

## ORIGINAL ARTICLE

## ASSOCIATION BETWEEN SITTING TIME AND NECK-SHOULDER PAIN AMONG OFFICE WORKERS: A CROSS-SECTIONAL STUDY

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**Background:** Much of literature is available on aetiological factors and prevalence of neck-shoulder pain in office workers but limited evidence is available on association between sitting time and Neck-Shoulder Pain (NSP) among office workers. The objective of this study was to determine the association between sitting time and NSP among office workers. **Methods:** This was a cross-sectional study, the data were collected using non-probability convenient sampling technique. Selection criteria included participants having work related aches, working duration more than 3 hours in a day and 20 hours per week, and between 20–60 years of age. Data were analysed on SPSS-21. **Results:** The working hours per week with intensity of neck and shoulder pain was grouped as no pain, mild pain, moderate pain and severe pain. The sitting was further classified as low, moderate or high sitting. The results were found statistically significant with age, gender, smoking and pain intensity within the last month. **Conclusion:** Total sitting time per week at office was significantly associated with neck-shoulder pain among office workers. Further, high total sitting time per week was associated with increased NSP intensity compared to moderate sitting or low sitting with age, gender, smoking status or pain intensity.

**Keywords:** Neck-shoulder pain, Sitting, Pain intensity, Office workers, Sedentary, Exercise, Posture

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## INTRODUCTION

Neck shoulder pain (NSP) is a frequent and very common in general population.<sup>1</sup> Neck shoulder pain is work related musculoskeletal issue with an obscure and undefined mechanism but still some of its major causes can be defined as an alterations in physical action, correction of posture and autonomic nervous system control which can be the pathogenesis of unending neck and shoulder pain.<sup>2</sup> Neck and shoulder pain which occurs deliberately is contemporary to health issues which annihilated millions of workers round the clock which shows that three foremost reasons for the pain that is constant sitting, continuous motion of hand in the same manner attention and application of the mind.<sup>3</sup>

Biomechanical risks which are commonly accepted aspects for neck shoulder pain may comprise of restricted functioning postures, high force demand, working with arms raised and repetitive movements. Reasonable evidence suggests that neck pain and tenderness is linked to workplace exposures.<sup>4</sup> Ergonomics is the science behind workplace design and human interaction and its effects. Ergonomics in Pakistan is still not regarded as an important element of most of the big projects and businesses, contrary to the fact that physical exposure of upper limb during work may cause body pain, lack of sensation, tingling of various body parts.<sup>5</sup>

However, risk factors linked with neck pain in workers includes geriatric, smoking, previous musculoskeletal pain, increasing working hours, low social support, job dearth and insecurity, low physical

potential, poor workstation design, poor postures, recurring and precise work and prolonged sitting.<sup>6-8</sup>

A systematic analysis conducted in Miami in 2019 concluded that the increased proliferation of innovations necessitates better ergonomic interventions. The survey population of people who use computers in their office settings showed signs of decreasing physical activity and worsening posture. Their work required them to sit and use computers for long durations. Neck shoulder pain was reported by the majority of the clients. 60% of staff with musculoskeletal disorders saw a drop in productivity as a result of poor posture during the workday.<sup>9</sup>

The etiological studies which consisted of complaints related to neck, shoulder and hands problems among computer workers are unclear and difficult to understand because their overall mental or physical stress actually count in.<sup>10</sup> Many root causes of neck, shoulder and hands problems are acknowledged which include physical exposure during work and conditions such as psychosocial conditions. Physical exposures include motionless neck and arms postures and doing monotonous and repetitive tasks.<sup>11-13</sup>

The epitomizing purpose of this research is to basically determine the aetiology, the association and the associated factors contributing and enabling the Neck-Shoulder pain among office workers in Pakistan. It was seen long sitting without support usually ends with neck shoulder pain. The objective of the study was to find association between sitting hours and the pain in neck and shoulders.

**METHODOLOGY**

This cross-sectional study was carried out to evaluate the association between sitting time and neck-shoulder pain among office workers. Information regarding neck shoulder pain in office workers were collected through a Questionnaire.<sup>14</sup> Data was collected after ethical approval of the Institute. The data was collected from different office setups such as Descon Power Solutions, Rasheed Associates, and the Pesticide Company Multan from April to November 2019 using convenience non-probability sampling technique. Inclusion criteria were age between 20 and 60 years, working at least for 3 hours in a day and 20 hours in a week. Exclusion criteria were pregnancy, absence due to sickness at the day of testing, any traumatic injury to the neck or shoulder region, refusal to sign consent, or working less than 20 hours in a week. The data was managed and analysed using SPSS-21 and Microsoft Excel 2013. To find out any association between variables, Chi-square test was applied, and  $p < 0.05$  was considered significant.

**RESULTS**

A total of 200 office workers (80% response rate) participated in this study. The mean age of participants was  $32 \pm 10.11$  years (Range: 21–60 years). Cross-tabulation of working hours per week

with intensity of neck shoulder pain was done and was grouped into no pain, mild pain, moderate pain and severe pain.

A total of 60 participants were falling in age group of 21–30 and the Chi-square showed non-significant association ( $p=0.11$ ). In age group of 31–40 years, non-significant association was found on Chi-square test ( $p=0.13$ ). Forty-three office workers were in age group 41–50 years. Results of this age group were significant. In age group 51–60 years, non-significant association was found ( $p=0.53$ ) (Table-1).

Association of neck shoulder pain and total working hours per week has been stratified with gender where there are 138 males and 62 females (Table-2).

The association of working hours per week and neck shoulder pain with smoking is shown below. The total smokers in the study were 49 and non-smokers were 151 (Table-3).

The association of working hours per week and neck-shoulder pain with symptoms which affected productivity at work within the last month. This was classified as no effect, mild effect, moderate effect and severe effect (Table-4).

**Table-1: Association between working hours per week/total sitting time and neck shoulder pain stratified by age [n (%)]**

Age (Years)	Working hours per week/total sitting time	Neck shoulder pain				Total (n=200)	p
		No pain	Mild	Moderate	Severe		
21–30	Low Sitting	0	6 (10)	2 (3.33)	0 (0)	8	0.11
	Moderate Sitting	3 (5)	11 (18.33)	19 (31.67)	6 (10)	39	
	High Sitting	1 (1.67)	2 (3.33)	6 (10)	4 (6.67)	13	
	Total	4	19	27	10	60	
31–40	Low Sitting	2 (3.13)	4 (6.25)	1 (1.56)	1 (1.56)	8	0.13
	Moderate Sitting	2 (3.13)	11 (17.19)	18 (28.13)	7 (10.94)	38	
	High Sitting	1 (1.5)	2 (3.13)	11 (17.19)	4 (6.25)	18	
	Total	5	17	30	12	64	
41–50	Low Sitting	2 (4.65)	6 (13.95)	1 (2.33)	0 (0)	9	0.051
	Moderate Sitting	1 (2.33)	8 (18.60)	11 (25.58)	2 (4.65)	22	
	High Sitting	0	2 (4.65)	8 (18.60)	2 (4.65)	12	
	Total	3	16	20	4	43	
51–60	Low Sitting	0	1 (3.03)	1 (3.03)	0 (0)	2	0.53
	Moderate Sitting	2 (6.06)	3 (9.09)	10 (30.30)	6 (18.18)	21	
	High Sitting	0	4 (12.12)	5 (15.15)	1 (3.03)	10	
	Total	2	8	16	7	33	

**Table-2: Association between working hours per week/total sitting time and NSP, stratified by gender [n (%)]**

Gender	Working hours per week/total sitting time	Neck shoulder pain				Total	p
		No pain	Mild	Moderate	Severe		
Male	Low Sitting	1 (0.72)	3 (2.17)	0 (0)	0 (0)	4	0.02
	Moderate Sitting	5 (3.62)	17 (12.32)	43 (31.16)	20 (14.49)	85	
	High Sitting	1 (0.72)	7 (5.07)	30 (21.74)	11 (7.97)	49	
	Total	7	27	73	31	138	
Female	Low Sitting	3 (4.84)	14 (22.58)	5 (8.06)	1 (1.61)	23	0.49
	Moderate Sitting	3 (4.84)	16 (25.81)	15 (24.19)	1 (1.61)	35	
	High Sitting	1 (1.61)	3 (4.84)	0 (0)	0 (0)	4	
	Total	7	33	20	2	62	

**Table-3: Association between working hours per week/total sitting time and NSP, stratified by smoking [n (%)]**

Smoking Status	Working hours per week/total sitting time	Neck shoulder pain				Total	p
		No pain	Mild	Moderate	Severe pain		
Smoker	Low Sitting	2 (4.08)	0 (0)	0 (0)	0 (0)	2	0.00
	Moderate Sitting	0 (0)	6 (12.24)	11 (22.45)	4 (8.16)	21	
	High Sitting	0 (0)	2 (4.08)	16 (32.65)	8 (16.33)	26	
	Total	2	8	27	12	49	
Non-Smoker	Low Sitting	2 (1.32)	17 (11.26)	5 (3.31)	1 (0.66)	25	0.01
	Moderate Sitting	8 (5.30)	27 (17.88)	47 (31.13)	17 (11.26)	99	
	High Sitting	2 (1.32)	8 (5.30)	14 (9.27)	3 (1.99)	27	
	Total	12	52	66	21	151	

**Table-4: Association between working hours per week/total sitting time and NSP, stratified by pain intensity within the last months [n (%)]**

Symptoms affected productivity	Working hours per week/total sitting time	Neck shoulder pain				Total	p
		No pain	Mild	Moderate	Severe		
No Effect	Low Sitting	1 (4.76)	2 (9.52)	0 (0)	0(0)	3	0.78
	Moderate Sitting	7 (33.33)	6 (28.57)	1 (4.76)	0	14	
	High Sitting	1 (4.76)	3 (14.3)	0 (0)	0(0)	4	
	Total	9	11	1	0	21	
Mild Effect	Low Sitting	3 (3.57)	7 (8.33)	5 (5.95)	1 (1.19)	16	0.00
	Moderate Sitting	1 (1.19)	22 (26.19)	24 (28.57)	1 (1.19)	48	
	High Sitting	1 (1.19)	1 (1.19)	14 (16.7)	4 (4.76)	20	
	Total	5	30	43	6	84	
Moderate Effect	Low Sitting	0 (0)	7 (9.72)	0 (0)	0 (0)	7	0.00
	Moderate Sitting	0 (0)	4 (5.55)	26 (36.1)	12 (16.66)	42	
	High Sitting	0 (0)	5 (6.94)	13 (18.05)	5 (6.94)	23	
	Total	0	16	39	17	72	
Severe Effect	Low Sitting	0 (0)	1 (4.34)	0 (0)	0 (0)	1	0.11
	Moderate Sitting	0 (0)	1 (4.34)	7 (30.43)	8 (34.78)	16	
	High Sitting	0 (0)	1 (4.34)	3 (13.04)	2 (8.69)	6	
	Total	0	3	10	10	23	

**DISCUSSION**

The study showed that neck-shoulder integrity is affected by total sitting time in office during working hours and during leisure time and office workers are prone to develop neck-shoulder symptoms due to prolong sitting.

A study done by Hallman DM *et al*<sup>14</sup> has explained association between sitting and neck shoulder pain. A linear association was impacted from the association between neck shoulder pain and total sitting time in a day. The results have clearly shown that participants with moderate sitting time were having less neck shoulder pain intensity while those having high shoulder pain intensity were those with more total sitting time daily in office. A non-significant association was found among males that implied less neck shoulder pain intensity associated with less sitting.<sup>14</sup> On the contrary, the present study shows that moderate sitting showed linear association between total sitting time per day and neck-shoulder pain in office workers. When stratifying by gender, a significant association was found among males in moderate sitting time which was associated with moderate and severe pain in some individuals. High sitting time was also associated with moderate pain among males. A non-linear association was found among females as no moderate or severe pain was observed in high sitting in them, only moderate and

mild pain was seen in some of the females in moderate and high sitting.

Hallman DM *et al*<sup>15</sup> demonstrated negative and positive association of less and moderate sitting times with neck shoulder pain respectively but there was no association found between high sitting time and NSP. We found that less/low sitting time showed non-significant association between total sitting time and neck-shoulder pain among office workers. But a significant association was found between moderate and high sitting times and NSP.

In a study<sup>16</sup> the results found were statistically significant for sitting and smoking. In another study<sup>17</sup> sitting was referred as ‘new smoking’. The present study demonstrated no difference of neck shoulder pain in smokers and non-smokers.

Yue P *et al*, have found neck shoulder pain association with long time standing, prolonged sitting, physical exercise and type of back support used.<sup>18</sup> The present study also confirms that prolonged sitting is associated with neck shoulder pain. Increase in physical exercise/work, light or strenuous activities was significantly associated with neck shoulder pain intensity. A review by Mayer J *et al*<sup>19</sup> in 2012 elaborated association of neck shoulder pain with physical work in office set ups which confirms our findings.

Streud T *et al*<sup>20</sup> have found some major causative factors to neck shoulder pain such as jobs with

high demands and working with flexed neck posture with uncomfortable lifting. In support of this along with prolonged sitting, we found another causative factor for NSP which is high force demand or level of physical demand needed to perform work at office which is significantly associated with NSP.

We suggest that by using proper back supported chairs and by taking small breaks during working hours, the intensity of NSP can be minimized because if not managed properly, it might be really harmful for causing NSP and other musculoskeletal (MSK) problems. This idea is in support of another systematic review which claimed that MSK symptoms can be reduced by using supported chairs for those individuals who work for longer periods of time.<sup>12</sup>

## CONCLUSION

The total sitting time per week at office was significantly associated with neck-shoulder pain among office workers. High total sitting time per week was associated with increased NSP intensity compared to moderate sitting or brief sitting. Increased age can increase the pain associated with increased sitting time. Gender and smoking have no such effect on pain in neck or shoulder region among office workers. Use of proper back support during sitting and small intervals to stretch and relax during long sitting hours can reduce incidence of NSP. Further work on larger scale is recommended.

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