

ORIGINAL ARTICLE

Factors Influencing Cervical Spondylosis

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ABSTRACT

Background: Cervical spondylosis is a degenerative disorder of cervical spine prevalent in our population. The disease advances insidiously that worsens with time. This study aims to highlight the factors influencing cervical spondylosis.

Methods: The present case control study was conducted at orthopedic OPD (Out Patient Department) and Radiology department of the Patel hospital from September 2018 to February 2019 after acquiring ethical approval from Ethical Review Committee (ERC) of Bahria University Medical and Dental College and Patel Hospital. The study enrolled 88 cases suffering from cervical spondylosis based on history and clinical examination and 88 controls i.e., healthy attendants. The radiography of cervical spine was used to assess degenerative changes of cervical spine. They were asked basic history entailing age, gender, working hours, nature of job, use of computers, mobiles. The independent t-test was used for comparison between these variables, and Fischer exact test and Chi square test was employed to find association between them.

Results: The study revealed a significant preponderance of females (56.8%) with shorter stature (159.14±8.88) in patients. There was a predilection for cases in outdoor workers (44.3%) and homemakers (43.2%) as well as increased working hours (73.9%). The mobile use had a significant impact (59.1%) on disease.

Conclusion: Considering factors like Middle Ages, females, short stature, obesity, outdoor workers and house workers with increased working hours and use of mobiles for more than 4 hours can influence development of cervical spondylosis. One can intervene in the progression of disease by adopting healthy lifestyle to prevent it.

Keywords: Cervical Spondylosis; Cervical Radiculopathy; Myelopathy; Neck Pain; Body Height; Spine.

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INTRODUCTION

The degenerative disorders of spine constitute one of the most common and devastating worldwide. They present as spondylosis and inflict damage to cervical spine in men as early as 20 years and in females at the age of 30 years¹.

Cervical spondylosis is the progressive degeneration at intervertebral disc, which is a common complaint in ageing population². It is the osteoarthritis of cervical spine and includes osteoarthritic changes occurring elsewhere in the body such as osteo-

phytes, intervertebral disc space narrowing, subchondral sclerosis, and subchondral cyst formation³. It presents commonly with either neck or back pain. It has a high prevalence and insidious onset therefore; it places a major burden on health care and is a crucial public health concern⁴. Nowadays modern technology and changes in ergonomics have also designated neck and shoulder area to be more prone for injury³.

The neck pain has also been linked to the usage of electronic gadgets such as tablets, mobile phones and laptops. A survey in Hong Kong revealed the

neck pain prevalence to be 17.3% to 67.8%⁵. Cervical spondylosis has been estimated to affect prevalence in middle age population as 3.3 cases per 1000 people⁶.

Cervical spondylosis is an umbrella term used for denoting degenerative process of cervical spine. It is the manifestation of clinical conditions compressing either cervical nerve roots or spinal cord as cervical radiculopathy or cervical myelopathy respectively, or as axial joint pain radiating to the medial scapula, chest, head and shoulder⁷. The factors predisposing for these degenerative diseases can be accounted due to a number of factors including anatomical features of cervical spine i.e., congenital canal stenosis, or biomechanics, such as improper posture, stress, sport or occupations⁸.

A number of imaging modalities have been employed to diagnose cervical spondylosis. X-rays are the easiest and approachable, cost effective modality, which can be used to examine cervical spine with less radiation dose as compared to MRI or CT scan. X-rays can easily evaluate vertebral dislocation, loss of lordotic curve, osteophytes and calcification⁹. Although, various studies have been conducted in Pakistan, but none has focused on exploring the factors, which are increasing its incidence in our society day by day. With this background, present study was designed to explore the

factors associated with cervical spondylosis in Pakistan.

METHODS

It was a case control study carried out after the ethical approval from ERC of Patel hospital and BUMDC (BUMDC ERC 45/2018). It enrolled 176 subjects, 88 cases and 88 controls between the ages of 25 to 75 years using convenient sampling. The study duration was of 6 months (September 2018 to February 2019) at orthopedic OPD and radiology department. The sample size was calculated by comparing two means and standard deviations of patient and control group taken from study¹⁰ on software G power 3.1.9.2. The margin of error was kept at 5% and confidence interval was set at 95%.

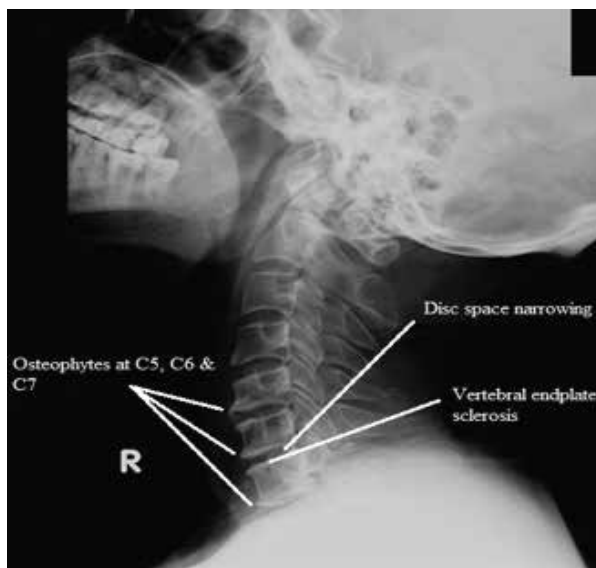
The written consent form was obtained by all the subjects, after explaining them the objectives of the study. The cases were diagnosed as cervical spondylosis based on, clinical examination and radiographic changes observed according to Kellgren-Lawrence Grade (Table 1). The controls were healthy attendants. The subjects with cervical rib, tumor, thyroid, parathyroid disorders, history of trauma to the neck, cervical surgeries, congenital anomalies of cervical vertebrae, pregnancy, or individuals below 25 years and over 75 years were excluded from the study.

Table 1: Kellgren-Lawrence Grading Scale.

Grade 0	No sign of degenerative disc disease
Grade 1	Minimal anterior osteophytes
Grade 2	Definite anterior osteophytes with possible narrowing of the disc space and some sclerosis of vertebral plates
Grade 3	Moderate narrowing of the disc space with definite sclerosis of vertebral plates and osteophytes
Grade 4	Severe narrowing of the disc space with definite sclerosis of vertebral plates and multiple large osteophytes

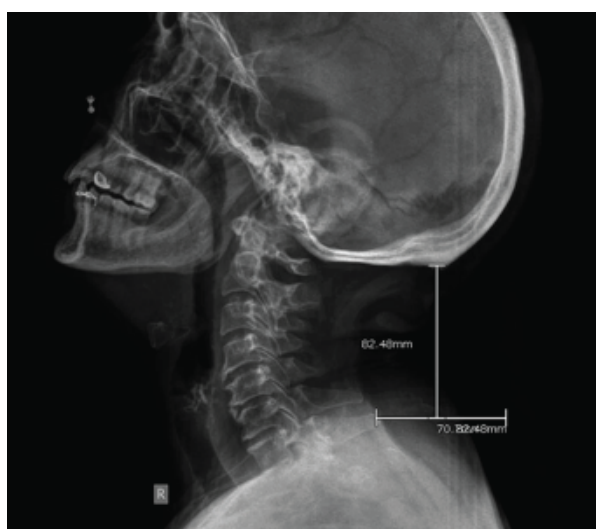
The principal investigator took the history, whereas orthopedic surgeon carried out the clinical examination. The weight and height was also calculated in orthopedic OPD with the help of stadiometer. The history included the age, trauma to neck, working hours, occupation and usage duration of mobiles and computers. The clinical examination conducted by the orthopedic surgeon included the Spurling maneuver, shoulder abduction test, Valsalva maneuver, tandem walking and cervical range of motion. All the

subjects underwent radiograph of the cervical spine, lateral view. The X-rays were taken in erect lateral position and the radiation exposure of 0.1mSv (millisievert) was given below the mastoid process at the level of thyroid cartilage with a focus to film distance of 100 cm by the same technician. The radiographs were processed with the help of Agfa Fuji CR-35X system to observe the radiographic changes in spondylotic patients. The radiographic changes were assessed according to Kellgren Lawrence scale⁶ (Table 1).



(a)

Figure 1a: Radiograph showing radiographic changes at radiology department, Patel Hospital, Karachi (2018-2019).



(b)

Figure 1b: Radiograph of a case-showing grade 3 degenerative changes (KL scale) radiology department, Patel Hospital, Karachi (2018-2019).



(c)

Figure 1c: Radiograph of a control showing no degenerative changes radiology department, Patel Hospital, Karachi (2018-2019).

A senior radiologist assessed all the radiographs. The radiographic changes ranged from grade 0 to grade 4 (Table 1) (Figure 1a). The principal investigator recorded the history, clinical examination and radiographic changes observed in lateral X-rays of cervical spine. The SPSS (Statistical Package for Social Sciences) version 23.0 was employed for statistical analysis of data. p-value less than 0.05 were implied statistically significant. The radiographs of case and control are shown in Figure 1b and Figure 1c.

RESULTS

The present study included 176 subjects out of which 88 were cases and 88 were healthy controls. Among 88 cases, there were 38 males and 50 females while the controls were 35 males and 53 females. The cases reported a mean height of 163.31 ± 9.88 cm and controls were found to have a mean height of 166.22 ± 9.07 cm. There was a prevalence of shorter height in cervical spondylotic patients as compared to the controls with a statistically significant difference. The disease was found to be common between the ages of 41-60 years and had a predilection for female population, outdoor workers and homemakers. There was a significant preponderance of pre-obese and obese cases. The mean height in males and females was found to be 168.81 ± 8.42 cm and 159.14 ± 8.88 cm respectively (Table 2).

Table 2: Personal characteristics in cases and controls.

Variables	Cases (n=88) Mean±S.D	Controls (n=88) Mean±S.D	p-value
Height (cm)	163.31±9.88	166.22±9.07	0.044**
Height vs. Gender			
i. Male	168.81±8.42		0.000**
ii. Female	159.14±8.88		
Weight (kg)	69.62±11.2	66.64±12.44	0.097*
Weight vs. Gender			
i. Male	73.94±11.93		0.001**
ii. Female	66.34±9.49		
BMI (kg/m²)			
Underweight	1 (1.1%)	5 (5.7%)	0.003* [€]
Healthy range	32 (36.4%)	49 (55.7%)	
Pre- obese	41 (46.6%)	27 (30.7%)	
Obese class I	14 (15.9%)	6 (6.8%)	
Obese class II	0 (0.0%)	1 (1.1%)	

Gender			
Male	38(43.2%)	35(39.8%)	0.76 [¥]
Female	50(56.8%)	53(60.2%)	
Age (years)			
<=30	4(4.5%)	40(45.5%)	0.000 [€]
31-40	14(15.9%)	22(25.0%)	
41-50	21(23.9%)	15(17.0%)	
51-60	22(25.0%)	8(9.1%)	
61-70	16(18.2%)	3(3.4%)	
71-75	11(12.5%)	0(0.0%)	
Occupation			
Outdoor workers	39 (44.3%)	48 (54.5%)	0.002 [€]
Manual Labors	3 (3.4%)	1 (1.1%)	

p-value ≤ 0.05 * denoted as statistically significant difference, Test utilized: Fisher exact test [€], T-independent test [¥], BMI²⁶:Underweight<18.49 kg/m², healthy 18.5–24.9 kg/m², pre-obese 25–29.9 kg/m², obese class I 30–34.9 kg/m², obese class II 35–39.9 kg/m² and obese class III ≥ 40 kg/m².

The increased working hours and longer duration of mobile use i.e., greater than 4 hours were the lifestyle factors common in cases (Table 3). The degenerative findings were most severely apparent in the later age ranges (Table 4).

Table 3: Lifestyle Factors in Cases and Controls.

Work hours	Cases (n=88)	Controls (n=88)	p-value
Less than 8 hours	23 (26.1%)	65 (73.9%)	0.000 * £
More than 8 hours	65 (73.9%)	23 (26.1%)	
Computer use			
No use	53 (60.2%)	30 (34.1%)	0.030 * £
Less than 4 hours	18 (20.5%)	42 (47.7%)	
More than 4 hours	17 (19.3%)	16 (18.2%)	
Mobile use			
No use	18 (20.5%)	11 (12.5%)	0.000 * £
Less than 4 hours	18 (20.5%)	49 (55.7%)	
More than 4 hours	52 (59.1%)	28 (31.8%)	

Test utilized Chi square test [£] p-value ≤ 0.05 * denoted as statistically significant difference

Table 4: Degenerative Changes in Cases with relation to age.

Age (years)	Radiographic Changes			p-V alue
	Grade 1 degenerative changes	Grade 2 degenerative changes	Grade 3 degenerative changes	
< 30	1 (2.9%)	3 (7.10%)	0 (0.00%)	0.000* €
31 -40	10 (29.4%)	4 (9.50 %)	0 (0.00%)	
41 -50	8 (23.5%)	12 (28.6%)	1 (8.3%)	
51 -60	8 (23.5%)	11 (26.2%)	3 (25%)	
61 -70	5 (14.7%)	8 (19.0%)	3 (25%)	
71 -75	2 (5.90%)	4 (9.50%)	5 (41.7%)	

p-value $\leq 0.05^*$ denoted as statistically significant difference, Test utilized: Fisher exact test €.

DISCUSSION

The present study depicted a number of factors in the cervical spondylosis namely short stature, middle age, females, increased Body Mass Index (BMI), homemakers and outdoor workers, and exaggerated use of mobile phones. The disease is manifested radiologically by reduced intervertebral disc space and marginal osteophytes formation. The osteophytes compress posteriorly into the spinal canal and into the intervertebral foramina laterally. In long-term cases, compression of the spinal cord can lead to its permanent damage including necrosis and demyelination of grey matter¹¹.

The data regarding height is different due to different ethnicities within a population. The present study observed the changes in height and correlated it with the disease and other demographics like age, gender and lifestyle factors. The present study demonstrated shorter height to be prevalent in cases and it was in accordance with other studies which reported shorter height in cervical spondylotic patients^{10,11}. The association of shorter height with cervical spondylosis could be explained by the fact that the Dural tube's transverse area, and likewise spinal canal and spinal cord were directly proportional to the height i.e., shorter height is more prone for the compression of the spinal cord¹².

There was a significant predilection for shorter height in females. Nagata and colleagues reported height, weight and BMI to be significantly higher in men as compared to women¹³. The age ranges most commonly affected by the cervical spondylosis were 40-60 years. These results were in accordance with study^{14,15} who reported the incidence of disease with increasing ages. The contradictory results were reported by other studies which found that the disease was more common in

younger generations i.e., 20-30 years^{16,17}. In the present study, the disease was common in middle age population, which can be justified by the fact that osteoarthritic changes at cervical spine start appearing in the middle age and they accelerate the degeneration process.

The BMI was also compared within cases and controls and it was found that the cases showed a predilection for pre-obesity and class 1 obesity. Sheng reported preponderance of obese population in the affected individuals similar to the results of present study¹⁸. However, results of another study were not in accordance with the present study, as they demonstrated no association of increased BMI with cervical spondylosis¹⁹. The results of present study can be explained by the fact that the increased weight might lead to acceleration in degeneration process of intervertebral disc as observed in research by Ogrenci²⁰.

A few studies have compared occupation and its influence on causing cervical spondylosis. There was increased incidence of disease in head load carriers and farmers^{21,22}. The present study demonstrated disease in outdoor workers and home makers. Another study reported similar finding delineating house intensity work to be a factor causing cervical spondylosis⁸. There were no head load carriers in the present study as it was conducted at a private hospital. There was a significant association of increased working hours in the affected population delineating it as a factor in causing spondylosis. A study also reported impact of increased workload with neck pain²³. The present study reported no association of computer use with the disease as there were more non users as compared to users. Other researchers observed significant association of computer use and cervical spondylosis^{3, 24}.

There was a significant mobile use in cases as compared to the controls highlighting mobile usage as a causal factor. The result was further supported by Jung et al., which also mentioned that breathing problems and improper posture was more in mobile users²⁵. The forward head posture disrupts the normal sagittal alignment making cervical spine more prone to the degenerative process of cervical spondylosis. On comparison of degenerative changes within spondylotic patients, it was found that there was a positive association of degenerative changes with age, which was in agreement with another study⁶. The severe degenerative changes were most evident in the later age ranges while younger age ranges showed least degeneration.

CONCLUSION

The study reported that the females, age ranges of 41-60 years, and obesity was more prone to cervical spondylosis. The occupations most inflicted were homemakers and outdoor workers with longer working hours and frequent usage of mobile phones. The degenerative changes were also severe in the middle ages. This knowledge should be communicated to the health care professionals that they could advise short height individuals, especially females to take precautions before the onset of the disease. The present study should also be carried out in multiple hospitals to assess the prevalence of disease and to find data that are more concrete on its association with different risk factors.

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CONFLICT OF INTEREST

The authors bear no conflict of interest.

ETHICS APPROVAL

The ethical approval was obtained from Ethical Review Committee of Patel Hospital (Approval form no 57) and BUMDC ERC 45/2018.

PATIENT CONSENT

A written informed consent was taken from all patients and controls.

AUTHORS' CONTRIBUTION

SBA conceived idea, did data collection and wrote down the manuscript, AQ supervised and finalized the manuscript, IR, ASN and MFS helped in literature

search and writing of the manuscript. Furthermore, SF helped in the critical review and editing of the manuscript.

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