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Original Research Article

ASSESSMENT OF POSTURAL DEVIATIONS IN GIRLS SCHOOL AGE STUDENTS

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ABSTRACT

Background: musculoskeletal deviations exist among children in the public schools that raises the need for a mandatory postural screening program.

Purpose: of this study was to identify the postural alternations that occur in girls school students between age 7 to 9years old.

Materials and Methods: three hundred thirty seven normal girls students were selected using multistage sampling methods , aged from 7 to 9 years old in governmental school in southern educational district in Alexandria they were photographed in sagittal and frontal planes (anterior, posterior and lateral view) from standing position with markers on certain bony landmarks, then images were analyzed using specially designed auto cat software program to detect postural abnormality as follow:1) postural scliosis, 2) postural kyphosis,3)sway back(excessive lumber hyperlordosis).

Results: showed that there is mild postural kyphosis (44%), mild percentage of excessive hyperlordosis (45%), very low percentage of postural scoliosis (27.6%) of sample representing population in in southern educational district in Alexandria. all of them are non-structural postural deviation.

Conclusion: there is a rise of postural alternation in school age girls in governmental school (postural kyphosis, excessive hyperlordosis, postural scoliosis) that need to be prevented by early detection of postural abnormality that can affect the quality of life during childhood and continue through adulthood.

KEY WORDS: Posture, Scoliosis, Postural Kyphosis, Excessive Hyperlordosis, Students.

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INTRODUCTION

Posture is defined as the relative arrangement of body parts. Good posture is the state of muscular and skeletal balance with the least expenditure of energy possible [1] Children reach full spinal growth by 24 years of age and experience several growth periods, especially during their school-age years, from 5 to 18 years [2]. To examine upright posture and subsequent compensatory responses, an examination of the kinematics of posture is required. Ideal postural alignment, according to Kendall, involves "a minimal amount of stress and strain and is conducive to maximal efficiency of the body" [3,4]. Ideal posture is described using a theoretical plumb line (or vertical posture line)

that passes through the auditory meatus, just anterior to the acromion, just anterior to the greater trochanter, slightly anterior to the knee joint and just anterior to the ankle joint [4,5,6]. Postural changes are prevalent problems in the adult population that also arise early at children and adolescents [7]. There are intrinsic and extrinsic factors that can influence a child's posture, such as heredity, physical conditions under which the child lives, level of physical activity, socioeconomic level, emotional factors and physiological abnormalities due to human growth and development. Furthermore, postural responses to daily demands differ according to gender and the individual's skeletal maturity [8].

Normal anterior pelvic tilt for children 3 to 5 years ranges from 10° to 20°22 and reaches adult angles by 8 to 10 years.22 Young children, whose balance has not fully matured, may present with slight forward trunk flexion with a wider BOS. Up to age 10, a protruding abdomen may be seen. It has been observed that children at approximately 9 years of age may demonstrate an increased lordosis which decreases with age[5]. Grimmer and Williams found girls were more likely to report back pain compared to boys [9]. Heavy loading of the spine during growth is known to induce vertebral stress, resulting in problems such as scoliosis, kyphosis and lordosis in children [10]. External forces, such as heavy backpack loads, poor sitting mechanics affect the development of normal skeletal alignment that alter postures and structures [11].

The term kyphosis refers to the normal sagittal plane posteriorly convex curves in the thoracic and sacral regions of the vertebral column. The term lordosis refers to the normal sagittal plane anteriorly convex curves in the cervical and lumbar regions of the vertebral column. S an abnormal increase in the normal posterior convexity may occur, and this abnormal condition called kyphosis. This condition may develop as a compensation for an increase in the normal lumbar curve, or the kyphosis may develop as a result of poor postural habits [12]. Consistent lateral deviations of a series of vertebrae from the LoG in one or more regions of the spine may indicate the presence of a lateral spinal curvature in the frontal plane called a scoliosis [13].The present study was therefore designed to determine the prevalence of postural deviation among school girl aged from 7-9 years old. This was meant to establish the necessity for health screening program as part of routine requisite formalities at basic schools.

MATERIALS AND METHODS

Study Location: The study was conducted at in governmental school in southern educational district in Alexandria.

Procedure: Ethical approval for this study was sought and obtained from the Ethical and Protocol Review Committee of the University of Education Service Directorate gave approval to screen the pupils upon Researchers' request. Subsequent permission was obtained from the school heads who in turn notified the parents and guardians. During the 2014/2015 academic session all the children whose parents/guardians agreed to the screening were assessed. Schedules of visit per day with regard to the time were discussed with the school heads so as not to interfere with the school routines.

Sampling of the Schools: Schools were selected using multistage sampling methods. The first stage involved eliminating all male gender schools from the list of schools obtained from the Education Service. The final stage involved selection of 4 schools each from the public schools by simple random sampling incidentally, one of the selected schools parents refused to photograph girls, thus leading to their elimination. So, three public schools were eventually selected for the study.

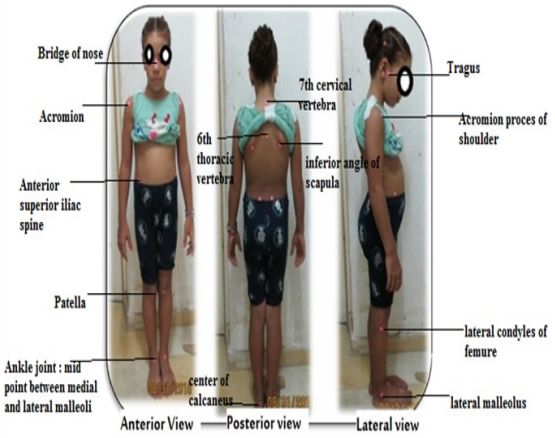
Participants: Participants for this study were female students within the age range 7 to 9 years. All the students attending the selected basic schools were eligible to participate in the screening programme. The sample size was determined using proportional allocation method ,using the power of 80% to detect the prevalence among primary school children where n is the minimum sample size required, p is the prevalence of postural deviation .students sample estimated at 50% based on previous preliminary data on the prevalence [percentage = 5%, alpha= 0.05 the effect size] Therefore, a projected minimum sample size of 337 female students was calculated. the 337 girls

students were selected through systematic sampling technique. Subjects were excluded from the study if they were with visual or hearing defect,other neurological disorders, musculoskeletal problems,previous orthopedic surgery ,any congenital abnormalities. ,recent fractures or cast or splints and Uncooperative students.

Materials for Data Collection

Measuring instruments: Data capturing form: was used to obtain information about age, height, weight, sitting hours, back pain, weight of back bag, way of sitting in school activity and level of physical activity. girls were Photographed in sagittal and frontal planes (anterior, posterior and lateral view) from standing position with markers on certain bony landmarks, then images were analyzed using auto cat software program to detect postural abnormality (posture zone).

Fig. 1: This figure illustrate body land marks from each assessment view (A : Anterior view , B : Posterior view and C : lateral view (right side))



Spinal assessment: In double stance, participants were examined to screen for asymmetry of the shoulders (elevated scapular), rib cage or hips; prominent scapula (winged scapular), lateral spinal curve (scoliosis),lordosis, apparent rib hump (kyphosis) torticollis and protruding abdomen. Forward-bend position firstly They were asked to stand at a fixed distance from the camera determined by landmark on the floor with light clothes on, secondly bony landmarks was determined by markers. Thirdly a picture was taking from anterior, lateral and posterior view. Finally collected photos was analyzed with posture zone assessment software and report printed. A digital camera was set on a tripod, 120cm high and 3 meters from the fixed floor landmark and a digital photograph was taken. Photographs were taken according to protocol set forth by Grimmer84 and adapted for this study. Subjects looked directly ahead at a target while a photograph was taken with a digital camera 3 meters away fixed on a tripod. The 5.0 megapixel camera178 with a resolution of 1600x1200 was set at the height of the subject's shoulder. A level was used to maintain the camera's position between sessions.

Data Analysis: The categorical data were analyzed using SPSS version 20, using descriptive statistics such as means, standard deviation, and percentages. Chi-square tests. The probability level of statistical significance was set at 0.05 alpha values.

RESULT

337 girl's school students participated in this study. Their mean ± SD age, weight, and height were 8.1 ± 0.87 years, 26.09 ± 2.18 kg, and 114.26 ± 5.42 cm respectively

Screening the study group for scoliosis revealed that there were 244 (72.4%) girls free, 41 (12.17%) had right scoliosis, and 52 (15.43%) had left scoliosis as demonstrated in Table 1.

Table 1: The frequency distribution of scoliosis in the study group.

	Scoliosis		
	None	Right	Left
No.(%)	244 (72.4%)	41 (12.17%)	52 (15.43%)
Total	337 (100%)		

Screening the study group for postural kyphosis revealed that there were 185 (55%) girls free, 3 (13%) had flat upper back, and 149 (44%) had kyphosis as demonstrated in Table 2.

Table 2: The frequency distribution of kyphosis in the study group.

	Postural kyphosis		
	None	Flat upper back	Kyphosis
No.(%)	185 (55%)	3 (13%)	149 (44%)
Total	337 (100%)		

Screening the study group for postural hyperlordosis revealed that there were 70 (21%) girls free, 31 (9%) had flattened curve, 152 (45%) had mild hyperlordosis, and 84 (25%) had moderate hyperlordosis as demonstrated in Table 3.

Table3: The frequency distribution of postural hyperlordosis in the study group.

	Postural hyperlordosis			
	None	Flattened	Mild	Moderate
No.(%)	70 (21%)	31 (9%)	152 (45%)	84 (25%)
Total	337 (100%)			

DISCUSSION

This study screened three hundred thirty seven normal girls students, aged from 7 to 9 years old in governmental school in southern educational district in Alexandria they were photographed in sagittal and frontal planes (anterior, posterior and lateral view) from standing position with markers on certain bony landmarks, then images were analyzed using specially designed auto cat software program to detect postural abnormality. Their mean ± SD age, weight, and height were 8.1 ± 0.87 years, 44.98 ± 2.13 lb, and 57.53 ± 4.8 inches respectively. The sample age came in agreement with Penha et al, 2008 who revealed that postural deviations are more common in girls aging 7 to 10 years old where There were abnormalities in children's postural development that are probably related to muscle, skeletal and flexibility differences in girls also these differences may influence each girl's postural pattern during growth [1]. Choosing the sample gender came in agreement with Marques, 2008 who revealed that postural deviations are commonly recorded in school students but some postural deviations are common in girls more than boys [6]. Penha et al, 2009 also stated that girls school students are more candidate for spinal postural deviations duo to Ligamentous laxity [14], their body building weaker than males and they can't tolerate high effort. Fassa et al, 2005 who confirmed that Higher prevalence of musculoskeletal disorders in females is attributed to the presence of more type-one fibers in the trapezius as well as sexual dimorphism of the spine in the former [15]. Also, Chansirinukor et al, 2001 who emphasized that gender differences in postural response and orthostatic balance relating to gender, spinal development level, muscle recruitment and skeletal maturity have been previously implicated in which females have better orthostatic equilibrium than men [16]. Screening the study group for scoliosis revealed that there were (72.4%) girls free, (12.17%) had right scoliosis, and (15.43%) had left scoliosis which is higher than that reported in previous studies as Bueno, 2012, who revealed that students with postural scoliosis have those percentages (S- shaped scoliosis 11.9 %and 21.3 % C-shaped scoliosis) [5]. Screening the study group for postural kyphosis revealed that there were (44%) had kyphosis. This result came in agreement with Amino, 2005 who reported that thoracic hyper kyphosis (postural kyphosis) in 9 years old girls was 45 %. Penha et al,2009 have found an increased prevalence of hyper kyphosis with increasing age. Thoracic hyper kyphosis was found in 21% of girls aged 7 years, 27% of girls aged 8 years, 45% of girls aged 9 years and 42% of girls aged 10 years [17]. Cil et al. 2004 have found an increase in the prevalence of thoracic hyper kyphosis among children up to 10 years of age [18]. Screening the study group for postural hyperlordosis revealed that there were (9%) had flattened curve, (45%) had mild hyperlordosis, and (25%) had moderate hyperlordosis. This result is close to Bueno, 2012 who approved that the prevalence of postural deviations was 27.9% for lumbar hyperlordosis. The ages of 8 to 12 years-old were a risk factor for lumbar hyperlordosis [5].

So this study suggests necessity for periodic screening in our basic schools so as to formulate effective preventive strategies through health surveillance on the possible progression to older age. It would be relevant to conduct a longitudinal follow-up of these children to assess the progress of these deviations throughout the children's development.

Conflicts of interest: **None**

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