



Assessment of Bite Force in General Population of Bareilly, India

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ABSTRACT

A bite force, also known as a masticatory force, is the outcome of the contact between the maxillary and mandibular teeth, bones, and muscles. Bite force, which is a result of the action of jaw elevator muscles modified by the craniomandibular biomechanics, is one measure of the functioning condition of the masticatory system.

Also, it has been noted that biting force is crucial in the diagnosis of stomatognathic system disorders.¹

According to reports, Borelli made the first attempt to measure bite force in 1681 using a tool called a gnathodynamometer. In order to measure intraoral

forces after that, Black created a new kind of gnathodynamometer in 1893.²

Bite force measurements have been performed using a variety of techniques and tools. These devices, which range from straightforward springs to sophisticated electronic gadgets, have either been mechanical, electrical, or a combination of the two.³

Electrical resistance strain gauges are used by the majority of modern equipment, and most of the instruments can measure stresses between 0 and 800 N with an accuracy and precision of 80%. Several researches have examined the connection between sex

and maximal bite force. According to certain research, males can bite more forcefully than females. According to the studies, the variations in muscle architecture (muscle size, diameter, and type of masseter muscle fibers), mandibular inclination, and training and activity types are to account for this variation.⁴

In this review, we emphasized important factors that affect bite force measurements, such as age, gender, periodontal support of teeth, signs and symptoms of temporomandibular disorders and pain, and dental status.

Aims & Objectives:

Aim of this study is to compare the bite force in various age groups and in people of different sex in the local population based on a one month observational study.

OBJECTIVES

To record bite force and compare in various age groups.

To record bite force and compare in different sex groups.

MATERIALS AND METHODS

It is a prospective study of one month starting from November 2023 till December 2023 conducted in the department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Bareilly consisting of patients who reported to the department for various treatments. Inclusion criteria consisted of patients with no gross or apparent neuromuscular defects, eight permanent incisors and four canines (deciduous or permanent) present, and no fractured, chipped, badly discolored, or heavily restored incisors, in Department of Oral and Maxillofacial Surgery over the given time period of 2 months. Exclusion criteria consisted of

patients who are completely edentulous. Patients who are unwilling to participate in the study.

Sociodemographic details such as age, gender and personal habits were recorded. Clinical data retrieved were the type of dentition, no. of teeth present, and endodontic treated tooth or missing tooth present. Total of 1002 patients were included in this study, out of them 649 were male and 353 were females, age range between 11 years old to 70 years old.

All the patients were examined according to the conventional procedure and various patients' bite force was recorded in measurement of Kg using a digital dynamometer.⁵ This appliance uses electronic technology and consists of the bite fork and digital body.

RESULT

A total of 1002 patients which constituted for maximum bite force analysis were included in the study out of which 649 were male and 353 were female, which showed a male predominance.

All patients varied in age ranging from 0-70 years of age with a higher no. of cases in 21-40 years of age in life.

Age, sex, and probably stature account for a part of the variation of the maximum bite force which was up to 29.64 ± 6.17 in the age group of 21 to 40 years.

The jaw closing force increases with age and growth, stays fairly constant from about 20 years to 40 or 50 years of age, and then declines (Fig 1). The maximum bite force is generally higher in men than in women which was 26.87 ± 6.86 in our study (Fig 3).

In addition, the muscle fibers may also differ in the terms of diameter and cross sectional area between the sexes. Therefore, the greater bite force in men seems to correspond with a greater diameter and cross

sectional area of the type II fibers in the masseter muscle.

During the period of adolescence, it was observed that there is a decrease in maximum bite force 27.64 ± 6.37 in both sexes, with the male maximum bite force being greater than the female maximum bite force. As

muscles of mastication are Temporalis, Masseter, Medial pterygoid and Lateral Pterygoid, still developing to their full strength.

In young adults, the male force became greater than the females, then both gender maximum bite force decreased after adulthood.

Table1: Bite Force (Kg) (Average) In Different Age Groups.

AGE groups	1-20 years	21-40 years	41-60 years	>60 years
No. Of participants	80	662	233	27
Bite force (kg) (average) Mean \pm SD	27.64 ± 6.37	29.64 ± 6.17	23.96 ± 6.48	15.1 ± 4.38

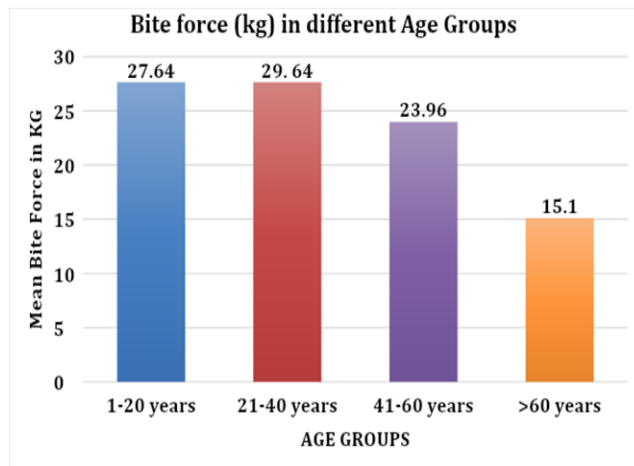


Table 2: Gender Distribution

Gender	Number	Percentage%
Male	649	64.8
Female	353	35.2
Total	1002	100.0

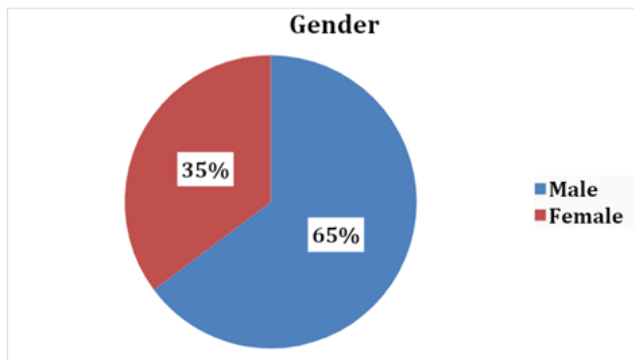
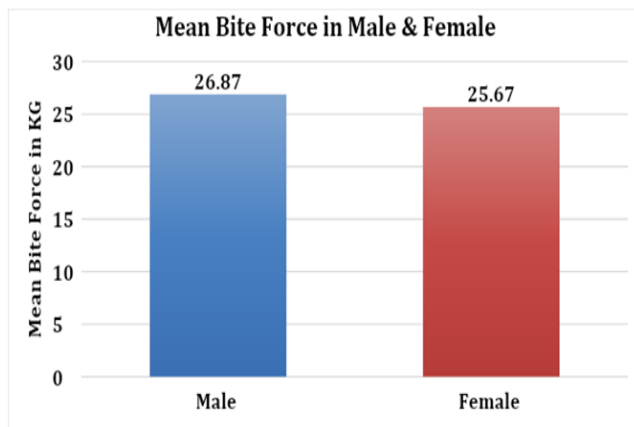


Table 3: Bite Force (Kg) (Average) In Different Gender

Gender	Number of participants	Mean Bite Force in KG (Mean ± SD)
Male	649	26.87 ± 6.86
Female	653	25.67 ± 6.26
Total	1002	26.45 ± 6.68



DISCUSSION

Maximum bite force is one indicator of the functional state of the masticatory system. The force results from the action of the jaw elevator muscles (in turn, determined by the central nervous system and feedback from muscle spindles, mechanoreceptors, and nociceptors) modified by the craniomandibular biomechanics.⁶

MBF is an objective and quantitative measure for evaluating masticatory performance, which verifies the effectiveness of incising, crushing, and pulverizing food by the number of functional teeth. The type of malocclusion has been reported to affect the masticatory performance and maximum bite force. Based on the Angle classification, studies have

compared the bite force among individuals with different types of malocclusions. It was found that subjects with normal occlusion had the highest bite force, followed by Class I, Class II, and Class III.⁷

A series of pain-related symptoms known as temporomandibular dysfunctions (TMDs) include TMJ dysfunction, masticatory system abnormalities, limited mouth opening, limited jaw movement, and TMJ noise.⁸ It is hypothesized that those with TMDs will bite with less force at their maximum. Patients with TMDs use more relative masticatory forces when chewing than healthy individuals. Researchers have looked into the relationship between biting force and temporomandibular disorders, and some have suggested that TMD may affect both bite force and muscle activity.⁹

The normal aging process may cause the loss of muscle force. Indeed, the jaw closing force increases with age and growth, stays fairly constant from about 20 years to 40 or 50 years of age, and then declines. In children with permanent dentition between the ages of 6 and 18, bite force has been significantly correlated with age.² The occlusal contact areas and maximum bite force were found to be significantly larger in the senior group than in the young group.

Maximum bite force is higher in males than females. The greater muscular potential of the males may be attributed to the anatomic differences. In addition, the correlation of maximum bite force and gender is not evident up to age 18. It is apparent that maximum bite force increases throughout growth and development without gender specificity. During the post-pubertal period, maximum bite force increases at a greater rate in males than in females and thus becomes gender-related.

Ferrario et al have recorded larger bite force values in males and explained this result by their larger dental size. Because the larger dental size presents larger periodontal ligament areas, it can give a greater bite force,¹⁰ Which correlates with our study.

Our study looked at the average curve between genders and analyzed that there is a variation of MBF according to age and gender. However, both the variables highly contribute for the maximum bite force assessment.

CONCLUSION

In this study, it was concluded that the MBF varies qualitatively along the human development process. A trustworthy way to evaluate the prosthetic treatment and the biomechanical characteristics of the masticatory system is to measure the bite force. Yet, while comparing biting force measurement in study, one should take other useful parameters into account. This is a single centric study, more multicentric study has to be conducted across the country to get average bite force among Indian population.

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