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The Prevalence of Postural Abnormalities among High School Students

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Abstract

A good stance and posture reflect a proper state of mind. A human posture goes through a series of changes in the course of body growth and development. Postural defects are very common among high school students. Posture screening during the schooling year's helps to discover the spinal deviations, especially those related to the use of backpacks and poor sitting postures. At the later stage spinal deviations progress to spinal deformities. This study was aimed to detect the prevalence of posture alterations in high school students. We had screened 100 (35 male and 65 females) high school students. A survey questionnaire was administered to identify their posture awareness. Then they were screened for sagittal and frontal alignments using the plumb line test. The results revealed that 86% (n=86) high school students were responsive to the importance of posture and 70% (n=70) were aware about their own posture. From the posture screening, 20% (n=7) of male and 10.8% (n=7) female participants were identified as having faulty posture.

Keywords: Faulty Posture, High School, Plumb Line, Posture.

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Introduction

Posture is a vital element for normal balance that maintains the mechanical efficiency of the neuromusculoskeletal system in the erect position. Good standing and sitting posture helps in stimulating the normal functions of the body's organs and increases the efficacy of the muscles, thereby minimizing fatigue. Changes in posture or poor body mechanics may bring about spinal alignment problems and muscle shortening causes postural imbalance in static and dynamic muscles. There are three postural defects commonly seen among adolescence kyphosis, lordosis, and scoliosis. [1] Kyphosis is an exaggerated curve of the thoracic region which causes the shoulders to be rounded; the neck to be shortened and the chin to poke forward. [2] The shortening of the thoracic muscles and weakness of the respiratory muscles distresses the pulmonary system by decreasing the thoracic and lung volume. Moreover the hormone relaxin during puberty causes ligamentous laxity more in females than males, which is associated with biomechanical changes seen during growth in the adolescent. [3] The weakness of abdominals and hip extensors with tightened trunk extensors and hip flexors causes lordosis, which is an exaggerated curve in the lumbar region that tilts the pelvis anteriorly. Scoliosis is the C-shaped (one curve) or S-shaped lateral curvature of the spine. The upright posture measurement of the spine

is a useful clinical tool to identify and prevent the developmental process of musculoskeletal conditions in its early stages. [4]

A study on the prevalence and the risk factors of poor posture among 3600 school children, reported that 38.3% of children had poor posture, more frequently reported in boys and the detected defects were protruding scapulae (50% of all children), increased lumbar lordosis (32%), and round back (31%). [5] Another study reported the prevalence of scoliosis as 1.4%, shoulder and scapula asymmetry 6.6%, forearm and trunk asymmetry 4.0% and spinal misalignment 1.9%. [6] A survey on the postural awareness among school-going students and teachers found a significant association of awareness between students and teachers and also suggested the need for further awareness about good body posture in order to prevent the prevalence of body pain due to poor posture. [7] Whereas, another study reported 70% of the students were unaware of their correct back discipline while washing clothes manually and more than half of the students (52%) were unaware about correct backpack carrying discipline. [8] The trunk asymmetry has been identified as the common occurring condition among adolescence. [6] The earlier studies have observed that the students spent much of their time in the sitting position both in front of computers and during the class sessions at school. The time they spent in this posture affects the posterior muscles of the lower limbs in a shortening position, which can generate posterior tilt and misalignment of the pelvis. [9] A strong significant association between watching television and musculoskeletal disorder (MSD) among 229 school

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children has been reported from the states of Selangor and Johor in Peninsular Malaysia. [10] Adolescents and children only seek for medical attention when their deformity is visible at the later stage, hence this represents a serious problem. The ergonomics awareness in school environment have not been implemented seriously in Malaysia, and as a result, most of the children pose greater risk to ergonomics hazard due to the heavy lifting of school bags and incorrect sitting posture in classrooms. [11] The Ministry of Health Malaysia (2013) has stated that skeletal abnormalities and obesity are common health problems detected among high school children. [12] The posture education programs in schools had shown marginal significance in the prevalence of postural asymmetry among students. [13] Posture screening at schools in Poland revealed that 50-60% of children and adolescents had abnormalities in posture and also reported 10% of the students were at the risk of progressive spinal deformities. [14] The posture screening among high school students has evidenced that 95% of students had never undergone posture screening. The benefit of the posture awareness during the growth phase helps the students to recognize the problems associated with ergonomic-unfriendly classrooms and desktop positions. [15] This present study was aimed to identify the posture awareness and postural abnormalities among high school students.

Methodology

Participants Recruitment

This cross-sectional study involved 100 (n=100) high school students from 24 schools of Melaka, Negeri Sembilan and Selangor states in Malaysia. The participants were recruited to the study when they visited a local private university to explore the tertiary education experience. The volunteers were informed about the purpose of the study and informed consent was obtained from each participant to ensure the voluntariness.

Data Collection

A questionnaire was distributed among the

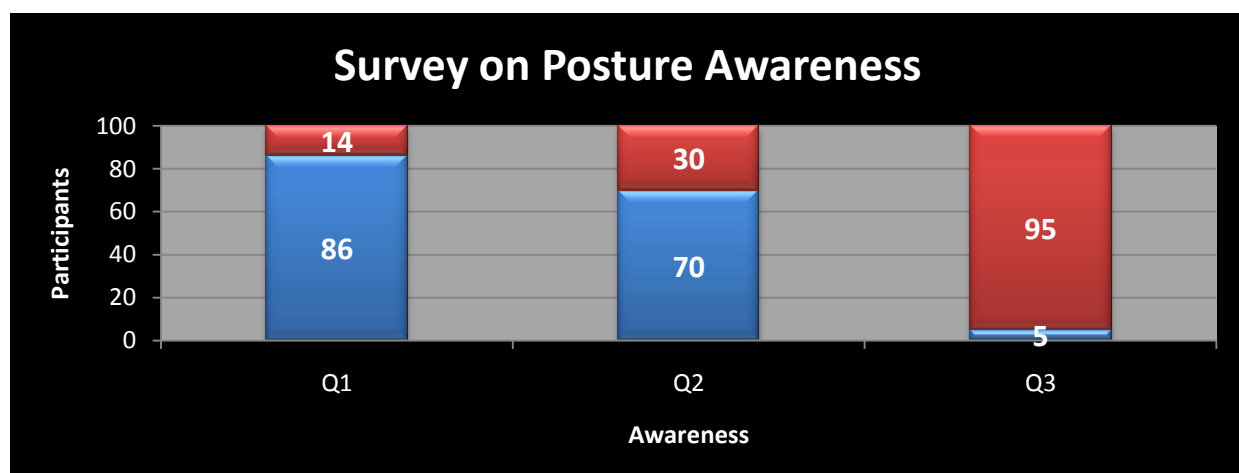
participants to collect the information regarding the importance of posture awareness, the awareness of their posture and their responses on personal screening status. Then the posture assessment of the subjects was carried out by a qualified physiotherapist. The posture screening was done through the observation in the sagittal and frontal plane by applying a plumb line test. The plumb line was attached by a plumb bob which was suspended midway between the participant's heels in posterior view, and just anterior to the lateral malleolus in the lateral view. The plumb line assessment was standardized by a 3 inch gap between the heels and 10° toeing out between the feet. Posteriorly the plumb line was aligned midway between the lower extremities through the midline of the pelvis, spine and occipital protuberance. Laterally the plumb line aligned anterior to the lateral malleolus through the knee joint, posterior to the centre of hip joint, midway between the spine, shoulder and through the external auditory meatus. A postural assessment form was used to document any deviations from the plumb line for each participant. The collected data were then tabulated and analysed in Microsoft Excel 2010.

Results and Discussion

A total of 100 high school students (male n=35, female n=65) participated in this study with the age between 16 to 17 years. The majority of participants (n=86) gave positive response about the importance of posture awareness for the first survey question ("Do you aware about the importance of posture"). This result is similar to [7, 9] which reported that 80% - 85% of high school students within the age of 17-18 years were aware of proper and erect standing posture. However only 70% responded positively for the second question on the aware of their own posture ("Do you aware of your own posture"). Almost all the participants (95%) had answered "no" to the third question ("Have you ever undergone a postural screening before"). The results for each of the three questions are shown in below Figure I.

Figure I

Participants' response rate on posture awareness



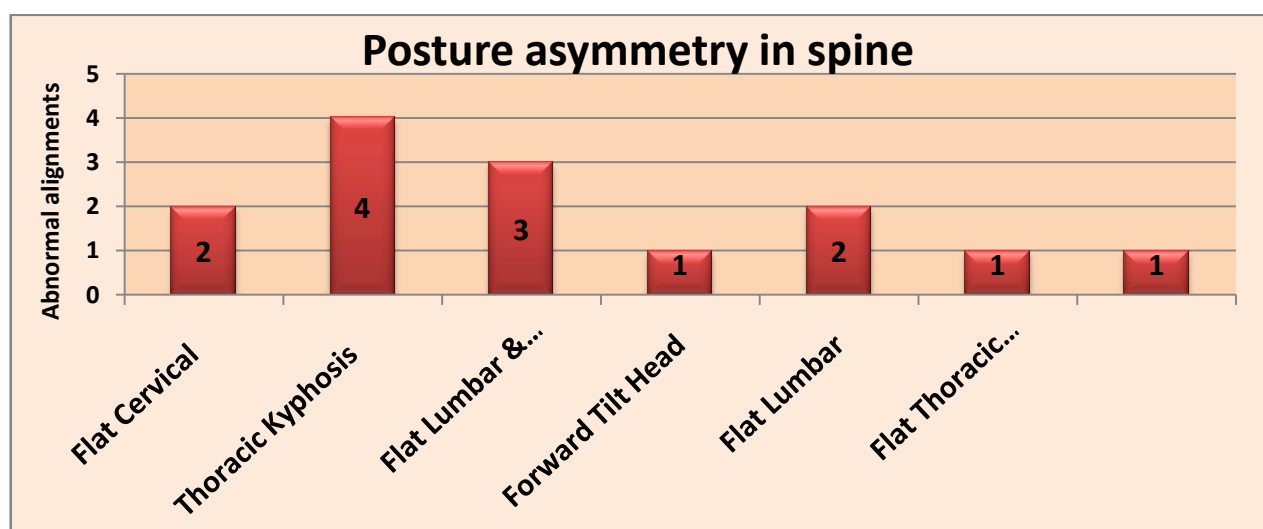
Posture asymmetry was reported among 14 students (14%), in which a higher posture deviation was observed in the sagittal plane plumb line assessment when compared to the frontal plane (as shown in Figure

II). Higher percentage (20 %) of male students were affected by faulty postural when compared to the female participants (10.8 %) as shown in Table 1.

Table 1 Posture Screening report (normal and faulty alignment percentage)			
Posture	Total Participants n	Male n (%)	Female n (%)
Normal alignment	86	28 (80.0%)	58 (89.2%)
Faulty alignment	14	7 (20.0%)	7 (10.8%)
Total	100	35 (100.0%)	65 (100.0%)

Figure II

Abnormal alignments of spine in sagittal and frontal plane

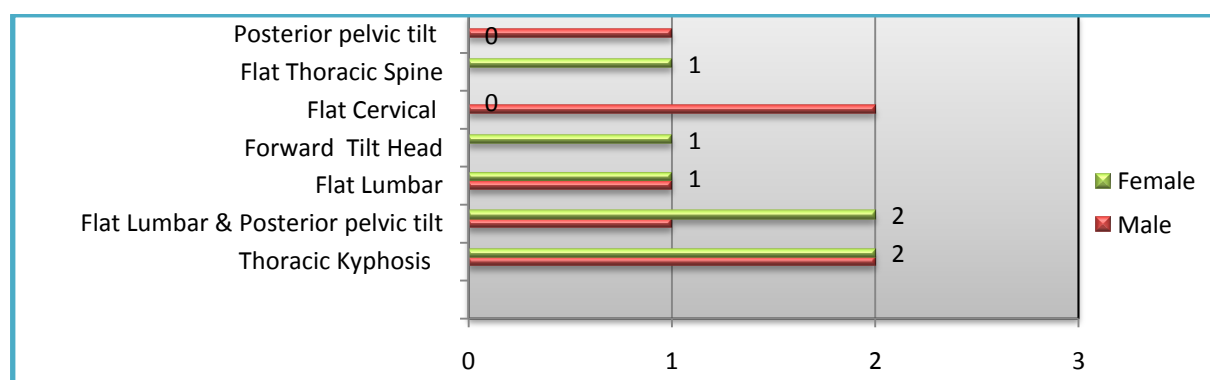


Among the 14 participants reported with postural asymmetry, the thoracic kyphosis was identified between 4 participants, whereas the flat lumbar spine with posterior pelvic tilt was found in 3 participants (as shown in Figure III). The occurrence of flat lumbar spine with posterior pelvic tilt was higher among females when compared with male students with the ratio of 2:1 whereas no difference among the gender was identified

in the existence of thoracic kyphosis. Our result conflicts with the previous findings, which reported the higher prevalence of abnormal kyphosis among male high school students (2.4%) as compared to the females (1.2%). [16] Similarly, another contradicting study also reported a high percentage of school children (43.78%) who had an increased flexion of thoracic spine, of which 63.54% were boys and only 25.72% involved girls. [17]

Figure III

Faulty posture between male and female gender



The incidence of flat cervical and flat lumbar spine were reported equal number of subjects (n=2). No female student was detected with a flat cervical spine while this abnormality was noticed in 2% (n=2) of male students. However no gender difference was observed in the frequency for the existence of a flat lumbar spine as shown in Figure III. The existence of a forward head and flat thoracic spine was not witnessed among the male students although 1% (n=1) of the female students was identified to have faulty posture. Our study reported only 1% of posterior pelvic tilt occurrence among the male students whereas the findings from a previous study showed the presence of posterior pelvic tilt among 6% of males and 7% of females. [18] A typical muscle imbalance scenario that causes posterior pelvic tilt involves tight hamstrings, gluteus and lower abdominal muscles coupled with weak quadriceps, psoas and lower back muscles. Tight muscles exert a pull on body structures that is not counterbalanced by the pull of weak muscles. The pelvis is pulled downward by the gluteus and hamstrings and also by the lower abdominals. [19] Therefore, the high prevalence of school students with reduced flexibility is indeed a cause for concern. The previous studies have reported the occurrence of scoliosis and lumbar lordosis among the students with the age range of 12-13 years. [5] However the incidence of scoliosis and lumbar lordosis was not reported in this study and this could be due to the difference in the age range (16-17 years) of the studied student population.

Conclusion

This study confirms the occurrence of postural asymmetry in high school students with more prevalence among male than female students. The existence of postural abnormality indicates the immediate importance of creating awareness of posture among high school students and teachers. Likewise, posture screening at an early stage will help to prevent, or at least reduce spinal problems in the future.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

Authors contributed to the conception and design of this study, and the analysis and interpretation of data. Have been involved in drafting the manuscript, and revising it critically for important intellectual content.

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