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Prevalence of forward head posture among 12–16-year-old school going students—A cross-sectional study

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ABSTRACT

Introduction: Posture is the attitude of the body, the relative arrangement of body parts for a specific activity, or a characteristic manner of bearing one's body. Forward head posture (FHP) is characterized by increased flexion of the lower cervical spine and upper thoracic region and increased extension of upper cervical vertebrae which also leads to changes in the lumbar spine. FHP is a measure of the poor posture of the neck, so this study was conducted to find the prevalence of FHP among 12–16-year-old school going students.

Methodology: Three hundred school going children of the age group 12–16 years were included in this cross-sectional survey study. After obtaining a voluntary signed assent, the neck was exposed and colored markers were placed on C7 vertebrae and the tragus of the ear. A photograph was taken, which was then digitized to calculate the cranio-vertebral angle (CVA) which is used to measure FHP by using Adobe Acrobat Reader DC.

Results: In all 300 students who were screened, 158 were males, out of them 88 males (56%) had FHP. One hundred and one females (71%) had FHP from 142 evaluated. Mean CVA was found to be 42.9° ± 7.43°. Out of the 300 students evaluated, 189 were found to have FHP.

Conclusion: The study revealed a prevalence of 63% of FHP among 12–16-year-old school going students.

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KEYWORDS

Forward head posture; cranio-vertebral angle

Introduction

Posture is defined as "a position or attitude of the body; the relative arrangement of body parts for a specific activity; or a characteristic manner of bearing one's body [1]. Forward head posture (FHP) is characterized by increased flexion of the lower cervical spine and upper thoracic region and increased extension of the upper cervical spine [2]. Bad posture is a serious health problem which causes more musculoskeletal disorders with age [3]. Children inculcate the habit of forward neck posture at a very early age due to studying in various odd positions. Improper house and school furniture and different physical structures and needs of different children play a significant role in children keeping the neck in this position [4]. Epidemiological studies have shown a high prevalence of spinal postural deviations in adults [4] with FHP and protracted shoulder (PS) posture being two of the most common postural deviations [5].

FHP is commonly defined as the protrusion of the head in the sagittal plane so that the head is placed anterior to the trunk. It can occur because of anterior translation of the head, lower cervical flexion, or both, and it is claimed to be associated with an increase in upper cervical extension [6]. It is associated with shortening of the upper trapezius, the posterior cervical extensor muscles, the sternocleidomastoid muscle, and levator scapulae muscle [7]. Thus, FHP may contribute to

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neck and shoulder pain [3]. Inadequate posture consists of poor interrelations between parts of the body [8]. These imperfect interrelations cause muscle tension and shortening, which make appropriate joint movements more difficult to achieve and may cause pain [7–9]. Once developed in childhood, the habit of a FHP can lead to above changes and predispose the child to pain in early adulthood, well before degenerative changes are known to be present [3]. Altered postures may hasten the degenerative changes that take place later in life.

There are currently no studies of FHP in school going children of Gujarat, India; Hence, this study was conducted to find the prevalence of FHP among school going students.

Materials and methods

A cross-sectional study was carried out involving students from two schools of Vadodara, Gujarat, India (Shree Ambe Vidyalaya and Bright School). The study duration was 5 months. Convenience sampling was used and a total of 300 students were evaluated. Male and female students aged 12–16 years who were willing to participate in the study were included. According to the school medical records, students who had known neuromuscular or musculoskeletal disorders or recent upper limb fractures or whiplash trauma, congenital disorders, and psychiatric comorbidity were excluded from the study. A Nikon Coolpix 12.5 megapixels camera and colored markers were used. Adobe Acrobat Reader DC software was used for analysis.

The Principals of both schools were approached and written consent was obtained to carry out the study. The study procedure was explained to each volunteer student. On deciding to participate in this study, they gave a written, informed, and signed assent. After obtaining the written assent, the upper neck was exposed; colored markers were placed on the tragus of the ear and the C7 vertebrae. The subject was instructed to stand and look straight ahead as shown in Figure 1. A single sagittal plane photograph was then taken using the Nikon Coolpix camera positioned in a direct line, at a distance of 1.5 m from the subject, at the shoulder level. The image was then digitized and the cranio-vertebral angle (CVA) was calculated using Adobe Acrobat Reader DC.

The CVA is the angle, in degrees, of the horizontal line intersecting a line drawn from the tragus of the ear to the spinous process of C7 [4] (Fig. 1). CVA was calculated using Adobe Acrobat software. A smaller CVA indicates a greater degree of forward head positioning with a CVA less than 48°–50° defined as FHP [9]. In this study, subjects with a CVA less than or equal to 48° were defined as having FHP. Greater than 48° of CVA angle is healthy. The reliability of this procedure is reported as high (intraclass correlation coefficient = 0.88) [10].

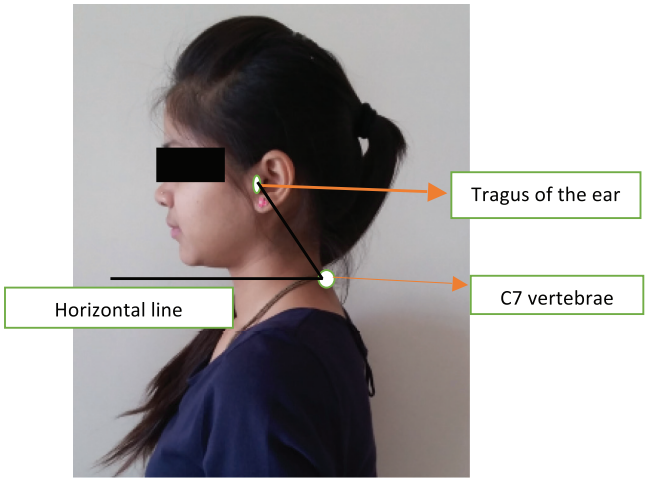

Figure 1. Measurement of CVA.

Results

In this study, 300 students were evaluated consisting of 158 males and 142 females. From 158 males, 88 males were identified as having FHP (55.7%). Of the 142 females evaluated, 101 females were with FHP (71.1%). The total number of both male and female students identified with FHP in this student population was 189 (63%). Descriptive data are presented in Figures 2 and 3. Age and gender wise prevalence are shown in Figures 2 and 3. The odds ratio was calculated. Odds of females having FHP were two times more as compared to males.

Discussion

The findings from this present study revealed that 189 students out of 300 were found to have a FHP i.e., 63% of students revealed an FHP postural abnormality. Similar results have been found in other studies [3,4]. The incorrect use of heavy backpacks, psychosocial factors such as depression or stress, lack of ergonomic school furniture and extended hours in incorrect postures in schools and in front of television and computers may be responsible for the findings [3]. Studies have also shown students have strong flexion of

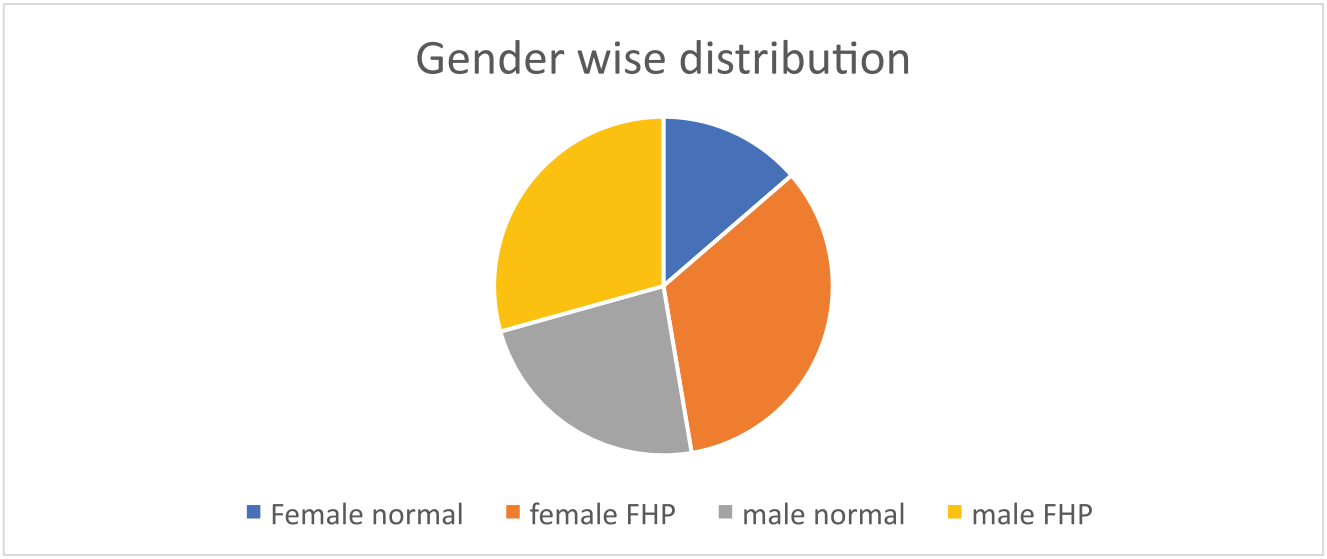

Figure 2. Distribution of all students with FHP by gender.

the neck when using smartphones. "Text neck," a 21st-century syndrome, is a term derived from the onset of cervical spinal degeneration resulting from the repeated stress of frequent forward head flexion while looking down at the screens of mobile devices and "texting" for long periods of time [4].

FHP may be attenuated due to the weight of backpacks having an effect on cervical and shoulder postures. The center of gravity is shifted in the direction of the load when carrying a backpack over the lower back or sacrum. To compensate, the child will lean in a direction opposite to this force i.e., moves the head and trunk forward. Harms-Ringdahl and Ekholm [8] reported an extreme forward-flexed position of the head and neck, if maintained, resulted in complaints of neck and upper back pain. Students with heavy backpacks have been reported to have poor posture and neck pain [11]. However, backpack usage was not considered in the present study.

In the present study, it was found that a greater percentage of female students (71.1%) displayed

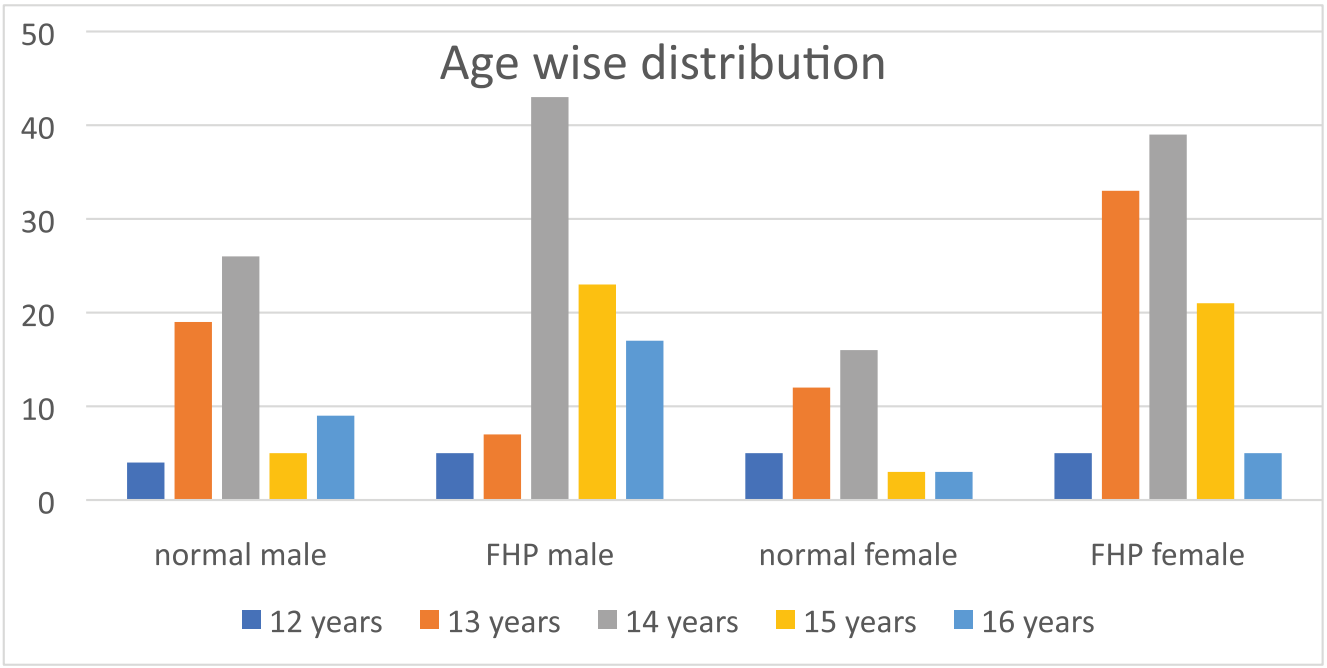

Figure 3. Distribution of students with FHP by age.

FHP when compared to male students (55.7%). Odds of females having FHP were two times more as compared to males. Females have been identified to habitually adopt 2°–3° more neck flexion compared to males which may be a contributing factor in this finding [10]. This has been attributed to psychosocial issues such as stress partly associated with secondary sexual characteristics [11]. Ruivo [9] assessed 275 adolescents, aged l5, 16, and 17 years reporting FHP and PSs are common postural disorders in adolescents, especially in girls. Dharmayat and Shrestha [12] performed a cross-sectional study involving primary school children aged 6–12 years and found that 66% of males and 65.7% of females who use backpacks have musculoskeletal pain. This percentage of students agrees with the percentage of students found with FHP in this present study.

Limitations of this study include not evaluating contributing factors to this high prevalence of FHP such as the use and weight of backpacks.

Further evaluation of students' body mass index reported the incidence of musculoskeletal pain and the presence of other postural abnormalities which should be considered in future research.

Conclusion

This study identified the prevalence of FHP among 12–16-year-old school going students in Gujarat, India to be 63%. However, the prevalence of FHP was not identified to progressively increase from 12 to 16 years. This high prevalence suggests there is a potential for the development of musculoskeletal conditions affecting the cervical spine and shoulder. Education on the consequences of an excessive FHP, what is the correct posture, and ergonomic advice to assist the maintenance of correct posture may be beneficial in reducing this rate in the future.

Conflict of interest

None.

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