Identification of Factors Associated with Nonspecific Neck Pain in Working Women

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J Health Allied Sci[NU] 2024;14(Suppl S1):S97–S103.

Abstract

Objectives Neck pain is a broad term that encompasses both nonspecific neck pain and neck pain-related disorders. It causes discomfort, impaired quality of life, disability, and affects workability alike in men as well as women. This study was designed to determine prevalence and evaluate the association of different factors with the occurrence of nonspecific neck pain in working women.

Materials and Methods A cross-sectional study was performed on working women ($n = 196$) age group between 25 and 53 years. A Google Form of the Questionnaire for the Evaluation of Risk Factors Associated With Non-Specific Neck Pain scale and Neck Disability Index (NDI) scale was given to individuals and further objective assessment of physical factors was conducted.

Statistical Analysis The association between individual, workplace, lifestyle, physical and psychological factors, and NDI levels of disability was also investigated using Pearson's correlation test and the chi-squared test using SPSS version 28.0.

Results Frequency of nonspecific neck pain in working women was 47.55%. Marital status was a significant ($\chi^2 = 8.89$) factor toward occurrence of neck pain in working women. Number of working hours/week ($\chi^2 = 19.97$), number of hours spend for entertainment on the computer ($\chi^2 = 41.84$), and height of keyboard & mouse ($\chi^2 = 18.52$) were significant factors leading to neck pain at workplace. Lifestyle factors such as mobile phones usage (p-value $= 0.02$) and posture assumed while using them ($\chi^2 = 19.56$) were significantly associated with neck disability. Levels of disability were significantly influenced by physical factors like tragus-to-wall tests ($r = 0.33$) and cervical flexion and extension ranges ($r = 0.41$ and $r = 0.31$). Importantly, psychological factors were strongly associated with neck pain and disability.

Conclusion Factors under psychological, workplace, and lifestyle domains were found significantly associated with nonspecific neck pain in working women.

Keywords
- neck pain
- working women
- prevalence
- quality of life
- computer
- posture

Introduction

Neck pain is a broad term that encompasses both nonspecific neck pain and neck pain-related disorders and it refers to any form of acute, subacute, or chronic neck pain in which no abnormal anatomic structure can be identified as the source of pain. The natural progression of nonspecific neck pain is unknown.[1] Neck pain is the most common symptom in adults

article published online
June 7, 2024

DOI https://doi.org/10.1055/s-0044-1786994.
ISSN 2582-4287.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

that mainly affects 14 to 71% of their lives, causing discomfort, impaired quality of life, disability, and hence affects workability.[2]

There are several risk factors that are related to neck pain that can be categorized into individual and professional.[3] Female gender, marital status, advanced age, demanding jobs, a lack of social or professional support, being a former smoker, and a history of past musculoskeletal problems have been related to occurrence of pain in the neck region. Additionally repetitive lifting of heavy things, frequent holding of the neck in a forward bent posture for extended periods, and long sitting hours influence manifestation of neck pain, whereas high educational levels and regular physical activities were found as protective factors in decreasing its incidence.[4] Numerous cross-sectional studies have demonstrated a connection between computer-related exposures and subjective complains in the neck and upper limbs.[5] Adaptations in physical function such as reduced cervical ranges of movement (ROM) in both flexion and extension as well as lower isometric strength in both flexor and extensor muscles of the neck when compared with healthy controls have been documented in patients with chronic neck pain.[6] In addition, psychological and sociological factors, such as stress and poor communication, were also linked to the neck and upper limbs.[7]

It was observed that the frequency of neck pain was associated with physical, individual, and psychological work-related factors in office-going men and women.[4] It has been highlighted that as compared with working males, employed females were exposed to a different risk factor, that is, stress related to their jobs and families. Based on these findings, this study was designed to identify factors categorized under domains such as individual, physical, psychological, workplace, and social lifestyle factors resulting in neck pain among working women. So far there is paucity of studies that has evaluated the wide-ranging combination of factors among working women at the workplace and at home in relation to the occurrence of nonspecific neck pain.[8]

Materials and Methods

The cross-sectional study was registered in the Clinical Trials Registry - India (CTRI/2023/03/050451) and ethical clearance from NTCC committee, Department of Physiotherapy, Amity University, Noida (NTCC/MPT-Ortho/22–23/October 2022/07). The sample size was calculated using Cochran formula[9] ($n = 196$). Participants with age group between 25 and 53 years,[6] working women past 2 years,[10] and participants who can read and write the English language and had cleared class tenth[11] were included in the study. Participants with cervical disc prolapse, cervical spinal stenosis, cervical postoperative conditions, history of severe trauma, cervical instability, pregnant women,[6] cervical radiculopathy,[10] medical history of cardiovascular or cerebrovascular accident or disease, hypertension, and history of smoking[11] were excluded from the study (►**Fig. 1**). A questionnaire for the evaluation of risk factors associated with nonspecific neck pain (QERNP) was used for the assessment. Section -A of QERNP had 19 items that included demographic details and items regarding any chronic disease, previous trauma, or surgery of the neck/shoulder and was used for the assessment of individual factors. Section B had 40 items that record work, computer, mobile usage, sleep, stress physical activity, and neck pain.[11] Section B was used to assess workplace factors (Questions 1–5,7–13), lifestyle factors (Questions 6, 14–20, 25–33, and 37–40), psychological (Questions-34 and 35), and physical factors (Questions- 21–24 and 36). Neck Disability Index (NDI) scale that includes 10 items addressing functional activities, as well as items on pain intensity, ability to concentrate, and headache presence was used to calculate neck disability.[12] A Google Form of the QERNP and NDI scale was formed and given to study participants to give appropriate responses.

Objective assessment of physical factors was done by measuring active cervical ROM (flexion, extension, right and left side flexion, right and left rotation) using a large universal goniometer with 12-inch arms and a full-circle plastic body. Participants were in seated position with back strapped to wooden chair. Hip, knees, and ankles were placed at right angles, and arms folded across chest to decrease the thoracic movement.[13] Tragus-to-wall (TTW) test was used to assess forward head posture that was measured using metric ruler as the subject stood with the neck retracted and naturally against the wall. Two-three trials were given to the subject to ensure the correct posture.[14]

The neck flexor muscle endurance test was performed in a supine, hook-lying position with a maximum retracted chin and isometrically maintained, approximately 2.5 cm just above the couch. Participant was instructed to tuck her chin or hold her head up and head while maintaining the retracted chin to the chest. Maintaining this position, a line was marked across two approximate folds of skin along the neck and assessor positioned his or her left hand on the table just below the occipital bone. The test was stopped if the edges of the lines began to separate, or the head of the subject encounters the assessor's hand for more than 1 second.[15]

Acromion-to-table distance test was used to measure rounded shoulders in which participant was asked to lie on the couch or table. In a supine position, the distance between the posterior border of the acromion and the table was calculated as shown in ref.[16]

Result

The association between individual, workplace, lifestyle, physical and psychological factors, and levels of disability calculated as per NDI was done using Pearson's correlation test and the chi-square test (SPSS version 28.0) for continuous and categorical variables, respectively (level of significance $p < 0.05$). Frequency of nonspecific neck pain in working women was 47.55% ($n = 68$). Results suggested significant relation between neck pain and marital status ($\chi^2 = 8.89$) among the working women suggesting married women had higher levels of disability due to neck pain than unmarried (►**Table 1**). Workplace factors like working - hours/week ($\chi^2 = 19.97$), job satisfaction ($\chi^2 = 34.99$), time

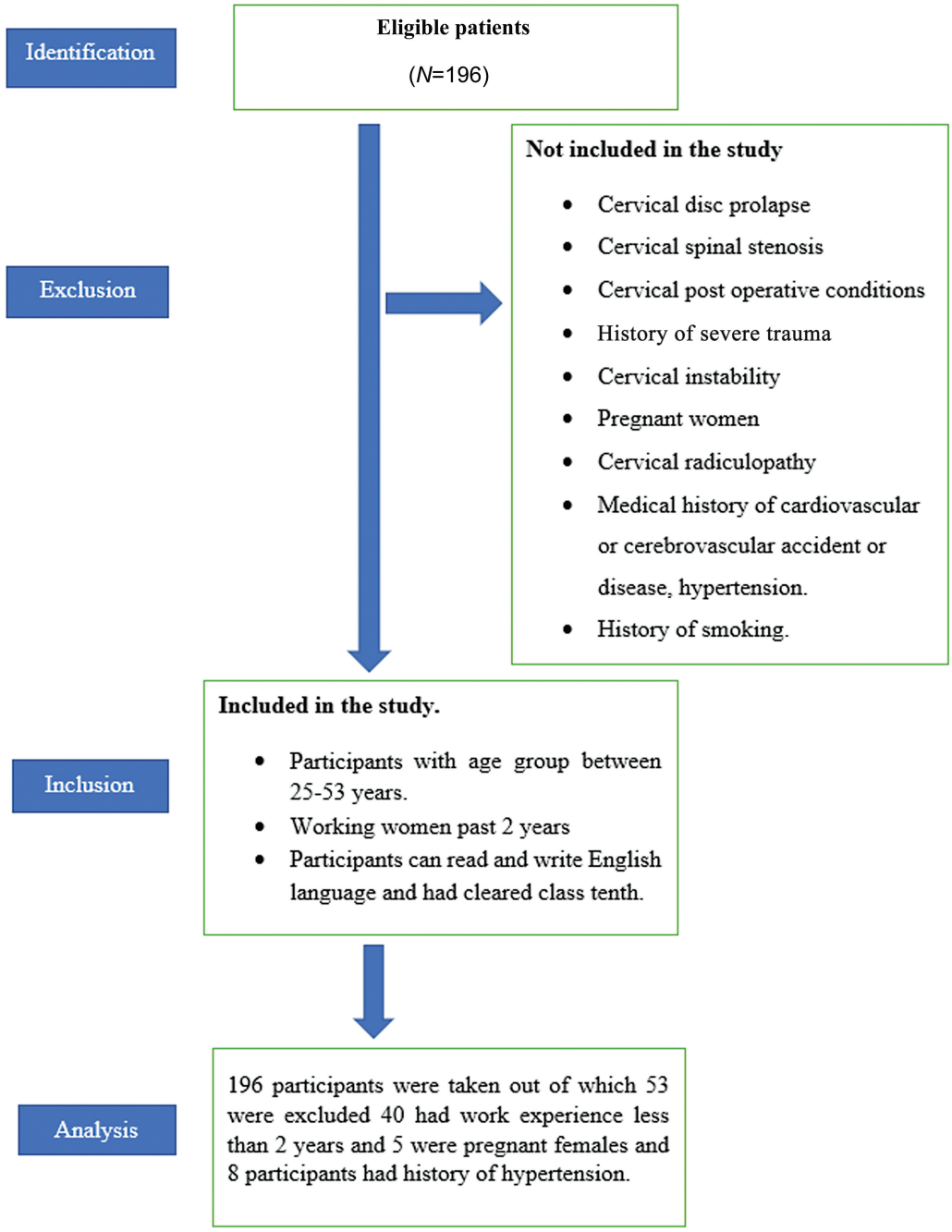

Fig. 1 **STrengthening the Reporting of OBservational studies in Epidemiology** (STROBE) chart showing study procedure.

spent on computer for work/entertainment ($\chi^2 = 41.84$), and height of keyboard and mouse ($\chi^2 = 18.52$) have shown significant association with neck disability scores among working women (►**Table 1**).

The study has demonstrated the relationship between the NDI and lifestyle factors as shown in ►**Table 1**. Neck pain was significantly associated with lifestyle factors like duration of mobile phone usage ($\chi^2 = 19.56$) as well as position assumed while using mobile phone ($\chi^2 = 22.28$). Sleep disturbances (difficulty in falling sleep and awakening at night) were significantly associated with disability associated with neck pain. Increase in neck pain disability scores was significantly associated with history of neck-related problems such as pain/stiffness past 1 year ($\chi^2 = 44.17$), history of seeking professional help ($\chi^2 = 18.99$), episode of neck pain lasting for more than 24 hours ($\chi^2 = 29.46$) and ability to perform daily activities ($\chi^2 = 23.61$).

The results of the analysis in ►**Table 1** showed that there was no significant association between levels of disability and self-rated fitness levels, physical activity, frequency, duration of exercising, and level of exertion during exercise. However, level of disability was significantly influenced by physical factors quantified objectively like TTW tests ($r = 0.33$), cervical flexion ($r = 0.41$), and extension ranges ($r = 0.31$) as shown in ►**Table 2**. Psychological factors like recent feelings of stress, tension, restlessness, work/personal

Table 1 Association between the occurrence of nonspecific neck pain with individual, workplace, lifestyle, physical and psychological factors among working women

Association of nonspecific neck pain (NDI) with		Chi-squared test	Result
Individual factors	Age	5.56	0.5 (S)
	Marital status	8.89	0.03 (S)
	Weight (kg)	16.148	0.06 (NS)
	Height (feet and inches)	9.341	0.2 (NS)
Workplace factors	Nature of occupation	7.18	0.3 (NS)
	Job duration (years)	4.34	0.2 (NS)
	Working hours/week	19.97	0.02 (S)
	Job satisfaction	34.99	0.000 (S)
	Computer use	3.69	0.3 (NS)
	Type of computer used	2.23	0.5 (NS)
	Posture adopted while using computer	6.89	0.6 (NS)
	Time spent on computer for work/entertainment (hours)	41.84	0.000 (S)
	Sitting tine in front of computer at a stretch (hours)	3.71	0.9 (NS)
	Level of computer screen w.r.t eyes	9.44	0.2 (NS)
	Height of keyboard & mouse	18.52	0.005 (S)
Lifestyle factors	Time spent on household work (hours)	15.81	0.07 (NS)
	Time spent talking/chatting/playing. on the mobile phone (hours)	19.56	0.02 (S)
	Position assumed while using mobile phone	22.28	0.03 (S)
	Distance between chin w.r.t. chest while using mobile phone (inches)	2.86	0.8 (NS)
	Use a tablet/I-pad	4.52	0.2 (NS)
	Daily tablet/I-pad use time (hours)	3.97	0.4 (NS)
	Position assumed while using tablet/I-pad	7.41	0.5 (NS)
	Distance between chin w.r.t. chest while using tablet/I-pad (inches)	4.68	0.3 (NS)
	Time spent per day watching television or movies (hours)	10.84	0.3 (NS)
	Position assumed while watching television	4.12	1.0 (NS)
	Position maintained while sleeping at night	7.36	0.6 (NS)
	Position maintained habitually while sleeping at night	6.26	0.7 (NS)
	Sleep time at night (hours)	7.87	0.5 (NS)
	Sleep sufficiency at night	2.09	0.6 (NS)
	Problems falling asleep in the past 6 months	18.12	0.006 (S)
	Troubled by awakening in night with problem in falling back asleep past 1 year	15.98	0.01 (S)
	Number of pillows used	10.12	0.3 (NS)
	Complaints of neck pain/stiffness past one year	44.18	0.0001 (S)
	Professional help taken for neck pain	18.99	0.0003 (S)
	Episode of neck pain lasting for more than 24 hours	29.46	0.0002 (S)
	Difficulty in doing daily activities because of neck pain	23.61	0.0003 (S)
Physical factors	Indulgence in any type of physical activity	10.83	0.09 (NS)
	Number of times per week physical activities like walking, jogging, exercising in the gym, swimming, or other exercises were done	8.23	0.5 (NS)
	Time spent per session on physical exercise (minutes)	16.49	0.2 (NS)
	Change in sweating and breathing during physical activity session	7.93	0.5 (NS)
	Overall fitness levels	12.52	0.2 (NS)

Table 1 (*Continued*)

Association of nonspecific neck pain (NDI) with		Chi-squared test	Result
Psychological factors	Difficulty in falling asleep due to feelings of stress, tension, restlessness, work/personal pressure, anxiety, or nervousness	34.78	0.000 (S)
	Feeling of depression in the past 6 months	25.71	0.000 (S)

Abbreviations: NS, not significant; S, significant.
Level of significance $p < 0.05$.

Table 2 Association between the occurrence of nonspecific neck pain with physical factors among working women

Physical factors	Mean	SD	Pearson's correlation	Level of significance
Flexion	38.64	7.07	0.40	0.000 (S)
Extension	47.36	10.11	0.31	0.000 (S)
Right lateral flexion	38.15	5.37	0.12	0.154 (NS)
Left lateral flexion	39.43	4.74	0.05	0.583 (NS)
Right rotation	63.43	10.03	0.15	0.066 (NS)
Left rotation	63.13	11.78	0.14	0.103 (NS)
TTW-right	10.40	2.32	0.33	0.000 (S)
TTW-left	10.31	2.16	0.33	0.000 (S)
Chin tuck test	18.10	7.76	0.15	0.080 (NS)
ATD-right	9.09	5.21	0.02	0.830 (NS)
ATD-left	8.57	1.75	0.13	0. 130 (NS)

Abbreviations: ATD, acromion to table distance; NDI, Neck Disability Index; NS, not significant; S, significant; SD, standard deviation; TTW, tragus-to-wall test.
Level of significance $p < 0.05$.

pressure, anxiety, or nervousness that make it difficult to fall asleep ($\chi^2 = 34.78$), as well as recent depressive symptoms ($\chi^2 = 25.72$), were strongly associated with neck pain and disability (►**Table 1**).

Discussion

Findings of this study suggested that most of the working women (75.52%) in the study lie in the age range of 21 to 30 years, followed by age group of 31 to 40 years (19.58%) and 41 years and above (4.90%). The results revealed that levels of disability due to neck pain and age were not significantly associated and earlier research also failed to find a significant relationship between age and neck pain.[17] It was crucial to remember that this study only included participants who were up to 53 years old, so findings cannot be generalized to other age groups. About 33.57% of working females were married, whereas 66.4% were unmarried. Still marital status was detected to be significantly associated with neck disability levels, with a greater number of unmarried women ($n = 52$) having mild-to-moderate levels of neck disability than married women ($n = 14$) (►**Supplementary Table S1**). Evidence showed mixed findings that being married will act as buffer against psychological component related to pain[18] while handful of studies indicate that married people have a higher prevalence of neck pain, which may be brought on by increased stress at the workplace and caregiving responsibilities at home.[19] Varied findings could be due to noninclusion of questions specifically related to contribution of family or workplace sufferings to their pain.

About 88.81% of females worked for more than 40 hours/week. Thus, a significant association between weekly working hours and NDI scores was seen ($\chi^2 = 19.97, p < 0.05$). The neck pain score was higher for females who worked more than 30 hours per week compared with people who worked less than 30 hours/week. Results were consistent with earlier research indicating that prolonged sitting or working in a static position could boost the risk of neck pain and disability.[20] Second, there was a significant association between levels of disability and job satisfaction. The NDI score was lower for people who were more satisfied with their jobs compared with those who were less satisfied. Previous study had similar findings that higher job satisfaction brings lesser incidence of musculoskeletal pain and disability.[19] The number of hours per day spent using a computer for work or leisure was significantly associated with disability levels caused by neck pain. Using a computer for an extended period might increase the risk of neck pain and disability. Working women should be advised to vary the tasks they undertake to reduce the impact of work and to take regular breaks in between. Regular breaks have been shown to help computer users with

neck, shoulder, and low back pain without compromising productivity.[21] Ergonomic setup, that is, height of the keyboard and mouse had significant association between levels of disability. The neck pain was higher in working women who responded that the keyboard and mouse were at the wrong height for them (23.16%) than in people who said it was the right height. According to earlier research, poor workstation ergonomics may raise the risk of neck pain and disability. It has also been reported that individuals taking less duration of breaks between working hours was a cause of neck pain.[19,22] The use of large forearm support, which has recently been shown to be effective in the prevention of upper-body musculoskeletal pain, was probably a solution when using a keyboard and mouse (►**Supplementary Table S2**).[21] The study's findings should be used to guide and administer ergonomic interventions to working women using computer such as more variety in posture and comfort can be achieved with dynamic and sit/stand chair or neck load can be lessened by using document holders, placing the screen properly, and using adjustable chairs. Further to decrease continuous computer usage, mandatory rest breaks may be implemented.[5]

About 53.15% of females used mobile phones for more than 2 hours/day. Texting on mobile devices caused people to adopt a static and flexed spinal posture, which was the most prevalent posture predisposing to neck pain. In the literature, it was observed that women were more likely to report experiencing pain in their shoulders and neck. A lower pain threshold in women than in men can be explained due to innate differences in somatic and visceral perception, lower levels of physical activity among females than males in our society, and a propensity for females to experience more mental and psychological stress than males all contribute to this general trend.[23] Further a strong relationship between disability levels and the position in which mobile phones were used was established. About 49.95% of females used mobile phones while sitting, 27.27% in half lying, 17.78% in lying or lying on their stomach, and 4.2% in standing position (►**Supplementary Table S3**). The best position is generally agreed to be a sitting position with a straight back, well-supported forearms, holding the phone with both hands, and using both thumbs while operating it. However, this position should not be held for extended periods of time. The main factors influencing the frequency and severity of neck and shoulder pain were collectively attributed to the degree of neck flexion while using a mobile device, as well as the frequency of use.[23] Other lifestyle factors significantly associated with neck pain in working women were disturbance in sleep pattern, history of neck pain/stiffness, duration of last episode of neck pain, difficulties performing daily tasks because of neck pain, and type of professional treatment taken. The importance of addressing these factors in managing neck pain was well highlighted by the study findings. Neck pain has been linked to several chronic pain conditions, and sleep disturbances have been shown to have a significant association with pain intensity and disability. So, treating and evaluating sleep issues should be a key component of neck pain management. However, the mechanisms underlying the link between pain and sleeping problems were complex. For instance, pain may be thought of as a wakefulness-inducing stimulator that also reduces the effectiveness of areas of the central nervous system that initiate and maintain sleep. Patients who have poorer sleep quality may also have lessened mu and delta opioid receptor sensitivity or lessened endorphin secretion. Pain seems to share a neurobiological process with sleep modulation and pain regulation. Hence, it was observed that sleep disturbance is associated with neck pain.[24]

Self-rated physical factors such as fitness levels, frequency, duration, and type of physical activity performed did not significantly affect levels of disability caused by neck pain (►**Supplementary Table S4A**). However, objective assessment of physical factors (neck mobility, posture, muscle endurance) leading to neck pain in working women was also addressed in this study. According to the study's findings, disability levels were significantly correlated with physical factors like neck flexion and extension ROM, TTW-left and TTW-right but not with factors like neck lateral flexion, rotation, chin tuck test, and acromion to couch distance. A significant relationship between neck disability and cervical ROM, particularly in flexion and extension, was found ($r = 0.404$ & $r = 0.312$) (►**Supplementary Table S4B**). It was reported in a systematic review that prolonged neck flexion and forward head posture while working were also linked to neck and shoulder pain. It may be worthwhile to consider including an active range of flexion and extension exercises in primary prevention programs for individuals with neck pain. Forward head posture was also linked to a reduction in cervical ROM.[25] Additionally, it was observed that maintaining a high neck flexion angle while working increases the weight of the head, which places additional strain on the spine and causes changes in the ligaments, tendons, and muscles that may eventually result in forward head posture. In comparison to adults without neck pain, adults with increasing forward head posture may have weaker deep neck flexors and extensors and more activity in their superficial muscles.[26]

Lastly, psychological factors exhibited a significant association between NDI scores and psychological factors (feelings of stress, tension, restlessness, work/personal pressure, anxiety, or nervousness that makes it difficult to fall asleep, as well as feelings of depression in the preceding 6 months). About 56.64% of females were occasionally troubled by stress and 13.29% were frequently troubled by stress, whereas 35.66% have sporadically felt depressed in the past 6 months and 9.79% reported regular symptoms of depression (►**Supplementary Table S5**). These results were consistent with earlier studies that showed how psychological factors affect neck pain and disability. In a recent review, stress has consistently been linked to symptoms of the neck and upper extremities at work in the general working population. More frequent breaks would be anticipated to lessen static loading on the neck muscles and perhaps also have a beneficial effect on psychological stressors. At home also sharing of caregiving responsibilities should be done by other family members.[19,25]

Limitation of the Study

This study was performed in one geographical region; thus it might not represent all populations and further it comprises of self-reported data that was subject to recall bias.

Conclusion

Individual (age, marital status) and psychological factors (stress and depression) are significantly associated with neck pain among working women. Job satisfaction, number of hours spent/week at workplace and on computer, and height of keyboard at workplace showed strong association with disability caused due to neck pain. Further history of neck pain/stiffness past 1 year, duration and posture assumed during mobile phone usage, and sleep disturbances were significant lifestyle factors associated with occurrence of nonspecific neck pain. In future, longitudinal studies can be designed by inclusion of extensive assessment of physical factors to determine the risk variables leading to development of nonspecific neck pain in working women.

Conflict of Interest
None declared.

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