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Original Research Article

The relationship between mechanical low back pain and lumbar curvature angle among computer users

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Abstract

Aim: To determine the relationship between mechanical low back pain and lumber curvature angle among bank worker computer users.

Material and methods: 30 male bank worker computer users were working for continuous 4-hours at least/day, five days/week, selected randomly from National Bank of Egypt, kafrelshiekh governorate, Egypt. They divided into 2 equal groups (A and B). Male in group (A) were suffering from low back pain (LBP) within the last 6 months; male in group (B) were free from LBP. Their age was ranged from 25 to 30 years. Their body mass index was less 30 kg/m^2. Lumbar curvature angle and pain intensity were measured by using the flexible ruler and visual analog scale for each participants in both groups (A and B).

Results: There were significant differences in participant's low back pain intensity (P = 0.001) and lumbar curvature angle (P = 0.001) between both groups. There was a statistically significant correlation between the pain intensity in lower back and lumbar curvature angle in both groups (A and B) (r = 0.463 and 0.37 respectively), as the pain intensity increased by increased lumbar curvature angle.

Conclusions: The bank worker computer users were more exposed to low back pain due to flattening of lumbar curve.

Key words

Computer users, Bank workers, Mechanical low back pain, Lumbar curvature angle, Visual analog scale, Flexible ruler.

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Introduction

Low back pain (LBP), a complex symptom is a very common condition. From time immemorial, the human race is paying a price for attaining the upright posture. From adolescence to adulthood 80 to 85% of people suffer from this ailment in the modern world. However, it results in tremendous loss of time and work productivity costing billions of dollars. Acute LBP lasts less than 6 weeks, where as chronic LBP lasts for more than 12 weeks [1]. The human body responds to the work environment hazards through four systems – central nervous, automatic nervous, endocrine and immune – which are constantly interacting as a complex network [2]. A safe workplace design commonly presumes the decrease of physical overload factors like heavy weights; working in a compulsory position or monotonously, but often the other work environment hazards, like low temperatures, high noise levels etc. have to be carefully considered. These hazards in the work environment which affect office workers are considered to be stress factors that alter the functioning of the organism and damage the peripheral and central nervous system [3]. Physical factors, psychosocial and organizational factors as well as individual factors are all thought to affect the workers musculoskeletal health [4, 5]. Working with computers presents ergonomic risks due to fixed and often awkward postures that are maintained for a too long time, repetitive and sometimes forceful [6]. The aim of this study was to determine the relationship between mechanical low back pain and lumber curvature angle among bank worker computer users in kafrelshiekh governorate, Egypt.

Material and methods

A total of 30 male bank worker computer users were working for continuous 4 hours at least/day, five days/week, selected randomly from National Bank of Egypt, kafrelshiekh governorate, Egypt. They divided into 2 equal groups (A and B). Male in group (A) were suffering from LBP within the last 6 months; male in group (B) were free from LBP. Their age was ranged from 25 to 30 years. Their body mass index was less 30 kg/m^2. None of them had been taken any medication or analgesia for pain relief during study. Those suffering from back pain due to any pathological condition (e.g. congenital, traumatic, infective, metabolic, malignant, or psychological reasons) kyphosis, scoliosis, scheuermanns disease, spondylosis, spondylolisthesis spinal bifida, T.B. spine, and osteoporosis were excluded. The design of this study was a case control study. Informed consent form had been signed from each participant before participating in the study. The study was done from October 2014 to December 2014. Lumbar curvature angle was measured for each participants in both groups (A and B) by using the flexible ruler (Fiskars, USA) [7], the participant asked to stand in an erect posture with the lower extremities slightly apart while keeping her head facing forward and arms beside her body, the spinous processes of L1 and L5 were determined, the flexible curve rule was placed over the spinous processes (L1-L5) of the lower back and shaped to fit its contour without distortion, the outline of the curve was traced on a paper, the length of the line drown from point L1 to point L2 named L was measured to the nearest (mm), the length of a perpendicular line drown from the midpoint of L to the curve named H was measured to the nearest (mm), the lumbar curvature angle (LCA) was measured using the following equation: LCA = 4 (Arctan 2 H / L) **(Figure - 1)**.

Pain intensity was measured for each participants in both groups (A and B) by visual analog scale (VAS), it a graphic rating scale with numerical values placed at equidistant along the length line, the descriptors and numbers help

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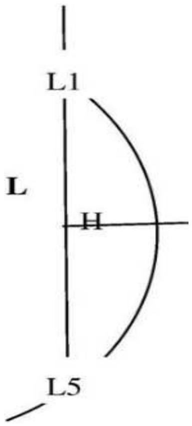
the participants to place her estimate on the line (0-4). The collected data was statistically analyzed by using Wilcoxon matched pairs test, Pearson correlation coefficient and Descriptive statistics: mean, standard deviation and percentage. Statistical significance level of 0.05 would be used within this study.

Figure – 1: Lumbar curvature angle (LCA).



Results

All data had been collected and statistically analyzed and presented under the following headings.

Physical characteristics of the patients

In this study, 30 participants were divided randomly into two equal groups (A and B). Group (A): 15 participants were included in this group; the mean age and BMI were (26.33±2.09) years and (27.38±1.49) Kg/m^2. Group (B): 15 participants were included in this group; the mean age and BMI were (27.06±2.01) years and (27.73±1.45) Kg/m^2. There was no significant difference (P = 0.9 and 0.83) between both groups (A and B) regarding their ages and BMI respectively.

Low back pain intensity

There was significant differences in participant's Low back Pain intensity (P = 0.001), as the mean values of pain intensity in Group A was 2.6±0.9 while in Group B was 0±0 as per **Table - 1**.

Table - 1: Mean values of Low back pain intensity for participants in both groups (A and B).

	Pain intensity	
	Group A	**Group B**
Mean	2.6	0.0
± SD	± 0.9	±0
p value	0.001	

Lumbar curvature angle

There was significant differences in participant's Lumbar curvature angle (P = 0.001), as the mean values of lumbar curvature angle in Group A was 45±2.12 while in Group B was 30±1.54 as per **Table - 2**.

Table - 2: Mean values of lumbar curvature angle for participants in both groups (A and B).

	Lumbar curvature angle	
	Group A	**Group B**
Mean	45	30
± SD	± 2.12	±1.54
p value	0.001	

The correlation between low back pain intensity and lumbar curvature angle

There was a statistically significant correlation between the pain intensity in lower back and lumbar curvature angle in both groups (A and B) (r = 0.463 and 0.37 respectively), as the pain intensity increased by increased Lumbar curvature angle as per **Table - 3**.

Table - 3: The correlation between low back pain intensity and lumbar curvature angle for participants in both groups (A and B).

	Pain intensity	Lumbar curvature angle	Pearson correlation coefficient (r)
Group A	2.6±0.9	45±2.12	0.463
Group B	0±0	30±1.54	0.37

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Discussion

The spinal column has protective, supportive and locomotor functions. The vertebrae articulate with each other anteriorly via the inter vertebral discs and posteriorly via the facets joints and are made exceptionally strong to withstand the compression forces during axial loading [8]. The mobile segment of the spine i.e. cervical and lumbar region, usually suffer the most loading stresses. A rapid stretch to spinal ligaments is less likely to cause the failure than slow repetitive stretch due to the viscoelastic properties of the osseoligamentous structure that deforms on slow loading. The anterior 2/ 3 structures of the spine provide support to the trunk and helps in 80% of weight transmission of vertebral loading and keeps us mobile, while the posterior 1/3 structures bears about 20% of weight bearing along with the posterior spinal complex and provide protection to the neural structure. It also determines the direction of movements. It has been observed that if the synovial facet joints were static the inter vertebral discs would wear out rapidly as a result of rotational and torsional stress leading to changes, like osteoarthritis, spondylolisthesis and spinal stenosis. The structure of the inter vertebral disc comprises of the tough fibrocartilagenous ring called annulus fibrosis while the central gelatinous nucleus pulposus consist of a matrix of special protein, glycosaminoglycan and water. The nucleus pulposus in young person evenly transmit the load towards the adjacent structures The shock absorbing, compression resisting, force decimating properties are reduced as age advances and this predisposes the lumbar disc to prolapse, particularly at L4-L5, L5-S1, which are the common sites of excessive strain and back pain. Under normal loading conditions, fluid seeps out and deformation of nucleus pulposis occurs, about six hours of standing can result in 16% - 20% loss in the vertical height of the disc. It has been observed that the intra discal pressure is higher in sitting than in standing position [9]. Our study proved that pain intensity of lower back among the bank worker computer users increased by increased lumbar curve angle which lead to flattening of lumbar curve. The pattern of weight transmission changes during the inactive, slumpy posture of the computer users causing an excessive abnormal loading of the spine which is also a contributory factor for the development of low back pain. During the loading of the spine the effect of the seating angle is a very important factor in the genesis of low back pain in people who sit for long hours at work. Lumbar disc pressure and electrical activity in the spinal muscles reduces as the seat angle increases from 90^o to130^o. A 110^o tilt angle is considered as an ideal one for working purposes. Mechanically this ensures a degree of forward rotation of the pelvis while maintaining the lumbar lordosis hence reduction in the loading of the spine and intra discal pressure [10]. It is rather interesting to note that most of the studies, world over, pertain to the visual/upper extremity musculo-skeletal discomfort having a prevalence rate of 40-66% (including the psychosocial, physical/ergonomic factors) but their subjective discomforts are short lived. A similar prevalence range is noted in LBP sufferers in VDT users having pronounced symptomology and dominant psychosocial and ergonomic variables with a prolong periods of discomfort [11]. The prevalence for LBP among typists is reported to be 53% and neck pain among 50%. Bivariate analyses found significant associations between VDU use, static postures, faulty ergonomics and laxity of back muscles, as the main reasons for the musculoskeletal symptoms. Symptoms appeared to increase as duration of VDU exposure increased. The incidence/ prevalence of LBP and other subjective discomforts could be decreased if all the contributory factors are addressed properly on the continuous use of VDU at a stretch is

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discouraged and about five minutes of rest every half an hour is practiced [1].

Conclusion

The findings of this study recommended that bank worker computer users be more exposed to Low back pain due to flattening of lumbar curve. Computer users and all other professionals who have to work for long hours in a particular posture should be advised to take a minutes of rest after working for some time to reduce pressure on the spinal column.

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