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Computers users and postural issues amid COVID-19: A study of WFH

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Abstract

Pandemic has compelled people from different sectors, like industrial, education, IT etc., to perform their office work from home. Work from home has become a new normal. Work from home policy has changed the work scenario completely; a single area is utilized as domestic space as well as workplace. Lack of physical boundaries making it more complicated to create a balance between work and family life. Present study is focused on workplace problems and associated WMSDs among the workforce working from home. Unavailability of specifically designed computer station at home is playing a significant role in physical discomfort among users. Yoga and workplace exercises along with design alterations work as remedial action for prevention of WMSDs faced due to prolonged unnatural postures.

Keywords: COVID-19, WFH (Work from Home), postural issues, computer users

Introduction

In present scenario no one can think about their lives without computer or mobile phones. Not even a single aspect like education, trade, health and other non- work related tasks (shopping, social media) etc. has been remained untouched by this techno revolution. In the year 2018, a report by ITU (International telecommunication Union) explained that number of internet users rose up to 60 percent in 2018 from 20% in 2005. Almost half of the households had at least one computer system which is quite a greater number than back in 2005. Data also revealed a comparative study of computer ownership among the households of developing and developed nations; i.e. 36.3 percent and 83.2 percent households respectively. Just after the outbreak of COVID 19 it was declared a pandemic by WHO, many of companies forced their employees to work from home (WFH). In India, Amazon, Flipkart, Uber, Swiggy, Snapdeal, Paytm, Ola, Wipro and Tech Mahindra were among the first companies to implement the WFH policy. The Economic Times report says that 90% of employees from IT industry worked from home out of which 65% worked from home in metros and 35% from small towns, as Indian government made WFH mandatory. Work from home policy has changed the work scenario completely; a single space is being used for domestic purpose as well as workplace; which is creating lots of difficulties in maintaining work-life balance. There are few major issues that make WFH more challenging;

1. Lack of physical boundaries between two environments; i.e. home and workplace that can have a great impact on family dynamic as well as work productivity and efficiency.
2. Lack of proper policies in different MNCs regarding WFH and
3. Lack of required infrastructure at homes

Posture is the key- Are we maintaining it during Work from Home (WFH)? This is an important question during this new normal. A live poll conducted by Mercer Hong Kong revealed that work-space set-up at home had negative impact on the work and interrupted by children (39%) and other family members (27%). Lack of proper work station can cause several ergonomic/ occupational injuries and illness. Relationship of ergonomics to workplace cannot be ignored anywhere as the root of the term originates from the Greek “nomos” meaning rule, and “ergo” meaning work. The ergonomic rules justify the fact that human operator or worker should be identified like a person not a robot or machine and suggest working with natural posture, keeping work necessities within easy reach, comfortable work space and minimization of injuries/ illness/ work related disorders. Darnell MW (1983) ^[10] explained change in work job interface or man-machine interface, that includes work process, tools or equipment and workplace environment, can help in attainment of these objectives.

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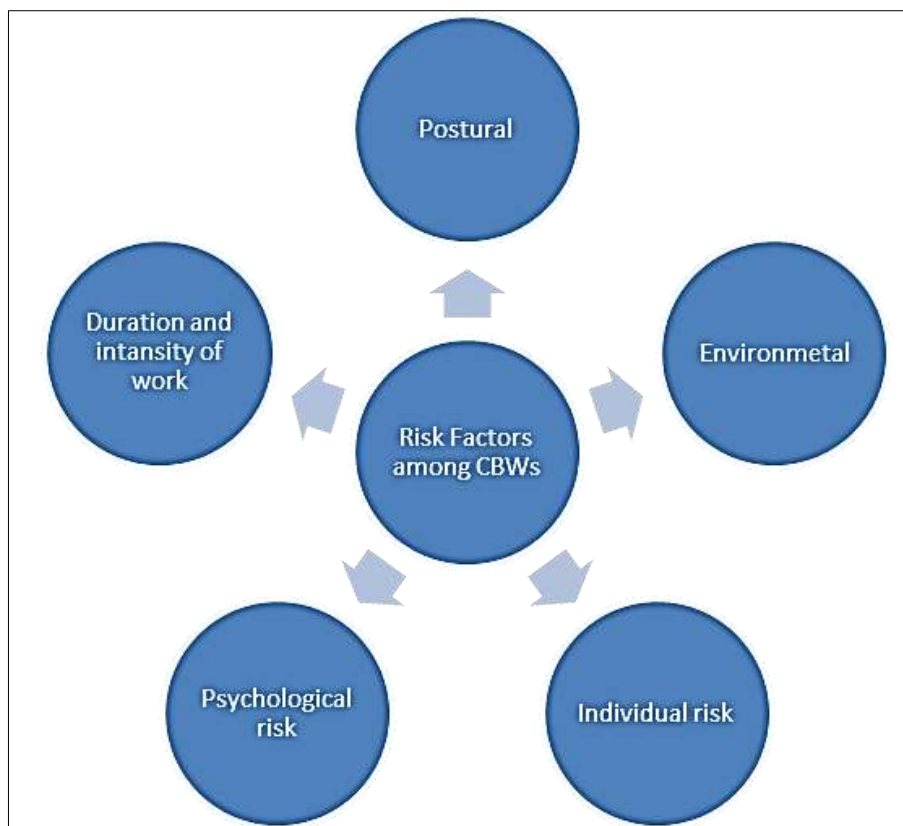
An estimated cost of \$20 billion a year is spent by the employers to provide compensation to ergonomic injuries, said the US Safety and Health Administration (OSHA) (Wynn M. 1998) [36]. In this unprecedented pandemic situation when people are compelled to work from home it can be quite harmful to their health to work at improper computer-workstation for a long period. As the result of the job demand and work environment, the risk of developing WMSDs is higher among computer workers which not only impacts the employee's wellbeing but also the productivity (Mani K, 2018) [22]. The ratio of increased production and benefits, due to ergonomic implications, is higher in developing nations than the developed ones as explained by Scott (2008) [31]. Major factors contributing to ocular, general MSDs and the physical discomfort are glare, fatigue and prolonged awkward posture (Lu H, Aghazadeh A 1996) [21]. Various researches concluded improper setting of monitors and keyboards showed association with discomfort in various parts of body including eye, head, shoulders and back. With this backdrop

this research is aimed to identify the postural issues faced by people who are working from homes in different sectors/ industries. As the scope of this article is limited to the population doing computer based work from home, following subhead reviews the ergonomic risk factors among office based computer workers, proneness to WMDs and relevant interventions and strategies for OCWs (Office computer workers).

Objective: The research article is focused on the identification of potential the postural and ergonomic issues among people who were working from home during COVID-19.

Review of literature

Posture is the carriage or position of a body, not only having the physiological importance as the positioning of limbs, head or neck etc. but also have psychological significance for example in nonverbal communication.



Ill designed workplace or poor environmental conditions at workplace includes non-adjustable workstation, improper positioning of the frequently used gadgets/ equipments like file folders, document holders, pen stand etc., placement of mouse and keyboard at different levels, poor illumination, improper positioning of computer screen that can cause glare, high pitched noise level etc. Poor workplace environment amplifies the risk of work related musculoskeletal disorders (WMSDs).

The risk of WMSDs is also associated with the individual factors i.e. medical history like pregnancy, endocrinal disorder, obesity etc., poor work behavior (binge working, ignoring body alarms like frequent pain in a particular part of the body, no rest breaks etc), gender (as women are at higher

risk) (Jensen C *et al.* 2002, Korhonen T *et al.* 2003, Mani K 2018) [18, 20, 22]. Various researches elucidate that viewing a computer screen from the distance of less than 50cm has higher risk of headache (N Shantakumari) and the major factors contributing to ocular discomfort are the environmental conditions that may cause dry eyes, Individual factors like low blinking rate, age, gender, wearing contact lens for prolong time etc (Blehm *et al.* 2005) [4].

Another study done by Daneshmandi H (2017) [9] revealed that along with the impact on job satisfaction and exhaustion, a prolonged sitting can also play a role in suppressed lipoprotein lipase activities, induced insulin secretion and reduced blood glucose uptake by skeletal muscles.

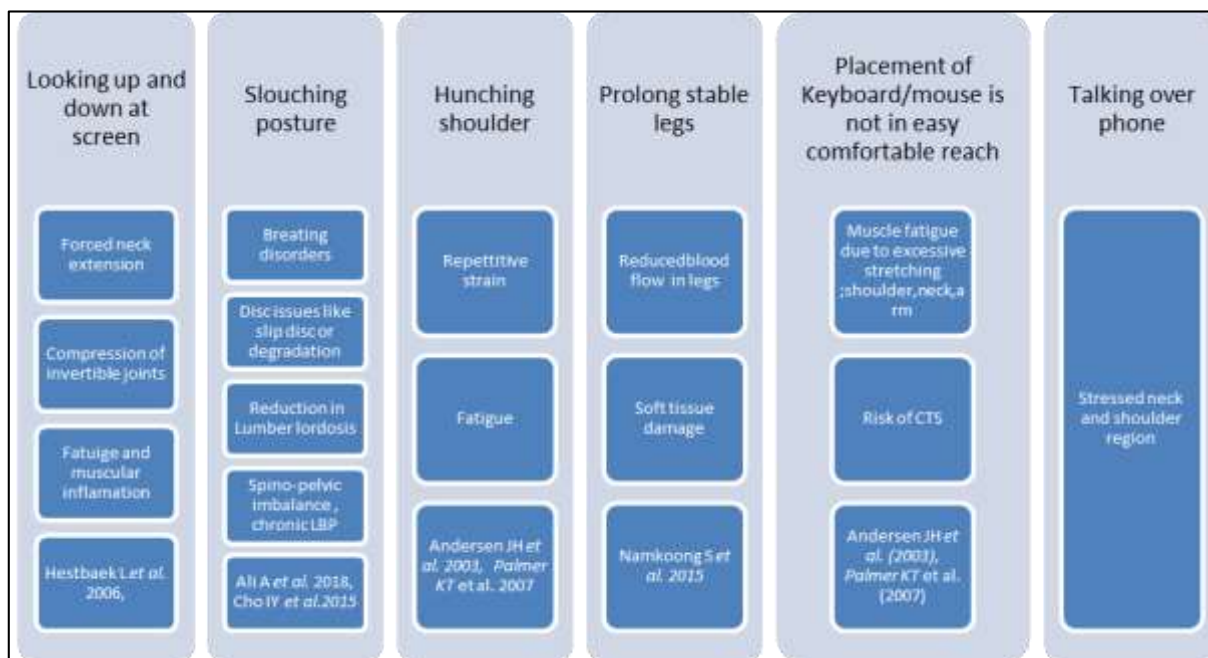


Fig 1: Bad posture and impacts

Ashraf A. Shikdar and Mahmoud A. Al-Kindi (2007) [3] explained eyestrain and musculoskeletal disorders as a major indicator of ergonomic deficiency among computer workstation users and revealed positive correlation between health and ergonomic training.

The nature of job in call centres leads to ‘Burnout Stress Syndrome’ (BOSS) characterized by chronic fatigue, insomnia and alteration of the 24-hour biological rhythm, which affects not only sleep but also proper functioning of the other body functions. 65.8% of the participants have average level of mental stress at work.

Occupational/workplace mental stress has a significant positive association with prevalence of MSD among call centre workers as explained by Nafeesa MAC (2018) [27]. Introduction of computers into the workplace was associated with substantial changes in the work processes, social relationships, management style, and the nature and content of job tasks. Some of these changes were beneficial, yet many had adverse effects on physical and mental health (Starr SJ (1984) [34], Bradley G (1989) [5], Westlander G (1994) [35], Michael J. SMITHI *et al* (1999) [25]). Stress at the workplace was a big challenge for corporations and achieved unprecedented heights.

80 percent of staff encounters job stress according to the National Institute for occupational safety and health. Stress is a demand for the adaptive capacities of the mind and body, according to David Fontana. The stress response is a complex emotion which produces physiological changes in order to brace us for "battle or flight," which Walter-Cannon quoted in 1932, in order to protect ourselves against the danger or flee.

Methodology

The study was conducted amid of pandemic COVID19, for that a well prepared questionnaire was developed with the help of Google form to study fifty random samples from different fields/occupations, who were working from home. The link of Google form questionnaire is shared to various social media platforms like whatsapp, instagram, facebook and g-mail to get the responses from the willing ones.

Variables

Independent variables: Age, monthly income, education, working hours during WFH, work-station settings at home.
Dependent variable: Postural issues.

Results and discussion

Posture, being the most important aspect related to human factors, becomes the most considerable point when we talk about a workstation which is not in its formal setting as in new normal situation of WFH. The survey revealed so some of the issues which required immediate actions and the impact of WFH to human body. The results presented in Table 1 reveals that maximum of the respondents doing WFH falls under the age group of 25-35 years which explains that the young generation is mostly involved followed by the age group of 15-25 while least were under the age of 55-65. The income profile of respondents suggest that forty present of them had income ranging from 10-20k and 30-40k (i.e. twenty percent in each category). Out of fifty respondents fifty-six percent respondent were post graduates followed by graduates (12%) and PhD holders (16%).

Table 1: Socio-economic status and work profile of respondents

Criteria	Sub-category	Respondents	Percentage
Age	15-25	10	20
	25-35	33	66
	35-45	1	2
	45-55	5	10
	55-65	1	2
Monthly income	10k-20k	10	20
	20k-30k	3	6
	30k-40k	10	20

	40k-50k	4	8
	50k-60k	5	10
	60k-70k	2	4
	70k-80k	3	6
	80k-90k	2	4
	90k-1lakh	1	2
	1lakh-2lakh	2	4
Educational Status	Intermediate	2	4
	Diploma (12+)	3	6
	Bachelors	8	16
	Post-Graduation	28	56
	MPhil	2	4
	PGDM	2	4
	PHD	6	12
Working hours		Before COVID 19	During COVID 19(WFH)
	1-3	0(0)	4(8)
	3-5	2(4)	9(18)
	5-7	9(18)	10(20)
	7-9	24(48)	11(22)
	9-11	15(30)	16(32)

Before COVID 19 maximum of respondents (48%) used to work for 7-9 hours per day but during COVID-19 maximum of them (32%) has worked for 9-11 hours. In his study K. Mohamed Ali (2006) ^[19] reported the mean hours of computer work per day as 9 hours which is further explained as 8 hours among male (87%) and female (83%) computer workers. He also recorded the prevalence of CTS in 1 out of every 8 computer professional. Similar outcomes from another study revealed that 40% participants spent 7-8 hours in front of computer, 33.7% spent more than 9 hours, 13.4% spent 2-4 hours (Muhammad Atif Khan, 2017) ^[26].

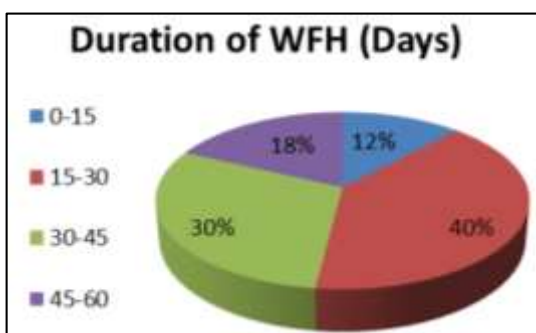


Fig 1: Days since respondent were doing

WFH

Forty percent of respondents were working since 15-30 days followed by 30-45 days (30%) and least of them (12%) worked for 15 days (Fig.1).

Maximum respondents (18%) were teaching professionals and engineers followed by research scholar (16%) and IT professional (10%) (Fig. 2). In Indian context students from nursery school to higher education are using various online portals or application like Zoom, Google-meet, whatsapp, facebook or youtube live etc.

Harsha R. (2020) explained that not only the students but teaching faculties are also upgarding their knowledge by registering themselves in various Online FDPs (Faculty Development Programes).

Seventy eight percent respondents need laptop/computer to perform the jobs (Fig. 3). In this new normal scenario of online, internet has become the backbone of work-life in every field. Amidst of Pandemic, in India the use of internet expanded its boundaries from IT sector and social media to the online education and online shopping, even in rural areas too. According to World Economic Forum (April 2020) in Wuhan about eighty one percent (i.e. 730,000) of K-12 student; i.e. kindergarten to senior secondary, were attending classes via the Tencent K-12 Online School.

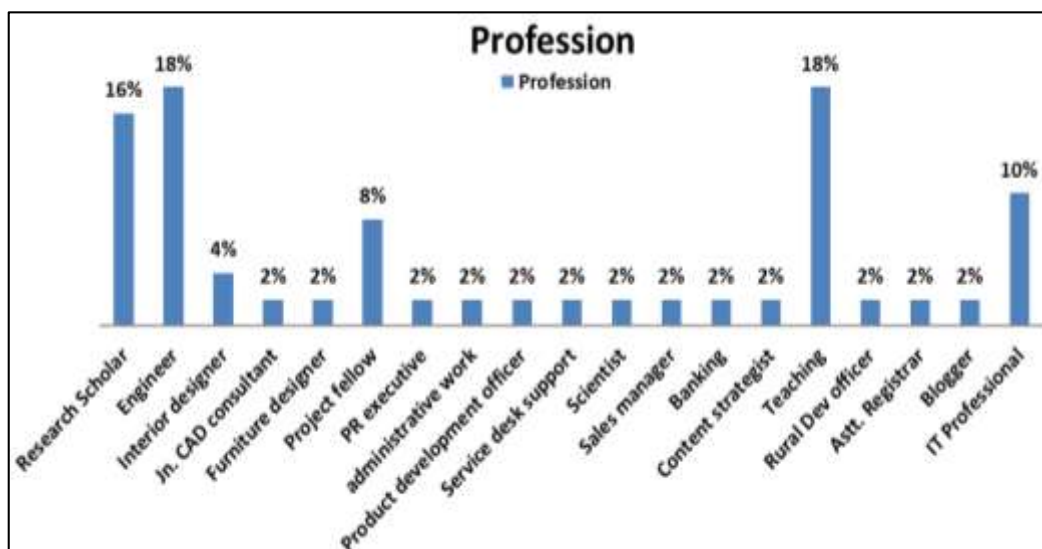


Fig 2: Profession of the respondents

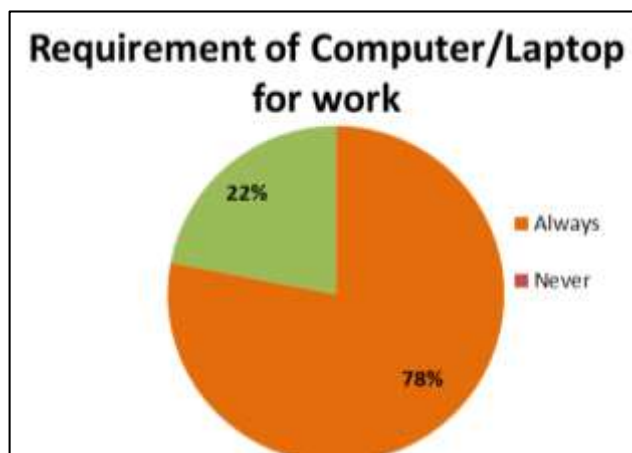


Fig 3: Need of computer/laptop for work during WFH

An ideal work station comes with an adjustable work surface, a sliding tray for keyboard and mouse to keep the both on same level and other needful items in easy reach. Along with this an adjustable office chair compliments the workstation. The data related to workstation (Fig. 4) revealed that less than the half of population had a proper computer workstation at home office while only twenty two percent (22%) had adjustable office chair. Rest of the population (78%) used

other chairs like plastic chairs or dining table-chair or sofa as a replacement of office chair. More than seventy percent of respondents didn't have any foot rest and sixty-six percent did not use any wrist rest. Knee space was available at maximum (68%) of the workstations. No use of wrist rest along with long work hours is a perfect combination to cause CTS (carpel tunnel syndrome). It can be explained as a compression of the median nerve within the wrist due to exerted pressure in wrist and hand because of the continuous or prolonged bearing of pressure and force from any hard working surface. Various studies has shown the evidences of CTS proneness among computer users, the prevalence of CTS was recorded to be 13.1% (95% CI 10.5–15.7% and the subjects who are involved in CBW (computer based work) for more than 8 years and over 12 hrs of work per day were at a higher risk for CTS, revealed K. Mohamed Ali, and B.W.C. Sathiyasekaran (2006) [19]. Among those, whose work profile needs repetitive forceful finger and wrist flexion-extension, trauma caused by repetitive motion of hand or wrist has been identified as major factor for CTS. Symptoms of median nerve compression include pain, numbness or tingling on the anterior surface of the index, middle or radial half of the ring finger Tinel's sign, Phalen's sign, and two point discrimination tests have been used for the clinical diagnosis of this condition Gorsche RG (1999) [16].

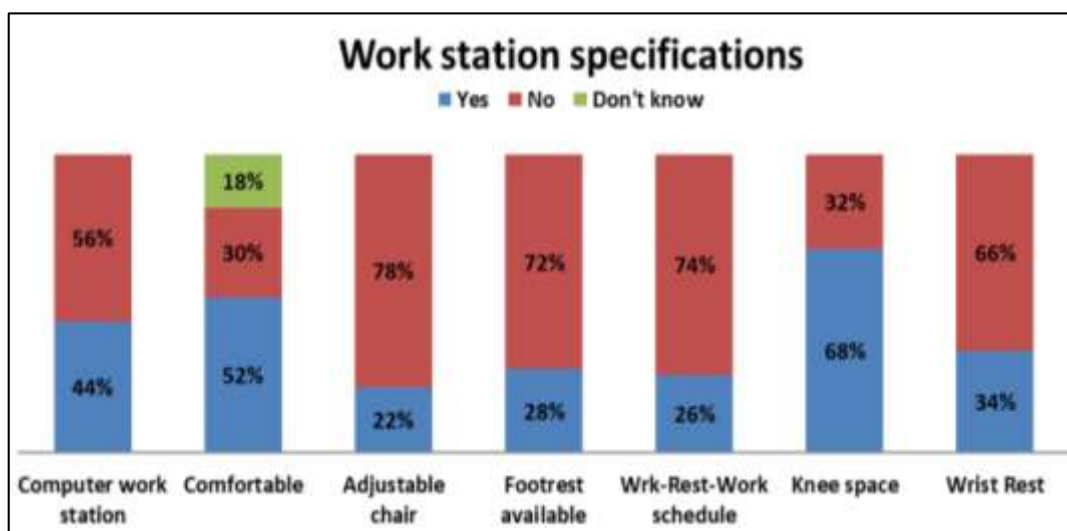


Fig 4: Work-station specification of respondents

Out of all the respondents, a majority of seventy four percent respondents did not follow 'work-rest-work' pattern. Various researches on occupational health and ergonomics shows that the micro-brakes (switch or change the posture/ position for

twenty seconds (20s) in every twenty minutes) are quite important while working on a computer station; it increases the productivity and reduces the discomfort and risk of MSDs (Espinoza-Martinez & Julie A. 2020) [15].

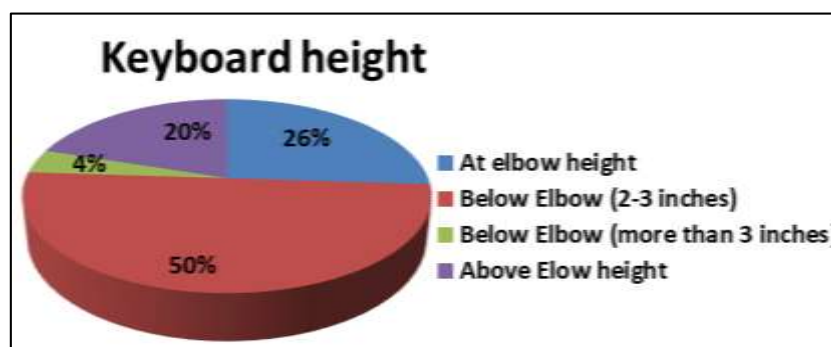


Fig 5: Placement (Height) of keyboard/ typing surface of laptop

Maximum respondent (50%) had keyboard 2-3 inches below the elbow (sitting posture) followed by at elbow level (26%) and 2-3 inches above elbow height (20%). Key board height above the elbow level increases the discomfort for the user (Sauter et al.)^[30].

In the case of forty eight percent of respondents (Fig. 6) computer/laptop screens were just below the eye level followed by forty percent of those having screen at eye level, ten percent above eye level and the least population was not sure about the leveling.

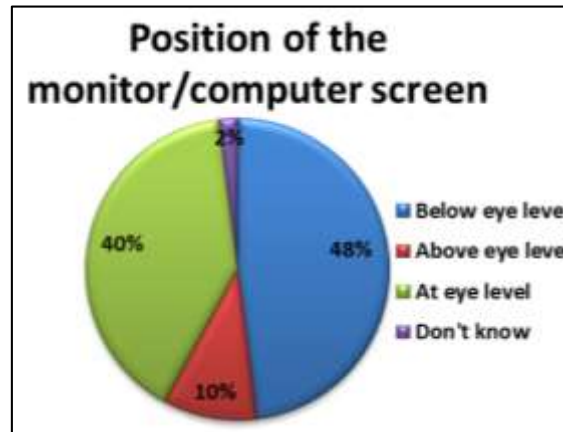


Fig 6: Position of monitor/computer screen with respect to eye level

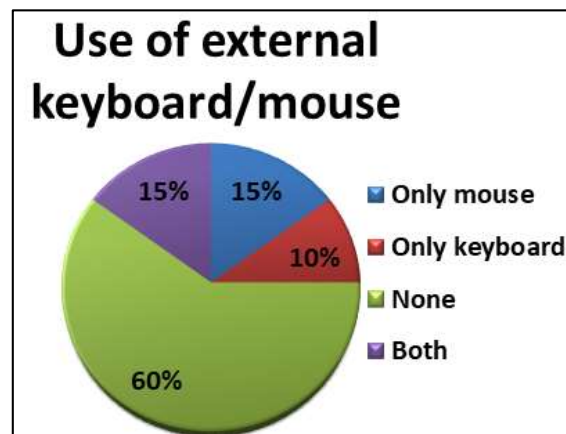


Fig 7: Use of external keyboard and mouse by the respondents

Use of external keyboard or mouse is helpful in reducing the prolonged static posture of hand while working on a laptop, and also helps in alternations to maintain the different levels/heights of computer screen and keyboard/mouse. It also reduces the static pressure on pressure points. The data

revealed that sixty percent of the respondents did not use either external keyboard or mouse while only fifteen percent used both. Fifteen percent of the total responses used only external keyboard followed by the ten percent using additional mouse.

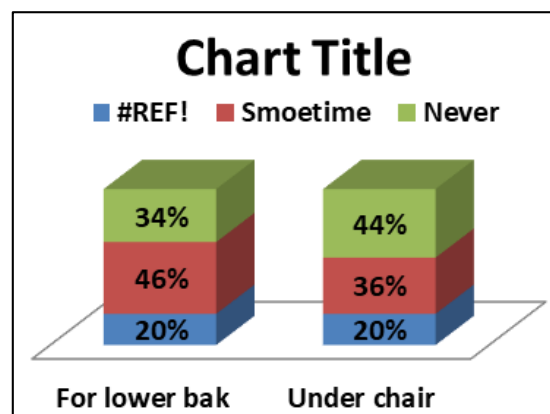


Fig 8: Use of cushions to support lower back and sit bone

In this modern era of self-dependency, people are trying different ways as an alternative to something which they cannot afford or is not available at the moment, is known as

DIY (Do it yourself). The people were surveyed for using additional cushions to support and reduce the pressure on lower back and lumbar region while sitting on chair as

maximum of them did not have the cushioned office chair at their home offices. The Response collected shows that maximum of them never used additional/portable cushioning neither for lower back nor for Ischial tuberosity/ sit bone (34% and 44% respectively) followed by them who used it sometime for both (46% and 36% respectively) and the least used it always (20% for each). Ashraf A. Shikdar & Mahmoud A. Al-Kindi (2007) [13] also reported the data related

to unsupported back i.e. people using computer workstations were not using proper backrest to support and to keep their back straight. Muhammad Atif Khan et al. explained that chance of lower back pain increases significantly when back rest is not used and seat width and depth is uncomfortable. Prolonged sitting hours (8-9 hours) are more susceptible to develop load on spine than standing (Dubey N et al. 2019) [13].

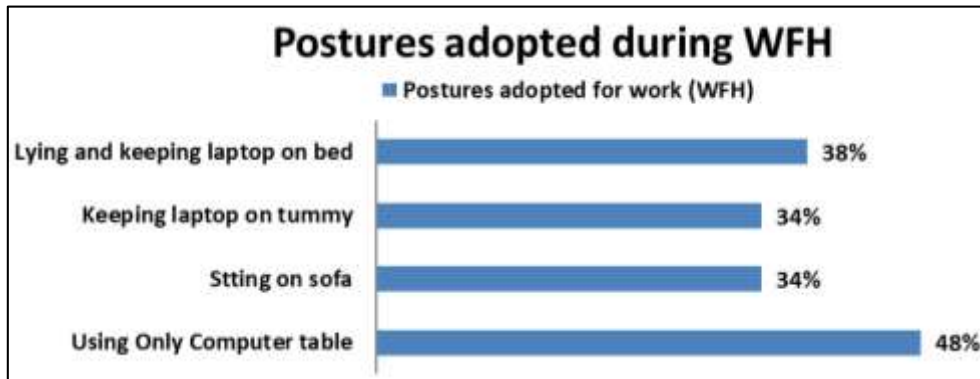


Fig 9: Posture adopted by the people working from home offices

Posture is the key, as it is well known that a neutral posture must be maintained while working by a computer user as well as a cobbler. Comfort and habits work as a major influencer while adopting a specific work posture (Dubey N et al. 2019) [13]. Data (Fig. 9) represents that forty eight percent of respondents preferred to use a chair table to perform the work while thirty eight percent adopted lying and keeping laptop on the bed followed by the equal number of responses for keeping laptop on tummy and sitting on sofa for work.

The optimal work position is the position in which your back is straight or laid down (95–110 °), where your shoulders are lower than 20°, where your elbows are at 90–100 ° and you devise your forearm, your wrist and arm in line to the work feature. Wrist extension or more than 15 ° divergence should be avoided. The legs must be perpendicular to the floor on the lower extremities; the ankles shall be parallel and the hip joint marginally higher than the knees. The feet should rest flat on

the floor or a footrest.

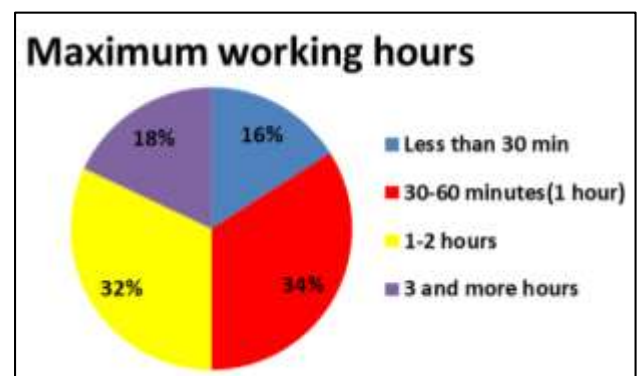


Fig 10: Maximum continuous working hours (Without change in posture)

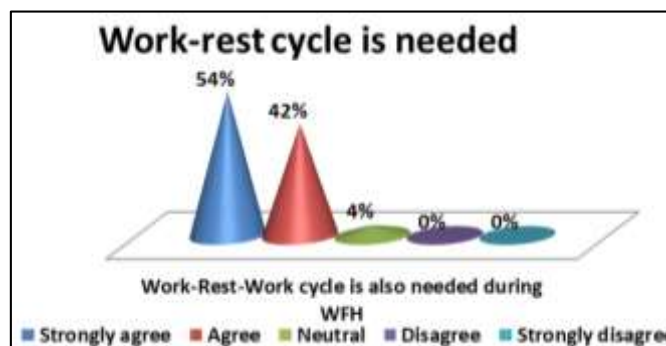


Fig 11: Respondent's opinion regarding the need of work-rest cycle

As the maximum respondents did not have a scheduled rest slot in between the work so the maximum hours of same posture holding among maximum respondents (34%) were 30-60 minutes followed by 1-2 hours(32%), 3hours(18%) and the least was less than thirty minutes(16%). Opinion of the respondents (Fig.11) regarding to the need of 'work-rest cycle' shows that majority of them (54%) were strongly agreed with the fact that 'work-rest cycle' is most important factor to be considered and needed during work from home situations too,

followed by forty-two percent of them who agreed on the same.

There was no disagreement on it which shows that population was aware of the need and pros of the 'work-rest cycle' but did not implement it in their home office jobs. An analysis showed that 78.3% of people at the VDT workstation did not take any micro or rehabilitation breaks while 19.2% took micro breaks in the VDT workstation (Muhammad Atif Khan, 2017) [26]. Analysis of postural issues (Fig. 12) reflected that

more than half of the population (54%) reported lower back pain in last thirty days of WFH followed by complains of red eye and pain (38%), neck pain (36%), wrist ache (26%). Minor issues reported as headache and numbness/tingling sensation in hand or leg. Chiu et al. [7] documented a powerful correlation between head posture and neck pain during computer work. Berge Z (2002) Garvan TN (1997), said that prolongation of stiffness in posture contributes to pain in the spine, back, leg, forearm, prolapsed vertebral discs, visual exhaustion and mental tension. Long-term vision can lead to computer vision syndrome (Dubey N et al 2019) [13], eye

conditions such as dry and irritated eye conditions, tired eye, blurred focus, red eyes, tears, headaches, light and colour perception changes, etc. can be seen (Dessie A 2018) [11]. ‘20-20-20 rule’ works perfectly when it comes to prevention from eye strain; i.e. look 20 feet away for 20 seconds in every 20 minutes, as suggested by American Ophthalmology Department.

Initial complaints of CTS include sensations of pain, numbness, and tingling in one or both hands at night. Wrist rest cushions should be placed properly to support your wrist not the palm.

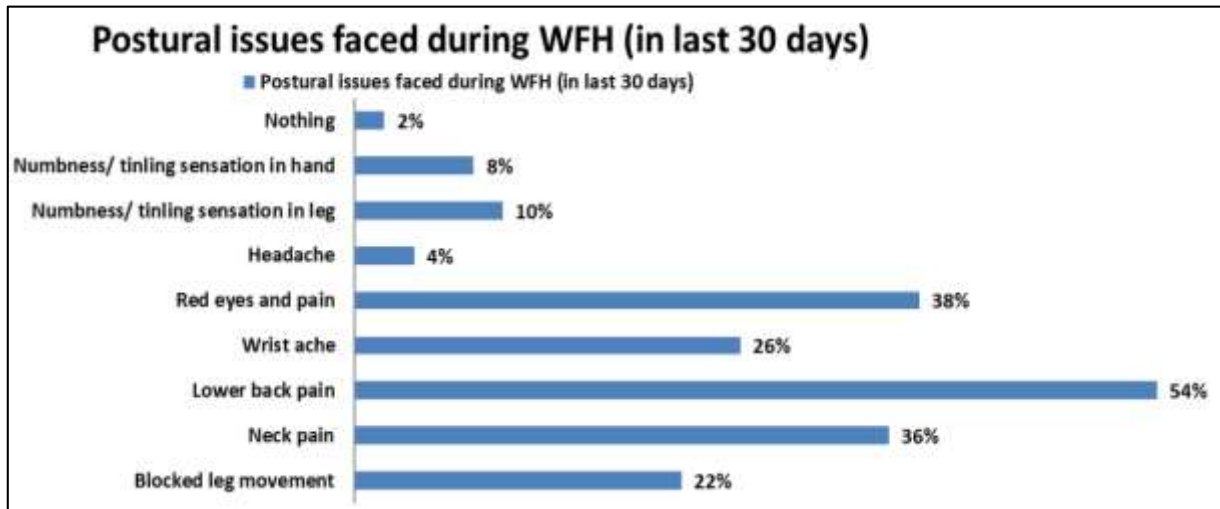


Fig 12: Postural issues among people working from home

Inappropriate seating leads to the improper posture of torso which is the major factor of lower back pain among computer users and other major pain/discomfort areas were neck, shoulder, lower & upper back revealed in a study done by Md. Golam Kibria & Md. Rafiquzzaman (2019) [23] on teachers

using computer.

A sound sleep of 6-8 hours, itself is a good remedy for many of the disease. Eighty-eight percent respondents take a siesta of maximum two hours while 6-8 hours sleep were taken by sixty-four percent respondents during night.

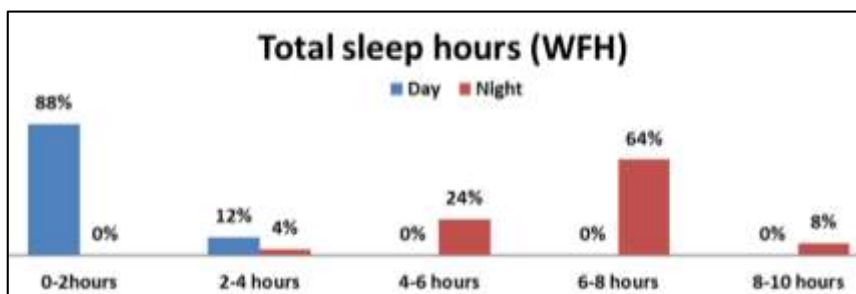


Fig 13: Total sleep hours in a day (Day hours and night hours)

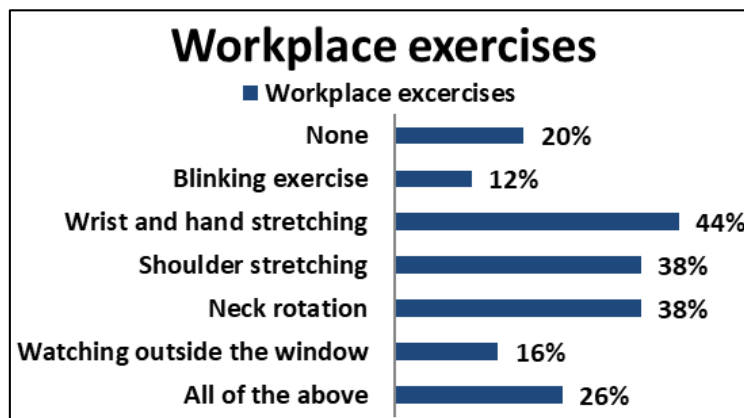


Fig 14: Exercises done in between work hours at workplace

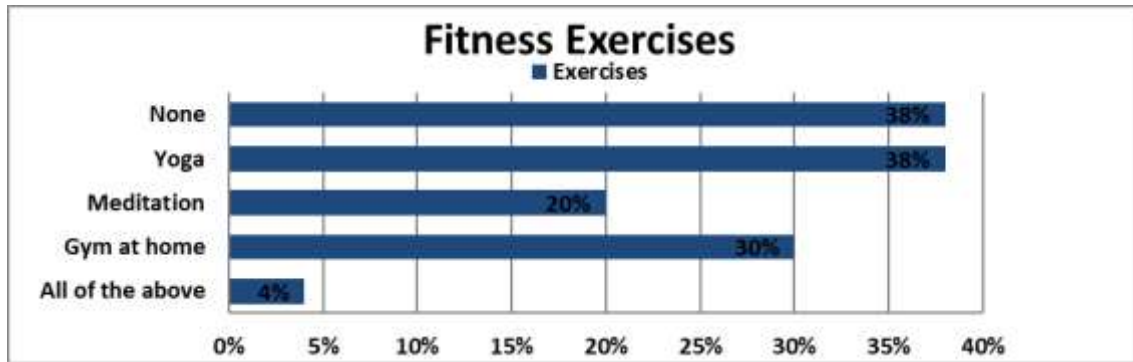


Fig 15: Exercise regularly done by the respondent

Workplace exercise (WE) can be defined as an intervention with specific physical exercises for workers carried out at the workplace or work-station, which aims to improve general outcomes like Quality of Life and occupational environment, as well as specific outcomes, such as muscle strength, and flexibility. Fig. 14 revealed that twenty percent of respondents did not do any kind of workplace exercises while forty-four percent respondents used to do wrist & hand stretching followed by shoulder stretching, neck rotation and watching outside the window. Don't be a victim of the "Desk Sentence" here are some of the recommended desktop exercises which a person can perform while at work in frequent breaks to have a health life ahead. Sedentarism is the result of lack of time and heavy workload; and the practice of workplace exercises has potential to develop better health and reduce the inactiveness at workplace (Rossato LC, Duca GFD, Farias SF, Nahas MV. 2013).

Thirty-eight percent respondent said they don't do any of the mentioned exercises or others while the same number of respondents was involved in yoga followed by gyming at home (30%) and meditation (20%). The organizational efficiency is the most significant factor in an organization's performance. The productivity in turn relies on worker's psychosocial well-being. Stress will affect your own wellbeing, job results, social life and your family relationship. The stress reaction is a dynamic feeling, which induces physiological changes in order to prepare us for "fight or flight." At person and corporate level the stressors and their effects must be known. Workplace turmoil has proved to be a serious problem for organizations and has hit alarming heights. Organizations ought to develop strategies for stress management and stress reduction. This paper focuses on corporate strategies for avoiding, reducing and resolving tension and to encourage diverse organizations better consider the importance of yoga, meditation and calming laughter as an answer better stress.

Yoga is one of the six pillars of Indian philosophy. For centuries it has been used to research the dynamics of mind and human life, and to describe and understand them (Feuerstein 1998). The Yoga sutras of Patanjali detail a professional way to live life that encourages peace and moderation (Becker, 2000). Bhole (1997) clarified numerous facets of yoga in his philosophical article. The assumption that such yoga innovations will enhance mental and physical wellbeing by down regulating the hypothalamic psychological adrenal (HPA) axis and the sympathetic nervous system (SNS) is confirmed by rising scientific proof. As the response to a physical or psychological demand (stressor), the HPA axis and SNS are activated, which contributes to a chain of physiological, behavioral and psychological impacts, mostly

because of release (epinephrine and norepinephrine) of Cortisol or Catecholamine. Regardless of the therapeutic route, yoga has been found to have psychological immediate effects: reducing anxiety and growing physical, social, and spiritual feelings. Several literature studies exploring yoga's impact on individual health problems, including cardiovascular disorders, obesity, diabetes, cancer and anxiety, have been carried out.

A research done by Rudra Bhandari *et al.* 2010 included yogic postures, breathing mechanics (pranayama), movements, psychic locks, concentrations and meditations, given for a month by 50 Indian Telecommunications Industry (25 male and 25 female) companies. The findings demonstrated substantial benefits of yogic action in order to handle and increase job efficiency ($p < 0,01$) and promoted the effectiveness of corporate yoga in enhancing person and organization's wellbeing, peace, spirituality, inspiration, participation, success and productivity. In 2015, Fang and Li published Yoga strategies for the nurse to improve the consistency of their sleep and alleviate stress after work shifts. Twice a week (50-60 minutes per session) the group which received the intervention followed the yoga sessions and reported improved sleep quality and decreased work stress. Yoga will improve the quality of life and back pain.

Conclusion

The research article highlighted some major issues prevalent among the workforce working from home amidst pandemic. Despite flexibility in time working hours had been increased up to 9-11 hours with no fixed rest schedules, unavailability of proper or ergonomically fit workstation, adjustable chairs and wrist rest/footrest. Respondents were acquainted with some of design requisites, such as leveling of screen i.e. at or just below eye level, but lacking in other specifications; leading to postural discomfort among the majority. No single posture can be marked as perfect that can fit to every individual. But some basic design goals can be considered, while designing a computer workstation or considering a corrigendum, to create a 'custom-fit' computer station. Following are some of the recommendations that must be followed in designing;

1. Top of the monitor or the top most readable line should be at or just below eye level (15 degrees below eye level)
2. Head and neck should be balanced and aligned with torso
3. Don't keep elbows far from the central axis and should be supported with armrest
4. Wrist and hand must be in-line with forearms and wrist rest should be there
5. Lower back supported; should be adjustable and contour to the curve of your lower back.

6. Adequate room for keyboard and mouse and both must be kept on same level; alternative external keyboard/mouse is preferable.
 7. Feet should be flat on floor and supported by footrest.
 8. 'Waterfall edge' panned chairs are preferable for prolonged sitting or work hours which can help in reduction of pain and numbness in legs.
 9. Good illumination should be maintained at workplace, depending on the type of work, to prevent the risk of eyes strain. For office work it should be 20-50 lumens per square foot for screen viewing and 50-70 lumens per square foot for reading printed documents.
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In the nutshell, while working from home workers has to create a safe workplace environment as per their physiological needs and demand of their work. They can use alterations and DIYs, such as using a sack of books to maintain the height of screen to eye level or making a rice/some grain filled wrist rest cushion or using an empty carton/box as a footrest etc., to achieve the needful design requirements as recommended in ergonomic guidelines and as per their physiological requirements to reduce the tendency of WMSDs and physical discomfort; as the basic concept of ergonomics is to fit the job to the worker not the worker to the job, not matter wherever is the workplace either in a formal office setting or at home.

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