



American Journal of Epidemiology & Public Health

Research Article

Prevalence and Levels of Forward Head Posture among School Going Children -

Hemendra Chandoliya¹, Varsha Chorsiya^{2*} and Dhananjay Kaushik³

¹Research Scholar, Faculty of Applied Sciences, Manav Rachna International University, Faridabad, Haryana, 121004, India

²Assistant Professor, School of Physiotherapy, Delhi Pharmaceutical Sciences and Research University, New Delhi, 110017, India

³Head, Physiotherapy, Inspire Institute of Sport, Karnataka-583275, India

***Address for Correspondence:** Varsha Chorsiya, Assistant professor, School of Physiotherapy, Delhi Pharmaceutical Sciences and Research University, New Delhi 110017, India, Tel: +91-801-000-3462; ORCID ID: orcid.org/0000-0002-6393-1422; E-mail: vk.c.chorsiya@gmail.com

Submitted: 03 February 2021; **Approved:** 15 February 2021; **Published:** 16 February 2021

Cite this article: Chandoliya H, Chorsiya V, Kaushik D. Prevalence and Levels of Forward Head Posture among School Going Children. American J Epidemiol Public Health. 2021 Feb 16;5(1): 022-025. doi: 10.37871/ajeph.id44

Copyright: © 2021 Chandoliya H, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Introduction: Exposure of overloaded bag packs and early usage of digital gadgets amongst school going children alters the cervical spine posture. The present research work intends to study the prevalence of forward head posture in school going children. The study also elucidates the ranges to consider for mild, moderate and severe forward head posture prevalence.

Methods: A total of 100 school students (50 males and 50 females) were recruited for cross-sectional study. Assessment of forward head posture was done using plumb line. The students were made to stand at a point marked 25 cm distance away from the plumb line. The researcher, from the side view, using a meter scale, measured the distance between the tragus of the ear and plumb line and record it. The weight of the school bag was measured using the weighing machine and the time for which gadgets were used was recorded as per the subject/parents feedback.

Results: The mean values for age, height, weight and BMI are 13.67 ± 0.55 years, 158.56 ± 7.71 cms, 46.47 ± 10.50 kgs and 18.40 ± 3.48 kg /m² respectively. The mean values for gadgets time use, distance plumb line and weight bag are 130.50 ± 67.07 min, 1.96 ± 1.19 cm and 4.32 ± 1.70 kgs respectively. About ~27% children having mild or no FHP (less than or equal to 1 cm), ~37% children having moderate FHP (ranging between 1.01 cm to 2.49 cm) and ~36% children found to have severe FHP (more than or equal to 2.5 cm).

Conclusion: The study showed that the FHP is developing at early stage in the school going children and it has the potential of altering cervical spine biomechanics. Early screening is much essential aspect to prevent FHP. The ergonomic based awareness programs should be organized to sensitize children about the right posture and to indulge them in physical activity.

Keywords: Forward head posture; Prevalence; School going children

INTRODUCTION

School environment plays an important role in the sitting position [1]. Children often sit with poor posture having their neck, shoulders, and back fixed for long periods during classroom lessons, and physical inactivity, repetitive static dynamic loading of the spine constitutes as a risk factor [2-4]. School pupils' primary tasks require them to sit for the majority of their classroom lessons and education years. Their seated classroom tasks include reading, writing, listening and computer use. As different postures are usually adopted for some of these tasks (e.g. writing compared with listening), chair and desk features may be contrary to recognized safe sitting postures [5].

Epidemiologic studies have shown that musculoskeletal problems due to any structural deviations in children are very common. A number of causal mechanisms have been proposed for adolescent back pain, including carriage of heavy school bags, rapid bony growth, inadequate fit of furniture to body size, poor muscle strength, poor motor control, balance and coordination, and poor posture [6].

Forward Head Posture (FHP) is one of the most common types of postural abnormality, and it is generally described as an anterior position of the head in relation to the vertical line of the body's center of gravity. If imbalances in cervical muscles resulting from postural misalignment are prolonged, an excessive load is imposed on the joint and muscle, thereby making the problems caused by FHP chronic [7]. Forward head posture is characterized by both an upper cervical extension and lower cervical flexion. These changes in the cervical region may lead to musculoskeletal dysfunction such as an "upper crossed syndrome" resulting from maintaining poor head position for a long duration of time. In addition, patients with FHP commonly complain of neck and shoulder pain [1,2,7]. For children and adolescents, upright posture measurements might be a useful clinical tool to identify and prevent the developmental process of musculoskeletal conditions in its early stages [8].

Nowadays, the digital technologies—use of gadget (mobile, laptops etc) replacing the physical activity and also the muscles are overloaded with back pack as shown in figure 1. These factors can provoke the changes at a very early stage. As per the literature reviewed, the forward head posture screening assessment can be an important tool to prevent further progression of the faulty posture. Therefore, the present research work intends to study the prevalence of forward head posture in school going children. Furthermore, the

study also elucidates the ranges to consider for mild, moderate and severe forward head posture prevalence.

MATERIALS AND METHODS

A total of 100 school students (50 males and 50 females) were recruited for cross-sectional study. Prior to the participation in the study, individuals were assessed according to inclusion and exclusion criteria and were explained about the procedure. The study protocol was approved by the Institutional Ethical Committee. The study is done in accordance with the National ethical guidelines for Biomedical and Health Research involving human participants-Indian Council of Medical Research (ICMR) guidelines (Revised 2017) and guidelines of Helsinki declaration 2013. The written informed consent was signed by the parents of the students for their voluntary participation in the study. The students between the ages of 10-14 years were included in the study. Simple random sampling was done. Students with postural abnormalities, such as spinal deviation or leg length discrepancy, or those with previous history of surgery on their spine or limb were excluded from the study.

Assessment of forward head posture was assessed by using plumb line as shown in figure 2. The student were made to stand at a point marked 25 cm distance away from the plumb line [9]. Then, the researcher from the side view using a meter scale, measured the distance between the tragus of the ear and plumb line and recorded it. The weight of the school bag was measured using the weighing machine and the time for gadgets usage was recorded as per the subject/parents feedback.

DATA ANALYSIS

Data Analysis was performed using Microsoft excel 2013 for window 10 software. The statistical analysis was done using IBM SPSS software version 24. The data was found to be normally distributed as calculated by Shapiro Wilk test for normality. Descriptive statistics was used to analyze and find out mean and standard deviation of subject's characteristics such as age, height, weight, bag weight and forward head posture. The percentile (25th, 50th, 75th) were used to calculate the mild, moderate and severe prevalence respectively.

RESULTS

A total of 100 subjects (50 males and 50 females) were included for the study. The mean values for age, height, weight and BMI are



Figure 1: Normal posture of school going student carrying bag.



Figure 2: Measurement of Forward Head Posture (FHP) using plumb line and ruler.

13.67 ± 0.55 years, 158.56 ± 7.71 cm, 46.47 ± 10.50 kgs and 18.40 ± 3.48 Kg/m². The mean values for gadgets time use, distance between tragus and plumb line and weight bag are 130.50 + 67.07 min, 1.96 ± 1.19 cm and 4.32 ± 1.70 kgs respectively. The descriptive percentile values for use of gadgets time (min), distance of plumb line (cm) and weight of bag (Kgs) are mentioned in the table 1. About ~27%

children were having mild or no FHP (less than or equal to 1 cm), ~37% children were having moderate FHP (ranging between 1.01 cm to 2.49 cm) and ~36% children were found to have severe FHP (more than or equal to 2.5 cm). The estimated use of the gadget time was also high in moderate to severe FHP and reported to be more than 1 hours and 3 hours respectively though no statistically significant association was found. Similar findings were observed with weight of the school bag. In mild FHP school bag was less than or equal to 3 Kgs, in moderate FHP it was between 3 to 4.6 Kgs and in severe FHP the bag weights were equal to or more than 4.7 Kgs. However, no statistically significant association was found between FHP and weight of school bag.

DISCUSSION

The study intended to find the prevalence and levels of forward head posture among school going children. The result revealed that ~ 36% students were having FHP equal to or more than 2.5 cms, ~ 74% students were using gadgets (watching TV, playing mobile etc) for more than 1 hour per day and ~ 43 % students were found to carry school bags weighing more than 2.5 kgs.

High school students carry their educational loads mostly in backpacks, without the workplace standards that have been developed for adults. There is limited understanding of adolescent postural responses to backpack loads and positions and exposure to load (i.e. the amount of time that it is carried). Efficient erect adult human posture is believed to reflect the least amount of physical activity required to maintain body position in space which minimizes antigavity stresses on body tissues. This is considered to occur in the unloaded state when the body is closely aligned with a vertical reference (reflecting gravity). Application of external forces to the body (such as in a backpack) is commonly associated with postural deviation from close alignment with the gravitational axis [10]. Similar study on the population of 11–14 year old, demonstrated, through a three-dimensional approach, how a backpack alters, significantly, posture and gait [11] that could be one of the probable reason in our study for forward head posture in school going children.

Therefore, early screening of posture at school level can prevent development of many musculoskeletal problems. In particular, head posture assessment is recommended as part of the examination of patients with neck pain to aid with diagnosis, determine treatment strategies and monitor the progress of the patient. Major therapeutic tasks performed in physical therapy involve teaching the ideal posture to patients in order to prevent postural problems, such as FHP, and the correction of faulty postures [12]. Further studies are required with a larger sample size, photogrammetry as the tool of measurement for FHP and to study FHP in the light of fatigued neck muscles.

Table 1: Mean, Standard deviations with Percentiles for variables studied.

Variables	Mean	SD	Percentiles		
			25 th	50 th	75 th
Time for gadget use [min]	130.50	67.07	67.50	120.00	180.00
Weight of Bag [Kgs]	4.32	1.70	3.000	4.000	5.700
FHP [cm]	1.96	1.19	1.000	1.900	2.500

Abbreviations: min: Minutes; Kgs: Kilograms; FHP: Forward Head Posture; cm: Centimeters



CONCLUSION

The study showed that the FHP which has the potential to alter cervical spine biomechanics is developing in the school going children at very early stage. Early screening is much essential aspect to prevent FHP. The ergonomic based awareness programs should be organized to sensitize children about the right posture and to indulge them in physical activity.

ACKNOWLEDGEMENT

The authors acknowledge the staff and management of schools (Dayanand School, DAV School and MR International School) of Faridabad, Haryana for extending help to carry out research at the institution. We are grateful for all the volunteers who participated in the study.

AUTHORS' CONTRIBUTION

VC developed the concept and conceived the study design; DK and HC prepared the methodology and carried out the data collection, and assisted in the drafting of the manuscript; VC carried out the statistical analysis and interpretation of the results; All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

REFERENCES

1. Lee EO, Olga K. Complex exercise rehabilitation program for women of the II period of age with metabolic syndrome. *J Exerc Rehabil.* 2013 Apr;9(2):309-15. doi: 10.12965/jer.130016. Epub 2013 Apr 25. PMID: 24278877; PMCID: PMC3836512.
2. Lee EO, Olga K. Complex exercise rehabilitation program for women of the II period of age with metabolic syndrome. *J Exerc Rehabil.* 2013 Apr;9(2):309-15. doi: 10.12965/jer.130016. Epub 2013 Apr 25. PMID: 24278877;PMCID:PMC3836512.
3. van Gent C, Dols JJ, de Rover CM, Hira Sing RA, de Vet HC. The weight of schoolbags and the occurrence of neck, shoulder, and back pain in young adolescents. *Spine (Phila Pa 1976).* 2003 May 1;28(9):916-21. doi: 10.1097/01.BRS.0000058721.69053.EC.PMID:12942008.
4. Park HC, Kim YS, Seok SH, Lee SK. The effect of complex training on the children with all of the deformities including forward head, rounded shoulder posture, and lumbar lordosis. *J Exerc Rehabil.* 2014 Jun 30;10(3):172-5. doi: 10.12965/jer.140113. PMID: 25061597; PMCID: PMC4106772.
5. Grimes P, Legg S. Musculoskeletal disorders (MSD) in school students as a risk factor for adult MSD: a review of the multiple factors affecting posture, comfort and health in classroom environments. *Journal of the Human-Environment System.*2004 Jan;7(1):1-9. doi:10.1618/jhes.7.1
6. van Niekerk SM, Louw Q, Vaughan C, Grimmer-Somers K, Schreve K. Photographic measurement of upper-body sitting posture of high school students: a reliability and validity study. *BMC Musculoskelet Disord.* 2008 Aug 20;9:113. doi:10.1186/1471-2474-9-113.PMID:18713477;PMCID:PMC2542508.
7. Lee HS, Chung HK, Park SW. Correlation between Trunk Posture and Neck Reposition Sense among Subjects with Forward Head Neck Postures. *Biomed Res Int.* 2015;2015:689610. doi: 10.1155/2015/689610. Epub 2015 Oct 25.PMID:26583125;PMCID:PMC4637041.
8. Lafond D, Descarreaux M, Normand MC, Harrison DE. Postural development in school children: a cross-sectional study. *Chiropr Osteopat.* 2007 Jan 4;15:1. doi: 10.1186/1746-1340-15-1. PMID: 17204148; PMCID: PMC1781952.
9. Nag PK, Chorsiya V, Nag A. EMG Activation Pattern during Voluntary Bending and Donning Safety Shoes. In *Applications, Challenges, and Advancements in Electromyography Signal Processing* IGI Global. 2014 May: 234-256. doi:10.4018/978-1-4666-6090-8.ch011
10. Grimmer K, Dansie B, Milanese S, Pirunsan U, Trott P. Adolescent standing postural response to backpack loads: a randomised controlled experimental study. *BMC Musculoskelet Disord.* 2002 Apr 17;3:10. doi: 10.1186/1471-2474-3-10. Epub 2002 Apr 17. PMID: 11960561; PMCID: PMC111061.
11. Negrini S, Negrini A. Postural effects of symmetrical and asymmetrical loads on the spines of schoolchildren. *Scoliosis.*2007 Jul9;2:8. doi:10.1186/1748-7161-2-8.PMID:17620121;PMCID:PMC1971247.
12. Nam SH, Son SM, Kwon JW, Lee NK. The Intra- and Inter-rater Reliabilities of the Forward Head Posture Assessment of Normal Healthy Subjects. *J Phys Ther Sci.* 2013 Jun;25(6):737-9. doi: 10.1589/jpts.25.737. Epub 2013 Jul 23. PMID: 24259842; PMCID: PMC3804999.