Physiotherapy Section

Prevalence of Functional Disability Due to Neck Pain and Back Pain among Microscope Users of Punjabi University Patiala, Punjab, India

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ABSTRACT

Introduction: Prolonged use of microscope can result in discomfort and injuries which may lead to functional disability.

Aim: To determine the prevalence of functional disability due to neck pain and back pain among microscope users.

Materials and Methods: This study was survey; conducted at Punjabi university, Patiala, Punjab, India. Total 100 microscope users of both genders, age; 19 to 40 years from different departments were included in the study. The prevalence of neck pain and back pain was evaluated with the use of an interview questionnaire. Furthermore, the functional disability related to neck pain and back pain was assessed by the Neck Disability Index (NDI) and Oswestry low back pain and Disability Index (ODI).

Results: The prevalence of neck pain and back pain was 46% and 24% respectively. The subjects who were at the age of 21-30 years were highly affected with neck and back pain. Around 50.0% subjects of back pain and 50% of neck pain had mild disability, 18.2% of back pain and 81.8% of neck pain had moderate disability, 36.4% subjects of back pain and 63.6% of neck pain had indicates severe disability and 13 subjects of back pain and 25 of neck pain indicates complete disability on NDI and ODI.

Conclusion: A higher risk of neck pain and low back pain among microscope users predisposes this occupation at high risk of developing spine injuries which needs further consideration like knowledge of ergonomics, appropriate body position while working, selection of good chair and break time, etc.

INTRODUCTION

Work Related Musculoskeletal Disorders (WRMSD) are one of the leading causes of occupational disability worldwide [1]. WRMSDs are associated with numerous occupational risk factors including physical factors such as static postures, high repetition, excessive force, excessive reaching, compression or contact stress, static exertions, repetitive motions, psychosocial stressors and individual factors which are also known to be important as predictive variables. WRMSD affects musculoskeletal system that significantly cost workplace problems thus affecting occupational health, productivity and career of the working population [2].

Like all other professionals, Microscope user's occupation is exposed to occupational health hazards which predispose them to develop a multitude of health problems. Their nature of work exposes them to various types of hazards like biological, physical, chemical and ergonomic hazards [3]. Using microscope for longer duration can cause discomfort and injuries which may lead to functional disability [4]. Functional disability is the acquired difficulty in performing basic everyday tasks. There are three dimensions for performance in functional disability i.e. physical, emotional and mental [5]. Microscope manufacturers in previous years were focused only on improvement in the optical functions and ignoring the ergonomics [4]. Use of microscope for prolonged time is associated with chronic pain syndromes and this has been known since three decades. Despite this, the microscope users are not well informed about this hazard untill they are afflicted. Neck pain and back pain is the most common pain syndromes associated with the amount of fixed working postures [6]. Neck pain is the second most common musculoskeletal problem after low back pain increasing in both the general population and in specific occupational groups caused by degenerative disease, trauma, inflammatory or mechanical disorders. Neck pain is defined as the sensation of discomfort in the neck area [7]. Prolonged and extensive use of microscope at workplace may cause many occupational injuries. Despite in development of latest

equipment still there is high incidence of Musculoskeletal Disorders (MSDs) among microscope users [4].

There is very limited literature available about neck and back pain in microscope users. The lack of research leaves a profound gap. The need of doing this study in microscope users is as many have prolonged sitting, bending, twisting, turning etc., and prolonged sitting hours of work under microscope which biomechanically affect posture and leads to functional disability in them. The specific aim of the current study was to determine the prevalence of functional disability due to neck pain and back pain among microscope users. Neck pain and back pain are the most common MSDs faced by the population. This study will help in finding the prevalence and its associated functional disability as a result of poor posture; prolong working hours and least knowledge of ergonomics in microscope users.

MATERIALS AND METHODS

This cross-sectional survey based study was designed to find the prevalence and its associated functional disability among microscope users. The study was conducted at Punjabi University Patiala, Punjab, India. The duration of study was for period of 14 months i.e., March 2015 to April 2016. Microscope users were taken from various departments (Botany, Zoology and Forensic sciences).

Sample Size and Sampling

The study population was 100 microscope users from various departments of Punjabi university Patiala. The method of sampling was random sampling. A sample size of 100 was calculated by G power. Microscope users (n=100) between ages 19-40 year were screened on the basis of following:

Inclusion Criteria

1) Subject within age group of 19-40 years of age; 2) both males and females were included; 3) Subject worked on a microscope more than 1 hour a day and 4) Subject who had worked on a microscope

for 1 year or more.

Exclusion Criteria

1) Subject who had undergone any back surgery; 2) Non cooperative subjects; 3) Subject having any pathology related to neck and back, recent trauma or surgery to neck or shoulder were excluded.

Outcome Measures

1. Oswestry low back pain and disability scale (ODI) (Mehra A et al., 2008) [8].

2. Neck Disability Index (NDI) (Vernon H, 2008) [9].

Description of Tool

1. **Oswestry low back pain and disability:** The Oswestry Low back pain and Disability Index (ODI) is a self-administered questionnaire in which 10 sections designed to assess limitations of various activities of daily living. The total possible score is 5. The section scoring criteria is based on the statement marked i.e. section score=0- if first statement is marked or section score=5- if last statement is marked. Each section score is summed to obtain the final score. The final score is then multiplied by 2, and the degree of disability is expressed as a percentage. 0% to 20% indicates minimal disability, 21%-40%: moderate disability, 41%-60%: severe disability, 61%-80%: crippled and in 81%-100% patient is bed-bound. Higher scores on the Oswestry questionnaire indicate greater levels of perceived disability. The questionnaire takes 3.5-5 minutes to complete and approximately one minute to score [8].

2. **Neck disability index (NDI):** The NDI consists of 10 items, each with a score up to 5, for a total score of 50. The lower the score, the less is the self-rated disability. The interpretation of score is: 0-4=No disability, 5-14=Mild disability, 15-24=Moderate disability, 25-34=Severe disability and 35 or over=Complete disability. Some patients may not find 1 to 2 sections applicable. These sections may be excluded and scoring is done by excluding 5 from the missing section and convert to 100% and divided by 2 [9].

STATISTICAL ANALYSIS

The data was analysed using the SPSS version 20.0 (SPSS Inc., Chicago, IL, USA) for Windows 7 Professional. Descriptive statistics were reported as means and Standard Deviation (SD) for continuous data or as percentage of counts.

RESULTS

[Table/Fig-1] shows the distribution of microscope users according to age. The minimum age was 19 years and maximum was 40 years. The sample was divided into three age groups that were less than 20 years, 21-30 years and 31-40 years. Maximum number of subjects of neck pain (39.7%) and back pain (24.4%) fall into the age group of 21 to 30 years and minimum were in 31 to 40 years.

Age groups		Area of pain			Total
		Back pain	Neck pain	No pain	
Less than 20 years	N	5	14	1	20
	%	25.0%	70.0%	5.0%	100.0%
21 to 30 years	N	19	31	28	78
	%	24.4%	39.7%	35.9%	100.0%
31 to 40 years	N	0	1	1	2
	%	0.0%	50.0%	50.0%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-1]: Distribution of subjects in different age groups.

[Table/Fig-2] shows that (53.7%) females suffered from neck pain, (26.9%) from back pain and 19.4% had neither suffered from neck nor back pain. The total numbers of male subjects were 33, Out of them 30.3% suffered from neck pain, 18.2% from back pain and 51.5% had neither neck nor back pain.

Gender		Area of pain			Total
		Back pain	Neck pain	No pain	
Female	N	18	36	13	67
	%	26.9%	53.7%	19.4%	100.0%
Male	N	6	10	17	33
	%	18.2%	30.3%	51.5%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-2]: Gender wise distribution of subjects.

[Table/Fig-3] shows that 50.0% of the subjects had neck pain, 23.3% had back pain and 26.7% who had no pain were working on microscope since 3 years. Around 41.7% of the subjects had neck pain, 20.8% of back pain were working on microscope since 7 years.

Years of work		Area of pain			Total
		Back pain	Neck pain	No pain	
1	N	1	0	0	1
	%	100.0%	0.0%	0.0%	100.0%
2	N	2	6	0	8
	%	25.0%	75.0%	0.0%	100.0%
3	N	7	15	8	30
	%	23.3%	50.0%	26.7%	100.0%
4	N	1	7	6	14
	%	7.1%	50.0%	42.9%	100.0%
5	N	3	3	4	10
	%	30.0%	30.0%	40.0%	100.0%
6	N	4	2	1	7
	%	57.1%	28.6%	14.3%	100.0%
7	N	5	10	9	24
	%	20.8%	41.7%	37.5%	100.0%
8	N	1	2	0	3
	%	33.3%	66.7%	0.0%	100.0%
9	N	0	1	2	3
	%	0.0%	33.3%	66.7%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-3]: Distribution of subjects according to years of work on microscope.

[Table/Fig-4] shows the highest percentage of subjects worked on microscope for 2 hours in a day and among them 48.9% suffered from neck pain, 20% from back pain and 31.1% had no pain. The second highest percentage was for 3 hours and in them 56.0% suffered from neck pain, 24.0% from back pain and 20% had no pain.

[Table/Fig-5] shows that 34.4% subjects of back pain, 65.6% of neck pain had gradual onset of pain. While 33.3% of subjects with back pain and 66.7% of neck pain had sudden onset of pain.

[Table/Fig-6] shows that 44 (55.7%) subjects of neck pain and 17 (21.5%) of back pain do not perform any physical activity in their daily routine whereas, 7 (33.3%) subjects of back pain and only 2 (9.5%) of neck pain performed physical activity in their daily routine.

[Table/Fig-7] shows the around 29 subjects got awakened from sleep because of pain while 41 did not awake, 30 subjects did not experience pain while sleeping.

[Table/Fig-8] shows that 19 subjects had good health status while the majority had bad health status.

Hours in a day		Area of pain			Total
		Back pain	Neck pain	No pain	
2	N	9	22	14	45
	%	20.0%	48.9%	31.1%	100.0%
3	N	6	14	5	25
	%	24.0%	56.0%	20.0%	100.0%
4	N	6	2	1	9
	%	66.7%	22.2%	11.1%	100.0%
5	N	1	5	9	15
	%	6.7%	33.3%	60.0%	100.0%
6	N	0	1	1	2
	%	0.0%	50.0%	50.0%	100.0%
7	N	2	1	0	3
	%	66.7%	33.3%	0.0%	100.0%
8	N	0	1	0	1
	%	0.0%	100.0%	0.0%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-4]: Distribution according to number of hours of work on microscope in a day.

Onset of pain		Area of pain			Total
		Back pain	Neck pain	No pain	
Gradual	N	22	42	0	64
	%	34.4%	65.6%	0.0%	100.0%
Sudden	N	2	4	0	6
	%	33.3%	66.7%	0.0%	100.0%
No pain	N	0	0	30	30
	%	0.0%	0.0%	100.0%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-5]: Distribution of subjects according to the onset of pain experienced.

Physical activity		Area of pain			Total
		Back pain	Neck pain	No pain	
No	N	17	44	18	79
	%	21.5%	55.7%	22.8%	100.0%
Yes	N	7	2	12	21
	%	33.3%	9.5%	57.1%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-6]: Frequency of subjects who do any physical activity in daily routine.

Awakened from sleep		Area of pain			Total
		Back pain	Neck pain	No pain	
Yes	N	1	28	0	29
	%	3.4%	96.6%	0.0%	100.0%
No	N	23	18	0	41
	%	56.1%	43.9%	0.0%	100.0%
No pain	N	0	0	30	30
	%	0.0%	0.0%	0.0%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-7]: Frequency of subjects awakened from sleep because of pain.

[Table/Fig-9] shows 50.0% subjects of back pain and 50.0% of neck pain belongs to the disability score of 0 to 10 which indicates mild disability. 18.2% subjects of back pain and 81.8% of neck pain belongs to the disability score of 11 to 20 which indicates mild to moderate disability. A 36.4% subjects of back pain and 63.6%

Health status		Area of pain			Total
		Back pain	Neck pain	No pain	
Good	N	7	0	12	19
	%	36.8%	0.0%	63.2%	100.0%
Poor	N	17	46	18	81
	%	21.0%	56.8%	22.2%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-8]: Distribution of subjects on the basis of their health status.

belongs to neck pain comes under the scoring of 21 to 30 which indicates moderate to severe disability. On the scoring of 31 to 40 and above 13 subjects of back pain and 25 of neck pain indicates complete disability.

Disability score		Area of pain			Total
		Back pain	Neck pain	No pain	
0 to 10	N	5	5	0	10
	%	50.0%	50.0%	0.0%	100.0%
11 to 20	N	2	9	0	11
	%	18.2%	81.8%	0.0%	100.0%
21 to 30	N	4	7	0	11
	%	36.4%	63.6%	0.0%	100.0%
31 to 40	N	5	4	0	9
	%	55.6%	44.4%	0.0%	100.0%
41 to 50	N	3	10	0	13
	%	23.1%	76.9%	0.0%	100.0%
51 to 60	N	4	8	0	12
	%	33.3%	66.7%	0.0%	100.0%
61 to 70	N	1	3	0	4
	%	25.0%	75.0%	0.0%	100.0%
NA	N	0	0	30	30
	%	0.0%	0.0%	100.0%	100.0%
Total	N	24	46	30	100
	%	24.0%	46.0%	30.0%	100.0%

[Table/Fig-9]: Distribution of subjects according to functional disability on NDI and ODI.

DISCUSSION

Microscope workers have the tendency to develop neck and back pain as a result of continuous static muscular work load [10]. In this study prevalence of functional disability due to back pain and neck pain was present in 70 subjects. Total 100 subjects were included, Out of these 46 subjects had neck pain, 24 had back pain while 30.0% did not report any type of pain. The subjects who were at the age of 21-30 were highly affected with neck and back pain. 60.4% of the subjects work on microscope in sitting posture with forward bending while, 42.0% work in prolonged standing posture.

Electromyography examination of microscopists have revealed that after 4 hours of work on microscope muscle strain in the neck and back is 25-56% greater at the beginning of work. The factors which lead to neck and back pain among the microscope users depends on the number of hours of sitting, work place settings and poor postural patterns adapted by them [11]. Falla D in his study also found that when the neck is in flexed position for prolonged period of time there is continuous loading and the soft tissues get tightened. Due to this loading, there is a decrease in blood flow and oxygen supply to the soft tissues causing pain [12]. Microscope users do not use adjustable microscope with respect to ocular height and angle which results in decreased muscular activity in the neck. A cross-sectional survey study was done by Sillanpa J et al., to support this in which when the old microscope table is replaced with the newer one with proper ergonomic settings and

modifications it was noticed that the static load on neck and back was reduced which lead to decrease in pain [10]. Gupta AA et al., in his study found that 67% general pathologists and 70.3% microbiologists experienced neck and back pain [13]. Haile EL et al., in his study concluded that individuals having age between 22-33 years having work experience of 1-6 years were more affected with work related musculoskeletal pain [14]. In the present study, 50.0% subjects of back pain and 50.0% of neck pain have disability score of 0 to 10 which indicates mild disability. Subjects suffered by back pain were 18.2% and 81.8% of neck pain comes under the disability score of 11 to 20 which indicates mild to moderate disability. Around 36.4% subjects of back pain and 63.6% of neck pain belongs to the scoring of 21 to 30 which indicates moderate to severe disability. On the scoring of 31 to 40, 55.6% of back pain and 44.4% of neck pain indicates complete disability. Bansal A et al., conducted a study on 74 dentists and found high prevalence of neck disability scores in high age group as well as in those who had worked for prolonged years as their most of the work involves prolonged bending and sitting. In the study it was also observed that as the working hours increased daily or weekly; the complaints of neck pain also increased due to inappropriate body posture in a limited area which have consequences on the cervical spine. [15]. Fritzsche FR et al., conducted a study amongst pathologists in Switzerland; it was found that MSDs affected more than 75% of pathologists with more than 40% having the symptoms during the last month [3]. They also concluded that increased working hours were associated with MSDs and improved ergonomic settings reduced the pain in WRMSDs.

The present study shows that the prevalence of functional disability due to neck pain and back pain is high among microscope users; which make it completely necessary to focus on the awareness of physiotherapy, break time during the prolonged working hours, postural correction and teaching ergonomics to microscope users. Since MSDs have slow onset, it is usually overlooked. One should be aware of the few early signs such as early fatigue, less concentration, muscle stiffness. The microscope needs to adapt to the user; an ideal microscope workplace needs adjustable table and chairs, so that users can sit in a relaxed and in an upright position. It is also essential to teach the ergonomic programs to the users. Ergonomics in the workplace helps ergonomics helps in making routine and repetitive tasks comfortable, thereby improving efficiency, quality and job satisfcation. This also reduces physical and psychological stress by lowering the fatigue factor and human error and prevents the WRMSDs in future.

LIMITATION

The sample size of study group was small and male and female ratio was also not equal; hence study results cannot be generalised for the entire population. No clinical examination of the subjects was done and study was delimited to a particular area was another limitation.

CONCLUSION

The incidence of neck pain is higher as compared to back. It occurs because of poor working posture, lack of knowledge of ergonomics. The microscopists should be aware of the work related illness. The efforts should be aimed at incorporating additional ergonomic improvement such as adjustable microscope, chair selection, etc. As neck pain is having higher incidence among these users so they have to be appropriately assessed with medical consultation as well as preventive measures to be taken so their reoccurrence can be avoided. Exercise standardisation, as well as duration, frequency and time of evaluation are necessary to reduce the risk of low back pain. The microscopists should be aware of physical activity which increases muscular strength, speed and decreases the degenerative changes in the loco motor organs. The exercise should be selected individually according to advice and possibilities. The microscopists are strongly encouraged to adapt preventive measures before symptoms develop and to seek medical evaluation if they experience symptoms. In conclusion, the results indicate that the risk of acquiring microscopy related problems will remain as long as preventive strategies are not being implemented by them. Sleep pattern of subjects was also affected along with activities of daily living which may have an impact on quality of life. Awareness must be created among the subjects regarding modifications of work.

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