

# A study of range of motion of neck in adult population of Western Rajasthan

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## Abstract

**Introduction:** The amount of motion available at a joint is known as range of motion.

**Background:** The purpose of the study was to predispose the effect of age and gender on movements of cervical spine in 100 normal subjects by the use of Goniometer.

**Materials and Method:** Study was carried out on 100 healthy subjects aged between 20-30 years. All the subjects having normal cervical spine were chosen and those who were not having any history of joint surgery, stress or any other type of abnormalities were included for determining the validity and reliability of the goniometric measurements.

**Result:** Females showed higher range of motion than male subjects except that of cervical flexion. Generally, females have a tendency to have larger range of motions, because of anatomical and physiological differences, like muscle mass size, geometry of joint and hormones.

**Conclusion:** A tendency existed for cervical ROM to decline with increasing age. The only exception is axial rotation which showed either same or it increases with age to compensate for an age related decrease in rotation in the lower cervical spine.

**Keywords:** Lateral flexion, Cervical spine, Flexion, Extension, Goniometer, Rotation.

## Introduction

The term Goniometry is termed as measurement of angles created at human joints it is used to describe both a peculiar joint position and the total amount of motion present at a joint. It is also used to accurately describe abnormal fixed joint positions. Osteokinematic mobility is described as taking place in one of three cardinal planes of body (sagittal, frontal and transverse) around three corresponding axes (medial-lateral, Ant-post and vertical).<sup>(1)</sup>

The cervical spine consists of certain joints. The Atlanto- occipital and Atlantoaxial joint are plane synovial joint. The motions allowed at the atlanto-occipital joint are flexion- extension in the sagittal plane around a medial-lateral axis and some rotation and lateral flexion. The median atlantoaxial joint is a synovial trochoid (pivot) joint, permitting rotation in the transverse plane around a vertical axis. The motions allowed at the three articulations are flexion-extension, lateral flexion and rotation.

There are total seven vertebrae in the cervical spine; the spinous processes lie at the level of the facets joints of the same vertebra. Mostly, the spinous process is absent or at least rudimentary on first cervical vertebra. This is why first palpable vertebra when we descend from the external occipital protuberance is the spinous process of second cervical vertebra.

Range of motion is the amount of motion available at a joint. The starting position for calculating all range of motion (ROM), except rotations in transverse plane is the Anatomical position. Three documentation systems have been used for defining ROM the 0 - to 180 - degree system, the 180 - to 0° system and the 360 - degree system. Firstly told by Silver<sup>(2)</sup> in 1923, its use was supported by many authorities.

The ROM at Atlantoaxial joint is affected by osteoarthritis, lateral instability, subluxation, torticollis. The type of motion available at a joint varies according to the structure of joint, sex and age.

Thus the determinants of Range of Motion are:-

- Shape of the Bone & cartilage
- Strength and Muscle tone
- Ligaments & joint capsule laxness
- Muscle Mass
- Subcutaneous tissue and Skin Flexibility
- Race (Indians are more mobile than Blacks, who are more mobile than Caucasians)
- Sex (women are more mobile than men)
- Age (Range of Motion decreases with age)
- Genetic make up

Day to day stresses on joints.

## Aim and Objectives

The objective of this study was to determine the effect of age and gender on movements of cervical spine in 100 normal subjects through the Universal Goniometer.

## Materials and Method

The study was conducted out on 100 healthy subjects aged between 20-30 years. All the subjects having normal cervical spine and not having any history of joint surgery, trauma or any type of abnormalities formed inclusion criteria of this study.

The subject's chosen for the study were checked out and validated for the following data-

- a. They are residents of Rajasthan.
- b. They have authentic documentation of their date of birth

**Goniometry:** The physical measurements of cervical spine for determination of range of motion were carried out on same individuals by use of Universal Goniometer by us.

**Materials:** Measurements were done by use of Universal Goniometer. The stationary arm is often adjusted parallel to the longitudinal axis of the proximal segment of the joint and the moving arm is adjusted parallel to the joint with distal segment.

#### Method

1. **Recommended testing motion:** It refers to body positioning which is recommended for obtaining Goniometric measurements.
2. **Stabilization required:** The recommended testing position which helps in stabilizing the subject's body and proximal joint being tested.
3. **Normal end feels:** Feeling, which is accomplished by an examiner as a blockade to extra motion at the end of a passive ROM is termed as end feel. It is normally three types soft, firm and hard.
4. **Anatomical bony landmarks** for Goniometric measurement:

These are as follows:

#### For Cervical Spine:-

##### a. Flexion

External Acoustic Meatus

Base of nare

##### b. Extension

External Acoustic Meatus

Base of nare

##### c. Lateral Flexion

Spine of C7 vertebra

Occipital protuberance

Imaginary line between mastoid process and acromion process.

##### d. Rotation

Imaginary line between two acromion process.

5. **Alignment of the Instrument:** Goniometer positioning implied to the positioning of the arms of the Goniometer with the proximal and distal segments of joint being assessed. Use of bony landmarks in conjunction with recommended testing positions should increase the accuracy and reliability of Goniometric measurement.

The following are the inclusion criteria:

1. Subject's name, age and gender.
2. Date of measurement
3. Type of Goniometer used
4. Body side, Motion & joint being assessed
5. Motion type being measured, may be active or passive
6. Any subjective knowledge, such as pain which is experienced by the subject during the testing procedure.

## Results and Discussion

The prevalence of neck pain among the adult population may vary from 6 to 50%. Estimates have shown that 67% of individuals suffer from neck pain at some time during their lives. Among children the estimates of neck pain complaints may range from 19% to 43%.<sup>(3)</sup> The present study was conducted on 100 participants (50 male and 50 females) volunteered for Goniometric study and their age group ranged between 20-30 years. The parameters observed were flexion, extension, right and left lateral flexion, left and right rotation regarded to cervical spine. Range, mean, standard deviation of all the parameters was calculated.

**Cervical Flexion:** In the present study the mean values of cervical flexion (Table 1) in age group (20 to 30 years) in males is  $50.6^\circ \pm 8.44$  and the range is from  $19^\circ$  to  $63^\circ$  in males. The mean values of cervical flexion in females are  $45.82^\circ \pm 7.87$  and the range is from  $30^\circ$  -  $55^\circ$  in females. American Medical Association (1988)<sup>(4)</sup> observed the mean values of cervical flexion as  $50^\circ$ .

**Cervical Extension:** In the present study the mean values of cervical extension (Table 1) in age group (20 to 30 years) in males is  $30.58^\circ \pm 9.82$  and the range is from  $15^\circ$  to  $45^\circ$  in males. The mean values of cervical extension in females are  $33.02^\circ \pm 8.60$  and the range is from  $20^\circ$  -  $55^\circ$  in females. American Medical Association (1988)<sup>(4)</sup> observed the mean values of cervical extension as  $60^\circ$ .

**Right Lateral Flexion:** In the present study the mean values of cervical right lateral flexion (Table 2) in age group (20 to 30 years) in males is  $34.92^\circ \pm 3.71$  and the range is from  $29^\circ$  to  $42^\circ$  in males. The mean values of cervical right lateral flexion in females are  $38.20^\circ \pm 3.59$  and the range is from  $32^\circ$  -  $45^\circ$  in females. American Medical Association (1988)<sup>(4)</sup> observed the mean values of cervical right lateral flexion as  $45^\circ$ .

**Left Lateral Flexion:** In the present study the mean values of cervical Left Lateral Flexion (Table 2) in age group (20 to 30 years) in males is  $30.66^\circ \pm 4.27$  and the range is from  $24^\circ$  to  $38^\circ$  in males. The mean values of cervical Left Lateral Flexion in females are  $36.38^\circ \pm 3.48$  and the range is from  $27^\circ$  -  $41^\circ$  in females. American Medical Association (1988)<sup>(4)</sup> observed the mean values of cervical Left Lateral Flexion as  $45^\circ$ .

**Left Rotation:** In the present study the mean values of cervical left rotation (Table 3) in age group (20 to 30 years) in males is  $70.96^\circ \pm 6.90$  and the range is from  $66^\circ$  -  $95^\circ$  in males. The mean values of cervical left rotation in females are  $75.3^\circ \pm 4.97$  and the range is from  $70^\circ$  -  $85^\circ$  in females. Youdas (1992)<sup>(5)</sup> in age interval 20-29 years in 20 males and 20 females suggested the value of mean values for left rotation to be  $69^\circ \pm 7$  in males and  $72^\circ \pm 6^\circ$  in females.

**Right Rotation:** In the present study the mean values of cervical right rotation (Table 3) in age group (20 to 30 years) in males is  $69.9^\circ \pm 6.37$  and the range is from  $61^\circ$  -  $87^\circ$  in males. The mean values of cervical right rotation in females are  $77.22^\circ \pm 5.85$  and the range is

from 70°-90° in females. **American Medical Association (1988)**<sup>(4)</sup> observed the mean values of right rotation to be 80°. **Lantz et al.**<sup>(6)</sup> in age group 20 to 39

years studied the right rotation and gave mean & SD values which were 72° ± 7.

**Table 1: Showing Cervical Flexion & Cervical Extension in age group 20-30 years**

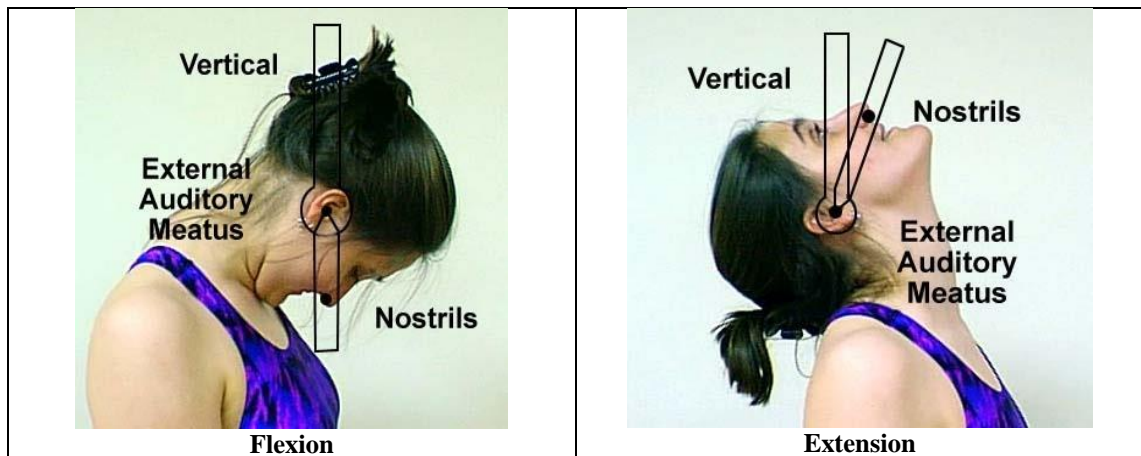
Motion	Measurements of Movement in Male (n= 50)			Measurements of Movement in Female (n= 50)		
	Range (in degree)	Mean (in degree)	SD	Range (in degree)	Mean (in degree)	SD
Cervical Flexion	19-63°	50.6 °	8.44	30-55 °	45.82 °	7.87
Cervical Extension	15-45 °	30.58 °	9.82	20-55 °	33.02 °	8.6

**Table 2: Showing Cervical Lateral Flexion in age group 20-30 years**

Motion		Measurements of Movement in Male(n= 50)			Measurements of Movement in Female(n= 50)		
		Range (in degree)	Mean (in degree)	SD	Range (in degree)	Mean (in degree)	SD
Cervical Lateral Flexion	Right	29-42 °	34.92 °	3.71	32-45 °	38.20 °	3.59
	Left	24-38 °	30.66 °	4.27	27-41 °	36.38 °	3.48

**Table 3: Showing Cervical Rotation in age group 20-30 years**

Motion		Measurements of Movement in Male (n= 50)			Measurements of Movement in Female(n= 50)		
		Range (in degree)	Mean (in degree)	SD	Range (in degree)	Mean (in degree)	SD
Cervical Rotation	Right	61-87 °	69.9 °	6.37	70-90 °	77.22 °	5.85
	Left	66-95 °	70.96 °	6.90	70-85 °	75.3 °	4.97





**Fig. 1: Showing Positions to Measure Flexion, Extension and Lateral Flexion & Rotation of the Cervical Spine<sup>(7)</sup>**

### Conclusion

On the basis of present study we can say that the range of motion is affected by various factors like age, gender, measuring method (goniometry), type of motion whether (passive or active) and clinically problems. Generally a predisposition existed for cervical ROM to decrease with increasing age. The only exclusion is axial rotation (which occurs primarily at the atlantoaxial joint) which has been reported either to stay the same or it increases with age to recompense for age related decrease in rotation in the lower cervical spine. Age may not justify for a large amount of variation in ROM but age presents a sound effect than gender.

### References

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