RESEARCH ARTICLE

A comparative study to assess thoracic kyphotic index in adults with and without mechanical neck pain

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Abstract

Objective: To assess thoracic kyphotic index in adults, and to find out the correlation between Neck Disability Index and Thoracic Kyphotic Index.

Method: The analytical cross-sectional study was conducted from October 2020 to January 2021 at the Shifa Tameer-e-Millat University, Islamabad, Pakistan, and comprised adults aged 18-35 years. Those with neck pain formed group A, while those without neck pain formed group B. The Numeric Pain Rating Scale and the Neck Disability Index were used to measure mechanical neck pain, while the Thoracic Kyphotic Index value was measured using a flexicurve ruler. Data was analyzed using SPSS 24.

Results: Of the 74 subjects, 37(50%) were in each of the two groups. There were 19 (51.40%) females and 18(48.60%) males in group A, while in group B there were 18(48.60%) females and 19(51.40%) males. The overall mean age of the sample was 23.35±3.31 years. Group A showed higher Thoracic Kyphotic Index value than group B (p=0.0001). The Neck Disability Index showed negative weak (r=-0.18, p=0.28) correlation with Thoracic Kyphotic Index in group B and moderate positive correlation (r=0.33, p=0.04) in group A.

Conclusion: Higher Thoracic Kyphotic Index value was found among adults with mechanical neck pain compared to healthy adults.

Keywords: Cross-sectional study, Female, Male, Neck pain, Pakistan, Young adult. (JPMA 73: 781; 2023)

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Introduction

Neck pain is the second most common musculoskeletal condition. Its prevalence in adults ranges from 16.7% to 75.1%.[1] In females, there is higher thoracic kyphosis compared to the males, which increases with age.[2] Mechanical neck pain can be reproducible by movement, by maintaining a posture for prolonged time, or by palpating the cervical tissue.[3] There are many environmental and psychological factors that affect the onset of neck pain.[4] The Neck Disability Index (NDI) is a commonly used, reliable and valid instrument for measuring and assessing neck pain.[5,6] Thoracic kyphosis is the primary curve and it consists of 12 thoracic vertebrae. Cervical and thoracic spines are biomechanically interrelated. The thoracic region acts as a base of the cervical region as it alters the cervical motion via a cervicothoracic junction. In 2018, a study concluded that kyphosis could alter the austerity of neck pain and could reduce neck movement.[7] Any mechanical dysfunctions in the thoracic region will affect cervical spine and vice versa.[8] It also affects weight-bearing, and the rigidity of curves may produce compensatory movements in these regions.[9]

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A posture is said to be ideal when there is alignment between the external auditory meatus and the vertical postural line. An ideal posture is the one that imposes less stress on joints.[10] A significant association between thoracic kyphosis and postural changes has been reported.[8] A large number of methods have been used to assess posture, but the flexicurve ruler has advantages over other methods as it is a non-radiological, inexpensive, convenient and quick method to assess thoracic kyphosis., and has been shown to have a strong correlation with the gold standard radiographic method.[11-14]

The current study was planned to assess the correlation between NDI and the Thoracic Kyphotic Index (TKI) in adults with and without mechanical neck pain.

Patients and Methods

The analytical cross-sectional study was conducted from October 2020 to January 2021 at the Shifa Tameer-e-Millat University, Islamabad, Pakistan. After approval from the institutional ethics review committee, the sample size was calculated using G-Power while keeping the mean value of thoracic kyphotic curvature in line with literature with effect size 0.8 and power of study 0.95.[15]

The sample was raised using convenience non-probability sampling technique. Those included were individuals of either gender aged 18-35 years with or without mechanical

neck pain. Those with any congenital spinal deformity, traumatic injury, functional or structural scoliosis or any underlying spinal pathology and history of spinal surgery were excluded. Those with neck pain formed group A, while those without neck pain formed group B.

After taking informed consent from the subjects, demographic details were noted using a self-structured questionnaire. Numeric Pain Rating Scale (NPRS) and NDI were used to measure the pain, while TKI value was measured using a flexicurve ruler. NPRS is a unidirectional measure of pain intensity with high test reliability (r= 0.96-0.95) and construct validity (0.86-0.95).[16]

The participants were asked to rate the disability of neck pain using NDI which consists of 10 items, and each item is scored on a scale of 0-5, with total score ranging 0-50. It is expressed in percentage terms which is then classified into 4 grades; grades 0-4 = lack of disability, 5-15 = mild disability, 15-24 = moderate disability, 25=34 = severe disability, and >35 = complete disability.[17]

Measuring thoracic kyphosis with flexicurve ruler is one of the oldest methods that is widely used. Flexicurve ruler is strip of lead which is covered with plastic. It can be moulded into different shapes and it keeps that shape intact. During the assessment of TKI, flexicurve was used and the spinous processes of the participants were palpated from T1 to T12, and stickers of different colours were used to mark the spinous landmarks (Figures 1-2). The subjects were asked to stand in the normal posture, as tall as possible, and the flexicurve ruler was kept aligned to the anterior-posterior curve of thoracic spine (spinal landmarks). The curve obtained was placed on a white A4 size paper. Then a straight line was drawn joining the two tips of the curve, and another line was drawn perpendicular from the highest point in the curve intersecting the straight line.

Figure-1: A participant with stickers at T1 and T12 spinous process.

Figure-2: Thoracic Kyphotic Index (TKI) was measured using flexicurve ruler.

TKI was calculated using the formula: height /length *100.[18]

Height (cm) ÷ Length (cm) × 100

Data was analyzed using SPSS 24. Age, gender, body mass index (BMI), NPRS, NDI and TKI values were expressed as mean and standard deviation. Independent t test was used to find out the difference of TKI value between the groups. P<0.05 was considered statistically significant.

Results

Of the 90 individuals screened, 37(41%) had mechanical neck pain. To keep the number of participants, equal in both groups, as many healthy subjects were enrolled. The final study sample comprised 74 participants; 37(50%) in each of the two groups. There were 19 (51.40%) females and 18(48.60%) males in group A, while in group B there were 18(48.60%) females and 19(51.40%) males. The overall mean age of the sample was 23.35±3.31 years (Table 1).

With respect to BMI categories, 16(21.6%) subjects were underweight, 40(54.1%) were healthy, 14(18.9%) were overweight and 4(5.4%) were obese. The NDI categories of the participants were also worked out (Figure 3). Group A showed higher TKI value than group B (p=0.0001). The NDI showed negative weak (r=-0.18, p=0.28) correlation with TKI in group B and moderate positive correlation (r=0.33, p=0.04) in group A (Table 2).

Table-1: Study variables.

Variables	NG (Mean±SD)	MNPG (Mean±SD)
Mean Age (years)	22.89±3.42	23.81±3.71
BMI (km/m^2)	22.71±4.53	22.06±4.05
TKI (º)	10.85±2.61	14.01±4.32
NPRS	0±0	4.49±2.23
NDI	3.51±3.30	11.95±5.75

SD: Standard deviation. NG: Normal group; MNPG: Mechanical neck pain group; BMI: Body mass index; TKI: Thoracic kyphotic index; NPRS: Numeric pain rating scale; NDI: Neck disability index.

Table-2: Correlation coefficient of Neck Disability Index (NDI) with Thoracic Kyphotic Index (TKI) of normal and mechanical neck pain groups.

Group	Test	Thoracic Kyphotic Index T1-T12	Neck Disability Index (%)	Mean±SD	*p*-value
Normal Group	Independent sample t test			10.58º±2.61	0.000
	Pearson Correlation	1	-0.18		0.28
Mechanical Neck Pain Group	Independent sample t test			14.01º±4.32	0.000
	Pearson Correlation	1	0.33		0.04

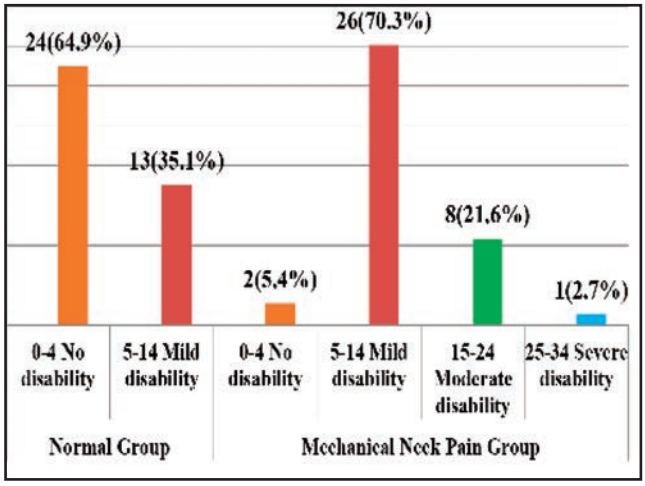

Figure-3: Neck Disability Index (NDI) categories in study groups.

Discussion

The study revealed that adults with mechanical neck pain had significantly higher TKI compared to normal healthy adults. Adults with higher TKI were more prone to neck pain.

A study in 2020 showed there was a significant difference in thoracic kyphotic curvature between subjects with and without chronic neck pain, and the thoracic kyphotic curvature was related to NDI.[15] Similar findings have been reported by the current study.

There was correlation between thoracic spine posture and neck disability, indicating that therapists should be aware of the association between thoracic spine and pain. A detailed assessment of thoracic spine posture is endorsed in mechanical neck pain patients.[12,14]

The current results revealed significant positive correlation between NDI and TKI of mechanical neck pain group and a negative correlation between NDI and TKI of normal healthy adults. A significant relation between degree of hyper kyphosis and neck pain and dorsal hyper kyphosis could influence the intensity of pain and could reduce the neck movement in the extension range of motion (ROM).[7]

A study in 2019 concluded that there was association between kyphosis and postural changes, and recommended that in mechanical neck pain patients, thoracic spine examination and intervention should be done.[8]

The current study found that adults with higher TKI were more prone to mechanical neck pain, and assessment of the thoracic spine is essential in such cases. The finding is in line with an earlier study.[19]

The current study has limitations because even a slight posture variation by the subjects at the time of assessment may have resulted in a measurement error irrespective of the strict protocol. Also, the sample represents a limited geographical area, limiting the generalisability of the findings.

Conclusion

Adults with mechanical neck pain had higher thoracic kyphotic index compared to normal healthy adults. Higher TKI was associated with increase in disability in adults with mechanical neck pain.

Disclaimer: The text is based on an academic project.

Conflict of Interest: None.

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