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A Study on Goniometric Measurements of Temporomandibular Joint Among Normal Adult Population of A Dental Camp In Garden City University.

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ABSTRACT

The present study aims to understand the actual measurements of Temporomandibular joint movements in healthy adults of both sexes and to correlate its range of motion finding to the existing literature. The present study has been carried out on a Dental camp organized by Garden City University, Bangalore. The study population consists of 152 healthy voluntary subjects (74 male, 78 female) aged between 18-30 years. This study included all participants with normal temporomandibular joint skeletons who had no prior history of Pain, trauma, joint surgery or other disorders. Goniometric measurements of Temporomandibular joint like Depression, Protrusion, Retrusion, lateral deviation were measured physically with the help of ruler. All these measurements were recorded and analyzed using statistical techniques. The present study shows the mean values of depression of mandible measurements in males 29.94 ± 10.76 mm and females 20.64 ± 7.6 mm, Protrusion of mandible measurements in males 5.41 ± 2.40 mm and females 4.65 ± 1.61 mm, Retrusion of mandible measurements in males is 3.71 ± 1.83 mm and females 4.20 ± 1.73 mm, lateral deviation of mandible measurements in males 5.97 ± 2.18 mm and females 6.07 ± 1.99 mm respectively. The current study's findings support the notion that a variety of factors, including age, gender, measuring methodology, type of range of motion (active vs. passive), and clinical concerns, affect range of motion. With the exception of retrusion, ROM in all active TMJ motions diminishes with age. Although there wasn't much of a gender difference, the males also had a higher mean ROM in right lateral deviation.

Keywords: Temporomandibular joint, Goniometry, Range of motion.

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INTRODUCTION

The Temporomandibular joint (TMJ) is the most unique type in terms of having anatomically and biomechanically complex structure. The TMJ is the synovial, condyloid, hinge type of as the mandible is the horse-shoe-shaped bone that joins with the mandibular fossa of temporal bone via the condylar process postero-superiorly. The articular surface of the temporomandibular joint is covered by fibrocartilage, an intra-articular disc, dense avascular collagen fibers, but there is no hyaline cartilage, making it a unique synovial joint [1].

Functionally, the TMJ belongs to ginglymoarthroidal type of joint as it exhibits a rotational movement in the sagittal plane and a translation movement on its own axis. Various passive factors such as ligament and muscle tension restrict these movements. Biomechanically, the movements in the TMJ is facilitated by rolling and gliding of articular surfaces on one another [2,3,4]. The functional movements allowed are lateral deviation, mandibular elevation and depression, protrusion and retrusion.

The main stability to the TMJ is provided by the articular disc and additional congruence is given by the coronoid process of the mandible lying on the immovable maxilla [1].

The term "goniometry" refers to the measurement of angles made at human joints. It can be used to ascertain both a specific joint position and the overall range of motion possible at a joint. The degree of movement possible at a joint is termed as its range of motion (ROM). The anatomical position is the starting point for ROM measurements for any motions other than rotations in the transverse plane. To define ROM, three notation methods have been used: the 0° to 180° system, the 180° to 0° system, and the 360° system. Its use has been backed by numerous sources since Silver [5] first described it in 1923.

Osteoarthritis, mandibular dislocation, and articular disc degeneration all influence the ROM at the temporomandibular joint. The chief components determine range of motion such as Cartilage and Bone Shape, Powerful, toned and bulky muscles, Laxity of the ligaments and the joint capsule, Race, Sex, Age (Range of Motion diminishes with age).

The most important aspect is understanding the range of motion. It's critical to distinguish between a restricted range of motion imposed on by tight muscles and a mechanical problem with the disc.

This study helps to understand and compare the actual measurements of Temporomandibular movements in healthy adults and to understand its range of motion measurements. Good knowledge of these measurements will help clinicians, physiotherapists to provide actual diagnosis and treatment for individuals suffering with temporomandibular disorders.

Aims and Objectives

To evaluate the impact of age and gender on normal subjects' temporomandibular joint movements in Garden city University.

MATERIALS AND METHODS

The present study has been carried out on a Dental camp organized by Garden City University, Bangalore. The study population consists of 152 healthy subjects aged between 18-30 years. All study participants signed a general consent form, indicating their consent to the possibility of their data being used in clinical research initiatives.

Criteria selection

Inclusion and Exclusion criteria: This study included all participants with normal temporomandibular joint skeletons who had no prior history of Pain, trauma, joint surgery or other disorders.

Study Design: Observational study design.

Sampling method: The Sampling method consists of convenience sample of healthy voluntary adult

population of both male (74 subjects) and female (78 subjects), who have participated in a Dental camp conducted by Garden City University, Bangalore.

Procedure: All subjects range of motion measurements should be recorded. We have asked the individual to be sit on a chair in a comfortable position with head tilting upwards in a resting state.

Goniometric measurements: We used a ruler to physically measure the temporomandibular joint movements in the same individuals to determine their range of motion.

For Temporomandibular Joint

- Depression (lower jaw inferiorly), measured as the distance between the upper and lower central incisors.
- Protrusion of the mandibular teeth, measured as the separation between the upper and lower central incisors.
- Retrusion (lower jaw turned inward): The separation of the upper and lower incisors.
- Lateral deviation of the lower jaw, measured as the distance of the upper and lower incisors.

The following items are recommended to be included in the recording:

- Subject's name, age and gender.
- Date of measurement
- Type of Goniometer used.
- Side of the body, joint and motion being measured for example left wrist flexion.
- Type of motion being measured, that is, passive or active motion.
- Any subjective information, such as discomfort or pain, which is reported by the subject during the testing.

Recordings should include both the starting and ending positions to define the ROM.

RESULTS

Table 1: Showing depression of lower jaw in age group 18-30 years

Sex	No of Subjects	Range (mm)	Mean(mm)	SD(mm)
Male	74	10-48	29.945	10.766
Female	78	8-42	20.641	7.663

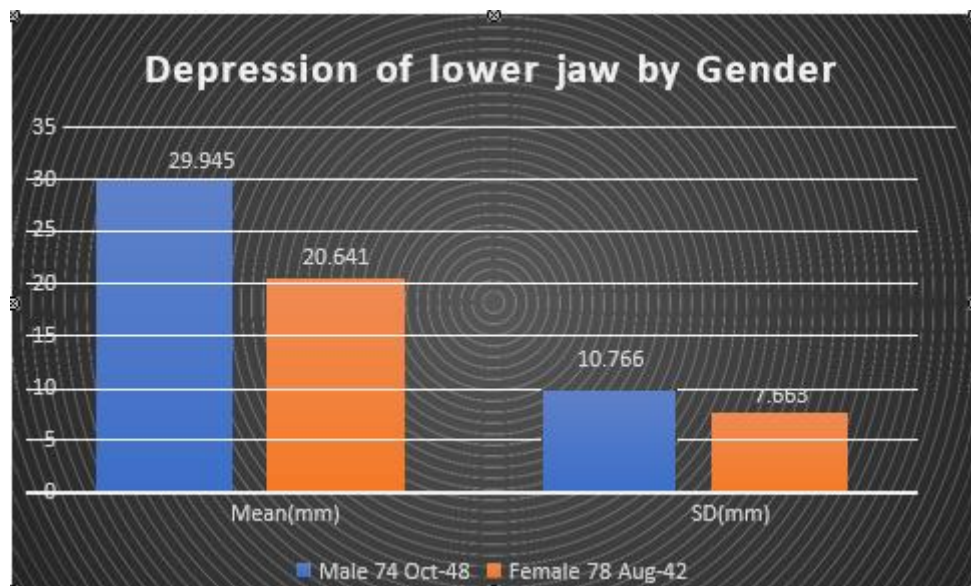


Table 2: Showing protrusion of lower jaw in age group 18-30 years

Sex	No of Subjects	Range (mm)	Mean(mm)	SD(mm)
Male	74	3-15	5.418	2.404
Female	78	2-10	4.653	1.618

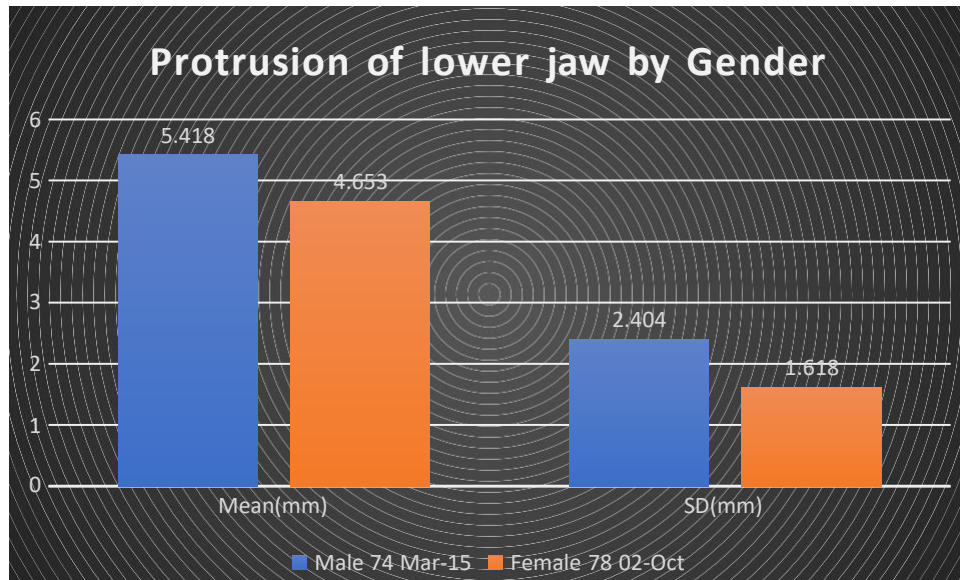


Table 3: Showing retrusion of lower jaw in age group 18-30 years

Sex	No of Subjects	Range (mm)	Mean(mm)	SD(mm)
Male	74	2-11	3.716	1.839
Female	78	2-9	4.205	1.738

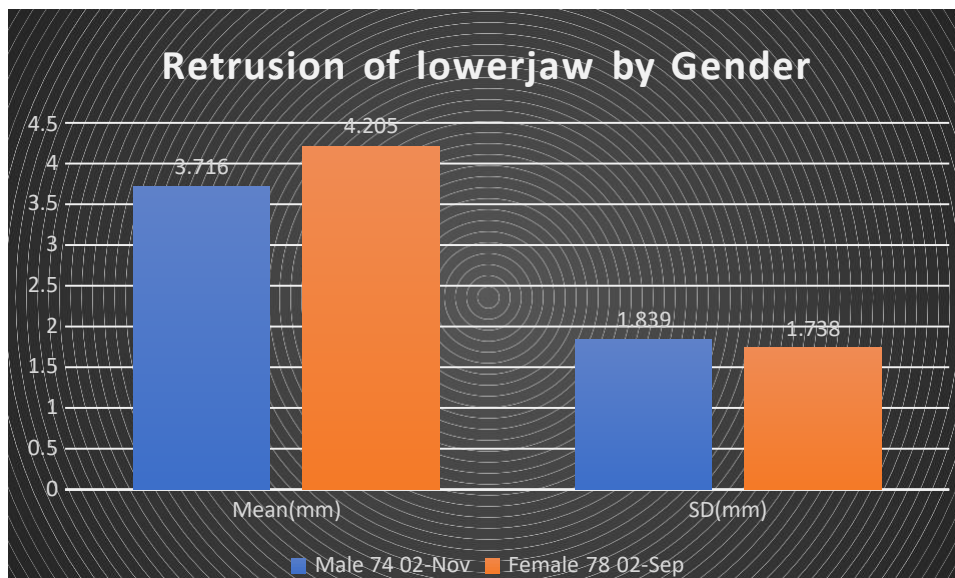
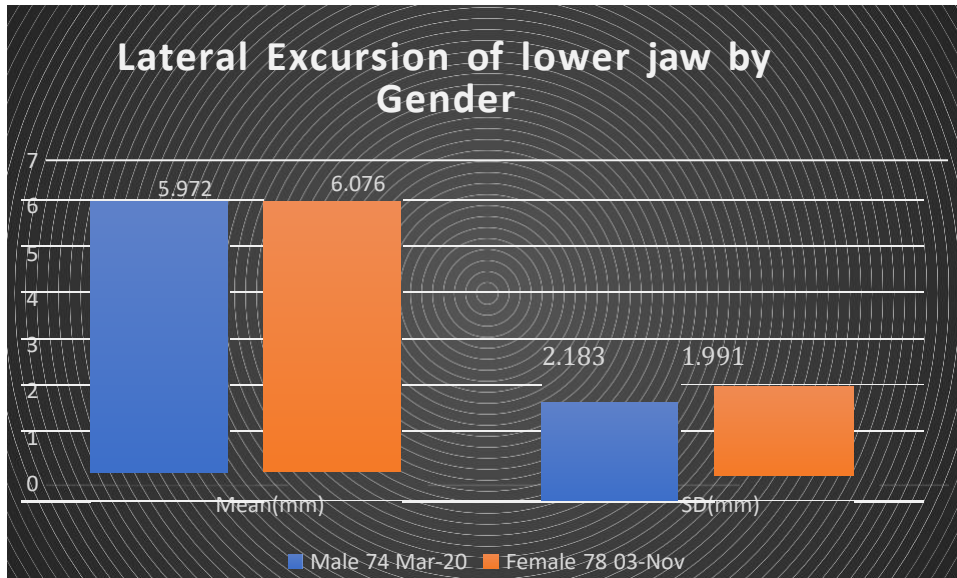


Table 4: Showing lateral excursion of lower jaw in age group 18-30 years

Sex	No of Subjects	Range (mm)	Mean(mm)	SD(mm)
Male	74	3-20	5.972	2.183
Female	78	3-11	6.076	1.991



DISCUSSION

The TMJ is essential for the functions of the mouth, particularly during chewing and mastication movements. The muscles of mastication contribute the forces and contractions that cause the main movements of the TMJ [3].

Several studies and researchers have found coordinated and parallel motions at the cervical spine joints and temporomandibular joint. They show that both the jaw and the neck muscles may be concurrently triggered by pre-programmed signals from the brain. Popping or clinking sounds (or both) in the joint during opening and closing of the mouth may be present in temporomandibular disorders. Other diagnostic signs and symptoms include facial pain, painful muscles, unilateral or bilateral tenderness in the TMJ region, headaches, and stiffness in the neck [6].

After puberty, temporomandibular disorders (TMDs) seem to be increasingly common in females of all ages. Higher stress levels, hormonal influences, and behavior’s of teenage girls that are especially dangerous to the temporomandibular joint serve as contributing factors to this. Excessive gum chewing, ice smashing, nail biting, jaw play, clenching, and bruxism are a few examples. Given the significance of the temporomandibular joint, investigations of various temporomandibular joint characteristics have received a lot of attention. The 152 volunteers for the goniometric study—74 men and 78 women—who were used in the current investigation ranged in age from 18 to 30 years. The parameters for the temporomandibular joint were opening, closing, anterior protrusion, and lateral deviation. All the parameters range, mean, and standard deviation were calculated.

Depression of Mandible (Opening of mouth)

In the present study the mean values of opening of mouth (Table 1) in age group (18 to 30years) in males is 29.94 mm ± 10.76 mm and the range is from 10 to 48 mm in males.

The mean values of opening of mouth in females are 20.64 mm ± 7.66 mm and the range is from 8 to 42 mm in females. Charu Taneja [8] observed that mean values of opening of mouth in males and females is 45 mm and 40mm approximately, which is little higher when compared to the present study.

Magee [8] noted that the subject's three fingers or two knuckles could fit between the upper and lower central incisor teeth if the mandible depressed between 35 and 50 millimeters.

Retrusion of Mandible

In the present study the mean values of retrusion (Table 2) in age group (18 to 30 years) in males is $3.71 \text{ mm} \pm 1.83 \text{ mm}$ and the range is from 2 to 11 mm in males. The mean values of retrusion in females are $4.20 \text{ mm} \pm 1.73 \text{ mm}$ and the range is from 2-9 mm in females. Magee [8] observed that the movement of anterior protrusion is 3 mm to 6 mm measured from resting to the protruded position. Walker [10] studied discriminative validity of temporomandibular joint range of motion measurement and gave Mean \pm SD of $7.1 \pm 2.3 \text{ mm}$.

Protrusion of Mandible

In the present study the mean values of anterior protrusion (Table 3) in age group (18 to 30 years) in males is $5.41 \text{ mm} \pm 2.40 \text{ mm}$ and the range is from 3 to 15 mm in males. The mean values of anterior protrusion in females are $4.65 \text{ mm} \pm 1.61 \text{ mm}$ and the range is from 2-10 mm in females. Charu Taneja [7] observed that mean values of Anterior protrusion in males and females is 7.1 mm and 6.8 mm approximately which is little higher when compared to the present study. According to Magee [8], the anterior protrusion moves between the resting and protruded positions by 3 to 6 millimeters. Walker [9] investigated the discriminative validity of measuring the range of motion in the temporomandibular joint and provided a Mean \pm SD of $7.1 \pm 2.3 \text{ mm}$.

Lateral deviation of Mandible:

In the present study the mean values of lateral deviation (Table 4) in age group (18 to 30 years) in males is $5.97 \text{ mm} \pm 2.18 \text{ mm}$ and the range is from 3 to 20 mm in males. The mean values of lateral deviation in females are $6.07 \text{ mm} \pm 1.99 \text{ mm}$ and the range is from 3-11 mm in females. Charu Taneja [7] observed that mean values of Anterior protrusion in males and females is 9.8 mm and 9.3 mm approximately which is little higher when compared to the present study. According to AP Brady, L McDevil, JP Stack, and D Downey [10], there should be a similar degree of lateral mobility to the right and left sides, between 10 and 12 mm, however this can vary from 6 mm to 15 mm [11-15].

CONCLUSION

The current study's findings support the notion that a variety of factors, including age, gender, measuring methodology, type of range of motion (active vs. passive), and clinical concerns, affect range of motion. With the exception of retrusion, ROM in all active TMJ motions diminishes with age. Although there wasn't much of a gender difference, the males also had a higher mean ROM in right lateral deviation.

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