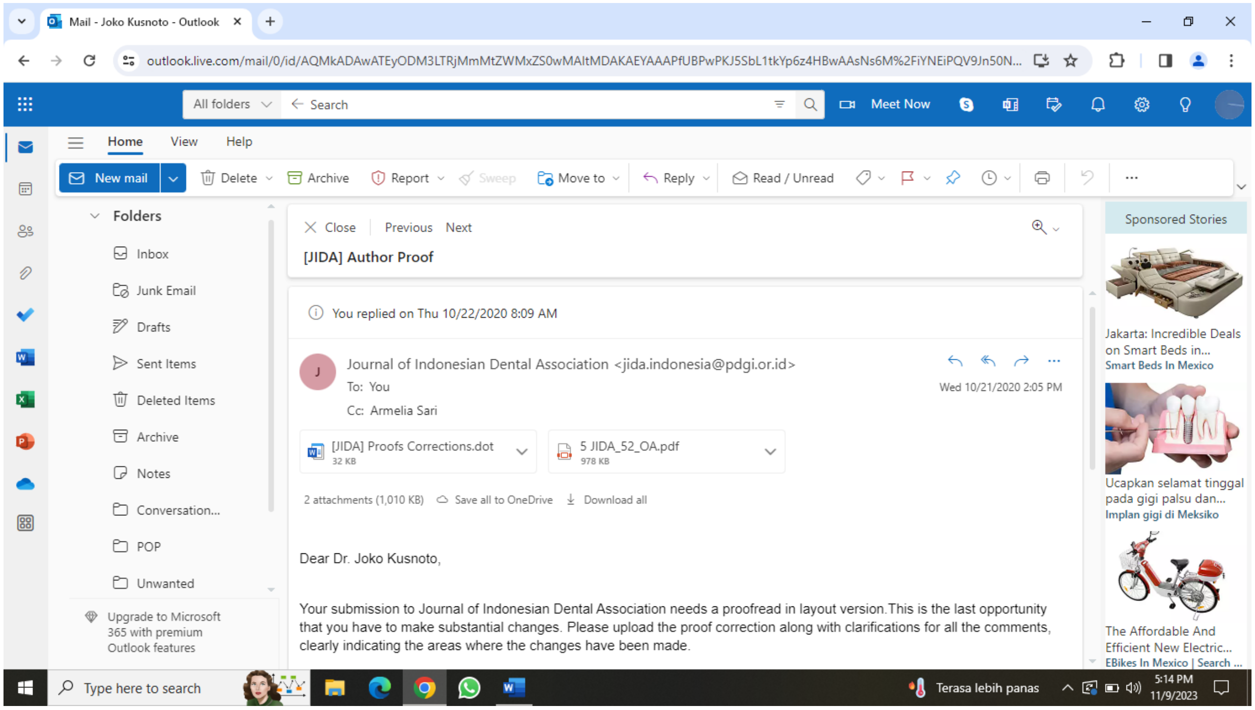
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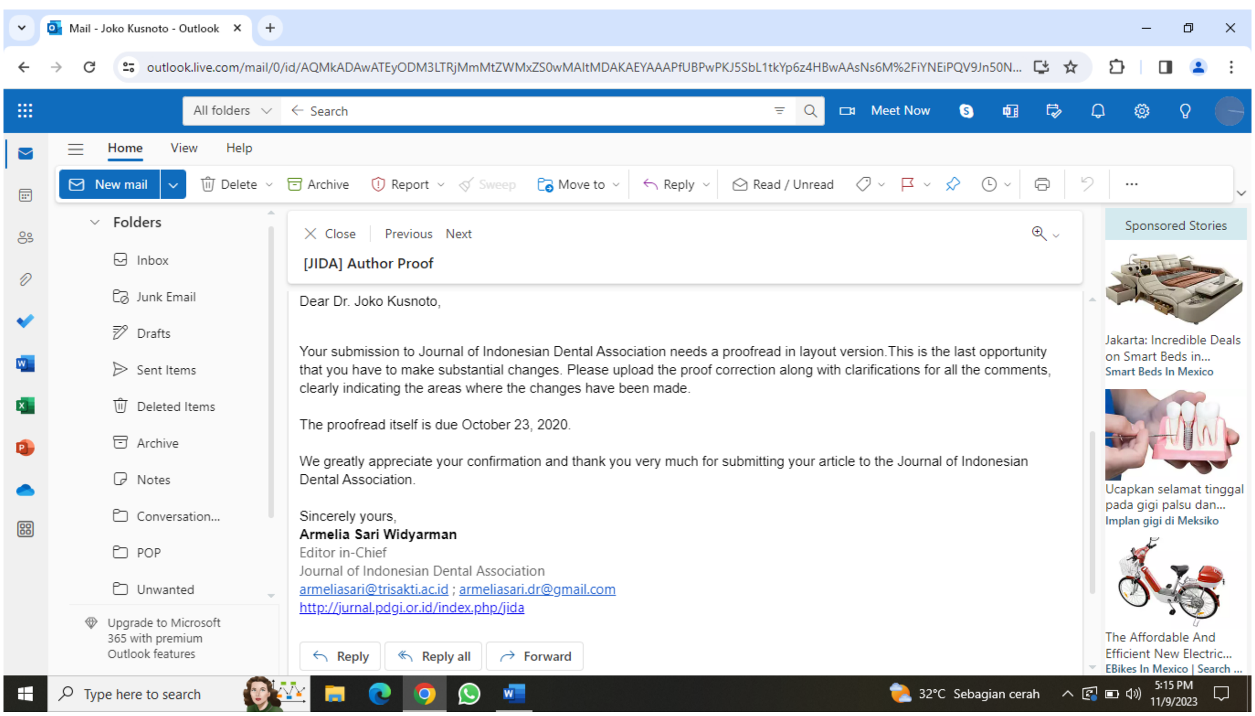
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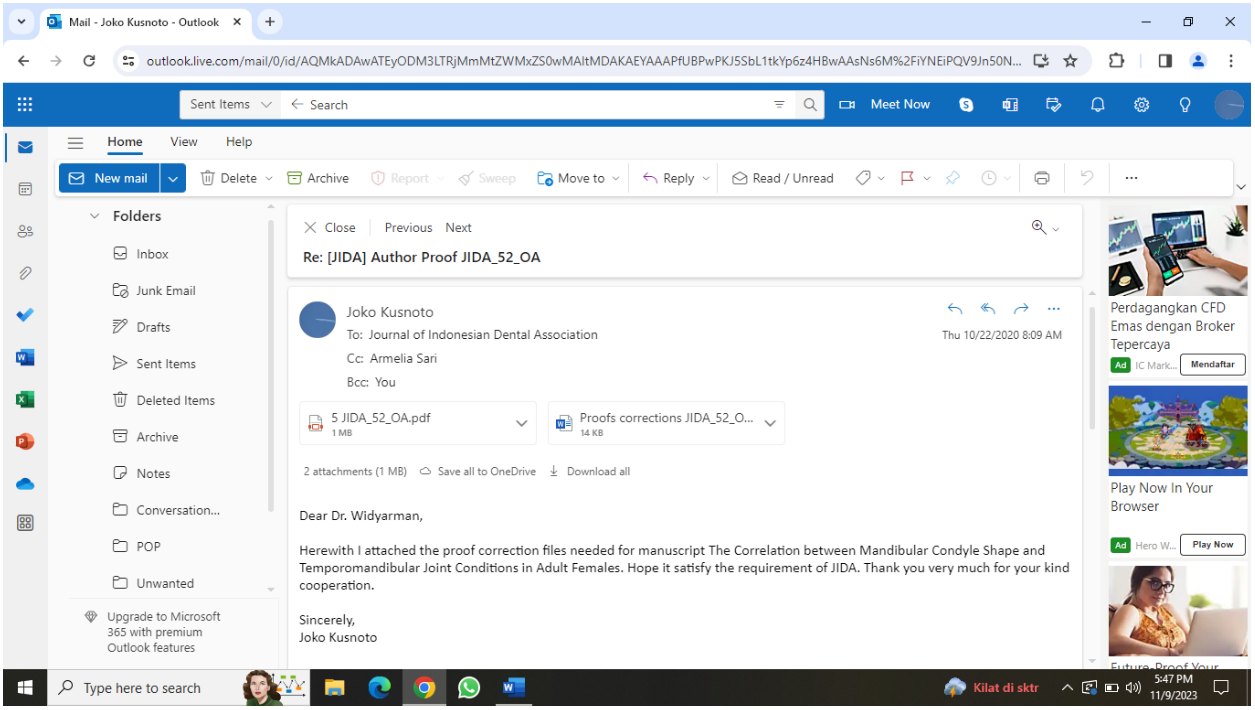

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Herewith I attached the proof correction files needed for manuscript The Correlation between Mandibular Condyle Shape and Temporomandibular Joint Conditions in Adult Females. Hope it satisfy the requirement of JIDA. Thank you very much for your kind cooperation.

Sincerely,
Joko Kusnoto