



## EFFECTS OF WORK FROM HOME POSTURE ON THE MUSCULOSKELETAL SYSTEM IN INFORMATION TECHNOLOGY WORKERS DURING THE COVID-19 PANDEMIC

Pindika Prabhu Jeevan Kumar<sup>1</sup> and Solkar Ankit Anant<sup>\*2</sup>

Physiotherapy, Alva's College of Physiotherapy, Moodibidri, Dakshina Kannada (Karnataka) India.

**\*Corresponding Author: Solkar Ankit Anant**

Physiotherapy, Alva's College of Physiotherapy, Moodibidri, Dakshina Kannada (Karnataka) India.

Article Received on 31/05/2023

Article Revised on 20/06/2023

Article Accepted on 10/07/2023

### ABSTRACT

**Aim And Objective:** The objective is to know the effect of musculoskeletal pain on the work from the home population. The study's aims were the following:

- 1) To see whether Information technology company workers had more severe musculoskeletal pain than before they started working from home.
- 2) To establish whether the pain was related to work conditions at home.
- 3) To recommend preventive measures.

**Background:** One of the side effects of the COVID-19 pandemic is a global change in work ergonomic patterns as millions of people replaced their usual work environment with home to limit the spread of the SARS-COV-2 infection. The aim of our study was to identify musculoskeletal pain that may have resulted from this change.

**Methodology:** Study design: survey method.

Study type: comparative study.

Sampling method: convenience sampling (nonprobability sampling method)

Study setting: bhandup.

Sample size: 80 (monkey survey). **Conclusion:** Based on the findings of the present have a look at, ergonomic education workshops on line or offline have to be conducted for personnel, to sensitize the postural advices and correcton

**KEYWORDS:** COVID-19 pandemic, back pain, ergonomics; gender; hand pain; neck pain; physical activity; workspace; work with computers; fear; musculoskeletal pain; sleep; stay-at-home social isolation.

## 1. INTRODUCTION

### 1.1 Background

The COVID-19 pandemic has modified our lives and our operating habits. From its start, employees have been noted operating from domestic to restrict the unfold of contamination with the intense acute respiration syndrome coronavirus 2 (SARS-COV-2). This extrude withinside the operating surroundings has, in turn, introduced important adjustments in paintings ergonomics and brought to the modern-day demanding situations to fitness at paintings, maximum appreciably in phrases of preventing/minimising musculoskeletal pain.

### 1.2 Need for The Study

With the recognized fitness and socio-monetary consequences of work-associated musculoskeletal disorders, there may be a want to swiftly overview the prevailing applicable literature to tell decision-making in the direction of on the spot applications and regulations that cope with the fitness and health of people who are

constantly running from domestic. The intersection among people and their running surroundings is an vital place of studies that desires proof to assist the improvement of responsive clinical interventions. The motive of this observe is to discover musculoskeletal ache signs related to work-from-domestic situations at some point of the COVID-19 pandemic.

### 1.3 Aims and Objective of The Study

The objective is to know the effect of the musculoskeletal pain on the work from home population.

The aims and objectives of study were the following:

- 1) To see whether Information technology company workers had more severe musculoskeletal pain than before they started working from home,
- 2) To establish whether the pain was related to work conditions at home, and
- 3) To recommend preventive measures.

## 2. AREA OF LITERATURE REVIEW

### 2.1 Search Strategy-

Database used : - PubMed, Google scholar.

Languages:- English

Boolean operators :- AND , OR ,NOT.

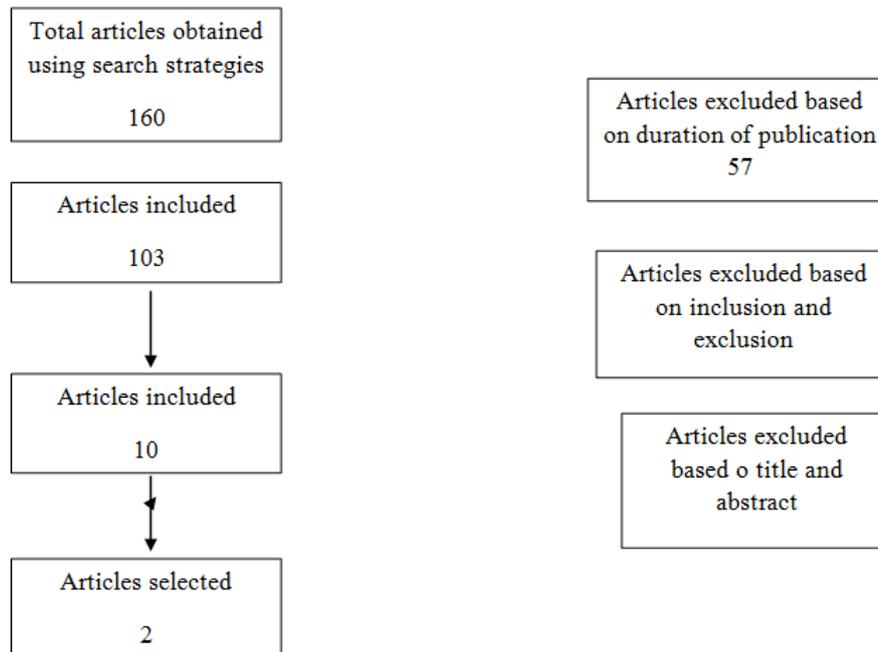
2.2 Section of literature review.

2.2.1 Section 1- Background knowledge about work from home and musculoskeletal pain in IT job workers during covid-19 pandemic.

2.2.2 Section 2- Survey method

2.2.3 Section 3- Survey and questionnaire development

### 2.2.1 Section 1:- Background knowledge about Work from home and musculoskeletal pain in IT job workers during COVID-19 pandemic



**Figure 01:- literature review of section 01.**

Article 01:- Computer work and musculoskeletal disorders of the neck and upper extremity: A systematic review Morten Wærsted, Therese N Hanvold & Kaj Bo Veiersted. The main results are summarized in Table 1, showing limited evidence for an association between computer work and some of the studied musculoskeletal disorders. We emphasize that these conclusions are based on few included studies of computer work and diagnostic entities.

Article 2: Work from home and musculoskeletal pain in telecommunications workers during COVID-19 pandemic: a pilot study Azra Hursidic Radulovic<sup>1</sup>, Roko Zajac<sup>2</sup>, Milan Milosevic<sup>2</sup>, Bojana Radulovic<sup>3</sup>, Ivica Luketic<sup>4</sup>, and Tajana Bozic<sup>5</sup> <sup>1</sup>Occupational Health Practice, Zagreb, Croatia <sup>2</sup>University of Zagreb School of Medicine, Andrija Štampar School of Public Health, Department of Environmental Health and Occupational and Sports Medicine <sup>3</sup>University Hospital Center Zagreb, Department of Emergency Medicine, Zagreb, Croatia <sup>4</sup>A1 Hrvatska doo <sup>5</sup>Polyclinic “Dr. Zora Profozić”, Zagreb, Croatia [Received in May 2021; Similarity Check in May 2021; Accepted in September 2021] summary of section 1:- There were 160 articles were selected based on keywords and according to the inclusion and exclusion criteria only 10 were selected

and based on the title and abstract 2 were selected for detailed review.

### 2.2.2 Section 2:- Survey Method

#### Search strategy

Database used:- PubMed, Google scholar.

Keywords :- Covid19, survey method, musculoskeletal pain, work from home,

Languages:- English

Boolean operators:- AND, OR, NOT.

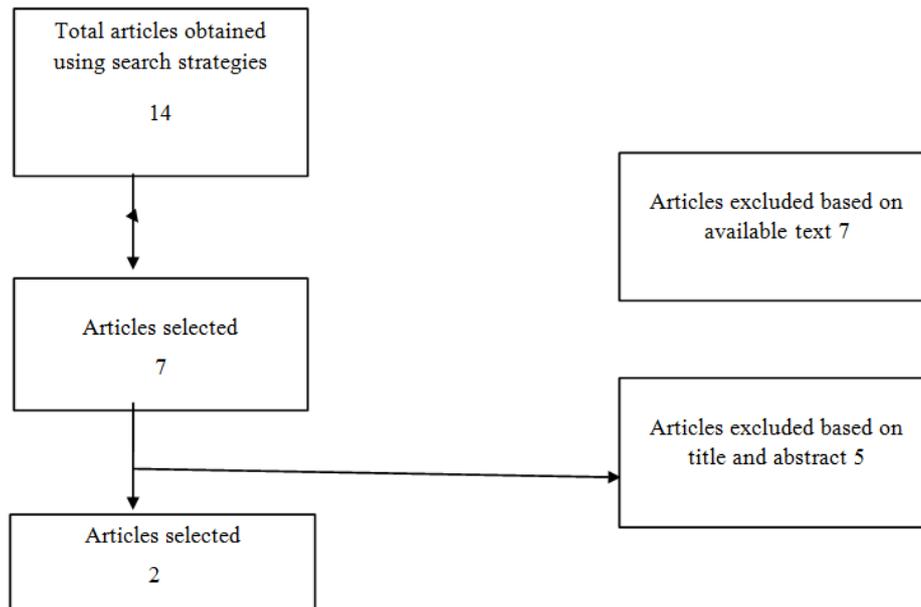


Figure 02:- literature review of section 02.

### Article 01:-Computer workstation ergonomics: Current evidence for evaluation, corrections, and recommendations for remote evaluation

Author links open overlay panel Susan Emerson MEd, OTR, CHT, CEES<sup>a</sup> Katelyn Emerson MA<sup>b</sup> Jane Fedorczyk PT, PhD, CHT<sup>c</sup>

Computer use in the workplace has increased substantially since the start of the information age in the mid-1980s through 2020. Desktops, laptops, and tablets are essential tools for communication and project management. As a result of the COVID-19 pandemic, many workers have transitioned to work from home (WFH) to sustain public health emergency guidelines, and it is anticipated that many WFH jobs will be maintained post-pandemic.

### Article 02:- Effects of workstation adjustment to reduce postural exposure and perceived discomfort among office workers - A cluster randomized controlled trial

Author links open overlay panel Fernanda Cabegi de Barros Cristiane Shinohara Moriguchi Tatiane de Oliveira Sato

This study aimed to evaluate the effects of workstation adjustment to reduce postural exposure and perceived discomfort among office workers in a cluster randomized controlled trial. Experimental (EG, n = 31) and control groups (CG, n = 30) were compared before (pre-intervention), immediately (post-intervention), and 3 months after (follow up) the intervention. EG received workstation adjustments and CG did not receive the intervention. Postural exposure of head, upper back and upper arms was objectively measured by inclinometers. Overall level of perceived discomfort for the whole body was evaluated using a visual analogue scale (0–100 mm).

EG showed a statistically significant reduction on the head (pre: 10.1°, SD 5.7°; post: 6.6°, SD 4.7°) and upper back flexion (pre: 15.4°, SD 10.7°; post: 10.4°, SD 8.4°) from pre to post-intervention.

### Summary of section 2

From the above-mentioned keywords 14 articles were selected and based on the inclusion and exclusion criteria 7 were selected. Also, based on the abstract were selected and the articles were basically of qualitative study design and interviews questionnaires were asked in those and also the outcomes was transcribed and perspectives and views was mainly positive.

### 2.2.3 SECTION 3: Survey and Questionnaire development

#### Search strategy

Database used:- PubMed, Google scholar.

Keywords:- covid19, kap survey, musculoskeletal pain, work from home

Languages:- English

Boolean operators:- AND, OR, NOT.

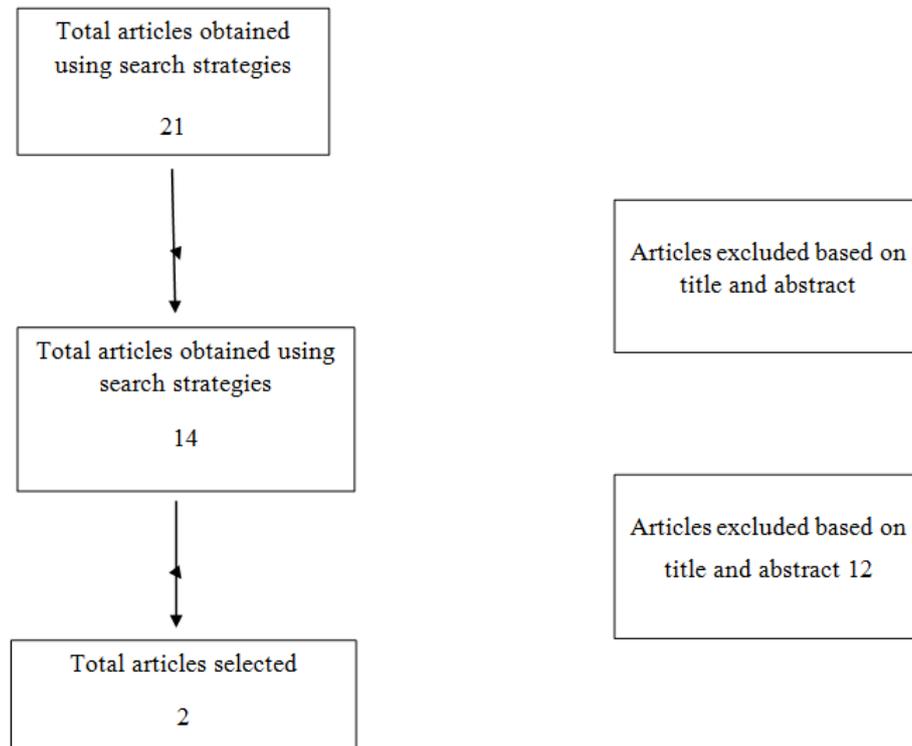


Figure 3:- Literature review section03.

#### Article 01

Work from home and musculoskeletal pain in telecommunications workers during COVID-19 pandemic: A pilot study

Azra Hursidic Radulovic<sup>1</sup>, Roko Zajac<sup>2</sup>, Milan Milosevic<sup>2</sup>, Bojana Radulovic<sup>3</sup>, Ivica Luketic<sup>4</sup>, and Tajana Bozic<sup>5</sup> Occupational Health Practice, Zagreb, Croatia<sup>1</sup> University of Zagreb School of Medicine, Andrija Štampar School of Public Health, Department of Environmental Health and Occupational and Sports Medicine<sup>3</sup> University Hospital Center Zagreb, Department of Emergency Medicine, Zagreb, Croatia<sup>4</sup> A1 Hrvatska doo<sup>5</sup> Polyclinic “Dr. Zora Profozić”, Zagreb, Croatia [Received in May 2021; Similarity Check in May 2021; Accepted in September 2021]

Our questionnaire has proved itself to be a welcome instrument for collecting relevant information to assess working conditions at home. Considering this study with participants from a telecommunication company has been our first, trial run, there is plenty of room for improvement, but, generally, we can conclude that the working conditions at home can be satisfactory, provided that the above preventive measures are in place. Further research should address gaps to be filled to get a complete picture of our findings and improve occupational safety and health assessment of work at home.

#### Article 02

**Characterization of Home Working Population during COVID-19 Emergency: A Cross-Sectional Analysis** by Milena Aulicino, Marco Paoletta, Sara Liguori and Giovanni Iolascon Department of Medical and Surgical Specialties and Dentistry, University of Campania “Luigi Vanvitelli”, 80138 Naples, Italy Author to whom correspondence should be addressed. *Int. J. Environ. Res. Public Health* **2020**, *17*(17) 6284; <https://doi.org/10.3390/ijerph17176284>

**Received: 28 July 2020 / Revised: 22 August 2020 / Accepted: 23 August 2020 / Published: 28 August 2020** Evidence about the characterization of home workers in terms of both work-related outcomes and health issues is lacking. The purpose of this cross-sectional study was to examine the impact of home working on perceived job productivity and satisfaction, work-related stress, and musculoskeletal (MSK) issues. We included 51 mobile workers, collecting data about demographic characteristics, working experience, job productivity, and stress. Job satisfaction was assessed through the Utrecht Work Engagement Scale (UWES), while MSK pain was investigated by the Brief Pain Inventory (BPI) and Fear Avoidance Beliefs Questionnaire (FABQ). Moreover, a home workplace analysis had to be carried out according to current Italian regulations.

#### Summary of section:- 3

Based on the key words 21 articles were selected and some of them were excluded based on inclusion and exclusion criteria 2 articles were found relevant and surveys were done for population working from home.

### 2.3 Summary of literature review

From the review of the above article, we understand that there are high risk of developing the musculoskeletal disorders at home settings in work from home population because of improper ergonomically arrangement of work station settings. However, articles are also providing information about questionnaire development, steps to followed in survey method, and procedure of data analysis, which will help us to check the impact of work from home and musculoskeletal pain.

## 3. METHODOLOGY

### 3.1 Introduction to methodology

An initial search of Pubmed was done to find keywords. The search strategy consisted of keyword according to Medical subject headings (Mesh). This strategy was conducted across Pubmed and Google scholar for articles published from 2019- 2022. The final search strategy was conducted using the search terms and Boolean logic and only full texted articles were included in study.

### 3.2 Study design

Survey method

### 3.3 Sampling

Sampling type :- Convenience sampling

Sampling size :- 80(monkey survey)

Study duration :- 3 months

Study frame :- Bhandup

### 3.4 Participants characteristics

#### Inclusion criteria

Work from home population , age group 18-45 years

#### Exclusion criteria

people with congenital musculoskeletal disorders, fracture, age more than 45years, pregnancy or spinal, intra-abdominal surgery, a history of trauma or accidents at the low back region or had been diagnosed with rheumatoid arthritis, ankylosing spondylitis, systemic lupus erythymatosus or osteoporosis, cardiovascular diseases or severe pulmonary diseases.

### 3.5 Outcome measures

Self-developed questionnaire. Materials required – self developed validated questionnaire

The questionnaire was prepared and validated by the panel of expert members, later questionnaire was send through an Email and recording was done with prior permission.

### 3.6 Procedure

1. Permission from “Alvas college of physiotherapy” was taken for the survey.
2. For survey participants that is Information technology workers were selected based on inclusion and exclusion criteria.

3. self-developed questionnaire was formed which will be asked about perspectives and opinions towards Work from home and musculoskeletal pain.
4. The questionnaire was sent to experts for face validation.
5. Once on completion of face validation the questionnaire was corrected and was utilized for survey.
6. The survey was conducted through Email interview's. Inform consent was taken and recorded. Responses from the participants was recorded. Based on the summary of responses, results were transcribed and analysed.

### 3.7 Method

Online survey based research was conducted to understand the work from home postures and prevalence of aches and pain. Survey questionnaire was prepared by google forms and was distributed via email and whatsapp. Survey forms were sent to participant population which was circulated by human chain. Clear instructions regarding honest responses while highlighted at the beginning of the survey. It was also mentioned that the survey is only applicable for age 18 – 45 who are professionals and working from home. All responses collected were strictly anonymous.

First part of the questionnaire featured general questions about individuals name, age, gender. Second part of the survey questionnaire were included details of individual working hours, working station, work posture. Last part of the questionnaire was formulated to gather information regarding load on musculoskeletal system and questions regarding region of pain, intensity of pain by NPRS, duration of pain, effect of pain on sleep, general physical fitness and whether the cause of the pain is due to their faulty posture to understand the awareness of ergonomics and awareness of posture in population.

### 3.8 Data analysis

All data were entered in EXCEL and descriptive statistics was used. In the survey both open and closed ended questions were asked in which for closed questions responses are presented in the form of pie charts and open-ended questions are listed out. The recorded responses of the participants were listed and presented in the form of pie charts.

## 4. RESULTS

The study was conducted to know the attitude of information technology workers of Bhandup area towards work from home posture and its effect on musculoskeletal system. The responses and data were analysed and results were presented in pie chart forms.

Among 130 respnses 50.8% were the male and 49.2% were the female.

Out of which 89.2% people responded they do not have any health issues whereas 9% responds that they were

suffering from PCOD. Followed by diabetes, other and hypertension 2% each and 1% respectively.

Also 93.8% people responds that they do not have any postural deformity whereas 6.2% people responds that they have postural deformity.

Out of total respondents 92.2% people are still working from home whereas 7.8% people do not continue with work from home.

68.55% people respondent that work from home is not comfortable for them, also 73.1% says that work from home is painful than office duty hours. Whereas 29.2% people respondent that they feel work from home is more comfortable and 26.9% reported that it is not painful than office working hours.

Over 48.5% spend 9-12 hours/day for work from home followed by 22.3%, 21.5% and 7.7% for 7-9 hours/day, 5-7 hours/day and more than 12 hours respectively.

Out of total respondents 78.5% respondent took breaks in between working hours and 6% respondent do not take breaks in between as well as 16.9% noted that they took breaks sometimes only.

Out of which 32.3% respondent that they took break after 2-3 hours of continue working hours. 25.4% respondent that they took breaks after working continuously for 20 mins and after 40-60 mins. 10.8% people reported that they takes break more than 4 hours of continue working and 6.2% reports that they took break after 4+hours of working.

Also 85.4% people reported that they suffer from pain after working for long period of time whereas 10% reported that they do not suffer any pain after working for long hours also 4.6% reported that sometimes they suffers from pain after working for long period of time.

When the area of pain ask to the people 40.8% reported that they suffer from low back pain, 17.7% reported that they suffer from neck pain, 10% suffers from middle back pain, 8.5 reports that they suffer from shoulder pain. Followed by hip, upper back, leg, foot and other about 7.7%, 6.2%, 5.4%, 3.1% and 0.8% respectively.

When the people were asked about the nature of pain, 37.7% reported that, "The pain comes and goes and its very severe", 25.4% reported that, "The pain comes and goes and its moderate", 17.7% reported that, "The pain comes and goes and its very mild", 13.8% reported that, "The pain is mild and does not vary much" and 5.4% reported that, "The pain is sever and does not vary much".

40% people reported that the pain been an ongoing problem for them for 1-3 months, whereas 34.6% noted that pain had been less than one month problem for them and 25.4% responded that they suffer from pain for more than 3 months.

When the question regarding ergonomics awareness were asked, 63.8% people responded no and 36.2% people responded yes for the awareness. 60% people had made appropriate workstation where as 40% people did not have any workstation at their home. The 47.7% people reported that the computer set up is not according to their body, 42.3% reported that the setup is appropriate to their body and 10% people are confused about there working setup.

48.5% people reported that they have adjusted screen at eye level, 33.1% above eye level whereas 18.5% below eye level.

When people were asked about, " Do you think the pain which you are suffering now is due to inappropriate posture, spending less timing on physical activities 86.9% and 88.5% respectively reported yes.

When people were asked about the physical fitness timing 50.8% reported that they spent less than 20 mins/day, followed by 20-40 mins /day with 38.5% and 10.8% for 40mis/day.

Also 46.9% reported that they do get proper sleep, 36.9% says no and 16.2% says sometimes they get proper sleep after working for long period of time. With sleeping hours of 46.9%, 26.9%, 16.9% and 9.2% gets 4-6 hours/day, 6-8 hours/day, 2-4 hours/day, and 9.2% respectively.

Age

130 responses

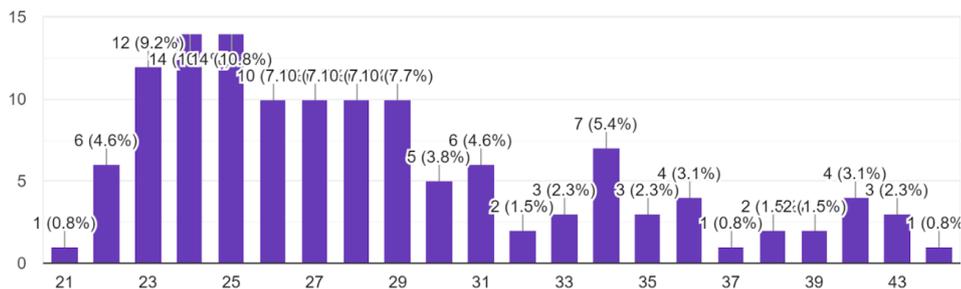


Figure 1.

Gender

130 responses

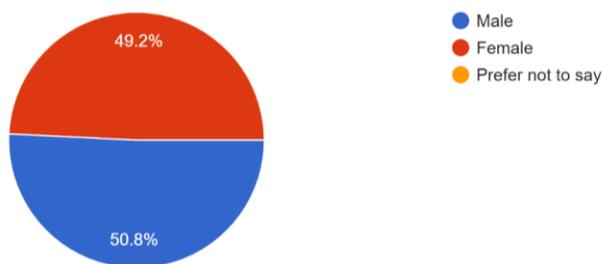


Figure 2.

Do you have any health issues?

130 responses

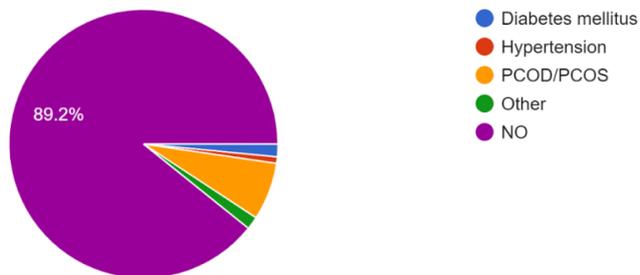


Figure 3.

Do you have any postural deformity?

130 responses

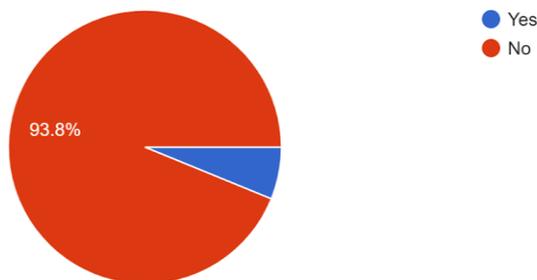


Figure 4.

Are you still working from home?

129 responses

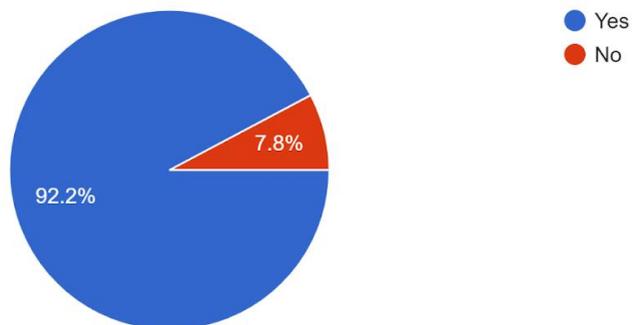


Figure 5.

If compare to office duty hours, do you feel work from home is better?

130 responses

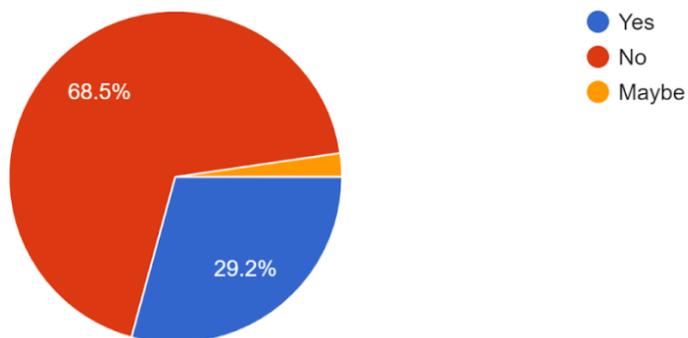


Figure 6.

How much time do you spend for work from home?

130 responses

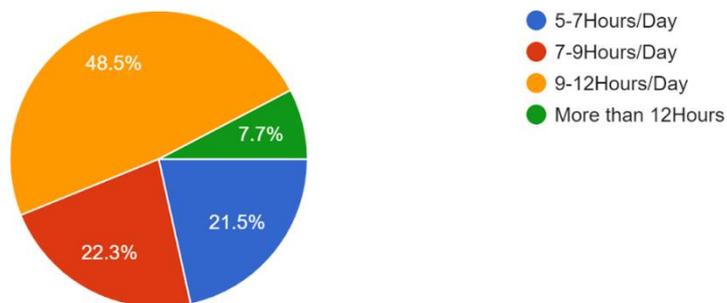


Figure 7.

Do you take breaks in between working hours?

130 responses

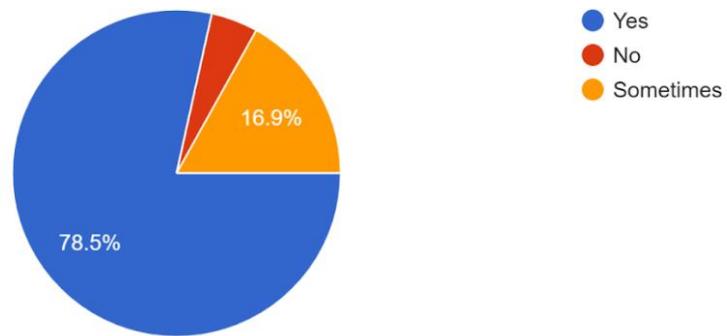


Figure 8.

If yes, then how frequent?

130 responses

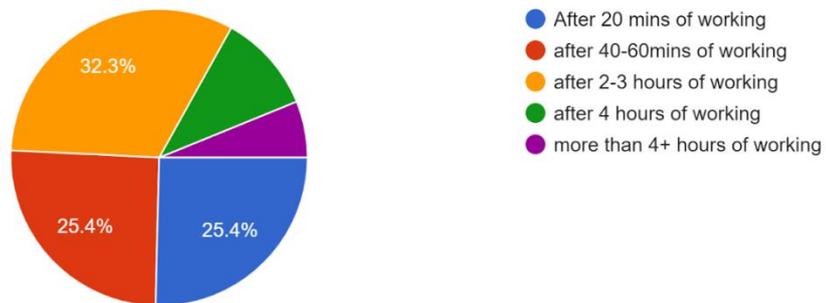


Figure 9.

If compare to office work hours, which type of work is more painful to you?

130 responses

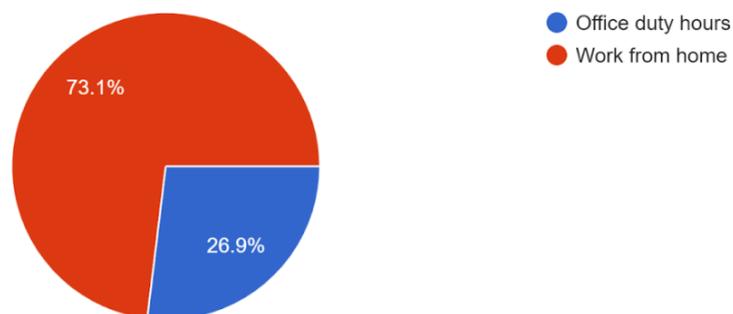


Figure 10.

Do you get pain after working for long hours?

130 responses

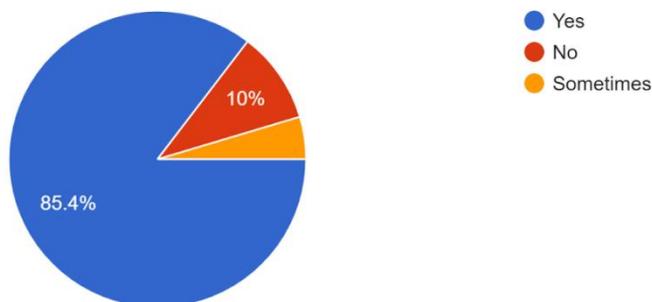


Figure 11.

Do you think , the pain which you are suffering now is due to continuous working hours ?

130 responses

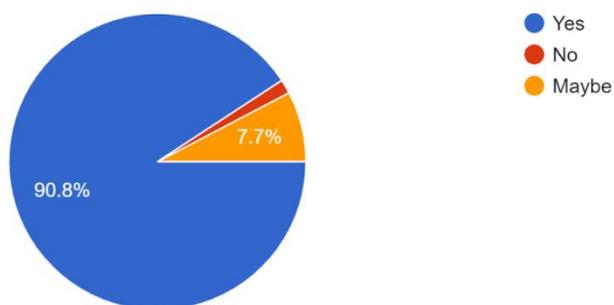


Figure 12.

Area of pain?

130 responses

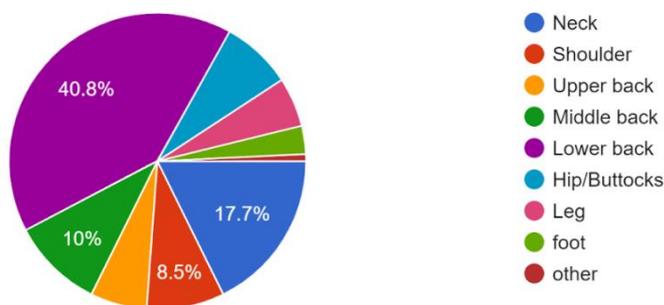


Figure 13.

NATURE OF PAIN

130 responses

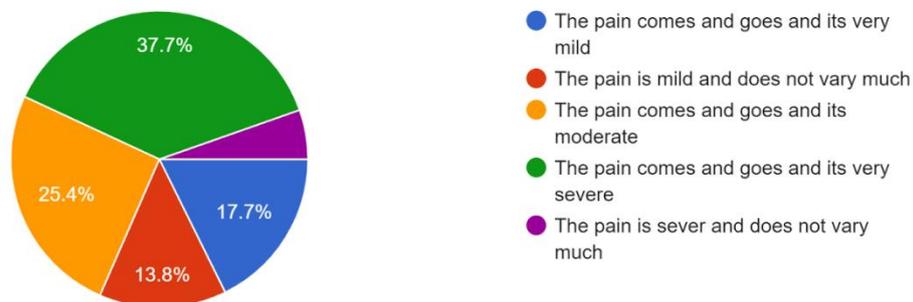


Figure 14.

PAIN INTENSITY if any,

130 responses

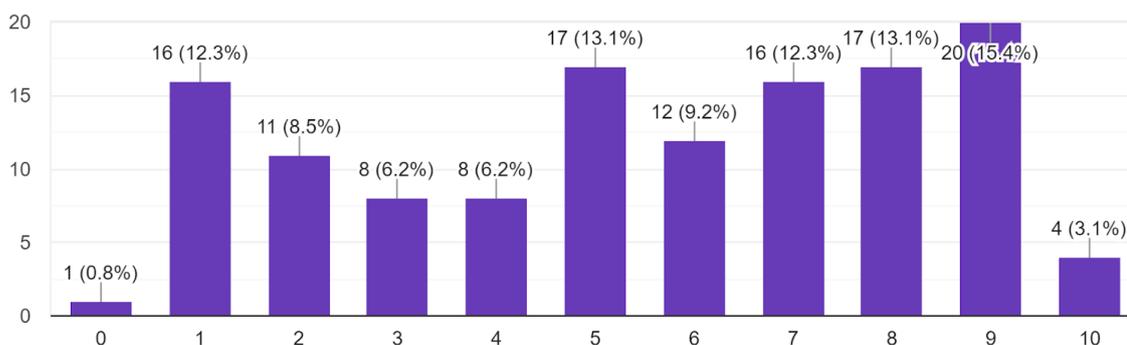


Figure 15.

How long has the pain been an ongoing problem for you?

130 responses

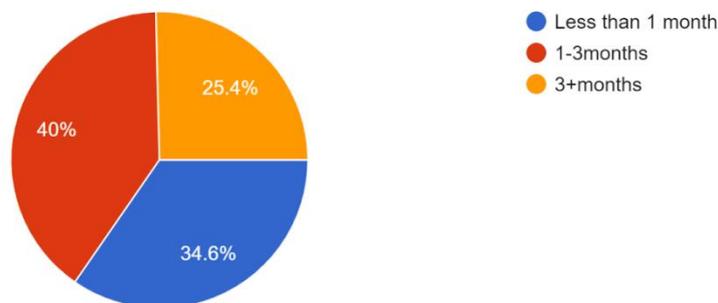


Figure 16.

How often has the pain been an ongoing problem for you over past 3 months  
 130 responses

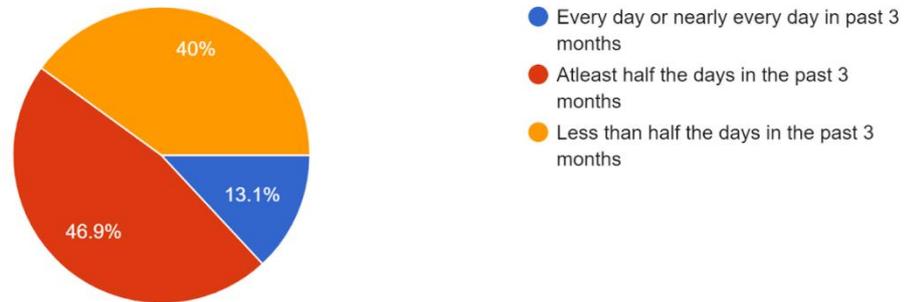


Figure 17.

Are you aware of ergonomics?  
 130 responses

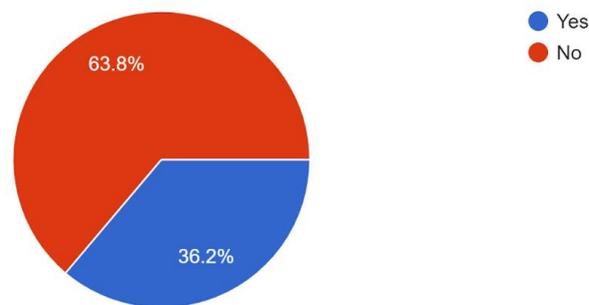


Figure 18.

Have you set up a workstation at home exclusively for work?  
 130 responses

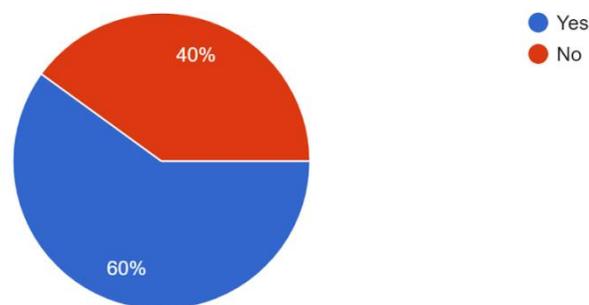


Figure 19.

How do you adjust your screen(laptop/desktop/mobile)?  
130 responses

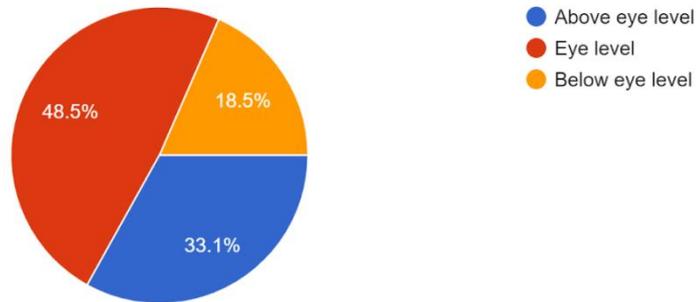


Figure 20.

Is your computer/working set up appropriate according to your body?  
130 responses

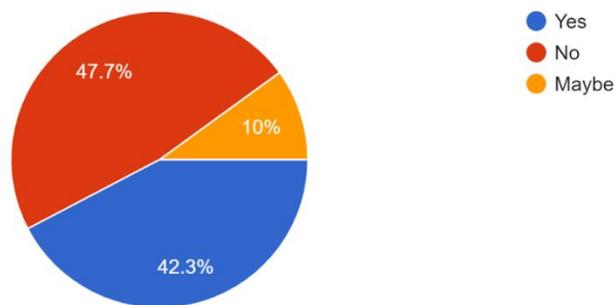


Figure 21.

Do you think, the pain which you are suffering from is due to inappropriate posture?  
130 responses

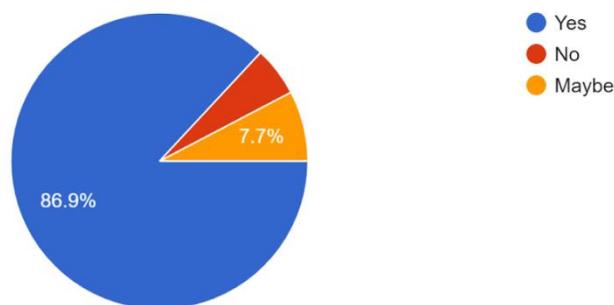


Figure 22.

Do you feel you are able to continue work due to pain?  
130 responses

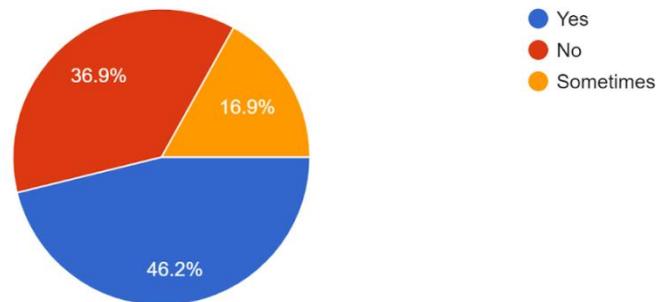


Figure 23.

Do you spend time for physical activities in a day  
130 responses

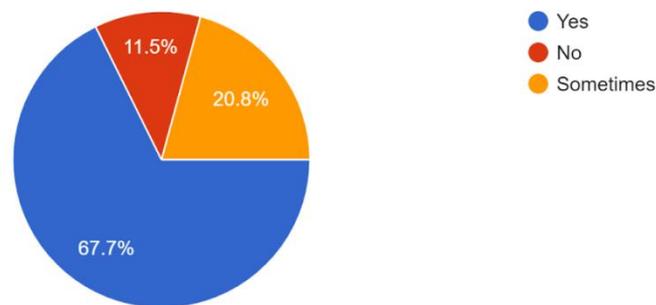


Figure 24.

If yes then, how much time do you spend for physical activities?  
130 responses

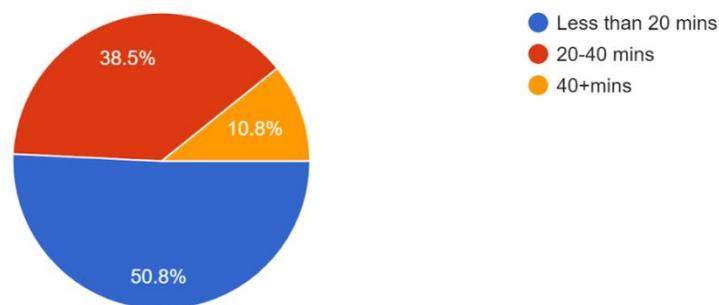


Figure 25.

Do you think, the pain which you are suffering from is due to spending less time on physical activities?

130 responses

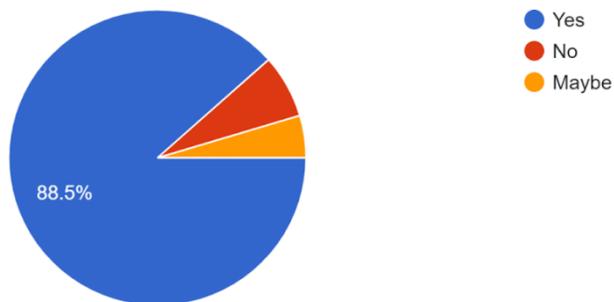


Figure 26.

Do you get proper sleep?

130 responses

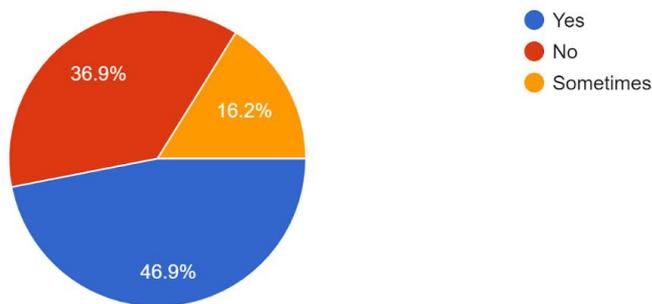


Figure 27.

How many hours on an average have you been getting sleep ?

130 responses

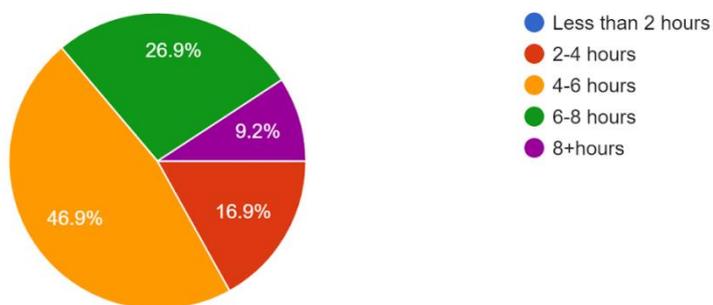


Figure 28.

Do you feel you are able to manage your work life and physical fitness together?

130 responses

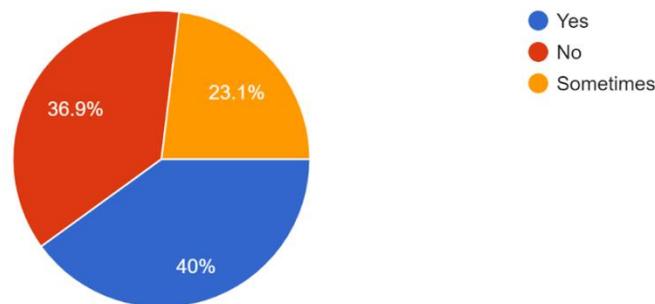


Figure 29.

## 5. DISCUSSION

As seen in the analytical findings of this survey, it is worrisome that most of the active young professionals are not considering or are ignoring their work from home postures which is indeed leading to overburdening of their spine causing neck and low back pain. It has already been reported in the past literature that even small postural changes increased the load on the musculoskeletal system.

As seen (3, 4) in the survey most of our participants worked long hours sitting on a chair with no desk while working on the laptop which forces us to assume the worst possible postures in which they are working for long hours. This postural faults result in structural abnormalities like excessive upper cervical extension, lower cervical flexion along with protracted scapulae and rounding of shoulders. This is the most dysfunctional posture as reported by szeto et al. and such a faulty<sup>[5]</sup> posture results in increased activity of upper trapezius and cervical erector spinae also leading to slumping which can cause nerve<sup>[3]</sup> involvement and neurological symptoms added up along with pain in the long run if such working postures are continued further.

This postural faults result in structural abnormalities like excessive upper cervical extension, lower cervical flexion along with protracted scapulae and rounding of shoulders. This is the most dysfunctional posture as reported by szeto et al. and such a faulty (5) posture results in increased activity of upper trapezius and cervical erector spinae also leading to slumping which can cause nerve (3) involvement and neurological symptoms added up along with pain in the long run if such working postures are continued further. It is also reported in the literature that faulty cervical posture can ultimately lead to compensatory changes in the entire spine causing low back issues along with other aches and pain in the body due to the overburden musculoskeletal system. Villaneuva et al reported that trunk muscle (3, 4) activity is influenced largely by head position. Round back sitting.<sup>[6]</sup>

Thus this survey was conducted to understand the work from home culture in a better way and thereby help people be more aware that postural correction can reduce their musculoskeletal pain as said by Mathiaasen et al. although we do agree that this was a survey study and hence proper objective knowledge of an individual's working posture and pain symptoms could not be evaluated and assessed.

## ACKNOWLEDGEMENT

The lead researcher would like to acknowledge the support and mentorship provided by the Research team and to the participants.

### Declaration by Authors

**Ethical Approval:** Approved.

**Source of Funding:** None.

**Conflict of Interest:** The authors declare no conflict of interest.

## 6. CONCLUSION

Though the degree of discomfort, ache and pain experienced by an individual is highly subjective it can still be related to external factors like work environment and ergonomics assumed while working. It is debatable if work ergonomics are usually incorrect or it is affected more due to work from home in this pandemic but this survey surely implies that work ergonomics do have an effect on musculoskeletal system and are one of the causes of chronic pain conditions. It implies the importance of spreading more awareness among our young working professionals regarding the correct work ergonomics and its long term effects. Also it paves a way to conduct a follow up study post.

Based on the findings of the present study, ergonomic training workshops online or offline should be conducted for employees, to sensitize them about preventive ergonomic measures such as regular postural breaks, rearrange workstation as per comfort and postural

adjustments. Also, the workstation design needs to be improved to provide a comfortable work environment for information technology employees to reduce the burden of work-related Musculo-Skeletal Disorders.

## 7. REFERENCE

1. [https://www.researchgate.net/publication/344045148\\_a\\_survey\\_of\\_musculoskeletal\\_symptoms\\_associated\\_with\\_work\\_from\\_home\\_culture\\_in\\_covid\\_19](https://www.researchgate.net/publication/344045148_a_survey_of_musculoskeletal_symptoms_associated_with_work_from_home_culture_in_covid_19)
2. <https://link.springer.com/article/10.1186/1471-2474-11-79>
3. [https://www.researchgate.net/publication/349596066\\_Assessment\\_of\\_musculoskeletal\\_problems\\_among\\_desk\\_job\\_employees\\_of\\_a\\_tertiary\\_care\\_hospital\\_in\\_Goa](https://www.researchgate.net/publication/349596066_Assessment_of_musculoskeletal_problems_among_desk_job_employees_of_a_tertiary_care_hospital_in_Goa)
4. [https://www.researchgate.net/publication/315956986\\_Effect\\_of\\_changes\\_in\\_head\\_postures\\_during\\_use\\_of\\_laptops\\_on\\_muscle\\_activity\\_of\\_the\\_neck\\_and\\_trunk](https://www.researchgate.net/publication/315956986_Effect_of_changes_in_head_postures_during_use_of_laptops_on_muscle_activity_of_the_neck_and_trunk)
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3036671/>
6. <https://sciendo.com/es/article/10.2478/aiht-2021-72-3559>
7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3036671/>
8. [https://www.researchgate.net/publication/7747210\\_A\\_comparison\\_of\\_symptomatic\\_and\\_asymptomatic\\_office\\_workers\\_performing\\_monotonous\\_keyboard\\_work\\_-\\_2\\_Neck\\_and\\_shoulder\\_kinematics](https://www.researchgate.net/publication/7747210_A_comparison_of_symptomatic_and_asymptomatic_office_workers_performing_monotonous_keyboard_work_-_2_Neck_and_shoulder_kinematics)
9. [https://www.researchgate.net/publication/228897818\\_A\\_survey\\_of\\_ergonomic\\_issues\\_associated\\_with\\_a\\_university\\_laptop\\_program](https://www.researchgate.net/publication/228897818_A_survey_of_ergonomic_issues_associated_with_a_university_laptop_program)
10. [https://www.researchgate.net/publication/14512267\\_Adjustments\\_of\\_posture\\_and\\_viewing\\_parameters\\_of\\_the\\_eye\\_to\\_changes\\_in\\_the\\_screen\\_height\\_of\\_the\\_visual\\_display\\_terminal](https://www.researchgate.net/publication/14512267_Adjustments_of_posture_and_viewing_parameters_of_the_eye_to_changes_in_the_screen_height_of_the_visual_display_terminal)
11. <https://link.springer.com/article/10.1007/s00402-013-1854-y>
12. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3036671/>
13. <https://pubmed.ncbi.nlm.nih.gov/35401773/>
14. [https://www.researchgate.net/publication/334972044\\_Ergonomics\\_for\\_Desk\\_Job\\_Workers\\_-\\_An\\_Overview](https://www.researchgate.net/publication/334972044_Ergonomics_for_Desk_Job_Workers_-_An_Overview)
15. [https://www.researchgate.net/publication/319298152\\_Applications\\_of\\_the\\_Standardized\\_Nordic\\_Questionnaire\\_A\\_Review](https://www.researchgate.net/publication/319298152_Applications_of_the_Standardized_Nordic_Questionnaire_A_Review)
16. [https://www.researchgate.net/publication/285635869\\_Work-related\\_Neck\\_Pain\\_Among\\_Desk\\_Job\\_Workers\\_of\\_Tertiary\\_Care\\_Hospital\\_in\\_New\\_Delhi](https://www.researchgate.net/publication/285635869_Work-related_Neck_Pain_Among_Desk_Job_Workers_of_Tertiary_Care_Hospital_in_New_Delhi)