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ORIGINAL ARTICLE

THE ASSOCIATION BETWEEN GENDER WITH THE SHAPE OF MANDIBULAR CONDYLE IN YOUNG ADULTS OF PESHAWAR

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Abstract

Background: The morphology of the condyles changes with age, gender, face type, occlusal force, functional load, malocclusion type, and the right and left sides. To diagnose temporomandibular disorders and to plan orthodontic and Prosthodontics therapies, it is imperative to evaluate these variances.

Objective: This descriptive cross-sectional study aimed to identify the variations in the shape of mandibular condyles as evaluated through Orthopantomogram (OPG) among young adults of both genders.

Material and Methods: The study was carried out by postgraduate Oral Biology students in collaboration with the Maxillofacial Surgery (OMF) department at Peshawar Dental College (PDC), Peshawar. The individuals who visited the outpatient department of the PDC, Peshawar during the period from December 2023 to November 2024 were included. Employing inclusion and exclusion criteria, the research involved 250 participants (Male 120 and female 130) within the age range of 18 to 26.The OPGs were examined utilizing a Digital Villa Rot graph EVO 3D. The print was examined on a single LED X Ray View box screen. Condyles were classified into four types: rounded, angled, flattened & mixed. Statistical techniques were employed to ascertain the percentage and p value.

Results: The majority of individuals exhibited a round-shaped left mandibular condyle 114 (45.6 %), followed by a mixed 54 (21.6 %) and a flattened shape 43 (17.2 %), while the angled shape was the least frequently 39 (15.6 %) observed. Similarly, most individuals also displayed a round-shaped right mandibular condyle 120 (48.0 %), followed by a mixed 54 (21.6 %), flattened 42 (16.8 %) and angled shapes 34 (13.6 %). No significant difference in the shape of mandibular condyle was observed between the two genders on both left and right sides(P >0.05).

Conclusion: The mandibular condyle's structure on both the right and left sides in early adults was found to be the same in both genders. The round shape condyles were most prevalent among both genders. Further work with larger populations from diverse communities is needed to verify the described results.

Keywords: Mandibular Condyles Morphology, Sex differences, Panoramic Radiography.
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Introduction:

The temporo-mandibular joint (TMJ) is a very complicated part of the body that enables various functions such as speaking, eating, and swallowing[1]. The condylar system is one of the components of the TMJ that contributes to the development of the mandibular bone, increasing its height and width[2]. Radiological assessment of the TMJ is crucial to differentiate a normal variant from an abnormal condition[3]. The TMJ presents a challenge for visualization through X-rays alone due to its intricate anatomy[4]. To ensure accurate diagnosis, multiple types of X-ray images are utilized[4].

Panoramic radiographs represent the most frequently utilized radiographic instrument by dental professionals for the assessment of teeth, the mandible, and other associated jaw structures[5]. The routine panoramic view is commonly recommended by dentists for evaluating the structural components of the TMJ due to its affordability and minimal radiation exposure[6]. Alterations in the structure of the mandibular condyle

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may arise from growth, illnesses, injuries, hormonal imbalances, and radiation therapy[7].

The differences in the shapes and sizes of condyles assist in diagnosing TMJ disorders linked to malocclusions, such as cross bite, deep bite, and open bite[8]. An earlier study categorized the condylar head into four distinct types; the predominant shapes observed in men are angular (40.4%) and round (38.6%), whereas in women, the round shape (39.6%) is most prevalent, followed by angular (31.8%)[9]. Additionally, some researchers have identified morphological changes in elderly individuals resulting from degenerative changes in the joint[10].

Yale et al. initially categorizes the shapes of the mandibular condyle as convex, flat, and concave when viewed from above, based on an examination of the skulls from the Terry collection[11]. Subsequently, they refined this classification into four distinct categories: flattened, convex, angled, and rounded[11].

During surgical exposure, four different condylar shapes were identified, which include the excavated form, oblique form, small round shape, and flattened shape[12]. In contrast, an examination of computed tomography images revealed several forms of condylar morphology, such as flat, convex, concave, round, and angled types[13].

The mandibular condyles exhibit morphological changes induced by functional loading throughout life in both sexes[14]. Young adults encounter differences in functional load between the two sexes, influenced by elements such as stress responses, hormonal activity, and neural connectivity[15].The thorough understanding of the morphological variations in the shape of the mandibular condyle is essential in clinical dentistry and forensic scienceso that a standard variant can be distinguished from the abnormal condition[14].

Furthermore, there has been no research undertaken to investigate temporomandibularjoint (TMJ) morphological classification, which categorizes the shape of the mandibular condyle into four distinct profiles. This system evaluates the superior and lateral surfaces of the condylar head using radiographic analysis. This study was conducted with the objective to observe various shapes of condylesand variations of condyle shapes among males and females through OPGs in young adults visiting the outpatient departments of Peshawar Dental College (PDC), Peshawar.

Material and Method:

Study design: Descriptive cross-sectional.

Setting and duration: This study was conducted by postgraduate students of Oral Biology in collaboration with the Department of Oral and Maxillofacial Surgery (OMF), at Peshawar Dental College, Peshawar. The duration of the study spanned. The duration of the study spanned from December 2023 to November 2024.

Inclusion criteria: The inclusion criteria were individuals of both genders with healthy jaw joints and mandibular condyles who were advised by their dentists to undergo an OPG for routine treatment planning**.**

Exclusion criteria: The people with a history of TMJ-related problems like hypoplasia or aplasia, or who had TMJ trauma, surgery, or oral prosthetics were excluded.

Data collection procedure:

This project received approval from the college's research ethics committee. The participants were informed of the project's goals and given the assurance that the information they provided would be kept confidential. They were then asked to give their written consent.

The sample size was determined using the formula: $N = (Z)^2 P(1-P) / d^2 = 250$. The confidence interval was set at 95% with a margin of error of 6.2%, and the population proportion was 50%. The participants ranged in age from 18 to 26 years. The study included 120 male and 130 female residents of Peshawar using Convenience Sampling Technique(Table-1).

The radiological assessment was conducted utilizing a digital OPG obtained from the Villa Rot graph EVO 3D, with exposure settings configured at 10 mA and 82 kV, thereby ensuring the absence of projection errors. This enabled a comprehensive perspective of the condyle on either side, exhibiting remarkable density and contrast. The OPG print of the patient was subsequently evaluated on a solitary LED X-ray view box screen. The reliability and validity of OPG interpretation were assessed by conducting repeatability tests.

Two oral radiologists and a maxillofacial surgeon, each with over five years of experience, performed independent evaluations of traced images from twenty patients. A subsequent evaluation of the samples was conducted within 15 days following the initial assessment to determine intra-observer reliability.Then, the findings were evaluated for reliability by employing the Intra-class Correlation Coefficient, which was used to standardize the views of the three observers. The intra-observer reliability found to be at a strong level of 0.89.

The mandibular condyle was categorized into four morphological shapes: rounded, angled, flattened, and mixed. If the arch was circular, it was classified as a rounded shape; if the slope was at a sharp angle, it was classified as an angled shape2. Whereas the flattened shape was mostly flat, and the mixed shape was a combination of the above.

Statistical Analysis: The data was statistically analyzed using the Statistical Package for Social

Sciences (SPSS), version 17. A Chi-square test was performed to evaluate the differences in condyle morphology according to gender and sides. The significance level was set at 0.05, and tables displaying the percentage of occurrences were presented.

Results:

According to the study, 52% of the patients were female and 48% were male (Table-01). Ages 24 to 26 were the most common for male patients whereas, female patients were common in the 18 to 20 ages (Table-1).

The left and right mandibular condyles have similar shapes and almost occur with similar frequency in the two sexes ($P > 0.05$). The rounded shape of left mandibular condyles was found to be the most common (114 subjects), followed by a mixed (54 subjects) and flattened shape (43 Subjects); the angled shape was the least common (39 subjects). (Table-2).

Similarly, the condyle of the right mandible was discovered to be rounded in 120 individuals, followed by mixed(54 individuals), flattened (42 individuals), and angled was observed among 34 individuals (Table-3). According to the Chi-Square test, no significant difference ($P > 0.05$) in the morphology of the mandibular condyle was noted between the genders.

Table1: Distribution of Subjects by Age and Sex

Age range(Years)	Male(Number)	Percentage	Female(Number)	Percentage
18-20	28	23.30	50	38.46
21-23	40	33.40	41	31.54
24-26	52	43.30	39	30.0
Total	120	48. 00	130	52.00

Table-02: Shape morphology of left condyle by sex

Shape	Male	Percentage	Female	Percentage
Rounded	54	45.0	60	46.2
Mixed	26	21.7	28	21.5
Flattened	21	17.5	22	16.9
Angled	19	15.8	20	15.4
Total	120	48.0	130	52.0

Table-03: Shape morphology of right condyle by sex

Shape	Male	Percentage	Female	Percentage
Rounded	58	48.3	62	47.7
Mixed	26	21.7	28	21.5
Flattened	20	16.7	22	16.9
Angled	16	13.3	18	13.9
Total	120	48.0	130	52.0

Discussion:

The differences related to gender are essential for clinical assessments, particularly in the planning of orthodontic and jaw surgeries. The present study describes the relationship between gender and the shape of the mandibular condyle in young adult residents of Peshawar.

Panoramic radiographs were conducted, and the mandibular condyles were categorized. A previous study used Cone-beam computed tomography (CBCT) and classified condyles into round, angle, pointed, and flat[16]. Some scientists classified condyles differently, even though they also used panoramic radiographs in their study[8].

The configuration of mandibular condyles in the current age groups is identical to that observed in earlier study7. Additionally, the left and right mandibular condyles also had no varied shapes/incidence in the current study, supporting the finding is consistent with the outcomes of other researchers[18]. Some scientists stated that in single individual, a difference can be found between the right and left side condyles[19].

A research study determined the morphology of the mandibular condyles in a Turkish population. The researchers identified a notable distinction in the shape of the right condyle between male and female subjects. In females, the right condyle exhibited a rounded shape, whereas in males, the right condyle appeared flattened[20].In young adults, healthy, functional mastication places generalized stress across both joints, encouraging a smooth, rounded, or oval adaptation to distribute this occult force[15].

In the current study, round-shaped condyles were predominant in both sexes, followed by angled, flattened, and mixed shapes. A condylar system with a similar architecture was previously reported21. However, some scientists observed different shapes of condyle in men and women[22]. Conversely, other studies found that 40.5% of mandibular condyles were found to be convex, 34.3% to be angled, 15.5% to be flat, and 9.6% to be round[23].

A research study was carried out involving a sample of 450 digital panoramic radiographs from Iraqi patients. It was also reported that the predominant shape of the mandibular condyle was the rounded (oval) shape, which appeared in comparable percentages among both males and females[8].

Furthermore, oval condyles were identified in 68% of the cases, whereas slanted fingers were recorded in 4.0%[7]. Another research indicated that 4.8% of condyles exhibited a slanted shape, and 50% were found to be oval in form[22]. A report highlighted that the pointed shape is most common among Malays, Chinese, and indigenous people from Sarawak[2].

Certain researchers demonstrated that individuals over the age of 56 often possess mandibular condyles that exhibit a flattened or angled configuration[20].Condyle

morphologic abnormalities can be brought on by radiation therapy, endocrine disorders, trauma, remodeling, developmental differences, and other illnesses[16].

A report indicated that tooth loss and the occurrence of a posterior cross-bite may be associated with alterations in the structure of the mandibular condyle[23]. Another research study revealed a positive relationship between open bite and the degradation of the condylar head[22].

A study discovered that there was no distinction among the open, deep, or normal bite groups in individuals with varying condylar morphology[22]. Certain researchers have shown that individuals who predominantly chew on one side are more likely to suffer from temporomandibular disorders compared to those who chew on both sides[24].

The research was confined to a small sample size due to a lack of funding. To clarify the findings on the subject, further research into large-scale populations in different communities worldwide utilizing advanced radiographic modalities is needed. The study was done to help the community, and the authors have no personal interests to mention.

Conclusion:

The results of the present study indicate that the majority of young adults in Peshawar possess a rounded shape of the mandibular condyle. Besides, the left and right mandibular condyles have similar shapes and the morphology of the condylar shape is not associated with the gender among the present limited study subjects. Investigation of large number of subjects will generate population-specific data and support potential forensic applications.

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