The Impact of Ergonomics on Children Studying Online During COVID-19 Lockdown

Maj S Bakhtiar Choudhary (Retd)^{1*}, Ashad Bakhtiar Choudhary², Sahera Jamal³, Rajesh Kumar⁴, Sanaa Jamal⁵

¹Professor, Director, Hyderabad Spine Clinics, 36-136, Defence colony, New Kranthi Nagar, Sainikpuri, Secunderabad, Telangana 500094, India

²Research Associate, Hyderabad Spine Clinics, 36-136, Defence colony, New Kranthi Nagar, Sainikpuri, Secunderabad, Telangana 500094, India

³Academic consultant, Hyderabad Spine Clinics, 36-136, Defence colony, New Kranthi Nagar, Sainikpuri, Secunderabad, Telangana 500094, India

⁴Principal, University College of Physical Education, Osmania University, Hyderabad, Telangana-500007, India

⁵Student Trainee, Hyderabad Spine Clinics, 36-136, Defence colony, New Kranthi Nagar, Sainikpuri, Secunderabad, Telangana 500094, India

DOI: [10.36348/jaspe.2020.v03i08.001](https://doi.org/10.36348/jaspe.2020.v03i08.001)

| Received: 27.07.2020 | Accepted: 03.08.2020 | Published: 09.08.2020

*Corresponding author: Maj S Bakhtiar Choudhary

Abstract

Background: Human body is still in the process of evolution. Incorrect ergonomics at workplace including working from home is not free from serious long-term health effects. Lockdown during COVID-19 pandemic, people stayed indoors. This has led children to depend on online classes, training and meetings. In view of this, study was undertaken to assess the effects of ergonomic settings on children spending more time on devices. **Methods:** About 186 children (aged between 10-18 years of both sexes) and their parents volunteered to respond to online survey with a questionnaire covering awareness of parents on ergonomics, problems encountered by children on 'make-shift' workplace adjustments, hours of sitting, screen time, eye-monitor ergonomics, backrest, footrest, keyboard & mouse ergonomics, breaks during work and gadgets they used. Problems encountered by the children were analysed. This was conducted 60 days after the first day of lockdown in Hyderabad (23 March 2020). **Results & Discussion:** Children spent longer hours on gadgets, on laptops (58%), android / apple phones (20%), desktops (12%) and tablets (10%). Their content on gadgets was 45% curriculum, 35% games and 20% others. Study revealed that parents were unaware of ergonomics and effects on their children. Very few parents understood the correct sitting posture (6%), eye-monitor ergonomics (1%), laptop ergonomics (3%) and (38%) importance of breaks. About 21% of subjects suffered upper back pain, 18% lower back pain, 13% eye strain, 11% headache, 6% had irregular sleep and 6% behavioural changes. Effects of wrong posture during work, repetition, loading and probable cause for pain were discussed in the paper. **Conclusion:** This pilot exploratory study revealed that parents and students were not aware of ergonomics. In a short duration of two months, lot of them have developed significant problems and this may increase the risk of many painful syndromes in future. These incorrect student-occupation practices may develop into permanent habits. There is a need of inclusion of ergonomics and workplace management in school curriculum, parents and teachers need training in the subject. More controlled studies are required to develop lifestyle strategies to combat these inevitable problems.

Keywords: Human body, Lockdown, COVID-19 pandemic, ergonomics.

Copyright @ 2020: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Human evolution has great impact on adaptability of human body to their environment and their lifestyle needs. Ergonomics can be defined as an applied science concerned with structuring and organizing things commonly utilized by individuals with the goal that both people and things connect most efficiently and securely [1]. Ancient humans spent their time either moving or resting; sitting was acquired later. Human anatomy is not in a favour of sitting posture as the loading effects on spine and appendages are much higher during sitting than in lying and walking. Animals

do not suffer back and neck pain as much as humans due to their horizontal spinal column compared to vertical human spine. COVID-19 pandemic has forced people to stay indoors. Schools, colleges and other educational institutions were shut down. This has led to a dependency on online classes, training and meetings. Thus, children were spending more time on androids, laptops, desktops and other devices. However, neither the children nor parents and teachers were aware of the problems associated with acquired incorrect postures, Repetitive Strain Injury (RSI), Cumulative Trauma Disorders (CTDs) and MSD's (musculoskeletal disorders). MSDs refer to a wide range of inflammatory

and degenerative disorders of muscles, tendons, and nerves. These disorders can result in pain and functional impairment affecting many body parts such as the neck, upper and lower back, shoulders, elbows, wrists, and hands [2]. Demand for online classes and education is growing, there are no relevant training programs or educational materials to make children understand or prevent postural problems related to prolonged screen usage programs. Modern gadgets, although handy and easy to use are addictive in children. Children with variable stature and size may not fit into 'make-shift workstations' at home and may increase the risk of RSI's. In view of this, study was undertaken to assess the effects of these incorrect ergonomic settings and new online education methodology on children.

METHODOLOGY

Online survey was conducted with a questionnaire addressing awareness of parents on understanding of ergonomics during prolonged hours of work by their kids on computers and other gadgets, problems encountered by children working on 'make-shift' workplace adjustments. With the consent of parents, questionnaire was filled by children who are studying, playing and undergoing training online. Out of 230 families 186 children (aged between 10-18 years of both sexes) with their parents responded. Children with pre-existing medical problems and who are not attending any online work, incomplete questionnaires were excluded from the survey. This was conducted 60 days after the first day of lockdown in Hyderabad (23 March 2020). They responded to questions on sitting duration, screen time, eye-monitor ergonomics, backrest, footrest, keyboard & mouse ergonomics, breaks during work, content, gadgets they used and the problems encountered by them. Questionnaires were collected online and analysed. Frequency of distribution and descriptive statistics were utilised. Due to covid-19 lockdown, personal examination, anthropometric data and real time workplace measurements were not obtained.

RESULTS

Study revealed (Table-1, Fig-1) that parents were unaware of ergonomics and the problems related to incorrect ergonomics such as RSI (Repetitive Strain Injury), MSD's (Musculoskeletal disorders) and CTD (Cumulative Trauma Disorder) on their children. They conveyed that schools and teachers never taught ergonomics in schools and it's not in their curriculum. Children spent (Table-2, Fig-2) sitting for 5-7 hours a day studying and working on gadgets. Children worked on laptops (58%), android / apple phones (20%),

desktops (12%) and tablets (10%). Children spent more time (Table-3, Fig-3) on school/college curriculum, online classes, course training (45%), on games and online recreation (35%) and watching others (20%). Very few parents knew right posture during sitting (6%), eye-monitor ergonomics (1%), laptop ergonomics (3%) and many parents (38%) knew the importance of regular breaks during prolonged sitting. Parents were not aware that incorrect ergonomics at workplace can have serious impact on child health.

Table-1: Awareness of Parents on Ergonomics

Knowledge of RSI / MSD's / CTD	0%
Sitting Posture	6%
Eye-monitor Ergonomics	1%
Keyboard & Mouse Ergonomics	0%
Breaks during Work or Study	38%
Laptop Ergonomics	3%
Contribution By teachers (ergonomics)	0%

Table-2: Studying Habits

Average hours on Gadgets (hours)	5 +/-1.2
Laptop users	58%
Android users	20%
PC (Personal Computer) users	12%
Tablet users	10%

Table-3: Online Content

Education (curriculum/training)	45%
Games / recreation online	35%
Others	20%

Many subjects (21%) suffered (Table-4, Fig-3) moderate to severe upper back pain (neck and shoulder area), 18% of children suffered mild to moderate low back pain, 13% felt eye strain (dryness, redness and pain), 11% suffered headache, many children had irregular sleep and 6% suffered behavioural changes such as inappropriate anger and some suffered severe boredom due to restrictions laid down due to covid-19 lockdown.

Table-4: Problems Reported (n-186, aged 10-17y of both sexes)

Upper back pain	21%
Lower back pain	18%
Wrist & hand pain	6%
Dry eye syndrome	13%
Headache	11%
Insomnia	8%
Behavioural changes(Anger, Irritation, boredom)	6%

Fig-1

Fig-2

Fig-3

DISCUSSION

Posture & Pain

Adults who work in an uncomfortable position tend to take breaks and relax after the work hours. Children tend to be actively involved in some other activity after their long hours being on systems. Children have peculiar characteristics with regard to their body size, stature and their stage of growth and development and these may have relevance with role of ergonomics in their work habits. We have no idea about their bone development and calcification and bone density reaches its peak in the late teens and how much poor ergonomics is responsible to children's back pain

in later in life, simply because this is the first generation to suffer from these. Often children skip their much-needed breaks.

There is not much Indian data available for ready reference. Current study suggests that RSI & Other MSD's are prevalent in children spending time on gadgets. One important study on computer professionals reported problems of RSI, CTD in majority of them [3]. Prolonged sitting coupled with wrong ergonomics leads to wrong posture, resulting in increase in risk for neck and back pain. Young children (stature less than 145cm) cannot fit into standard chair

and computer workstations, our study revealed that many children couldn't reach their feet on floor while working thus forcing them to work in slouch posture with forward head posture. Children working on smart phones had the worst ergonomics. 'Make-shift' arrangements with regard to improvised chair and table pose increased risk of musculo-skeletal pain. Forward head posture is a [4] known cause which puts lot of pressure on cervical and lumbosacral spine, intervertebral disc and the pain resulting from the respective nerve territories. Fixed postures of neck while focusing on the monitor probably caused severe pain in the neck and shoulder muscles. The persistent pain in the shoulder area is also attributable to static loading or isometric contraction of muscles of neck, shoulder and arms in order to maintain the position of function [5, 6]. Wrist and hand pain may be due to ill-fitting keyboards and mouse and overuse of touch-screen. Repetitive typing and clicking of mouse/track balls/think pads/touch pads can cause micro trauma in carpal tunnels. Prolonged sitting is known to increase appetite thus, increasing their calorie intake, body fat and increasing risk for disease early in life.

Eye strain, Headache and Irritation

Asthenopia, an eye fatigue syndrome experienced by young children while viewing at laptop/desktop/smart phone monitors for a long period. Frequent focusing on different size of fonts, colours, and moving screens cause severe strain on rectus and oblique muscles of the eye ball, more so, in spectacle wearers. Children are more engrossed while playing games on computer and unaware of eye monitor level, eye monitor distance, glare and posture in which they are working. Children have a tendency to not to blink their eyes often while watching interesting subjects on screen thus lacrimation of eyeball is reduced and it causes dryness and redness of the eyes. Direct or indirect glare, incorrect eye monitor ergonomics are responsible for eye strain and headache and it may lead to myopia early in life. Headache, irritation and insomnia may attribute to prolonged exposure to microwave radiation from gadgets and boredom due to lockdown itself.

CONCLUSION

This study during covid-19 lockdown period revealed that many children suffered from RSI and other MSD's. Children and parents were not aware of ergonomics and working habits. There is an urgent need of including ergonomics and workplace management in their school syllabi. Children need micro breaks from their sitting postures and they should be encouraged to undertake positive life style habits. Administrators need to focus on class room ergonomics with suitable ergonomic aids. RSI is not a medical disease but it is a strong platform for future preventable disease. Current study prompted us to develop a unique software

programme which can guide programmed breaks, on site anti-RSI exercises and complete understanding of man-machine relationship.

RECOMMENDATIONS

1. There are no readymade gadgets and furniture to suit every child. It is important to understand, learn and practice sound ergonomics
2. Teachers, parents and children must be trained in fundamentals of workstation ergonomics, it should be incorporated in their school curriculum
3. Tall and short statured children need customised workstations
4. Children should strictly be prevented from using smart phone for online studies
5. Children should be encouraged to have frequent micro breaks from their sitting
6. School curriculum should include ant-RSI deskbound stretches and recreational games
7. Children with MSD's and RSI's should be treated by Occupational health and Sports physicians.

Acknowledgements: We convey sincere thanks to parents who patiently answered all our questionnaires and provided suitable information. We thank Prageeth Ramachandran, Hyderabad Spine Clinic and tenet diagnostics staff for their help during preparation of manuscript.

Conflicts & Funding: Nil

REFERENCES

1. Gupta, A., Bhat, M., Mohammed, T., Bansal, N., & Gupta, G. (2014). Ergonomics in dentistry. *Int J Clin Pediatr Dent.* 7:30-34.
2. Buckle, P. W., & Devereux, J. J. (2002). The nature of work-related neck and upper limb musculoskeletal disorders. *Appl Ergon.* 33:207-217.
3. Choudhary Bakhtiar, S., & Sapur, S. (2000). 'Can We Prevent Occupational Stress In Computer Professionals?'. *Indian Journal of Occupational and Environmental Medicine.* 4(1):4-7.
4. Maj. Choudhary Bakhtiar, S., Sapur, S., & Deb, P. S. (2000). Forward head posture is the cause of 'Straight Spine Syndrome' in many professionals. *Indian Journal of Occupational and Environmental Medicine.* 4(3):122-124.
5. Ferguson, D. (1984). The 'New' industrial epidemic. *Med J Aust.* 318-319.
6. NOHSC (National Occupational Health and safety Commission). (1986). RSI Committee Report and Model Code of Practice Canberra: Australian Government Publishing Service, 7.