DOI: https://doi.org/10.53350/pjmhs2022161213

ORIGINAL ARTICLE

Effects of Posture Correction on Chest Expansion with patient with Forward Head Posture

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ABSTRACT.

Background: Poor posture and sedentary lifestyle cause Forward Head Posture (FHP). Although Posture Correction Band (PCB) is used quite often to correct FHP, yet it is not exactly known that the PCB influenced the chest expansion in population with FHP.
Aim: To find out the effects of PCB on chest expansion in population with FHP.
Methodology: Randomized Control trial was conducted on forty-two subjects with forward head posture. Subjects were divided in two groups. G1 was educated as per McKenzie exercise principle. G2 wore postural correction band.
Results: Data was entered and analyzed by SPSS version 25. The mean age in Group 1 was 27.09±6.33 and in Group 2 was 29.5±5.34 in terms of outcome measures of chest expansion. The chest expansion was significant in group B with mean clinical difference as 0.22±0.05, 0.39±0.08 and 0.21±0.09 at axillary, 4th intercostal and xiphisternum level respectively.
Conclusion: The study concluded that there are significant effects of wearing PCB on chest expansion in terms of mean clinical significance and statistical significance.
Keywords: Chest Expansion, Forward Head Posture, Posture Correction Band

INTRODUCTION

FHP is the hyperextension and anterior translation of the cervical-spine[1]. It is related to the head pointing in anterior direction more than an inch over atlas on which skull rests compared to an "ideal" position, in which ears are lined up with the shoulder[2,3]. FHP is also recognized as "reading neck", "text neck", "wearies neck", "scholar's neck", "iHunch", or "cervical posture in sagittal plane"[1,4]

Etiologically, FHP is a postural malformation that is produced by many reasons including head raised overly elevated while sleeping, prolonged usage of computers, laptops and cellular gadgets, book reading, poor occupational and work related ergonomics, poorly developed back muscles strength and nutritional deficiency such as calcium[1]. Bad posture and sedentary routine are the major culprits of FHP these day[5]. The deskbound routine alters the natural body configuration, instigating FHP[6]. Forward head posture is also related to the exaggerated curve of thoracic-spine (hyper-kyphosis), with some studies indicate the etiology of FHP to be the ascending component i.e. hyper-kyphosis causes the forward head posture while other studies indicate the descending component i.e. forward head posture causes the hyper-kyphosis[2,7].

Now a days, as the use of mobile phones or laptops in a poor posture and prolonged consecutive sitting hours increases, the occurrence of FHP also become dominant[5]. The prevalence of FHP among the students of universities was found to be 63.96%, including both genders[8]. A study showed 85.5% prevalence of FHP and a significant relation amid FHP and gender was observed[9]. Another study on heroin addicts showed that 36.7% had modest while 20% had severe FH[10]. The prevalence among children and teenagers was 53.5%[11].

Normal craniovertebral angle is approximately 49.9-50 degrees[1]. The CVA in males with FHP is approximately 48.8 degrees or below with mean age group of 22-44 years[1], the craniovertebral angle in females with FHP is approximately 47.6 degrees or below with mean age group of 23-66 years[1]. The smaller craniovertebral angle showed a negative effect on pulmonary function and chest expansion in terms of their measured values[12,13].

FHP produce dominant external flexion torque on cervical spine causing severe tension on the neck extensors and adjacent connective tissues[14]. This caused persistent spinal deformity due to increased load on spinal tissue. Also, FHP lessens the sensation of proprioception in cervical spine[15,16]. Forward head posture negatively affect the pulmonary volumes due to imbalance and weakness of the associated respiratory muscles[17,18].

Many conservative treatments, such as and McKenzie's posture correction exercises, muscle stretching and strengthening exercises, electrical stimulation therapy and traction techniques are used to improve FHP[19,20]. Comparing effects of kinesio-taping (KT) and therapeutic training showed that both produce helpful effect on the treatment of FHP but typically physiotherapeutic training program is more operative[21]. To correct FHP, stretching of sternocleidomastoid, tightened upper fibers of trapezius muscle and levator scapulae is indicated and strengthening of the deep flexor muscles of cervical spine has been found supplemental[22].

Use of PCB is another commonly used method to correct FH[5]. Those patients who put on a PCB due to upper back pain, there was the improvement in lordotic curve and decrease of forward hea[23]. FHP shifts the center of gravity anterior from spine. This lays unusual tension on the cervical musculature causing muscle disparit[24]. As the PCB re-aligns the center of gravity of the body, it upholds the spinal curvature correctly and hence reduces FH[25].

In modern era, there is use of mobile and laptops for official and personal needs. This increase usage leads towards the poor posture and poor body mechanics in all age groups. That poor posture is responsible for many musculoskeletal problems along with reduce respiratory functions and chest expansion measurements due to changes in anatomical structures, so it is dire need to find out the effects on respiratory function due to forward head posture so that it could be treated with appropriate and best physiotherapy approach.

The study determined the effects of PCB on chest expansion in asymptomatic population with FHP.

MATERIALS AND METHODS

It was a Randomized Controlled Trial. Registered trial in WHO Registry having reference # IRCT20191117045462N4. After approval from Institutional Ethical Review Board, sample size of 42 individuals was measured by using EPI-TOOL with 0.80 power of study, with 0.05 margin of error and 95% confidence interval through PEFR[5]. Although 46 patients were recruited by assuming 10% attrition rate and then divided into two groups with 23 subjects each. Data was collected through Non-Probability Convenience Sampling Technique. Participants were selected as per the

Received on 13-07-2022
Accepted on 23-11-2022

inclusion criteria; between age group of 18 to 45 years including both genders, with cranio-vertebral angle less than 50° and NDI-U score less than 5[5]. Urdu version of the neck disability index (NDI-U) was used to rule out neck pain and disability. Those were excluded who have any acute or chronic neuromusculoskeletal pain, history of spinal or chest surgery, severe obesity (body mass index > 40), diabetes, or malignant tumors and Clinical abnormalities or severe comorbidities[5]. Data was collected through chest expansion measurement by measuring tape after 2 weeks
G1 was the group whose subjects were educated for posture correction as per McKenzie exercise principles and were asked to assume correct posture. The pre-treatment chest expansion measurements of this group were performed before they were educated for posture correction as per McKenzie exercises principle. The post treatment chest expansion measurements were performed after education as per McKenzie exercises principle.

G2 was the group who wore PCB for 2 hours and their Chest expansion was measured with measuring tape before wearing and after removing PCB. The recorded measurements were the average of two readings. For the upper portion of thorax expansion, the measuring tape was placed at the apex of axillary fold at the level of 5th spinous process of thoracic spine and at the midclavicular line on 3rd intercostal space. For middle portion of thorax, measuring tape was placed at nipple line at 4th intercostal space joining both nipples round the chest and for the lower portion of thorax, the measuring tape was sited at the level of the 10th spinous process of thoracic spine and at the xiphoid process tip point. Measurements were recorded at maximal inspiration and significant attention was taken to slack or pull the measuring tape too tightly during the measurements.

RESULTS

Baseline values of socio-demographic data of both groups were comparable on basis of mean ± std. deviation. This table summarized the comparison of socio-demographic variable like age, weight, height, BMI, NDI-U scores and CVA across both groups. In Group 1, the mean age of participants was 27.09±6.33 years and in Group 2, mean was 29.52±5.34 years. Mean value of weight was 75.7619±8.9381 kg in Group 1 and in group 2 was 77.8571±9.8807 kg. Mean value of height in Group 1 was 173.2381±6.7668 inches and in Group 2 was 172.0476±10.4138 inches. Mean value of BMI in group 1 was 25.22±2.55 kg/m2 and in group 2 was 26.29±2.35 kg/m2. Mean value of NDI-U score in Group 1 was 2.5714±0.7464 and in Group 2 was 2.6667±0.6582. Mean value of CVA in Group 1 was 46.6190±1.2440 degrees and Group 2 46.3333±1.4605 degrees. To compare two populations at pre- treatment and post-treatment level of G1 and G2, parametric tests were applied. Independent t-tests were applied to compare between group analyses on outcome variables. Table 1 showed the comparison of pre and post-treatment of Chest expansion between both groups by independent sample t-test. It was statistically insignificant but mean clinical difference of group 2 with 0.22±0.05, 0.39±0.08 and 0.21±0.09 was greater than group 1 with 0.19±0.08, 0.00±0.11 and 0.29±0.11 for chest expansion at axillary level, 4th intercostal space and xiphisternum level respectively.

Table 1: Between group comparison of chest expansion

			Treatment groups		p-value
			G1 (n=21)	G2 (n=21)	
Chest Expansion at axillary level Chest	Pre-treatment	Mean±SD	39.4762±2.50	38.6190±2.4642	0.853
	Post-treatment	Mean±SD	39.281±2.42	38.833±2.41	0.553
Chest Expansion at 4th intercostal space	Pre-treatment	Mean±SD	36.9048±2.82	35.9286±2.3091	0.651
	Post-treatment	Mean±SD	36.90±2.93	36.31±2.38	0.493
Chest Expansion at xiphisternum level	Pre-treatment	Mean±SD	37.7619±2.44	37.5238±2.1004	0.763
	Post-treatment	Mean±SD	37.47±2.33	37.73±2.01	0.699

DISCUSSION

The results of current study showed that within group analysis using paired sample t-test. The results were statistically significant across group 1 and 2 in terms of chest expansion. The chest expansion was increased ($p<0.05$). Our primary finding is Chest expansion measurements do change with the PCB. In the current study, results showed that there was no statistically significant difference between two groups in terms of chest expansion that was not increase significantly ($p > 0.05$) compared to group 1 and group 2.

Conferring to earlier studies, increase in tidal volume was observed by comparing the results before and after use of back support in normal adults. In addition, a correlation was found between chest mobility and pulmonary volumes in normal adults in a way that the pulmonary volumes decreased as the chest mobility decreased as stated by Lanza et al[5]. Our results are in line with this study.

In another study, individuals with forward head posture showed comparatively decreased pulmonary volumes than normal individuals. The results of this study are similar with the aforementioned study by Kim et al. The study compared the respiratory volumes in normal adults with FHP, and the study results found that adults with FHP have decreased pulmonary volumes compared to normal individuals. Because the pulmonary volumes was not measured directly in normal adults, it is indirectly assumed that the low pulmonary volumes of the individuals of this study was due to FHP[5].

FHP produce dominant external flexion torque on cervical spine causing severe tension on the neck extensors and adjacent connective tissues[17]. This caused the persistent spinal deformity due to increased load on spinal tissue. Also, FHP lessens the sensation of proprioception in cervical spine[18]. FHP reduced the EMG events of the middle trapezius, splenii, and sternocleidomastoid muscle and these decreased activities are related with a decreased ability of these muscles to produce force resulted due to changes in muscle length caused by FHP[19].

A study conducted by Han Jin-Tae et al. investigate the VC and maximal voluntary ventilation (MVV) in twenty-eight subjects with FHP. All the variables were significantly decreased statistically compared to normal subjects. This study showed that the pulmonary volumes of subjects with forward head posture was decreased due to bad posture of neck that weakens the neck musculature along with accessory muscles of respiration[20].

Postural correction band does not limit the chest expansion in individuals with FHP. PCB can somehow psychosomatically affect breathing, such as feeling tight. Also, breathing exercises like McKenzie's exercises, fascia release followed by neck flexion exercise have improved chest expansion and respiratory volumes in subjects with forward head posture, not only a PCB but also breathing exercises are necessary.

CONCLUSION

The study concluded that there are significant effects of wearing PCB on chest expansion in terms of mean clinical significance and statistical significance.

Conflict of interest: Nothing to declare

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