



ASSOCIATION BETWEEN WORK-RELATED RISK FACTORS AND NON-SPECIFIC NECK PAIN AMONG OFFICE WORKERS: A RETROSPECTIVE CASE CONTROL STUDY

Dr. Jasrah Javed*

MPT, The Oxford College of Physiotherapy, Bangalore, Karnataka, India. *Corresponding Author

ABSTRACT

BACKGROUND: Non-specific neck pain has become a common musculoskeletal condition and is a leading cause of work-related disability, decreased quality of life, absenteeism from work and decreased work productivity. The work-related musculoskeletal disorders are considered to be the major contributing factor in increased medical expenses due to disability. There are several work-related, individual, physical and psychosocial risk factors that might lead to pain and disability in the neck. The aim of this study is to identify the work-related individual, Physical and psychosocial risk factors associated with development of non-specific neck pain among office workers in India. **METHODS:** a retrospective case control study was conducted including 74 participants who fulfilled the inclusion criteria. The current study included participants from the offices of Bangalore. The study included office workers with and without pain both male and female of age between 21-40 years with their major task involving the use of computer/visual display unit for prolonged periods every day. **RESULTS:** There are several work-related individuals, physical and psychosocial factors with strong association of ($OR > 1, p < 0.05$) with neck pain development such as, higher BMI, older age, job content, frequency of breaks, number of working years, working in same/different organization, working shift Whereas, female gender, low level of physical activity and fear avoidance shows weak association ($OR < 1, p > 0.05$). **CONCLUSION:** several individual, physical and psychosocial risk factors were identified to be associated with non-specific neck pain among office workers.

KEYWORDS : non-specific neck pain, office workers, computer, visual display unit, risk factors, physical factors, individual factors, psychosocial factors, workplace

INTRODUCTION:

Non-specific neck pain is defined as pain in the neck without any known cause or specific underlying disease-causing pain. Symptoms of the non-specific neck pain varies over time and depends on the amount of physical activity level. Non-specific neck pain can be investigated and diagnosed on clinical grounds, provided there should not be a presence of red flags like, neurological symptoms, cancer, infection, inflammation, vascular insufficiency, trauma or skeletal injury. Therefore, it's not merely a clinical problem, but it often develops into a complex disorder affecting functional capacity, quality of life, psychological and social distress due to the rise of environmental consciousness.¹ Non-specific neck pain has become a common musculoskeletal condition and is a leading cause of work-related disability, decreased quality of life, absenteeism from work and decreased work productivity.²

The World Health Organization defines work related musculoskeletal disorders as 'as a fitting nomenclature for a constellation of disorders showing a clear association with one or more workplace exposures. Musculoskeletal disorders include damage to the muscle, nerve, tendons, joints, cartilages, and spinal discs developed as a result of exposure to the work-related risk factors. The common feature associated with the Work-related musculoskeletal disorders is that it develops as a result of work or may exacerbate because of work causing restrictions in the work environment.³ Work-related musculoskeletal disorders are recognized by multiple terms such as repetitive motion injuries, repetitive strain injuries, cumulative trauma disorder, occupational cervicobrachial disorders, overuse syndrome, regional musculoskeletal disorders, soft tissue disorders. WRMD are associated with work patterns that include fixed or constrained body positions, continuous repetition of movements, force concentrated on small parts of the body, a pace of work that does not allow sufficient recovery.⁴

It has now become a worldwide trend to intensively use computer for prolonged periods every day. This has happened because of increased computer-based tasks at work, at home and for leisure activities.⁵ Sedentary or office workers are reported to have a high incidence of neck pain development due to their workplace environmental exposure.⁶ Work-related neck pain is common in individuals who are intensive computer users.⁷

Office workers are defined as those working in an office environment with their main tasks involving the use of a computer, reading, phoning, making presentations, and participating in meetings.^{8,9}

Current literature suggests that office workers spend an average of three quarters of their work time in sitting, which also makes workplace sitting as one of the significant contributors to total

everyday sitting time.⁹ Studies have suggested a definite relationship between neck pain and psychological factors and is often considered to play a major role in neck pain as compared to the physical factors. Studies have suggested a definite relationship between neck pain and psychological factors and is often considered to play a major role in neck pain as compared to the physical factors.^{10,11}

The biopsychosocial pain model focuses on both the disease and illness. Illness is viewed as a complex interaction between biological, psychological and social factors contributing to pain development. Therefore, it is essential to identify all the factors associated with non-specific neck pain development among office workers incorporating a biopsychosocial model of pain.¹²

Risk factors are the variables associated with likelihood of developing a specific pathology. The Canadian Center for occupational health and safety enlists the following work-related factors associated with WMSD; work posture and movements, repetitiveness and pace of work, force of movements, vibrations, temperature, lack of influence or control over one's job, increased production pressure, lack of or poor communication, monotonous tasks, perception of low co-worker's support.¹⁰

Evidence suggests that pain in neck in office workers is atraumatic, multidimensional and multi-factorial associated with and influenced by an array of complex individual, physical and psychosocial factors.¹⁴ There are several factors (exposure) which can be associated with the development of non-specific neck pain among those working on computers for prolonged hours. These factors can be physical, individual, sociodemographic or psychosocial.¹³

METHODOLOGY

The current study is a retrospective case control study, conducted for a period of six months. The study included 74 office workers, male and female of age between 21-40 years, with and without non-specific neck pain, full time office workers with at least 6 hours of computer related work per day, at least 5 days in a week. Those having a known cause of neck pain, history of neck surgery, trauma and part time office work were excluded.

Outcome measures:

Pain: Numeric Pain Rating Scale (NPRS): Reliability ICC-0.67, excellent face, construct validity and criterion validity.

Neck Disability Index (NDI): Reliability ICC-0.87, good face, construct and content validity.

Fear avoidance: fear avoidance belief questionnaire (FABQ) questionnaire, test-retest reliability of ICC-0.97, the correlation coefficients for work and physical activity subscales are 0.63 and 0.51.

Job satisfaction: Job content questionnaire (JCQ). The JCQ has an adequate test-retest reliability, good construct and content validity.

Level of physical activity: International physical activity questionnaire (IPAQ), having good reliability and validity.

Procedure:

The Ethical Clearance was obtained from the Institutional Research Committee (IRC), The Oxford College of Physiotherapy, Bangalore, Karnataka and permission to proceed with the research was obtained. The informed consent was obtained from all participants after explaining the procedure of the study and its potential benefits.

The data was obtained in two sessions through google form at two different points of time; form 1 and 2 were sent to the participants via email, WhatsApp, Telegram app, Instagram. Doubts related to the questionnaires (if any) were clarified via phone calls/text messages/emails.

Components of form 1:

Individual demographic data (sociodemographic risk factors): age, gender, occupation, history (medical, surgical, present, past, personal, family),

Pain history: onset, intensity, duration and location. Pain intensity measured via NPRS.

Fear avoidance belief: measured using fear avoidance belief questionnaire (FABQ).

Disability: measured using neck disability index (NDI).

Level of physical activity: measured using International physical activity questionnaire (IPAQ).

Components of form 2:

Work history: number of working hours/days, frequency of breaks, type of visual display unit used, shift rotation, years of working the current organization,

Workplace Ergonomics: estimated using Cornell Ergonomic Workstation Advisor by University of Cornell is designed to evaluate the ergonomics of a computer workstation.

Job satisfaction: measured using Job content questionnaire. Designed to measure job satisfaction through six domains: skill discretion, job insecurity, decision authority, psychological demands, coworkers and supervisor support.

Risk Factors were identified according to the scores of the outcome measure and exposures. The exposure and outcome measures were analyzed by calculating odds ratio.

STATISTICAL ANALYSIS:

The scores for neck pain intensity using NPRS were dichotomized so that participants could be appropriately allocated into the "No Pain" (score of zero) or "Pain" (score >0) groups. Odds ratio was calculated to determine the risk factors associated with development of non-specific neck pain for case and control groups.

The upper and lower 95% CI is summarized. A $p < 0.05$ was accepted as statistically significant. If $OR > 1$, the exposure is associated with higher odds of outcome. If $OR < 1$ the exposure is associated with lower odds of outcome. Tabulated description is used to summarize the results.

RESULTS:

Table 1. Demographic characteristics of participants in case and control group

Demographic data	Office workers with neck pain Mean (SD)	Office workers without neck pain Mean (SD)
Age (years)	28.14(2.59)	27.14(3.59)
Height (cm)	171(8.19)	169.4(9.05)
Weight (Kg)	70.2(14.06)	69.6(11.9)
BMI (Kg/m ²)	24.04(3.59)	24.8(3.66)
Gender n (%)	20(54.1)	24(64.8)
Male		
Female	17(45.9)	13(35.2)

Table 2. Association between Individual Risk factors and development of non-specific neck pain among office workers.

Risk Factors	OR	Upper 95% CI	Lower 95% CI	p
Gender (female)	0.7	0.959	0.148	0.04
Higher BMI	1.2	3.107	0.498	0.65
Older Age	4.7	18.968	1.212	0.02

Graph 1. Association between Individual Risk factors and NSNP pain among office workers.

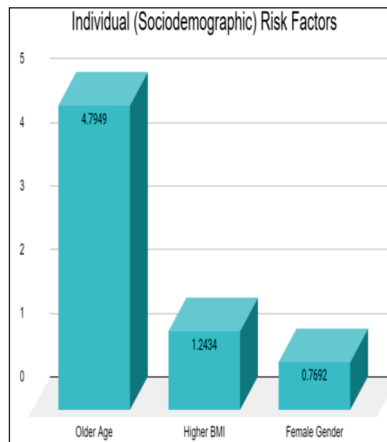


Table 3. Association between Physical Risk factors and development of non-specific neck pain among office workers.

Risk Factors	OR	Upper 95% CI	Lower 95% CI	p
Higher Level of Physical Activity	0.74	2.166	0.256	0.60
Poor Ergonomics	4.54	12.251	1.686	0.00
Higher Disability	9.53	28.782	3.161	0.00

Graph 2. Association between Physical Risk factors NSNP among office workers

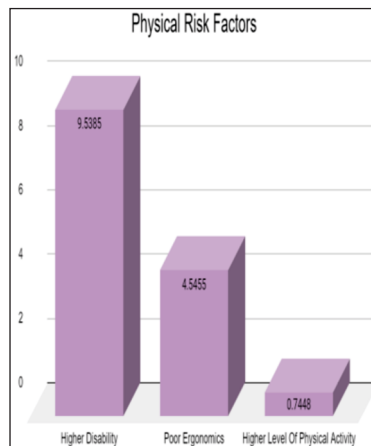


Table 3. Association between Physical Risk factors and development of non-specific neck pain among office workers.

Risk Factors	OR	Upper 95% CI	Lower 95% CI	p
Higher Level of Physical Activity	0.74	2.166	0.256	0.60
Poor Ergonomics	4.54	12.251	1.686	0.00
Higher Disability	9.53	28.782	3.161	0.00

Table 4. Association between Psychosocial Risk factors and development of non-specific neck pain among office workers.

Risk Factors	OR	Upper 95% CI	Lower 95% CI	p
Fear Avoidance Belief	0.04	1.10	0.00	0.30
Skill Discretion	0.76	2.10	0.28	0.62
Decision Authority	1.00	5.32	0.18	0.00
Psychological Demand	3.64	9.75	1.35	0.01
Job Insecurity	2.12	12.4	0.36	0.40
Coworker Support	0.08	0.71	0.01	0.02
Supervisor Support	0.37	1.59	0.08	0.18

Graph 3. Association between Psychosocial Risk factors and NSNP among office workers.

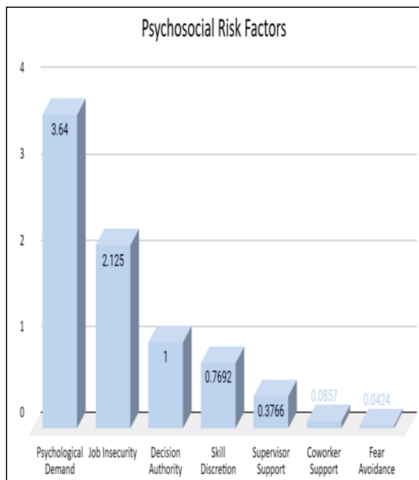
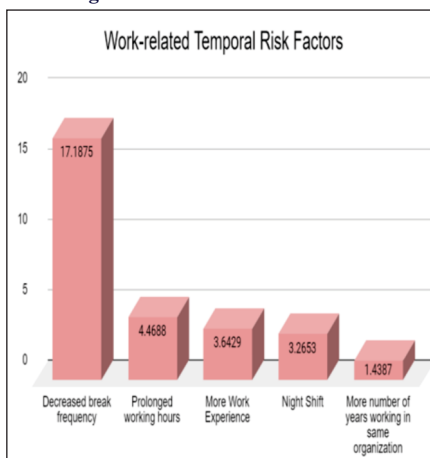


Table 5. Association between Work-related Temporal Risk factors and development of non-specific neck pain among office workers.

Risk Factors	OR	Upper 95% CI	Lower 95% CI	p
More number of years working in same organization	1.43	3.79	0.54	0.65
Night Shift	3.26	9.31	1.14	0.02
More Work Experience	3.64	10.3	1.27	0.01
Prolonged working hours	4.46	15.4	1.29	0.01
Decreased break frequency	17.1	59.7	4.94	0.00

Graph 4. Association between work-related temporal Risk factors and NSNP among office workers.



DISCUSSION:

The current study was conducted to find the association between work-related factors and non-specific neck pain among office workers. According to the findings of the current study several potentially modifiable individual and work-related factors were identified to be associated with the presence of self-reported neck pain in office workers.

Individual risk factors association with neck pain:

The individual risk factors evaluated in this study were BMI, age and gender. The association between higher BMI and non-specific neck pain development has shown a strong association in the current study supporting the findings of the previously conducted study by (Mohanty PP et al, 2017). There is a considerable deterioration in strength, flexibility and endurance of the muscles and increased loading in obese due to heavy weight on the joints. It is one of the most discussed links between higher BMI and pain. Greater BMI is associated with greater defective and degenerative changes in spine. Overloading of muscles due to sustained awkward posture at work, prolonged sitting for long hours without breaks in association with sedentary lifestyles contributes greatly to development of non-specific neck pain among office workers.

The association between older age and non-specific neck pain development among office workers showed a strong association in the current study consistent with the findings of the previous studies.

Participants with older age are more prone to neck pain development as compared to their younger counterparts. According to the previously conducted studies, there is a loss of 20% of strength beginning at the age of 20 years however, this might differ according to each individual. Older individuals may perform same task as a younger individual but at a much lesser pace. The increase with age can be understood by increasing degeneration of the cervical spine with age.

There is a higher risk of developing MSDs in older age, as there is more time given to the condition to develop due to the number of working experiences. The musculoskeletal system weakens over time, resulting in decreased capacity, keeping this into consideration repetitive movements can cause more harm like use of mouse and keyboard and maintaining sustained posture. There is also a deterioration in vision with age. Older individuals become more vulnerable to workplace stress due to exaggerated emotions and reduced capacity for skill discretion.

The findings of the current study show a weak association between female gender and neck pain among office workers, contradicting the findings of the previously conducted by (Chen X et al, 2018)

Physical risk factors associated with non-specific neck pain:

The physical risk factors examined in this study are workplace ergonomics, disability and level of physical activity. The work-related temporal risk factors being number of working hours, frequency of break during work and shift.

The current study shows a strong association between poor ergonomics and non-specific neck pain among office workers, supporting the findings of the previously conducted study by (Calik B et al, 2020)

There is a strong association found between poor ergonomics and non-specific neck pain among office workers consistent with the findings of the previously conducted studies.

The level of physical activity has shown a significant association in some of the previously conducted studies however, this study does not support the results of earlier studies.

Work-related temporal factors:

The number of working hours of 8 or more and frequency of breaks during work has shown to be associated with development of neck pain among office workers in the current study, consistent with the previously conducted studies. Continuous standing or sitting while working is a common source of discomfort and fatigue. Long periods of work are usually accompanied by changing curvature of the spine, increased pressure on vertebral discs, ligaments, and muscles leading to development of non-specific neck pain over time.

The result of this study supports the results of the previously conducted study by (Jensen C, 2003), those working in the same organization for prolonged years have higher neck pain complaints. Studies suggest that due to lesser variation at work at the same organization for a greater number of years creates lack of interest and reduced focus resulting in psychological distress.

The current study shows a strong association between night shift and non-specific neck pain. The Institute for Work and Health (IWH) reports that there is strong evidence that night shifts are associated with increased risk of work-related musculoskeletal injuries. This is associated with fatigue and less supervisor and co-worker support during night shifts.

Frequent breaks at work allow a reduction in computer exposure and facilitate muscle relaxation. Sustained posture and repetitive work if continued without considerable breaks in between causes constant activation of the muscles of neck and shoulder and allows lesser recovery time. The current study shows a strong association between frequency of breaks and non-specific neck pain among office workers.

Psychosocial risk factors association with non-specific neck pain:

There has been a high risk of neck pain development in association with psychosocial risk factors at work in this study. However, the Job

content questionnaire consists of only six parameters associated with workplace psychosocial risks (skill discretion, job authority, psychological demands, job insecurity, coworker and supervisor support).

The psychosocial factors at workplace causing pressure of time-based targets, workload, lack of decision making, monotony, poor development opportunities and lack of social support may lead to several physiological, psychological and behavioral responses. Behavioral responses to stress have shown to result in development of MSDs as it causes an increased physical and psychological exposure to risk factors.

A common stress reaction observed is tensing muscles particularly of the upper limb, clenching of teeth or keeping a tightly closed fist. This results in muscular asymmetry and formation of myofascial trigger points in. There is also a decrease in pain sensitivity due to extensive psychological demands at the workplace.

Out of these six parameters, three parameters (job authority, psychological demand and job insecurity) have been found to be significantly associated factors whereas the other three parameters (skill discretion, coworkers and supervisor support) do not show significant findings.

The findings of this study are consistent with the results of the study conducted by (Yang H et al, 2017) However, there are contradicting findings for coworker and supervisor support from a study conducted by (Ranasinghe P et al, 2011). This inconsistency in the results might be due to the use of different outcome measure scales used in the study.

The result of the current study shows weak association between fear avoidance belief (work might cause harm) and neck pain among office workers. However, fear avoidance belief has been shown to be a significant risk factor in a study conducted by (Chen X et al, 2018)

LIMITATIONS:

The self-reporting of the data by participants may cause recall and responder bias.

The ergonomics related data was collected through online questionnaires and could not be observed or analyzed in office premises due to work from home scenario, this could compromise the accuracy of data.

CONCLUSION:

Work-related factors are associated with non-specific neck pain development among office workers. There has been a higher risk of development of disability among those complaining of neck pain.

The results of the current study will be beneficial to take preventive measures in the scope of biopsychosocial model of pain. Identification of several sociodemographic, physical and psychosocial risk factors developing non-specific neck pain among office workers will help the clinicians to work towards the holistic pain approach and hence, correction of the causative risk factor will help in elimination and worsening of acute pain.

Identifying the specific risk factor causing neck pain will be helpful while designing treatment protocols focused on the exposure and its effect. This in turn can save recovery time and can result in better prognosis. Using a biopsychosocial approach of diagnosis provides the knowledge that is necessary to treat all factors contributing to pain instead of only identifying limited factors. Identification of work-related factors causing neck pain among office workers using a holistic approach will help the clinicians identify the true cause of pain, making the diagnostic, prognostic and treatment approach to be more efficient and cost effective.

Conflict of interest: None

Abbreviations:

1. NSNP: Non-specific neck pain
2. WMSD: Work-related Musculoskeletal Disorders
3. WNRP: Work-related neck pain
4. NPR: Numeric Pain Rating Scale
5. NDI: Neck Disability Index
6. JCQ: Job Content Questionnaire
7. IPAQ: International Physical Activity Questionnaire
8. BMI: Body Mass Index

9. OR: Odds Ratio
10. CI: Confidence Interval

REFERENCES:

1. Tsakitzidis G, Remmen R, Peremans L, Royen P V, Duchesnes C, Paulus D, Eysen M. Non-specific neck pain: diagnosis and treatment, KCE reports, 2009.
2. Hoy D, Protani M, Dea R, Buchbinder R. The epidemiology of neck pain, Best Practice & Research Clinical Rheumatology 24 (2010) 783–792.
3. Cagnie B, Danneels L, Tiggelen D, Loose V, Cambier D. Individual and work-related risk factors for neck pain among office workers: a cross sectional study. Eur Spine J, 2007; 16:679–686
4. Petit A, Bodin J, Delarue A, D'Escatha A, Fouquet N, Roquelaure Y. Risk factors for episodic neck pain in workers: a 5-year prospective study of a general working population. Int Arch Occup Environ Health. 2018; 91:251-261.
5. Ye S, Jing Q, Wei C, Lu J. Risk factors of non-specific neck pain and low back pain in computer users using office workers in China: A Cross-sectional study. BMJ open, 2017;7:e014914.
6. Aytutulu G, Birinci T, Tarakci E. Musculoskeletal pain and its relation to individual and work-related factors: A cross-sectional study among Turkish office workers who work using computers. 2020; Nov 5;1-8.
7. Chen X, O'Leary S, Johnston. Modifiable individual, work-related factors associated with neck pain in 7440 office workers: a cross-sectional study. Brazilian Journal of Physiotherapy, 2018; 22 (4):318-327.
8. Darivemula S, Goswami K, Gupta S, Salve H, Singh U, Goswami A. Work-related neck pain among Desk job workers of Tertiary care Hospitals in India. Indian Journal of Community Medicine, 2015; IP: 117.250.69.228.
9. Pakasaikol A, Janwantanakul P, Lawsirirat C. Development of a Neck Pain Risk Score for Predicting Nonspecific Neck Pain with Disability in Office Workers: A 1-Year Prospective Cohort Study. Journal of Manipulative and Physiological Therapeutics, 2014; 468-475
10. Canadian Center for Occupational Health and Safety (CCOHS).
11. Sabeen F, Bashir M, Hussain S, Ehsan S. Prevalence of Neck Pain in Computer Users. 2013;131 annals vol 19, issue 2, apr. –jun.
12. Tzenalis A, Beneka A, Malliou P, Godolias G, Staurou N. The biopsychosocial treatment approach for chronic neck and back pain: A systematic review of randomized controlled trials. 2016;8;1,29-48.
13. Celik S, Celik K, Dirimese E, Tasdemir N, Arik T, Buyukkara I. Determination of pain in musculoskeletal system reported by office workers and the pain risk factors. International Journal of Occupational Medicine and Environmental Health, 2018; 31 (1):91-111
14. PP Mohanty, Anchal Singh, Monalisa Pattnaik. Risk factors responsible for Musculoskeletal Pain among Computer operators. EC Orthopaedics, 2017; 15-31.
15. Calik B, Yagci N, Oztop M, Caglar D. Effects of Risk Factors Related to Computer Use on Musculoskeletal Pain in Office Workers, International Journal of Occupational Safety and Ergonomics, 2020.
16. Jensen C. Development of neck and hand-wrist symptoms in relation to duration of computer use at work, Scand J Environ Health. 2003; 29:197-205
17. Yang H, Hitchcock E, Haldeman S, Swanson N, Lu M, Choi B, Nakata A, Baker D. Workplace Psychosocial and Organizational Factors for Neck Pain in Workers in the United States. 2016; Jul;59(7):549-60
18. Ranasinghe P, Perera Y, Lamabadusuriya D, Kulatungal S, Jayawardana N, Rajapakse S, Katulanda P. Work related complaints of neck, shoulder and arm among computer office workers: a cross sectional evaluation of prevalence and risk factors in a developing country, Ranasinghe et al. Environmental Health 2011, 10:70.