



## A Radiological Study Of Prevalence Of Cervical Ribs In Population Of Uttar Pradesh

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

### Abstract

#### Introduction:

Cervical Rib is expressed as an anomalous, super- numerary extra rib which arises from the seventh cervical vertebra.

Cervical rib is the costal element of seventh cervical vertebra perhaps a scanty epiphysis on its transverse process, but more frequently it consist of head,neck and tubercle. if a shaft is there, it is of variable length, expand antero-laterally into the posterior triangle of the neck, where it can end freely or attach the first rib or costal cartilage or sternum. It is usually fibrous in nature, however in some cases it can undergo ossification. (1) The axial skeleton layout is determined by "HOX GENE" and mutation within them are likely related to emerge of cervical ribs.

#### Method And Materials

This study was conducted in the department of anatomy IIMS&R Integral University Lucknow (U.P), after obtaining permission from Institutional research committee and ethical committee.

This study was conducted on 1082 cervical spine and chest X-rays for the presence of cervical ribs.

X-Ray films were collected from Radio Diagnosis Department of IIMS&R Integral University-Lucknow (U.P), Radio Diagnosis Department of National Capital Region Institute of Medical Sciences Meerut (U.P) and Ved Diagnostic Centre – Jaunpur (U.P).

#### Result-

This cross-sectional study shows that among total 1082 Cervical spine and Chest Radiographs analyzed, we have found 10 (0.92%) radiographs of cervical ribs presence.

Among 644 (59.52%) females cases analysed, we have found 7 (1.08%) cervical ribs cases which include: 1 (10%) bilateral, 4 (57.14%) unilateral right side and 2 (28.58%) unilateral left side.

Out of 438 (40.48%) male cases analysed, we have found 3 (0.68%) cervical ribs cases of unilateral right side only.

Only one (1) patient with bilateral cervical ribs was found out of 10 cervical ribs cases. Unilateral cervical ribs on right side were identified in 7 (70%) patients and unilateral cervical ribs on left side were identified in 2 (20%) patients' only. Therefore, this study indicates that the overall incidences of unilateral right side cervical ribs were more pronounced than the unilateral cervical ribs of left side.

#### Conclusion

The frequency of cervical ribs presence is around 0.92% with female predominance.

Unilateral right side cervical ribs are common as compared to the left side cervical ribs

In patients presenting symptoms of upper limb Ischemia and Paresthesia. The presence of cervical ribs should be ruled out. Although, the incidence is less than 1%.

**Keywords:** Prevaence,Cervical Ribs, Hox Gene Thoracic outlet syndrome(TOS)

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## Introduction

Cervical Rib is expressed as an anomalous, super-numerary extra rib which arises from the seventh cervical vertebra.

Cervical rib is the costal element of seventh cervical vertebra perhaps a scanty epiphysis on its transverse process, but more frequently it consist of head,neck and tubercle. if a shaft is there, it is of variable length, expand antero-laterally into the posterior triangle of the neck, where it can end freely or attach the first rib or costal cartilage or sternum. It is usually fibrous in nature, however in some cases it can undergo ossification. (1)

The axial skeleton layout is determined by “HOX GENE” and mutation within them are likely related to emerge of cervical ribs.

The ossification of the cervical rib resembles that of a standard cervical vertebra. Additionally during the sixth month of intrauterine life, each costal process has its own centre, which emerges with the body as the transverse process during the fifth to sixth year of life.

A cervical rib can develop from the costal element of the seventh cervical vertebra.

A cervical rib is an extra rib that arises from the seventh Cervical spine (C7) vertebra. Afterwards, it attaches to the first rib close to the location where the Scalenus anterior inserts If the cervical rib is more than 5 cm long, it mostly displaces the branchial plexus and sub-clavian artery upwards.(2).

Vertebral bones can be seen in parts. On each side, costo-transverse joints are visible due to significant amount of calcium they contain. Posterior portions of the rib are easier to observe. As they move anteriorly, the rib gets wider and thinner. If the cartilage are not calcified then they cannot be seen. (3)

Etiology of Cervical rib take place approximately 1% of the population. It causes symptoms only in 10% of cases. Symptoms are very rare in children, but are

most commonly seen in women in 3rd and 4th decades. Frequently, a well developed musculature make susceptible for compression. Females with long narrow necks can lead to few variations in anatomy of the head and neck. Gradual descending of the shoulder girdle may be from atrophy of the local musculature can cause onset of symptoms in the 2nd or 3rd decade.(4)

Pathological compression of the brachial plexus generally affects its lower trunk (C8 & T1) where the Ulnar nerve is mainly involved. Vascular features can be intermittent from compression or temporary occlusion of the sub-clavian artery.

Clinical Features of Thoracic outlet syndrome differ depending on the compression of either nerves or blood vessels or both. Preponderance of patients are middle-aged women. However, younger group can also be involved. Routinely, symptoms of compression on either nerves or blood vessels dominate.(4).

Neurological manifestation are numbness, paraesthesia and pain generally present in fingers and hands along ulnar nerve distribution. Pain is insidious on onset and generally distributed. It usually involves the neck, shoulder, arm, hand and fingers. It can even radiate to the anterior chest or posteriorly to the parascapular region. Numbness and paraesthesia are more precise distribution and mainly involve with the cutaneous skin supplied by C8 and T1 (ulnar nerve distribution). Subsequently neurologic deficits can develop in the form of motor weakness, sensory loss and atrophy.(4).

Vascular manifestations of arterial compression are seen less commonly in about 1/4th of cases. It consist of paraesthesia, numbness, pain, coldness and weakness of the arm or hand. These features are accentuated by exposure to cold and exercise. Distal end embolization may cause Reynaud's phenomenon, which in later cases can cause digital ulceration and

even gangrene. The venous features include pain, oedema, venous distension and cyanosis. (4)

### Differential Diagnosis Of The Thoracic Outlet Syndrome.

1. Cervical spondylosis
2. Protrusion of cervical disc
3. Compression of cervical cord
4. Brachial neuritis
5. Reynaud's phenomenon
6. Carpal-Tunnel Syndrome

### Aim & Objective

**Aim:-** Incidence of cervical ribs in Uttar Pradesh population.

### Objective:

1. To Study radiographs for the presence of cervical ribs.
2. To find out sexual dimorphism with respect to the occurrence of cervical ribs.
3. To find out if it is unilateral or bilateral
4. To compare the incidence with studies in other population groups.

### Method And Matirial

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Capital Region Institute of Medical Sciences Meerut (U.P) and Ved Diagnostic Centre – Jaunpur (U.P).

Each chest X-ray was placed on x-ray viewer to assess the presence or absence of cervical ribs (Fig.1).

The cervical ribs is attached to seventh cervical spine projected horizontally unlike the transverse process of the first thoracic vertebra which extends diagonally upwards from its point of origin.

A well-developed cervical rib must be separate but articulate with the transverse process of seventh cervical spine. If it is fused with the vertebra and longer than the first thoracic spine transverse process, it is classified as poorly developed or incomplete cervical ribs.

It has no connection with the manubrium sterni although it may form a bony fusion with the first rib thus distinguishing a cervical rib from rudimentary first rib.

The data will be tabulated and statistically analyzed.

### Inclusion Criteria

1. Radiographs of Cervical spine and chest X-rays
2. Radiographs of subjects belonging to Uttar Pradesh population.
3. Radiographs of subjects who are 25 years or more.

### Exclusion Criteria

Poor quality X-rays where ribs were not clearly visible.

**Fig – 1- Evaluation Of X – Ray Film**



**Fig – 2 Normal X – Ray Of Cervical Spine (AP View)**



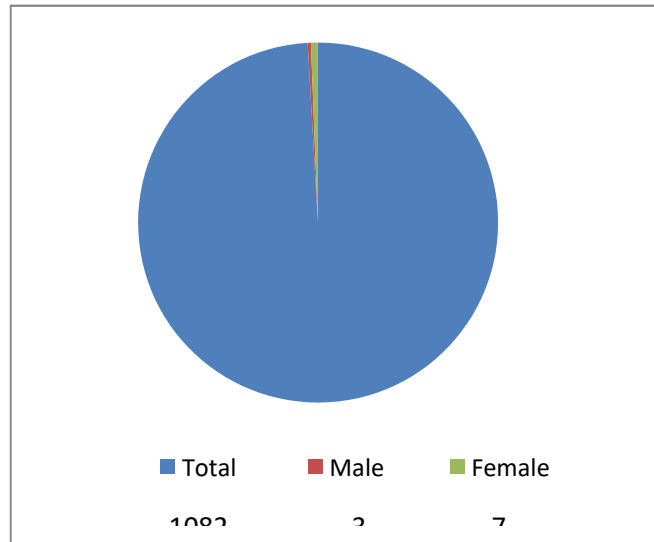
**Fig – 3 Normal X – Ray Of Chest (PA View)**

**Observation & Result**

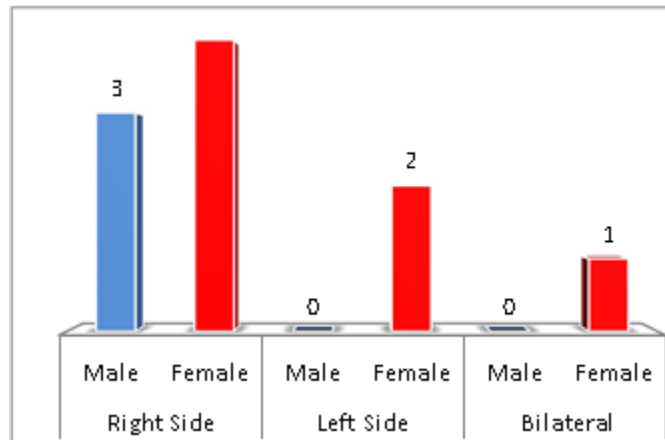
**Table-1: Incidence Of Cervical Ribs:-**

	Male (%)	Female (%)	Total (%)
X-Rays Studied	438 (40.48)	644 (59.52)	1082
Presence of Cervical ribs	3 (0.68)	7 (1.08)	10 (0.92)
Bilateral Cervical ribs	Nil	1 (10)	1
Unilateral Right side	3 (0.68)	4 (57.14)	7
Unilateral Left side	Nil	2 (28.58)	2

**FIG-4: Incidence Of Cervical Ribs**



**Fig. 5: Incidence Of Cervical Ribs In Male And Female.(Comparative)**



This cross-sectional study shows that among total 1082 Cervical spine and Chest Radiographs analyzed, we have found 10 (0.92%) radiographs of cervical ribs presence.

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Out of 438 (40.48%) male cases analysed, we have found 3 (0.68%) cervical ribs cases of unilateral right side only.

Only one (1) patient with bilateral cervical ribs was found out of 10 cervical ribs cases. Unilateral cervical ribs on right side were identified in 7 (70%) patients and unilateral cervical ribs on left side were identified in 2 (20%) patients' only. Therefore, this study indicates that the overall incidences of unilateral right side cervical ribs were more pronounced than the unilateral cervical ribs

**FIG- 6 X-ray cervical spine with right side cervical ribs**



**FIG- 8 X-ray cervical spine with bilateral cervical ribs**



**FIG- 7 X-ray Chest with left side cervical ribs**



**Table-2: Incidence of Cervical ribs in Indian Population**

Region	Author	Year	Percentage
Lucknow (U.P)	Antima Gupta et al	2012	0.60%
Raipur (Chattisgarh)	D.K Sharma et al	2014	1.22%
Pune (Maharashtra)	M.G Savgaonkar et al	2006	0.60%
Kashmir (J &K)	Mudassir Hamid Bhatt et al	2015	2.67%
Guwahati (Assam)	Sushant Agarwal et al	2018	0.79%
	Vathsala Venkatesan et al	2014	1.16%
Chennai (Tamilnadu)	Mallikarjun Ningappa Adibatti et al	2022	1.38%
Uttar Pradesh	Present Study	2022	0.92%

**Table-3: Incidence Cervical ribs in different population groups of the world:-**

Region / Country	Author	Year	Percentage
Malawian ( East Africa)	L.E. Ebite et al	2007	0.58%
Urhobo (Nigeria)	E.O Abimbola et al	2014	0.60%
Nigerian	C.C. Ani et al	2012	0.65%
London	J. Brewin et al	2009	0.74%
American	M.J. Walden et al	2013	1.2%
White American	V.G Viertel et al	2012	1.3%
Anatolian (Turkey)	I.N Gluekon et al	1999	3.0%
Saudi Arabian	R.F Bokhari et al	2012	3.4%
Turkish	E.Erken et al	2002	6.2%
Nepal	S Lalchand et al	2016	1.1%
Pakistan (Khyber Pakhtunkhwa)	Shazia Iftikhar et al	2020	0.38%

### Discussion

In the second century, while dissecting human cadavers “Galen” discovered the cervical rib for the first time. Cooper was the first to note the clinical features of cervical rib induced neurovascular compression. The seventh cervical vertebra is home to the abnormal or additional rib known as the cervical rib, which may only be an epiphysis on the transverse process. Cervical rib incidence can be unilateral or bilateral, more common in female on right side.(15).

The paraxial mesoderm gives rise to the skeletal system. On either side of neural tube , somites are produced by the mesoderm cell. The cells of the Sclerotome transform into mesenchymal cells and finally into ribs towards the conclusion of the fourth week of development. The evolution of the cervical rib in the ancestor of mammals is likely related to the Hox genes” that are responsible for patterning of the axial skeleton and mutation within them. The remaining portion of the transverse process is united with these small primitive ribs. (15)

To study the incidence of cervical ribs, a total of 1082 cervical spine and chest radiographs were studied which include 644 (59.52%) female and 438 (40.48%) males.

Out 1082 cases, 10 cases (around 0.92%) of cervical ribs were found which are less than 1% of the total studied cases. This study shows that the incidence of cervical ribs is more prominent in females as compared to male cases.

Out of 10 cases, bilateral cervical ribs are seen only in 1 (10%) case. The incidences of unilateral cervical ribs are more common. Its presence on right side was seen in 7 cases (around 70%) and on the left side in

2 cases (around 20%). This study shows that overall incidence of unilateral cervical ribs is more common than bilateral ribs.

The Comparison of previous Indian Studies (Table-2) have shown that the highest prevalence (around 2.67%) was reported among the Kashmiri population (Mudassir Hamid Bhatt et al.,2015) and lowest ( around 0.6%) in Uttar Pradesh (Antima Gupta et al.,2012) and Maharastra (Savgaonkar M.G et



al.2006). In Tamilnadu population, it is reported around 1.38% (Mallikarjun Ningappa Adibatti et al.,2022) and 1.16% (Vathasala Venkatesan et al.2014). In Chhatishgarh study, the incidence is reported around 1.22% (D.K Sharma et al). In assam population, the incidence of cervical ribs is reported around 0.79% (Sushant Agarwal et al.2018).

The Comparison of previous Foreign Studies have shown that the highest prevalence (6.2%) was reported in Turkish population (E. Erken et al, 2002), second highest (3.4%) in Saudi Arabian Population ( R.F Bokhari et al., 2012) and then Anatolian (Turkey) population (around 3%, I.N Gluekon et al., 1999). The incidence of cervical ribs in White American population is around 1.2% to 1.3% (V.G Viertel et al.,2012 and M.J Walden et al.,2013). Nepalese population has around 1.1% cervical ribs prevalence (S. Lalchand et al.,20`16).

The lowest prevalence (around 0.38%) of cervical ribs was reported in Pakistan (Khyber Pakhtunkhwa) Population (Shazia Iftikhar et al.,2020), second lowest (around 0.58%) in Malawian Southeastern Africa population (L.E Ebite et al.,2007). Around 0.60-0.65% cervoical ribs prevalence is reported in Nigeria population (E.M Abimbola et al.,2014, C.C Ani et al.,2012). In London population, the prevalence of cervical ribs is around 0.74% (J. Brewin et al.,2009).

In this study, the incidence of cervical ribs is found around 0.92% which is very similar to the Indian and foreign studies (Tables-2 and 3).

In most of the Indian and foreign studies, the prevalence of female cervical ribs have been reported more in male population. Our study also corroborates with similar prevalence of female cervical ribs as reported in different studies (Table-2 and 3). Some studies (Vathsala Venktesan et al. 2014, and D.K Sharma et al.2014) have reported Male cervical ribs prevalence.

The presence of right side unilateral cervical ribs were reported prominently by most of the authors (Table-2 and 3) as compared to the left side unilateral ribs. This study also shows similar prevalence of the unilateral right side cervical ribs. The presence of bilateral cervical ribs is not very common. However, some of the Indian studies have reported the presence of bilateral cervical ribs higher than the unilateral

cervical ribs (Antima Gupta et al. 2012, D.K Sharma et al,2014 , Sushant Aharwal et al.2018).

## Conclusion

1. The frequency of cervical ribs presence is around 0.92% with female predominance.
2. Unilateral right side cervical ribs are common as compared to the left side cervical ribs
3. In patients presenting symptoms of upper limb Ischemia and Paresthesia. The presence of cervical ribs should be ruled out. Although, the incidence is less than 1%.

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