

# Exploring the relationship between mouth opening ability, neck measurements, and their implications for oncology patients undergoing radiotherapy

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**ABSTRACT** **Aim/purpose:** The purpose of the study (well Iraqi adults) is to 1) Determine the association between neck edges and maximum mouth opening, 2) Assesses overweight/obese association between neck edges and maximum mouth opening, 3) Evaluates neck circumference as a metabolic risk marker, 4) To compare and reveal on the available study discovering the differences in the anatomic, clinical, anthropometric and other characteristics of different structures of the human anatomy, 5) Maximum Mouth Opening (MMO) capability and neck measurement in the normal adult is an essential analytic reference for dental and anesthetic clinicians, 6) The Neck Circumference (NC) size is the simple screening measurement in which can be used as an index of upper body measurements reference for dental and anesthetic clinicians.

**Materials and methods:** Whole of 150 young, Iraqi healthy the adults age (18-40 years) (75 male, 75 female) was designated to the cross-sectional, education. Subsequently procurement ethical approval from Diyala university medical college start study from September 2020–February 2022 in Ba'quba teaching hospital. Were logged the maximum mouth opening, age, sex, height, and weight of the members. Independent (sample t-tests) were used to inspect variance maximum mouth opening comparative to the sex. The Pearson's correlation and simple linear regression was used to estimation association among maximum mouth opening and each neck measurement. A questionnaire in which entailed of anthropometric measurements and demographic structures were use.

**Results:** The average maximum mouth opening cross a 150 members were 52.22, 5.19 mm, and the average maximum mouth opening of males (53.18, 5.31 mm) were a significant higher than of the females (49.62, 3.69 mm;  $P < 0.001$ ). The mean maximum mouth opening were moderately positively associated with the height ( $P < 0.001$ ) and weight ( $P < 0.001$ ). In the reversion model, it were assessed that, for each 11 cm or 11 kg. The maximum mouth opening increased by about 3.8 mm or 2.7 mm.

**Conclusion:** Through restrictions of the parameters of the current study, both the height and the weight were establish significant associated through the maximum mouth opening of the Iraqi young healthy adult and might be important analysts of the (maximum mouth opening) size. The Neck Circumference (NC) size is the simple screening measurement in which can be used as an index of upper body measurements reference for dental and anesthetic clinicians.

**Keywords:** Maximum mouth opening; The body height; The weight of the individual; The neck measurement; Oncology patients; Radiotherapy

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**Word count:** 2727 **Tables:** 02 **Figures:** 01 **References:** 14

**Received:** 06 October, 2023, Manuscript No. OAR-23-115916;

**Editor assigned:** 09 October, 2023, PreQC No. OAR-23-115916 (PQ);

**Reviewed:** 23 October, 2023, QC No. OAR-23-115916;

**Revised:** 22 October, 2024, Manuscript No. OAR-23-115916 (R);

**Published:** 29 October, 2024, Invoice No. J-115916

## INTRODUCTION

The mandibular functions are to assessed by using sequence of analytic assessments, include, the palpation of masticatory muscles and Temporomandibular Joint (TMJ), occlusal estimation, and radiographic check. The mandibular purpose is assessed by sequence of analytical test, with a palpation of the masticatory muscle of the face and the Temporomandibular Joint of the Mandible (TMJ), occlusion assessment, and a radiographic investigation [1].

- Maximum Mouth Opening (MMO) were significant analytic orientation aimed at anesthetic clinician as an initial estimation. Restricted the mouth open through mandibular activities consequence after Temporomandibular joint Sickness (TMS), oral submucosal tissue fibrosis, aching rheumatic disorder, oral tissue infection, tissue malignancies, or facial tissue trauma [2].
- Starting usual variety aimed at Maximum Mouth Opening (MMO) might permit anesthetic clinician, to accurately assess management properties and standard therapeutic aims to patient performance mandibular, practical uses [3].
- Prior research require attempted, for collect the usual variety of functional the mouth opening, size and measurements, but the variability in Maximum Mouth Opening (MMO) were moderately great since it differs intensely with the age, the sex, the race, the joint state, the mandibular size, the cranial base size, the body height, and the body weight [4].
- The anesthetic clinicians investigate a patients to decide has incomplete the (mouth open size). It is consequently important to study relationship among Maximum Mouth Opening, (MMO) and every correlated physiological indicator. The relationship among age and Maximum Mouth Opening (MMO) in ethnic Iraqi adult has before been considered [5].
- Neck circumference is seldom assessed in clinical practice or study, while it is more practical and likely well measurement, which might be specifically useful in special people such as Maximum Mouth Opening (MMO) individuals [6]. Hence further educations are needed in unlike populations to reveal the value of this measure for evaluating Maximum Mouth Opening (MMO). The old anthropometric measurements are not practical or legal [7].
- The objective of this present study in order to create normal range of MMO in the of young Iraqi adult and to evaluate possible correlations of MMO with neck circumference [8].

## MATERIALS AND METHODS

### Study population and sampling method

Multistage, the stratified, modest accidental sampler project were used to select members of societies in Ba'quba city. Subsequently procurement ethical approval from Diyala university medical college, agreed the protocol of the study and informed agreement were achieved from all members. The study start from September 2020-February 2022 in Ba'quba teaching hospital. A community was chosen to characterize the variation of financial progress and geographic distribution. A whole of 150 (75 males, 75 females), age between 18-40 years were drafted in this study. A Subject with past history of the thyroid illnesses or the neck lumps was excluded.

### Data collection

The information arranged public-demographical characteristics (age, sex, job, the teaching level, somatic action, past personal history of the diabetes, medical past and nutrition behaviors were collected by skilled examiners using questionnaire. Physical checkup were also done, and height, weight and neck circumference was measured according to typical protocols [7]. An anesthetic form were done for volunteers gathering the resultant addition values:

- General health.
- Had signed an educated agreement.
- Complete the permanent dentitions (not any dental prosthesis).
- Not at all past history of the oral sub-mucosal fibrosis.
- Not at all previous history of the head or the neck tumors;
- Not at all previous history of the jaw or the face painful, whichever at rest or throughout activity.
- Not at all previous history of TMD or bruxism.
- Not at all previous history of TMJ, the jaw, the head, or the face distress.

The neck circumference was measure under the thyroid cartilage (below Adam's apple) in anterior, and at near of the mid cervical spine at posterior by the measure tape, with individual upright position. The height and weight, both measure to nearby tenth in centimeters and kilograms, individually. MMO dimension was taken by two before skilled inspectors and then standardized. Then sat restfully in chair (upright and calm situation, viewing straight head). Each participant was instructed to open his or her mouth as wide as possible. Each members were frequently measure three times within 15 minutes.

### Neck circumference

The neck border is well-clear the boundary of neck, taken completed the cervical at the vertebral and the uppermost of the collarbone at the anterior. The difficult with the revealing of these landmarks, mainly when the person is wearing a blouse with a collar. The neck circumference as the place with the smallest circumference around the neck, measured horizontally in the part and transversely on the side. The experiment show the work as estimated the lateral neck height.

### Measure neck size

A calculating adhesive tape round neck at tallness where neckline would be usually rest just below Adam's apple. Fix the neck by squeeze the lower jaw depressed. A tape must be resting informally on neck skin and not hugging the tape. Grip single finger underneath the tape measure to confirm. Don't pull too forcefully to generate excessive pressure, just sufficient to get correct width. Doubt measure neck without finger beneath the tape and then dress blouse size necessity 2.5 cm more.

### Measure neck size

Fix a head by one hand whereas examine neck.

### Inspection

- Note a standard concavity of the cervical spine.
- Detect transverse process of C7.
- Detect trapezius and sternomastoid muscles.

### Inspection

Sense every spinous process observing for important parts of tenderness.

### Joint

Feel for crepitus during passive motion.

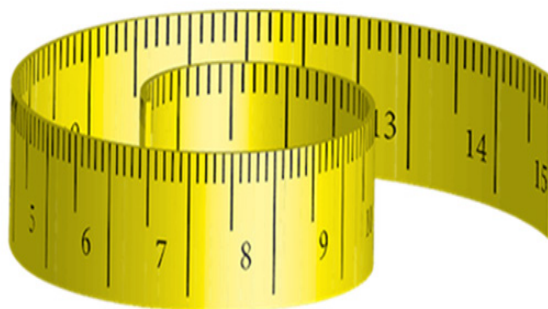
### Para spinal muscles

**Normal:** The 30 unit cycle, skillful to trace chest through the jawbone, the 55 unit extension and the 40 unit lateral twist.

The no opposition throughout range of signal.

### Yellow measuring tape

Most adult male neck sizes range between 14 and 19 inches (48.26 cm), with the normal adult male neck circumference being around 15 inches (38.1 centimeters) (Figure 1).



**Fig. 1.** Yellow measuring tape.

## Other measures

The questionnaire were directed the skilled evaluators and comprised of sociodemographic features, regime issues included diet, physical motion, and sleep period and illnesses, and health and personal history with drugs use. Sleep disorderly breathing was evaluated by described physician analysis the sleep apnea, insomnia. Physical actions were well-defined at minimum 150 minutes (moderate-intensity aerobic physical action/week) or as at minimum 75 minutes (vigorous-intensity aerobic physical action/week) or equal mixture of moderate- and vigorous-intensity action.

## Other measures

According to the criteria.

## Statistical analysis

Completely continuous variable was obtained as mean  $\pm$

standard deviation. The Pearson correlation coefficient was use to determine relationship among neck circumference then further anthropometrical measurements. The study applicants were compared by normal neck circumference categories using Student's t-test. The purpose of usual distribution, logarithmic change was useful to totally statistical studies. The P values were used the significance equal 0.05. Totally of the analyses were completed with SPSS Statistics 17.0 for Windows (SPSS Inc.).

## RESULTS

A total of 150 participants were studied. The mean ( $\pm$  S.D) age of the total 150 members were 27.7-4.3 years, and the average ( $\pm$  S.D.) age of females (21.5  $\pm$  3.1 years) were significantly younger than that of males (25.9  $\pm$  5.2 years;  $P < 0.025$ ) (Table 1). Individuals with high and normal neck circumference were similar in age and gender.

<b>Tab. 1.</b> Mean ( $\pm$ S.D.) of issue, MMO and neck circumference (mm) strength variables for the males and females issues.		<b>Males</b>	<b>Females</b>	<b>Differences</b>	<b>p-value</b>
	Age (years)	24.9 $\pm$ 5.2	22.5 $\pm$ 3.1	-11 $\pm$ 26	0.0235
	Maximum Mouth Opening MMO	50.18-4.09 mm	47.62-3.41 mm	10.63 mm	0.001
	Neck circumference (mm)	42.0 $\pm$ 4.8 cm	36.1 $\pm$ 2.9 cm	5.9 $\pm$ 7.6	0
	(MMO) with height	177.4 $\pm$ 4.6	171.6 $\pm$ 3.7	174 $\pm$ 4.3	0.001
	(MMO) with weight	76.4 $\pm$ 4.5	69.7 $\pm$ 3.4	74.1 $\pm$ 3.95	0.001
	BMI	25.3, 29.1	25.0, 29.6	0.3	0.001
<b>Note:</b> P value $< 0.05$ is measured statistically significant.					
*Test practical: Independent T-test.					

The average maximum mouth opening MMO for all members were 50.02-4.09 mm, and the mean maximum mouth opening MMO of males (52.18-4.21 mm) were statistically greater than females (47.63-4.41 mm,  $P < 0.0001$ ).

Average neck circumference to totally members were 42.0  $\pm$  4.8 cm for the male, and that of females (36.1  $\pm$  2.9 cm;  $P < 0.000$ ). As estimated, the group with high neck circumference had higher BMI. The data illustrations that neck circumference has a minor correlation with BMI. The neck edge would be greater, as neck border would be further independent of BMI.

There were an abstemiously positive correlation between MMO and height ( $P < 0.001$ ), and between MMO and weight ( $P < 0.001$ ).

A inclination of MMO to rise with stature or weight was recognizable, it were expected for each 11 cm or 11 kg, MMO increased by nearly 4.56 mm or 2.1 mm, correspondingly.

According to Table 2, there are positive partial correlation between neck circumference with physical activity, drug history, sleep abnormality, smoking, body mass index, fasting glucose and blood pressure. Partial correlation was designated as easier to abstract and not differentiate between exposure and result. Among those with high neck circumference 47.8% and physical activity compare with normal 55.2%, drug history (high) 39.6% with normal 46.6%, sleep abnormality (high) 30.1% with normal 39.5%, sleep breath abnormality (high) 58.4% with normal 69.7%, smoking (high) 15.4% with normal 21.4%, body mass index kg/m<sup>2</sup> (high) 46.3% with normal 37.8%, fasting glucose (%) (high) 84.9% with normal 86.4% and blood pressure (high) 66.2% with normal 53.7%.

Tab. 2. Mean ( $\pm$ S.D) of issue, MMO and neck circumference (mm) strength variables for the males and females issues.	Neck circumference			Maximum Mouth Opening MMO		
	Normal	High	P-value	Normal	High	p-value
Physical activity (%)	55.2	47.8	0.01	67.4	53.8	0.001
Drug history (%)	46.6	39.6	0.01	31.6	27.7	0.01
Sleep abnormality (%)	39.5	30.1	0.01	28.1	24.8	0.01
Sleep breath abnormality (%)	69.7	58.4	0.01	30.1	28.6	0.001
Smoking (%)	21.4	15.4	0.001	30.4	29.7	0.001
Body mass index kg/m <sup>2</sup>	37.8	46.3	0.001	59.9	62.9	0.001
Fasting glucose (%)	86.4	84.9	0.01	91.8	79.3	0.001
Blood pressure (%)	53.7	66.2	0.001	69.9	77.5	0.001
<b>Note:</b> P value <0.05 is measured statistically significant *Test practical: Independent T-test						

Also there are positive partial correlation between maximum mouth opening MMO with physical activity, drug history, sleep abnormality, smoking, body mass index, fasting glucose and blood pressure. Partial correlation were designated as easier to abstract and not differentiate between exposure and result. Among those with high maximum mouth opening MMO 53.8% and physical activity compare with normal 67.4%, drug history (high) 27.7% with normal 31.6%, sleep abnormality (high) 24.6% with normal 28.1%, sleep breath abnormality (high) 28.6% with normal 30.1%, smoking (high) 29.7% with normal 30.4%, body mass index kg/m<sup>2</sup> (high) 62.9% with normal 59.9%, fasting glucose (%) (high) 79.3% with normal 91.8% and blood pressure (high) 77.5% with normal 69.9%.

Among those with high neck circumference, 15.4% were current smokers compared to 21.4% in those with normal neck circumference. As expected, the group with high neck circumference had higher BMI [9].

## DISCUSSION

Our study protest the neck circumference were significantly correlated with measures of Maximum Mouth Opening (MMO) [10]. The neck circumference should be involved in guidelines and mentioned for considering obesity, mainly in circumstances when traditional anthropometric measures are not presented, useful, possible, or expressive [11-13].

Significantly, compared to the old-style anthropometric methods for example BMI, neck edge, the neck circumference revealed higher positive relations with Maximum Mouth Opening (MMO) [14]. As neck circumference seems to be moral measure without adjusting stature, as the relations were similar when careful factoring differences in height. On the other hand, Maximum Mouth Opening (MMO) is a simpler and more useful anthropometric parameter, not impeded by clothing or last meal. Our data demonstrations that, the neck circumference has a slighter correlation with BMI.

The correlation relating to both measures of neck circumference, maximum mouth opening (MMO) and other of sociodemographic measure are suggesting modest to weak correlation and highly positive to relating body mass index.

On other hand neck circumference and Maximum Mouth Opening (MMO) suggesting that might mediate the association with sleep breath abnormality independent of obesity.

The demonstration of body height were powerfully interrelated with MMO and Placko et al., create the MMO were more in high patient, irrespective of gender and oldness. Though, Ying et al., found a significant relationship between MMO and weight, but not between MMO and tallness. Gallagher, et al., and Reicheneder, et al., unsuccessful discovery a relationship among weight and MMO.

As with neck circumference and Maximum Mouth Opening (MMO) seems to be a good measure without adjusting for height, as the associations were similar when we considered factoring variations in height by using neck to height ratio. Neck circumference and Maximum Mouth Opening (MMO) should be included in guidelines and recommended for assessing obesity, especially in situations when the traditional anthropometric measures are not available, convenient, feasible, or meaningful. Our study adds to the evidence that it is well correlated with other anthropometric measures and may be a good marker.

## CONCLUSIONS

- Our conclusions revealed the neck border to definitely and individualistically related the mouth opening in the both genders.
- The neck boundary can be used as analytical pointer to trigger screening for the mouth opening. The neck circumference may be an essential measured be study the routine assessment to the chief precaution clinic and other medical precaution locations and for research educations that usage of expensive and sophisticated machines lab are neither easy nor acceptable.
- It may be principally useful between populations such as pregnant women wherever traditional measures may be challenging or not significant.
- Tendency for the MMO of males be significant more than females were understood steadily study. This can be abnormality in anatomy of head and face bone of the male are commonly more than that of females.
- The ages were significant analyst of MMO measurement. The MMO been revealed gradually growth subsequently birth and the adulthood, and formerly slowly decrease as aging advancements, which might be clarified the growth of the articular prominence of the TMJ, in addition to several morphological variations associated with trauma.
- The head point is also an significant influencing factors to

responsible MMO into the healthy adults. The perpendicular mandibular open important and sequentially diminished in advancing head positions.

- In our study the volunteers was positioned in upright and calm point to abolish the possible effect of dissimilar head and neck sites. Relationship among MMO and both height or weight are controversial.

## RECOMMENDATIONS

In this study, the conclusion of a height and weight require significant effects about the MMO of fit adults. The better sample size and the wider selection of ages must be reviewed in next study, with further causal factor, such as length, breadth, and angle of mandible to accept and decorative the results of the study.

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