

## ORIGINAL ARTICLE

**RELATIONSHIP OF ROUNDED SHOULDER POSTURE WITH PEAK EXPIRATORY FLOW RATE IN UNDERGRADUATE MEDICAL STUDENTS HAVING MECHANICAL NECK PAIN**

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**ABSTRACT**

**Introduction:** Undergraduate medical and allied health sciences students spend a large part of their day studying in numerous wrong positions for a prolonged time. This leads to the development of back discomfort and may affect the structural development of the spine. Lack of focus on posture, giving too little time to physical activity and mental stress have been reported to cause musculoskeletal problems such as Rounded Shoulder Posture (RSP) and Mechanical Neck Pain (MNP). RSP causes a decrease in lung compliance, affecting Peak Expiratory Flow Rate (PEFR).

**Material & Methods:** A cross-sectional study was conducted on undergraduate medical students with a sample size of 218 where 113 were females and 105 were male. Two questionnaires were used, Northwick Park Neck pain questionnaire (NPQ), for checking the level of neck disability and pain, and a self-structured questionnaire where general questions were asked and values of RSP and PEFR were noted. The degree of RSP was checked through the vernier caliper manually whereas PEFR was calculated by taking the meaning of three values taken from each participant through flow meter. Ethical approval for the study was granted by Institutional Review Board and Ethical Committee of Alliance Healthcare, under approval number IRB&EC/2023-HIS/057.

**Results:** In the study, Pearson correlation test showed that the RSP is associated with PEFR in participants having MNP. Mean and standard deviation of Rounded Shoulder Posture was  $8.33 \pm 1.75$  cm and PEFR was  $265.11 \pm 112.11$  L/min. The test showed that the P-value was  $<0.01$  and R-value was 0.239. The significance is  $<0.01$  which showed that there was correlation between RSP and PEFR. whereas when we applied the same test on participants having only MNP with PEFR, no significance ( $<0.426$ ) was seen.

**Conclusion:** The study concluded that there is a relationship of RSP with PEFR, as the severity of abnormal posture and the degree of rounded shoulders increase, there is a significant decrease in expiratory flow levels.

**Keywords:** Mechanical Neck Pain, Peak Expiratory Flow Rate, Rounded Shoulder Posture

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## INTRODUCTION

Undergraduate medical students spend a large part of their day studying in numerous wrong positions for a prolonged time, and there is little possibility for changes, of which they are unaware.<sup>1</sup> Posture is a position in which the body must be held to stay upright, balancing the effects of gravity through muscular interaction.<sup>2</sup> Long duration of incorrect sitting leads to the development of back discomfort and long-term poor posture may affect the structural development of the spine.<sup>3</sup> Ergonomic correct positioning while performing tasks is a major focus but mainly it is ignored.<sup>4</sup> In recent research it was found that less than 20% students could find the correct chair/desk combination.<sup>1</sup> Most students use chairs with seats that were either too low or too high.<sup>5</sup> Correct posture is the one that keeps joints and bones in alignment to each other.<sup>6</sup> It is important for the students to make themselves physically correct as today's school pupils are tomorrow's adult workers.<sup>7</sup> Poor posture can lead to musculoskeletal issues, depression, and cardiovascular health issues.<sup>8</sup> Due to functional changes associated with lack of postural awareness, poor occupational ergonomics and muscular imbalances can cause increased thoracic kyphosis.<sup>9</sup> Making regular changes to the posture can prevent neck and back pain. If improvements were made to the ergonomics it will improve circulation and spinal alignment as well as decrease pressure on abdominal cavity and diaphragm.<sup>10</sup> Changing posture is a feature of comfortable posture.<sup>11</sup> Rounded shoulder posture and forward head posture are two of the main postural misalignments which are caused by muscular imbalance leading to variety of pain patterns in shoulder and neck.<sup>12</sup> Slumped posture has a significant effect on lung capacities, semi-upright sitting has large variations in inspiratory and expiratory pressures as compared to upright sitting.<sup>13</sup> The ability of muscle fiber to develop length-tension relationship, is affected by the length of muscle. Therefore, it is supposed that the change in rib cage may alter this, consequently decreasing the rate and depth of breathing.<sup>12</sup> Abnormal breathing is

caused in students having forward head posture and rounded shoulder due to weakening of respiratory muscles which decreases vital capacity, total vital capacity, gas partial pressure because the normal expansion of lungs is difficult.<sup>14</sup> Some exercises can be done to alter respiratory muscle function, these are, pursed lip breathing, active expiration and yoga.<sup>15</sup> An effective method of respiratory physiotherapy in the rehabilitation of pulmonary diseases is breathing exercises to be done in the supervision of physiotherapists.<sup>16</sup> Research done in 2023 stated that diaphragmatic release techniques also help in improving chest expansion and neck pain.<sup>17</sup> The aim of our study was to determine the relationship between Rounded Shoulder Posture on Peak Expiratory Flow Rate in Undergraduate Medical Students having Mechanical neck pain. The goal of our study was to find any effect of rounded shoulder posture on expiratory flow rate in young adults. If the effect of rounded shoulders on PEFR is verified it will make students understand to modify their lifestyle, take proper breaks in their study hours, make their studying place accordingly to avoid rounded shoulders, perform breathing exercise regularly to normalize peak expiratory flow rate. To spread awareness among the undergraduate students that adaptation of adequate body behaviors and postural habits must be shaped during early age to minimize postural disorders and their consequences in late adult life.

## MATERIAL AND METHODS

This was a comparative cross-sectional study conducted at Northwest Institute of Health Sciences and Northwest School of Medicine Peshawar, from April 2023 to October 2023. Targeted sample size was 218, calculated by open Epi calculator with a 95% of confidence interval. Total sample size was 218 including 113 females and 105 males, recruited using purposive sampling technique. The known cases of metabolic disorders, hypertensive, peripheral and central nervous system disorders and disc prolapse, and spinal injury were excluded. The data was collected after approval from ethical committee of the

Northwest Institute of Health Sciences, Peshawar, Pakistan. Before starting the short survey, the introduction was given to participants, and they were asked to fill it in according to the instructions given. The data was collected through specified questionnaires, Northwick Park Neck pain questionnaire (NPQ) used for Mechanical neck pain, Self-Structured Questionnaire, Vernier Caliper for Rounded Shoulder and Peak Flow Meter to measure Peak Expiratory Flow Rate.

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 29. Descriptive statistics, such as frequencies and percentages were calculated for categorical variables. Pearson correlation tests were used to explore the relationship between RSP and

PEFR, and results were presented in the form of tables, graphs and charts.

**RESULTS**

**Demographic Data:**

Total 218 undergraduate medical students in which 98 (44.9%) participants were taken from Northwest school of medicine and 120 (55.04%) from Northwest Institute of health sciences. The mean age was 18-25 years. TABLE 1 shows that in total of 218 the majority of participants were female, 113 and 105 male participated accounting for 51.8% and 48.2% respectively. BMI was also checked in which most were healthy 160 (73.4%), 24 (11.0%) were underweight, overweight 33 (15.1%) and only 1 (0.5%) was obese.

**Table 1: Showing Frequency and Percentages of Demographics**

Variables		Frequency	Percentage
Gender	Male	105	48.2%
	Female	113	51.8%
BMI	Underweight	24	11.0%
	Healthy	160	73.4%
	Overweight	33	15.1%
	Obese	1	0.5%

Table 2 shows correlation between Rounded Shoulder Posture and Peak expiratory flow rate, Mean and standard deviation of Rounded Shoulder Posture is 8.33±1.75 and PEFR is 265.11 ±112.11. Pearson correlation is used for relationship of Rounded Shoulder with PEFR in which P and r values are found,

where P-value shows association and R-value shows level of association whether it's strong, weak, or negligible. P-value is <0.01 and R-value is 0.239. The significance is <0.01 which shows there is correlation between RSP and PEFR.

**Table 2: Correlation of Rounded Shoulder Posture with Peak Expiratory Flow Rate**

		Rounded Shoulder	PEFR
Rounded Shoulder	Pearson Correlation	1	.239**
	Sig. (2-tailed)		.000
	N	218	218
Peak expiratory flow rate	Pearson Correlation	.239**	1
	Sig. (2-tailed)	.000	
	N	218	218

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows correlation between Mechanical neck pain and PEFR where, Mean, and standard deviation of Mechanical Neck Pain is 20.46±1.75 and PEFR is 265.11

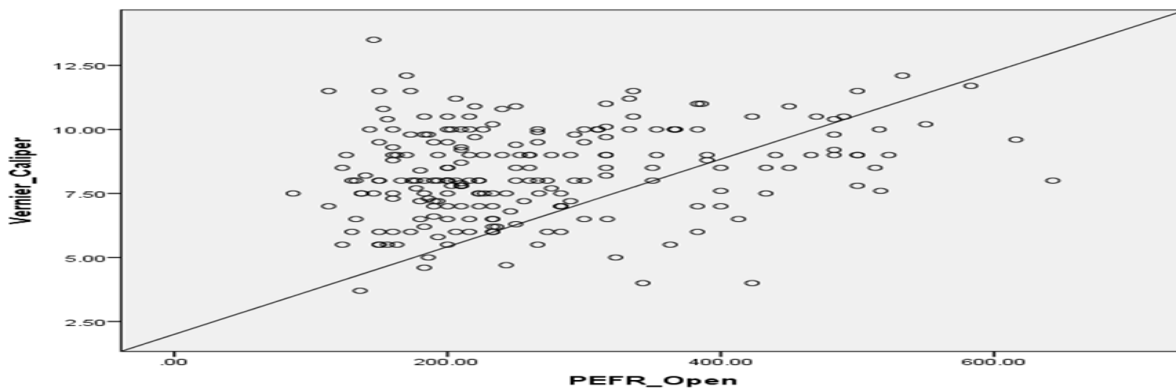
±112.11. Pearson correlation is used for relationship of Mechanical Neck Pain with PEFR in which P and r values are found, where P-value shows association and R-value

shows level of association whether it's strong, weak, or negligible. P-value is <0.426 and R-value is 0.054. The significance is <0.426

which shows there is no correlation between MNP and PEF.

**Table 3: Correlation of Mechanic Neck Pain with Peak Expiratory Flow Rate**

		Mechanical Neck Pain	PEFR
Mechanical Neck Pain	Pearson Correlation	1	.054
	Sig. (2-tailed)		.426
	N	218	218
Peak Expiratory Flow Rate	Pearson Correlation	.054	1
	Sig. (2-tailed)	.426	
	N	218	218



**Figure1: Shows Graphical View of Association of Rounded Shoulder with PEFR**

**DISCUSSION**

The aim of our study was to find the relationship of Rounded Shoulder Posture with Peak Expiratory Flow Rate in medical students having Mechanical Neck Pain. The results of a study by Pearson Correlation revealed that there was a significant positive correlation of Rounded Shoulder Posture with Peak Expiratory Flow Rate. This correlation seems important clinically because it provides evidence that those participants with Rounded Shoulder have lesser PEFR, showing that their lung function is reduced compared to those with normal posture. This is likely because Rounded Shoulder can restrict chest expansion and reduce the space available for the lungs to inflate. As a result, breathing becomes less efficient. A study done by Prateek et al. in 2020 reported that a total of 58.3% students were prone to neck pain and rounded shoulders whereas 3rd and 4th year students were 2.9 times higher.<sup>4</sup> These mechanical changes likely result from restricted thoracic

expansion and reduced compliance of the ribcage, which limits lung capacity and airflow among participants with postural deviations.

In current study competitive exams were conducted resulting in long duration of study hours with slouched posture causing musculoskeletal issues. No breaks between study hours, physical activities, stress of studies and adaptation of different gadgets are some of the key factors contributing to abnormal posture as a result decreasing PEFR. We checked expiratory flow rate through flow meter showing significance of <0.01.

Another study done in 2022 by Hussain SA, stating that inspiratory and expiratory pressures are affected by variance in posture.<sup>18</sup> Our study also stated that improving sitting habits and doing regular exercises can reduce the risk of musculoskeletal issues as well as PEFR.

Research done by Deepika and Zubia in 2017 stated that increased cervical lordosis leads to

increased thoracic kyphosis, further this hyper kyphosis might lead to complications such as comprised physical function or poor respiratory function.<sup>10</sup>

A study done in 2020 stated that prevalence of neck pain in past six years was 87.8% leading to abnormal posture that results in increased kyphosis and rounded shoulders due to which the lung compliance decreases.<sup>4</sup> Recent study showed that rounded shoulder affects respiratory flow but not all students having low PEFR had neck pain.

Majority of the research has been conducted regarding pulmonary capacity and forward head posture<sup>10</sup>, but our study aims to assess the relationship of rounded shoulders with pulmonary capacity. Our study showed that those with rounded shoulders had lower expiratory flow as compared to those without rounded shoulders.

A study reported that the arm movement can also alter the lung volume by changing the ribcage expansion thus effecting respiration.<sup>19</sup> This supported our study that the closer the abnormal posture the lower vital capacity. PEFR has been correlated to the maximum expiratory pressure which represents respiratory muscle strength.<sup>20</sup> Our study shows that if any changes in upper thoracic muscles occur, it causes changes in the lung expansion and prolonged changes results in change in the lung compliance which in returns effects the expiration.

Another study done in 2020 by B.R. Ganesh stated that any changes to posture can affect the way spine, ribs, and joints move, which in turn can impact breathing. If compliance of rib cage changes, it can affect how respiratory muscles work and the movement of chest wall.<sup>14</sup> Recent research shows that the more abnormal posture is, the less the lung expansion occurs.

In the current study, Northwick Park neck pain questionnaire was used which has a nine five-part sections. It was attempted by every participant and the percentage was calculated by physical therapist. Percentage ranging from 0-100%. Where the higher the percentage, the greater the neck disability and pain.<sup>10</sup> The correlation of NPQ and PEFR is calculated

using Pearson correlation where p-value came out to be  $<0.426$  and R-value is 0.054. A significance of  $<0.426$  shows that there was no correlation of MNP with PEFR. For checking the relationship of rounded shoulder with PEFR we used again Pearson correlation where p-value comes out to be  $<0.01$  and R-value was 0.239. This showed that there is correlation between rounded shoulder posture and PEFR.

## CONCLUSION

Our study showed that rounded shoulders have a relationship with peak expiratory flow rate. The greater the degree of rounded shoulder, the less the PEFR. This showed that rounded shoulder posture has a weak association with peak expiratory flow rate. The expiratory values are decreased with an increasing rounded shoulder degree.

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