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Association of work related risk factors on the development of the neck and upper extremity pain among adult and middle-aged population - A survey based analysis

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ABSTRACT

The aim of the study is to create awareness about neck and upper extremity pain caused by work related risk factors. Work related musculoskeletal disorders (WRMSD) are defined as injuries or disorders of musculoskeletal tissues associated with workplace related risk factors. Work related musculoskeletal disorders are also known as cumulative trauma disorders, repetitive strain injuries or overuse injuries. Work related musculoskeletal disorders of the neck are more common among people who spend a great deal of time using computers. Musculoskeletal disorders are the most common causes of long term sick leave and disability pension in several industrial countries. A questionnaire was created with a set of 19 questions related to their type of occupation, amount of stress, any musculoskeletal disorders due to stress, and about the awareness of musculoskeletal disorders. 100 random participants of adults and middle aged population were selected for the study. Random sampling method was done. The participants were asked to fill the questionnaire in an online site using Google forms. 12% of the participants experience neck or upper extremity pain very often which is followed by 24% experiencing it often. 63% of the respondents agree with the fact that a small walk every 40 minutes between work will reduce work related neck or upper extremity pain. This survey aims in creating awareness among people about work related risk factors on the development of neck and upper extremity pain in the adult and middle aged population.

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INTRODUCTION

Work related musculoskeletal disorders (WRMSD) are defined as injuries or disorders of the musculoskeletal tissues associated with work related risk factors (Ariëns *et al.*, 2000). It is also known as cumulative trauma disorders, repetitive strain injuries or overuse injuries. Upper extremity musculoskeletal disorder refers to soft tissue disorders in the neck, shoulders, arms, wrists, hands and fingers. The soft tissues include nerves, tendons, muscles, ligaments and fascia. Usually the upper extremity musculoskeletal disorders are documented as

carpal tunnel syndrome, epicondylitis, neck tension syndrome, tendinitis, tenosynovitis, thoracic outlet syndrome (Bongers *et al.*, 2002). The symptoms of upper extremity musculoskeletal disorders are generally characterized by pain, aches, discomfort, numbness, stiffness or weakness.

The work related musculoskeletal disorders are severe degenerative diseases affecting joints. These damages are the ultimate manifestation of progressive and chronic damages caused by work related degeneration in joints of the body. Hence this condition can be regarded as the cumulative trauma disorders, repetitive strain injuries or overuse injuries because of their pathophysiology (Bernaards *et al.*, 2006). As the repetitive and continuous work and stress given to the musculoskeletal system of the body in many jobs, they tend to wear and tear so quickly than a normal human's body system and leads to severe permanent damages in many conditions (Sekar, 2019).

These diseases in one point look similar to the "continuous stress theory" as the stress exerted by the humans due to their work related scenario, upon the musculoskeletal system of the body (Johnson, 2020). As the fact of continuous stress and damage to the tissues, they lack the duration and time for healing or recovery as the body's regenerative capacity is being compromised.

Work related musculoskeletal disorders of the neck are a major problem among people who spend a great deal of time using computers (Barbe and Barr, 2006). Upper extremity musculoskeletal disorders are common in jobs such as video display terminal (VDT) operators, food processors, automobile and electronics assemblers (Faucett and Rempel, 1994) carpenters, garment workers.

Musculoskeletal disorders are the most common causes of long term sick leave in several industrial countries (Côté, 2008). As far as these work related musculoskeletal disorders are concerned the stress caused by the body posture at work referred as the 'ergonomics' plays a crucial role too. Studies have shown that adverse ergonomic factors at work such as improper postures, heavy loads, rapid movements, repetitive tasks constitute substantial risks both separately and in combination to the neck, shoulders and hands (Kannan and Thenmozhi, 2016).

Already, the humans suffer from many severe known and unknown diseases in their life, these work related musculoskeletal disorders further worsen their health and reduce their quality of day to day life activities (Nandhini, 2018). It also has to be noted that, these WRMSD not only affects the type of jobs involved in body movement but also in a sedentary type of jobs as it may impact every joint like the hip joint, knee joint, ankle joints of lower limbs, shoulder joint, elbow joint, wrist joints of upper limbs, atlanto-occipital joint, atlanto-axial joint, joints of cervical region, etc., (Seppan *et al.*, 2018).

Many factors apart from the physical workload are important in the development of musculoskeletal disorders. WRMSD has many associated environmental factors which influence the progress and severity of this condition. Numerous studies have revealed association between work related musculoskeletal disorders and the psychosocial/organizational work environment (Keerthana and Thenmozhi, 2016).

In addition to work related risk factors the prevalence of several disorders have been linked to individual risk factors such as increasing age and high body mass index (BMI) and smoking (Krishna and Babu, 2016). Circumstances outside work such as family responsibilities and opportunity to relax, recover or exercise may also play a role in developing neck or upper extremity pain (Fredriksson, 1999). Thus the aim of the study was to investigate and analyze the association between the work related risk factors on the development of the neck and upper extremity pain among adult and middle aged population.

MATERIALS AND METHODS

The study was done in an online setting portal using Google forms, done among the Chennai population. Institutional review board approval is obtained. 2 reviewers (Principle investigator and guide) were involved in this study. The sample size of 100 participants of adults and middle aged population were selected by a simple random sampling method. Randomization (including all variables) and no sorting process were done to minimize the bias. Internal validity was pre tested questionnaires. External validity was homogenization, replication of experiment and cross verification with existing studies. A set of self-structured questionnaires which included name, gender, age, occupation, amount of work stress, working hours, sleep deprivation etc., were circulated among the participants through an online forum.

The results were collected and tabulated in excel sheets. The results were imported for statistical analysis using SPSS statistical software, version 20.0 by IBM. The statistical test used is the Chi square test. Dependent variables are demographics such as age, gender and independent variables are stress related neck or upper extremity pain. Type of analy-

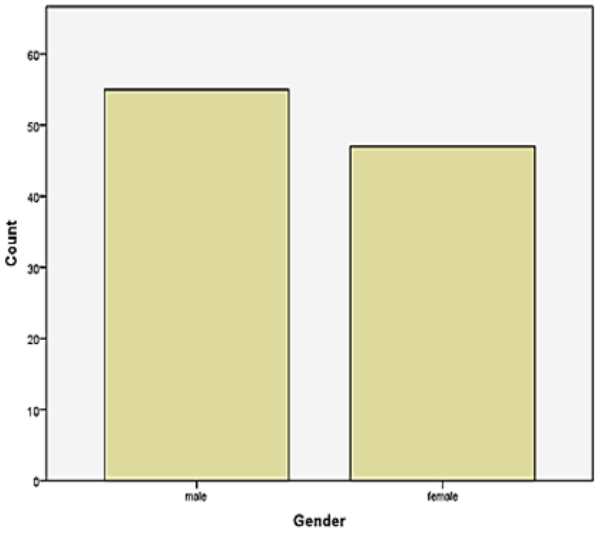

Figure 1: The graph shows the gender distribution. Males were 54% and females were 46%

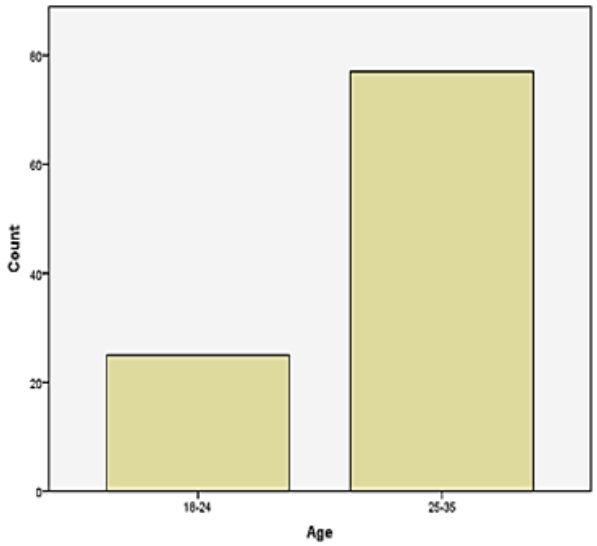

Figure 2: The graph shows the age distribution of participants. 18-24 years were 24% and 25-35 years were 76%

sis used is correlation and association. The results were statistically analyzed and represented in bar graphs.

RESULTS AND DISCUSSION

About 54% male and 46% females participated in the survey Figure 1. X- axis represents gender and Y-axis represents number of respondents

Age groups participated in the survey was 18-24 years (24%) and 25-35 years (76%) Figure 2. X-axis represents age and Y- axis represents number of respondents

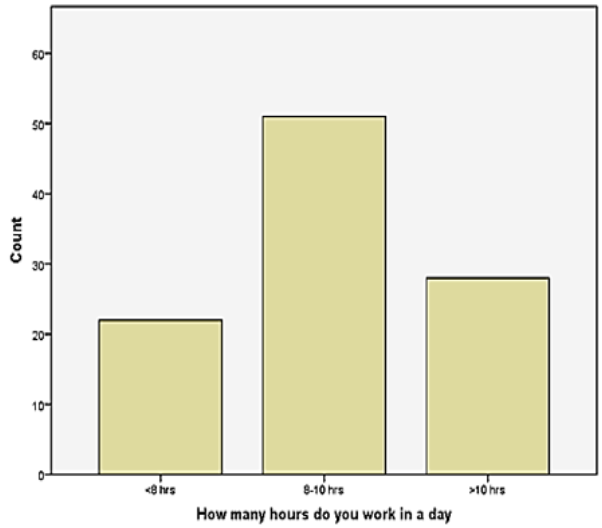

Figure 3: The graph shows distribution of hours of work a person does

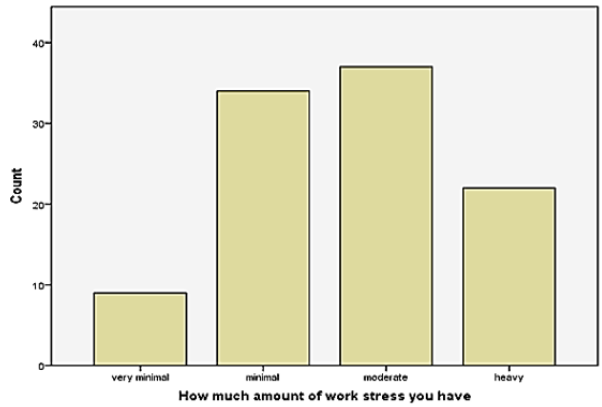

Figure 4: The graph shows distribution of the amount of stress

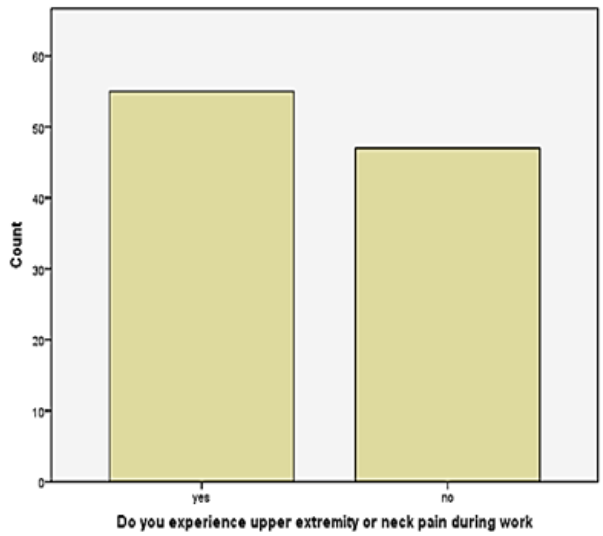

Figure 5: The graph shows the prevalence of neck or upper extremity pain during work

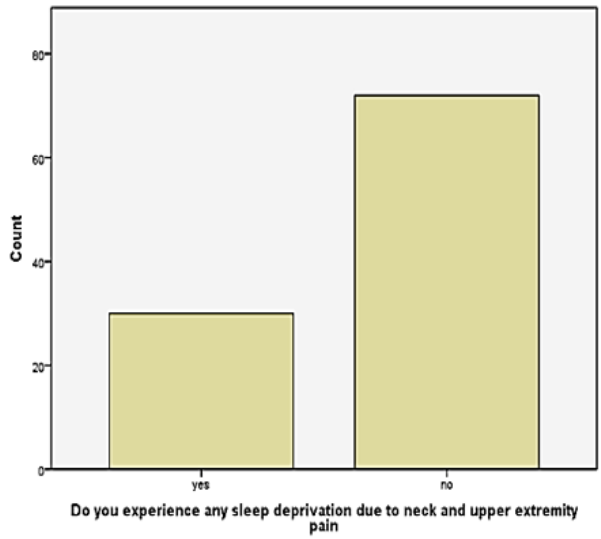

Figure 6: The graph shows the prevalence of sleep deprivation

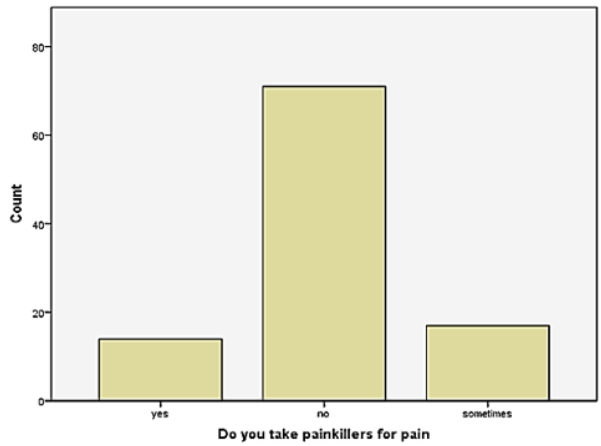

Figure 7: The graph shows the predilection of respondents taking painkillers

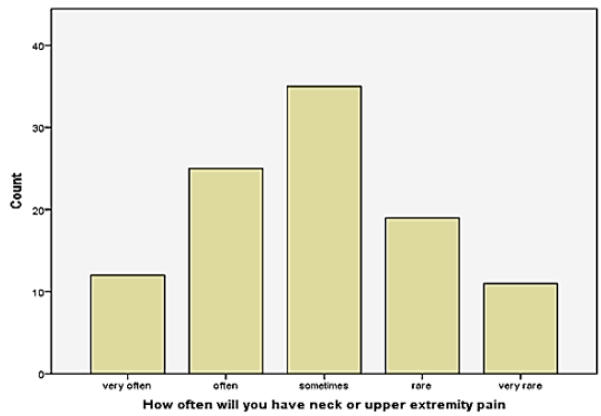

Figure 8: The graph shows distribution of neck or upper extremity pain

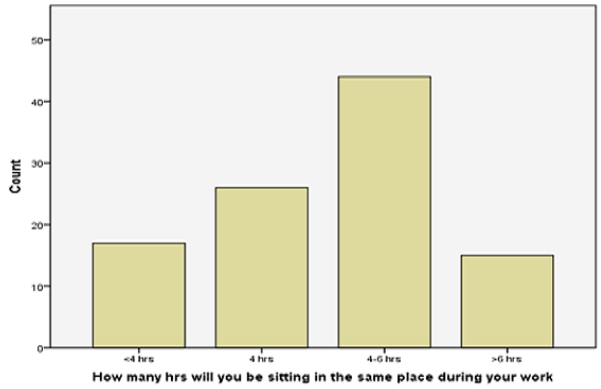

Figure 9: The graph shows frequency of respondents sitting in the same place

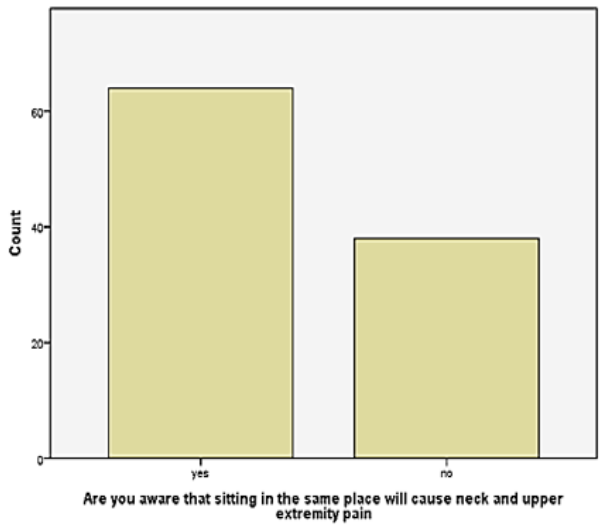

Figure 10: Graph shows distribution of awareness about association between sitting in same place and upper extremity pain

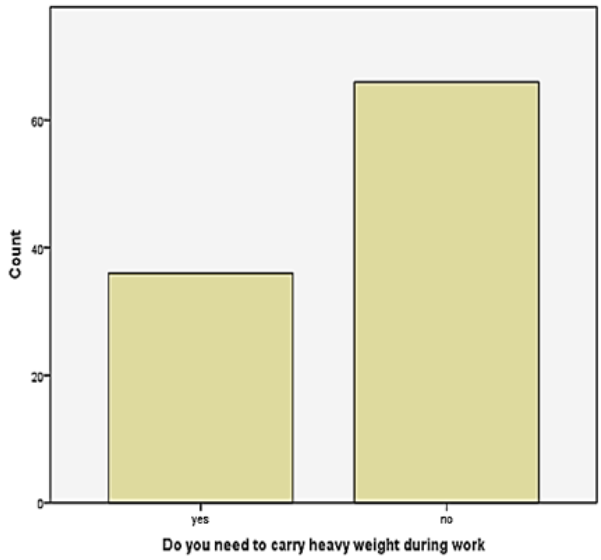

Figure 11: The graph shows the predilection to carry weight during work

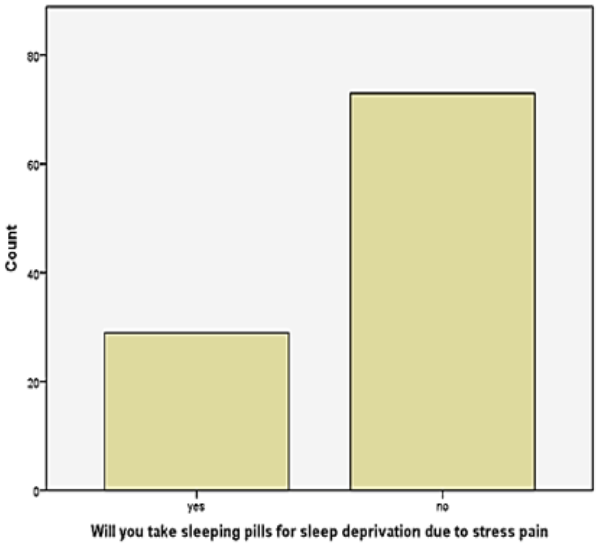

Figure 12: Graph shows predilection of respondents taking sleeping pills for sleep deprivation due to work stress

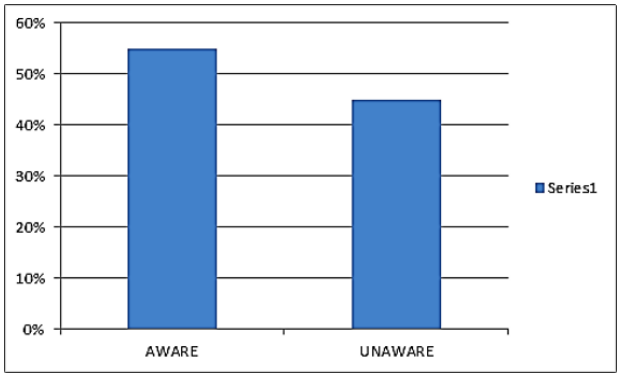

Figure 13: The graph shows distribution of awareness about depression due to sleeping pills

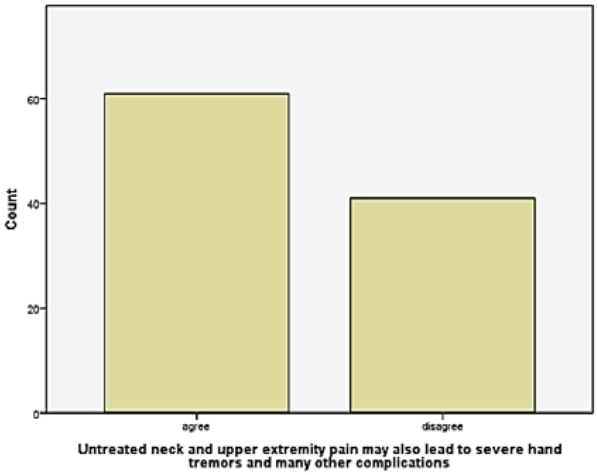

Figure 14: The graph shows the association between awareness of untreated neck pain and severe hand tremors

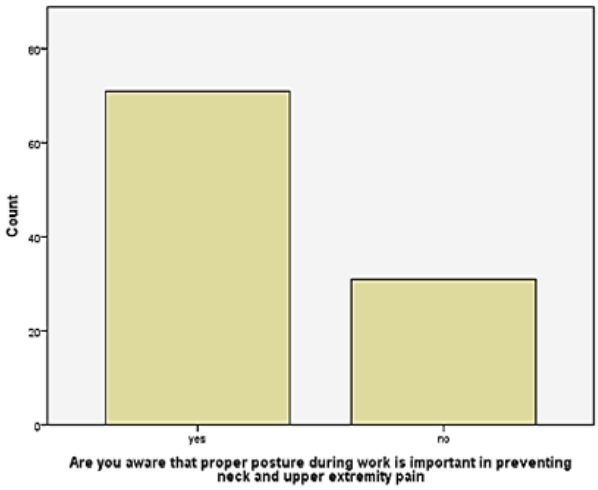

Figure 15: The graph shows the awareness of proper posture to reduce upper extremity pain

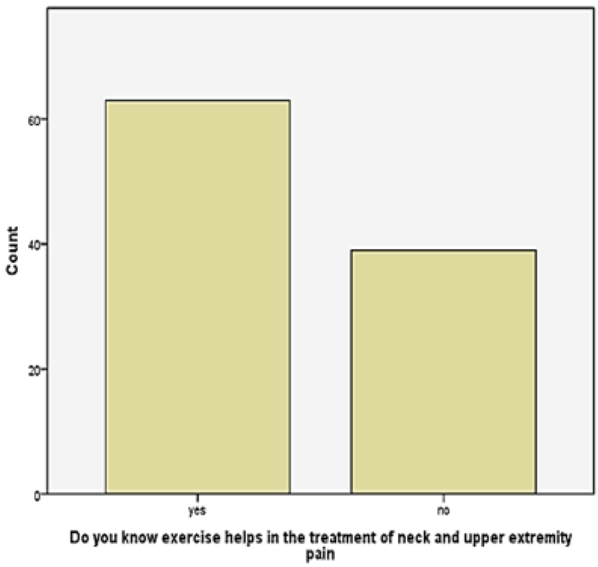

Figure 16: The graph shows the awareness of exercise in treatment of upper extremity pain

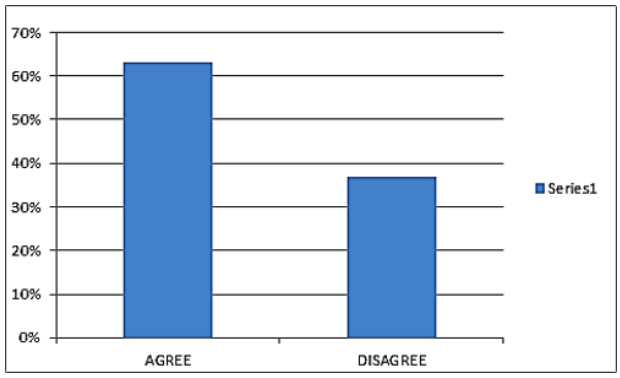

Figure 17: The graph shows the awareness of small walk every 40 minutes in reducing upper extremity pain

22% of the participants work <8 hours per day, 50% work 8-10 hours per day and 28% work >10 hours per day Figure 3. According to a study 34% works <10hours per day, 66% works>10 hours per day (Bahrami-Ahmadi, 2016). <8 hours - 22%,8-10 hours - 50% and >10 hours - 28%. p=0.01, (p<0.05) indicating statistically significant

It was observed that, 10% of respondents have very minimal amount of work stress, 32% has a minimal amount of work stress, 36% has a moderate amount of work stress and 22% has heavy work stress Figure 4. According to an earlier study, 30% of the population experience heavy work stress (Abebe, 2014). Very minimal (10%), minimal (32%), moderate (36%) and heavy (22%). p=0.09 (p>0.05) statistically not significant

From the data, it was found that, 54% of the participants experience neck or upper extremity pain and 46% do not experience neck or upper extremity pain Figure 5. According to a study, 47.8% employees experience neck and shoulder pain whereas 52.2% employees do not experience neck and shoulder pain (Bahrami-Ahmadi, 2016). Yes - 54% and no - 46%. p=0.01, (p<0.05) indicating statistically significant

The data depicted that, 29% of the participants experience sleep deprivation due to neck or upper extremity pain whereas 71% does not experience sleep deprivation Figure 6. which was 29% "yes" and 71%"no". p=0.007, (p<0.05) indicating statistically significant

Similar results were seen in a study, 40.9% workers experience sleep deprivation due to work stress whereas 59.1% workers do not experience sleep deprivation due to work stress (Knudsen *et al.*, 2007). 14% of the participants take painkillers for musculoskeletal pain, 70% never take painkillers whereas 17% of the participants take painkillers sometimes Figure 7. which are 14% - yes,70% - no and 17% sometimes. p=0.15, (p>0.05) indicating statistically not significant

It was inferred from the data that, 12% of participants experience neck or upper extremity pain very often, 24% experience pain often, 34% experience pain sometimes. 19% experience pain rarely and 11% experience pain very rarely Figure 8. 12%-very often, 24%-often, 34%-sometimes, 19%-rarely and 11%-very rarely. Chi square test p=0.001 (p<0.05)

Similar evidence was seen in a study (Ariëns *et al.*, 2000). 17% of the participants respond as they will be sitting in the same place d=for <4 hours, 25% respond as 4hours, 43% respond as 4-6 hours and 15% respond as more than 6 hours Figure 9. 17% < 4 hours, 25% - 4 hours, 43% - 4 to 6 hours and 15% > 6 hours. Chi square test p=0.32, (p>0.05), 63% of the respondents were aware that sitting in the same place for time will cause neck or upper extremity pain whereas 37% were unaware Figure 10, Yes (63%) and no (37%). Chi square test p=0.27 (p>0.05)

35% of the participants need to quarry heavy weight during their work whereas 65% don't need to carry heavy weight Figure 11. 35% needs to carry weight and 65% doesn't need to carry weight. Chi square test showed p=0.17, (p>0.05)

Similar evidence is seen in a study (Buckle, 2005). 28% of the respondents will take sleeping pills for sleep deprivation due to stress pain whereas 72% do not Figure 12. Yes (28%) and 72% (no). Chi square test p=0.002, (p<0.05). This result was in accordance with the study reported by Kripke and his team (Kripke, 2016).

55% of the participants were aware that sleeping pills cause depression whereas 45% were unaware Figure 13. 55% were aware whereas 48% were unaware. Chi square test showed p=0.10, (p>0.05). Similar evidence is seen in a study, incidence of depression is 48% among participants who take hypnotics (Kripke, 2016). 60% of the participants agree that untreated neck or upper extremity pain will lead to head tremor whereas 40% disagree Figure 14. 60% agree and 40% disagree. Chi square test showed p=0.05,(p<0.05). 70% of the respondents were aware that proper posture during work will reduce neck or upper extremity pain whereas 30% were unaware Figure 15 (Menon and Thenmozhi, 2016). 70% were aware and 30% were unaware. Chi square test p=0.02, (p<0.05)

62% of the respondents agree to the fact that exercise helps in the treatment of upper extremity pain or neck pain whereas 38% disagree Figure 16. 62% were aware and 38% were unaware. Chi square test showed p=0.09, (p>0.05). According to a study, 71% aware about the role of exercise in stress pain and 29% were unaware (Desa *et al.*, 2018). 63% of the participants agree with the fact that a small walk every 40 minutes will reduce neck or upper extremity pain whereas 37% of the participants disagree Figure 17. 63% were aware and 37% were unaware. Chi square test p=0.42, (p>0.05)

WRMSD can lead to both the neck and upper extremity problems. If the neck is affected more it cause several effects such as headache, nausea, burning sensation at back of neck, severe pricking pain on root of neck and shoulders as sternocleidomastoid, trapezius, sub-occipital muscles are involved, reduced neck movement at atlanto-

occipital joint and atlanto-axial joint (Hafeez and Thenmozhi, 2016). If the upper extremity is affected more it cause several effects such as numbness in fingers, severe shoulder joint pain, pricking pain and burning sensation at upper limbs.

There is strong evidence for the role of job satisfaction, monotonous work, social support at work place, high work demands, job stress and emotional stress at work. All these factors are considered as risk factors leading to severe low back disorders (Skov *et al.*, 1996). Psychosocial factors such as higher levels of perceived job demands and job stress are more consistently linked to upper extremity disorders. Psychosocial factors that are not work-specific (e.g., general worry/psychological tension, depression/anxiety, general coping style, and response to pain) can also cause back and upper extremity disorders (MacDonald *et al.*, 2001).

Limitations

The present study is limited to lesser sample size and it is a single centered study. It does not represent all ethnic groups or populations.

Future scope

Study for a larger population should be done. Awareness of the effects of work related stress should be created among the population and the association of work stress with neck and upper extremity pain.

CONCLUSION

The present study highlighted the effects of work related stress on neck and upper extremity disorders. Thus the survey study serves as evidence that there is an association between workload and neck or upper extremity pain and can be utilized for further studies at larger populations and clinical studies. As a preventive measure, it is necessary to maintain a proper ergonomic posture at work place, doing regular physical exercises specific to extremities, indulging in any physical outdoor games can improve the structural and functional aspects of the human body.

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Conflict of interest

The authors declare that there was no conflict of interest.

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