

The Prevalence, Risk Factors and Consequences of Neck Pain in Office Employees

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Abstract

Background: Office workers, especially computer users are at risk of developing neck pain (NP), while limited studies have been conducted on this issue.

Objectives: The purpose of this study was to identify the prevalence, risk factors, and consequences of NP in office employees, and its effect on their quality of life and work.

Methods: This research was a cross sectional study conducted during years 2014 and 2015. Among all employees, 220 people were randomly selected from 10 welfare organization offices of Semnan city of Iran. Data regarding the individual characteristics, occurrence of NP and its intensity, health status, risk factors and consequences of NP including functional disability and quality of life and work, as well as work-related factors were collected.

Results: Immediate, last month, last six months, last year, and lifetime prevalence of NP were 38.1%, 39.7%, 41.1%, 45.8% and, 62.1%, respectively. The point prevalence of NP was significantly related to age, gender, health status, job satisfaction, and length of employment ($P < 0.05$). Elongated working hours on the computer, taking a prolonged sitting position, and static postures were the most irritating factors, respectively ($P < 0.001$). Taking medications and physiotherapy were the most effective intervention strategies that participants chose for the treatment of NP (60.2%).

Conclusions: The findings provide evidence that the prevalence of NP in office employees was high. The modifiable individual and work-related factors were as follows, improving health status, job satisfaction, reduction of working hours on the computer, avoiding prolonged sitting and static postures, having a rest time during working hours, and performing regular daily exercises.

Keywords: Neck Pain, Office Employee, Prevalence, Risk Factors, Consequence, Quality of Life

1. Background

Neck pain (NP) is one of the most common musculoskeletal complaints that affects about half of the adult population during a 1-year period (1). It is considered as a major public health problem, both in terms of health and overall well-being of the person and the society (2-4). It has imposed relatively high direct and indirect costs, and may affect the quality of life and working condition of patients (2, 5, 6). Among occupational groups, office workers, especially intensive computer users, are at high risk for developing NP (7-14). Increasing computer-based tasks at the workplace may cause poor working postures and repetitive movements, especially in head and neck regions (15).

Different studies have demonstrated that office workers were at high risk of developing NP, yet, they reported different prevalence rates (15-17). In an epidemiological study by Jensen et al., carried out on office workers, 53% of female workers of call centers reported having NP (15). More than 59% of office workers at a Hong Kong university

16 and 63% of medical secretaries, included in a Swedish study, reported NP (17).

The etiology of work-related neck pain disorders (NPD) seems to be multidimensional and is associated with physical and psychosocial factors (18). A number of factors, including both individual factors (e.g. gender and age) (17, 19, 20), and work related factors (e.g. repetitive work, prolonged sitting, and static posture), and also psychosocial factors, have been discussed as risk factors for NPD in office workers (17, 20-23). Work-related psychosocial factors, such as interpersonal associations at work, funds, and finances appear to play a major role on the occurrence of NP (18, 22, 23). Studies have provided evidence showing the role of these factors and the importance of controlling the risk factors for reducing or modulating occurrence of NPD in office workers (24).

Since, previous reports about the prevalence rate of NP in office employees have not been consistent (25), the present study aimed at addressing the prevalence rate of NP in randomly selected office employees from the Sem-

nan population, considering clear inclusion and exclusion criteria, and a defined prevalence period.

2. Objectives

We aimed at estimating the prevalence and risk factors of work-related neck pain in Semnan office employees and to evaluate how individual and work-related factors may predict the risk of neck injuries and pain in this population.

3. Methods

This cross sectional study was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences. Considering a power of 80% and probable drop rate of 10%, 220 people were randomly selected from ten welfare organizations in Semnan city. Office employees were included if they were currently employed (for a period of at least one year) and were willing to participate in the study. The exclusion criteria were as follows, spinal deformities (e.g. scoliosis), history of neck surgery, malignancy, osteoporosis, neck tumor, multiple sclerosis, any fracture or disorder of the neck region, trauma, and inflammatory conditions.

Applying inclusion and exclusion criteria, 200 office employees were identified eligible and were invited to participate in the study and complete the questionnaires. All participants were provided written information about the aims of the study by a research coordinator allocated to each office and they were asked to sign a consent form before taking part. Finally, 192 office employees were included. The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the institution's human research committee.

The general questionnaire contained demographic characteristics and background data such as gender, age, height, weight, body mass index (BMI), and marital status. The specific questionnaire included questions regarding the existence and duration of neck pain, working posture and its duration (for example sitting or standing positions during work), duration of working on the computer, the prevalence of NP, and possible risk factors for NP in office worker's population along with the consequences. The validity and reliability of the questionnaires were evidenced (26). To detect the rate of NP prevalence, immediate, last month, last six month, annual, and lifetime prevalence were recorded. The definition of NP was stated in the questionnaire as pain, ache, or discomfort in the area between the occiput and the third thoracic vertebra, and between the medial borders of the scapula (26). A drawing

demarcating of the anatomical area was provided in the questionnaire.

Data were analyzed using the SPSS software (version 22). Proper statistical tests such as Pearson Correlation and Chi-Square (χ^2) tests were used to evaluate the association between the variables. Also odd ratios (ORs) and related 95% confidence intervals (CIs) were calculated. Logistic regression model was run to show the relationship of NP with risk factors.

4. Results

4.1. The prevalence of Neck Pain

The response rate was 96% (n = 192). Of all subjects, 67.2% were female. Detailed descriptive statistics showing the epidemiological records and characteristics of participants are shown in Tables 1 and 2, respectively. Estimating the prevalence of neck pain for office employee (results shown in Table 3), indicated that immediate, last month, last six months, last year, and lifetime prevalence of NP in office workers were 38.1%, 39.7%, 41.1%, 45.8%, and 62.1%, respectively.

Table 1. Characteristics of Office Workers at Welfare Organizations

| | Mean (SD) | Range |
|--------------------------|---------------|---------------|
| Age (years) | 41.34 (8.47) | 24 - 60 |
| Height (m) | 1.63 (0.09) | 1.37 - 1.85 |
| Weight (kg) | 70.65 (12.86) | 42 - 110 |
| BMI (kg/m ²) | 26.51 (4.17) | 16.41 - 38.10 |
| Years of employment | 17.85 (4.12) | 1 - 32 |

Table 2. Treatment Options Received by Office Workers of Welfare Organizations, Who Had Experienced Neck Pain

| Procedure/Treatment | Number | Percentage (%) |
|------------------------------------|--------|----------------|
| Medicine | 31 | 17.7 |
| Physiotherapy | 29 | 16.2 |
| Using supporters (cervical collar) | 8 | 4.2 |
| Medicine and Physiotherapy | 43 | 26.3 |
| No treatment | 58 | 35.6 |
| Total | 119 | 100 |

Table 2 demonstrates the management of NP by office employee. Overall, 58% received no treatment and 43% received medicine and physiotherapy together. As demonstrated in Table 2, 111 (64.4%) participants reported having

Table 3. Neck Pain Prevalence for Office Workers of Welfare Organizations

| Period of Prevalence | Office Workers |
|-----------------------|----------------|
| Immediate prevalence | 38.1% |
| Last month prevalence | 39.7% |
| Six month prevalence | 41.1% |
| Annual prevalence | 45.8% |
| Lifetime prevalence | 62.1% |

different management for their NP; of these, 31 individuals (17.7%) had medications only, 29 (16.2%) received physiotherapy, 8 (4.2%) used cervical collar, and 43 (26.3%) received a combination of medications and physiotherapy. **Table 4** shows the frequencies and ORs with 95% CIs for predictive factors of point prevalence of NP using logistic regression model.

The VAS of office workers with NP was 20.80 ± 14.82 mm (ranging from 1 mm to 80 mm). Of office workers, who had NP, 66.7% reported referral pain in head and 69.4% in upper limb.

4.2. Risk Factors of Neck Pain

The results demonstrated that NP reported significantly more by female office employees than males ($P = 0.001$). The results also indicated that older office employees were more likely to experience NP compared to the younger participants ($P = 0.01$). Office workers with abnormal range of BMI (low or high) were more likely to have NP compared to those with normal range of BMI, yet, this difference was not statistically significant ($P = 0.52$). Length of employment was a potential risk factor for NP; those who had a work experience of longer than 20 years were more likely to develop NP ($P = 0.005$). Office workers, who had a good general health, reported lower NP than unhealthy office workers ($P = 0.00$). Those participants, who were not satisfied with their job, were more likely to experience neck pain ($P < 0.05$) (**Table 4**).

Having rests (37.5%), taking medicine (27.5%), and participation in sport activities (10.2%) were reported as the most effective factors for decreasing NP. According to the data from structured questions, working hours on a computer (35.5%), prolonged sitting (32.4%), and prolonged standing (17.5%) were found to be the most aggravating factors for NP. **Table 4** indicates that the length of working time on a computer appeared to be one of the predictive factors of NP prevalence in office workers ($P < 0.05$). The results demonstrated that 27% of participants reported doing regular exercise. Although, those who did regular exercise were less likely to report NP, no statistically signif-

icant association was found between exercise and the occurrence of NP ($P = 0.88$).

4.3. Consequences of Neck Pain

Analyses of data indicated that quality of life and quality of work were decreased in 26%, and 23% of office workers with NP, respectively. Among participants with NP, 18% had some absence from work, which highly affected their quality of work. **Table 5** shows that 81.1% of office workers with NP had low to high level of sleep disturbances ($P < 0.001$). Indoor activities were limited in 17.6% of office workers in range of moderate to high disturbance ($P < 0.001$). Furthermore, 18.9% of office workers were involved in outdoor activities and had NP in range of moderate to high disturbance ($P < 0.001$). Among all office workers with NP, 23% reported moderate to high limitation in their social activities ($P = 0.02$). Of them, 59.4% couldn't carry heavy objects with low to moderate disturbance ($P = 0.01$). Driving was highly limited in 10.9% of office workers with NP ($P < 0.001$).

5. Discussion

The present study indicates that NP was a common disorder in office employees. Immediate, last month, last six months, last year and lifetime prevalence of NP were 38.1%, 39.7%, 41.1%, 45.8% and, 62.1%, respectively. These findings regarding prevalence were consistent with previous studies (2, 7, 10, 16, 27). In line with our results, neck disorders are shown to be among significant sources of pain and activity limitations in office employees (28). Neck pain disorders result from complex relationships between individual characteristics and workplace risk factors (21-24). We found certain factors, such as gender, age, length of employment, job satisfaction, and general health status to be significantly associated with the occurrence of NP among office employees. Results from some other investigations were also confirmatory (24, 29). A systematic review of literature had shown that NP in workers was associated with age, previous musculoskeletal pain, high quantitative job demands, low social support at work, job insecurity, low physical capacity, poor computer workstation design, work posture, sedentary work position, repetitive work, and precision work. In addition, gender, occupation, headaches, emotional problems, smoking, poor job satisfaction, awkward work postures, poor physical work environment, and workers' ethnicity may be associated with NP. Our study revealed certain work-related determinants, such as working hours on the computer, prolonged sitting, and forward flexion posture during working, which were the most common factors that enhanced the risk of developing NP among office employees (30). We found that having a rest during working hours and performing regular

Table 4. Adjusted Odds Ratios and 95% Confidence Intervals for Risk Factors of Immediate Prevalence of Neck Pain Using Enter in Single Step Logistic Regression Model for Office Workers, who had Experienced Neck Pain

| Variables | Frequency (%) of Total Sample | Frequency (%) Affected by NP | Chi-Square | Odds Ratio | 95% Confidence Intervals | P Value |
|-------------------------------|-------------------------------|------------------------------|------------|------------|--------------------------|---------|
| Gender | | | 10.76 | 0.33 | 0.17 - 0.67 | 0.001 |
| Female | 129 (67.2) | 59 (79.7) | | | | |
| Male | 63 (32.8) | 14 (20.3) | | | | |
| Age | | | 8.58 | | | 0.01 |
| ≤ 40 | 76 (39.6) | 22 (29.7) | | 3.31 | 1.47 - 7.47 | |
| 41 - 50 | 78 (40.6) | 30 (40.5) | | 2.2 | 0.99 - 4.84 | |
| > 50 | 38 (19.8) | 22 (29.7) | | | | |
| BMI | | | 0.47 | | | |
| Low < 20 | 7 (3.6) | 3 (4.1) | | 0.92 | 0.20 - 4.28 | 0.91 |
| Normal 20 - 25 | 70 (36.5) | 24 (32.4) | | 1.23 | 0.66 - 2.30 | 0.52 |
| Overweight > 25 | 114 (59.4) | 47 (83.5) | | | | |
| General health | | | 26.05 | 0.29 | 0.06 - 1.36 | 0.00 |
| Healthy | 92 (47.9) | 20 (27.1) | | | | |
| Unhealthy | 100 (52.1) | 53 (72.9) | | | | |
| Years of employment | | | 11.58 | | | |
| < 10 | 51 (26.6) | 14 (18.9) | | 3.04 | 1.4 - 6.58 | 0.004 |
| 10 - 20 | 67 (34.9) | 21 (28.4) | | 2.72 | 1.35 - 5.48 | 0.005 |
| > 20 | 74 (38.5) | 39 (52.7) | | | | 0.005 |
| Do exercise | | | 0.02 | 1.05 | 0.54 - 2.04 | 0.88 |
| Not exercising | 142 (74) | 54 (73) | | | | |
| Exercising | 50 (26) | 19 (27) | | | | |
| Pain intensifiers | | | 7.42 | | | |
| Prolonged standing | 22 (11.5) | 13 (17.5) | | 0.33 | 0.11 - 1.03 | 0.06 |
| Prolonged sitting | 94 (49) | 24 (32.4) | | 0.45 | 0.19 - 1.06 | 0.07 |
| Forward flexion posture | 29 (15.1) | 11 (14.6) | | 0.15 | 0.023 - 0.96 | 0.04 |
| Working hours on the computer | 47 (24.5) | 26 (35.5) | | | | |
| Job satisfaction | | | 51.68 | | | |
| No | 27 (14.1) | 25 (33.8) | | 0.004 | 0.00 - 0.07 | 0.00 |
| Low | 76 (39.6) | 30 (40.5) | | 0.15 | 0.02 - 1.25 | 0.03 |
| Moderate | 78 (40.6) | 18 (24.3) | | 0.33 | 0.04 - 2.79 | 0.08 |
| High | 11 (5.7) | 1 (1.4) | | | | |

daily exercises were protective factors that decreased the occurrence of NP in office employees. Rest and daily sports activity can be suggested as the strategies, which office employees can perform to reduce their pain intensity. The alleviating effect of rest breaks, observed in this study, was also reported in other studies 10. Rest permits a decrease in maintaining static posture in the working environment

and also increases muscle relaxation. We also found that medications and physiotherapy were the most effective intervention strategies for the treatment of NP (60.2%). In line with our results, previous findings have shown that work involving long hours or abnormal night-day schedules can lead to a harmful effects on performance, sleep patterns, accident rates, mental health, and cardiovascular

Table 5. Consequences of Neck Pain on Quality of Life of Work Officers

| Variables | Frequency (%) of Total Sample | Frequency (%) Affected by NP | Chi-Square | Sig. |
|--|-------------------------------|------------------------------|------------|------|
| Sleeping | | | 97.63 | 0.00 |
| Without sleeping disturbance | 119 (62.3) | 14 (18.9) | | |
| Low | 54 (27.7) | 43 (58.1) | | |
| Moderate | 13 (6.8) | 11 (14.9) | | |
| High | 6 (3.1) | 6 (8.1) | | |
| Indoor activity | | | 71.84 | 0.00 |
| Without disturbance in indoor activity | 128 (66.7) | 23 (31.1) | | |
| Low disturbance in indoor activity | 46 (24) | 38 (51.4) | | |
| Moderate disturbance in indoor activity | 10 (5.2) | 8 (10.8) | | |
| Higher level disturbance in indoor activity | 8 (4.2) | 5 (6.8) | | |
| Outdoor activity | | | 80.04 | 0.00 |
| Without disturbance in outdoor activity | 123 (64.1) | 19 (25.7) | | |
| Low disturbance in outdoor activity | 50 (26) | 41 (55.4) | | |
| Moderate disturbance in outdoor activity | 14 (7.3) | 12 (16.2) | | |
| Higher level disturbance in outdoor activity | 5 (2.6) | 2 (2.7) | | |
| Social activity | | | 100.23 | 0.02 |
| Without limitation | 120 (62.5) | 14 (18.9) | | |
| Low limitation | 51 (26.6) | 43 (58.1) | | |
| Moderate limitation | 18 (9.4) | 16 (21.6) | | |
| High limitation | 3 (1.6) | 1 (1.4) | | |
| Carrying heavy items | | | 82.08 | 0.01 |
| Without limitation | 107 (55.7) | 11 (14.9) | | |
| Low limitation | 26 (13.5) | 19 (25.7) | | |
| Moderate limitation | 24 (12.5) | 20 (27) | | |
| High limitation | 35 (18.2) | 24 (32.4) | | |
| Driving | | | 103.8 | 0.00 |
| Without limitation | 117 (60.9) | 12 (16.2) | | |
| Low limitation | 63 (32.8) | 54 (73) | | |
| Moderate limitation | 9 (4.7) | 7 (9.5) | | |
| High limitation | 3 (1.6) | 1 (1.3) | | |

mortality (31). However, a systematic review on evidence-based studies, showed that performing workplace resistance training for three times a week and 20 minutes per session, could promote pain intensity in shoulders, wrists, cervical, dorsal and lumbar spine (32).

Immediate prevalence of NP was significantly related to female gender. Our study supports previous studies, indicating that NP was a more common complaint among female office employees than male (16, 17, 19, 20, 27, 33). A higher prevalence of chronic pain has been reported

in musculoskeletal system of females compared to males (34). Females are at greater risk of incidence of many musculoskeletal pain conditions (35). It has been suggested that this gender difference is due to differences in musculoskeletal systems and physiological mechanism of pain perception between the two genders (36, 37). Wijnhoven et al., in their study, also showed that prevalence rates of musculoskeletal pain were higher for females than males (33). However, the difference in prevalence reports may be due to use of different methodologies, unclear definition

for NP, unclear prevalence periods, heterogeneity of study samples and different sample size, as well as background circumstances.

The present study also revealed that age and employment years were risk factors associated with NP. This finding confirmed previous studies demonstrating a positive association between age and NP occurrence (17, 19, 20, 24, 27). These studies showed that workers at the age above 40 years and with high work experience were at greater risk of NP (17, 19, 20, 27). Degenerative joint disease in cervical spine increases with age. In the present study, the age and the length of employment were also associated with the occurrence of NP. In agreement with previous findings (27), we found that unhealthy status was associated with increased risk for the occurrence of NP.

Work conditions, hours spent on the computer, prolonged sitting, and prolonged static postures were found as factors, which increased the risk of NP. These results confirmed previous findings that showed long sitting periods, especially when working on the computer for more than 3 hours, increases the risk of NP and LBP occurrence (38). Using the computer during a long period is an occupational risk factor of NP in office workers, which is related to holding static postures of head and neck (15, 19, 26). Ariens et al. (39) also demonstrated that sitting for more than 95% of the working time could enhance the risk of NP. Other studies also confirmed our results and indicated that longer time spent on the computer and improper work conditions may contribute to the development of NP among office workers (15, 19, 32, 33). However, Waersted and colleagues (2010) reported that there was limited evidence about the relationship between computer work and tension neck syndrome, and further studies are required in this regard (40).

Confirming our results, other studies also demonstrated that low job satisfaction was associated with development of NP (24). The findings of this study showed that NP could significantly increase the risk of disability and decrease the quality of life and work, as the main consequences. Patients with NP reported lower quality of life, quality of work and also problems in ADL including sleeping, indoor and outdoor activities, social activities, carrying heavy things, and driving (28, 41).

5.1. Limitation and Suggestion

The current study was conducted in Semnan city, thus, the results cannot be generalized to all Iranian office employees. The current study only investigated the prevalence of NP and associated risk factors. Future studies should focus on the assessment of different protective strategies and long-term follow up with a greater empha-

sis on the effect of ergonomic factors to reduce the impact of NP on office employees.

5.2. Conclusion

Findings of this study indicate a high prevalence of NP among office employees. Office work is a high risk occupation for NP. Age, gender, length of employment, healthy status, and job satisfaction were known as risk factors for developing NP. Working hours on the computer, prolonged sitting, and prolonged standing were found as work-related factors that correlated with NP occurrence among office employees. Office employees with NP have a low quality of life and limitation in doing their ADL such as sleeping, indoor activities, outdoor activities, social activities, carrying heavy things, and driving disturbance. Some protective strategies such as having a break during working hours and performing regular daily exercises were found as useful protective factors to reduce the incidence of NP in office employees.

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Footnotes

Authors' Contribution: Study concept and design: Fatemeh Ehsani and Zahra Mosallanezhad; acquisition of data: Fatemeh Ehsani and Ghazaleh Vahedi; analysis and interpretation of data: Fatemeh Ehsani and Ghazaleh Vahedi; drafting of the manuscript: Zahra Mosallanezhad; critical revision of the manuscript for important intellectual content: Fatemeh Ehsani; statistical analysis: Fatemeh Ehsani and Zahra Mosallanezhad; administrative, technical, and material support: Fatemeh Ehsani and Zahra Mosallanezhad; study supervision: Zahra Mosallanezhad.

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