Evaluation of Occupational Health Status Related to Musculoskeletal Disorders Among Neurosurgeons of North India: A Cross Sectional Study

Chandra Sameer[1], Chandra Shalini[2], Joshi H S[3], Joshi Gaurav[4], Singh Kashmir[5]

ABSTRACT

Introduction: Common injuries due to poor ergonomics knowledge at workplaces usually affects back, neck and upper limb and are mainly caused by repetition and over strain at tendons and joints, unbalanced and prolonged postures, chronic inflammation and weakness. During craniotomy surgery, because of the prolonged action and maintaining a fixed position, neurosurgeons, in both the sitting and standing positions, face various musculoskeletal problems in the absence of proper position. In view of this, the present study was planned and undertaken to find the prevalence of musculoskeletal disorders among neurosurgeons due to poor ergonomics at their workplaces.

Material and method: A descriptive cross-sectional study consisting of 28 neurosurgeons was conducted to determine musculoskeletal work related pain in North India. The study was conducted by sending questionnaire via electronic-mail. Subjects were recommended to implement ergonomics at their workplace and were again approached after 1 month. Chi- square test was used for the analysis. A 95% Confidence Level was used and a p-value of less than or equal to 0.05 was considered statistically significant.

Results: 32% reported lack of rest, 46% maintenance of same position for long time and remaining reported both the reasons for the occurrence of this disorder. The areas affected by musculoskeletal pain and discomfort was neck in 74% cases, shoulder 37%, hands or wrists 24%, elbows 39%, upper back 46%, low back 32%, knees 2%, hips and thighs 2%, ankles and feet 4%. 72% reported that they lack coordination of all the arrangements around operation table during operation. 43% reported that they accommodate themselves to fit the surgical microscope instead of finding most comfortable working position by defining free space zone.

Conclusion: The factors of occupational health problems affecting medical professionals particularly musculoskeletal disorders need to be evaluated with greater accuracy, along with occupational safety methods to help decrease their prevalence.

Keywords: Musculoskeletal Disorders, Neurosurgeons

INTRODUCTION

Pain and muscle tension are common experience in a neurosurgeon's day to day life. A neurosurgeon is a physician who specializes in the diagnosis and surgical treatment of disorders of the central and peripheral nervous system including congenital anomalies, trauma, tumors, vascular disorders, infections of the brain or spine, stroke, or degenerative diseases of the spine.[1] Due to critical operations and long operating hours neurosurgeons require compromising positions. During craniotomy surgery, because of the prolonged action and maintaining a fixed position, neurosurgeons, in both the sitting and standing positions, face various musculoskeletal problems in the absence of proper position.[2] Implement of proper ergonomics at workplace is important to prevent repetitive strain injuries, which can increase over the span of time and can lead to long-term disabling conditions and working can be made as comfortable as possible.[3] The word ergonomics means natural laws or systems at work. Thus, it is an applied science concerned with designing products and procedures for maximum efficiency and safety. It is also a study of the relationship among the personnel, equipment and environment in the work area. Common injuries due to poor ergonomics at workplaces usually affects back, neck and upper limb and are mainly caused by repetition and over strain at tendons and joints, unbalanced and prolonged postures, chronic inflammation and weakness.[4] In view of this, the present study was planned and undertaken to find the prevalence of musculoskeletal disorders among neurosurgeons due to poor ergonomics at their workplaces.

MATERIAL AND METHOD

A descriptive cross-sectional study consisting of 28 neurosurgeons was planned and carried out to determine musculoskeletal work related pain in North India. Ethical clearance was taken from institutional ethical committee for the commencement of the study. The study was conducted by sending questionnaire via electronic-mail to 50 neurosurgeons and only 28 neurosurgeons responded to the questionnaire. Telephonic conversation was carried out to follow the participants. Informed consent was taken from all the study participants via electronic-mail. The study was planned in two phases. Standardized Nordic Questionnaire (SNQ)[5] (modified according to work area of neurosurgeons) (table 1) and questionnaire regarding affects and reasons of work related musculoskeletal problems (table 2) consisted of mainly objectives questions. In the first phase, the subjects were given questionnaire related to the musculoskeletal pain happened

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over last twelve months. The reliability and validity of questioner was determined by carrying pilot study by asking the 10 subjects to refill the questioner and reliability of the questioner was determined by using cronbach's alpha coefficient test value degree 0.92. Thus, in the first phase musculoskeletal problem was analysed. In the second phase of study, subjects were recommended to implement ergonomics at their workplace (table 3). After one month subjects were again approached and given questionnaire about the musculoskeletal disorders.

STATISTICAL ANALYSIS

Data so obtained was analyzed using Statistical Package for Social Science (SPSS) Version-16 data analysis software. Chi- square test was used for the analysis. A 95% Confidence Level was used and a p-value of less than or equal to 0.05 was considered statistically significant.

Have you at any time during the last 6 months had suffered ache, pain, discomfort in:	
Neck	
1 No	2 Yes
Shoulders	
1 No	2 Yes
Upper back	
1 No	2 Yes
Low back	
1 No	2 Yes
Elbows	
1 No	2 Yes
Wrists/ Hands	
1 No	2 Yes
One or both hips and thighs	
1 No	2 Yes
One or both knees	
1 No	2 Yes
One or both ankles/feet	
1 No	2 Yes

Table-1: Standardized Nordic Questionnaire (SNQ) (modified according to work area of neurosurgeons) about pain and discomfort in various locomotor organs

According to you, reason for your musculoskeletal problem: A) Lack of rest B) Position maintained for long time C) Both
Have you administered medicines for relief or consulted the orthopaedicians for discomfort? Yes No
Have you experienced musculoskeletal pain after a day of surgery? Yes No
Do you take care of correct working distance between your body and the table? Yes No
Do you think that the during operation all the arrangements around operation table are properly coordinated? Yes No
Do you accommodate yourselves to fit the surgical microscope or find your most comfortable working position by defining your free space zone? Yes No

Table-2: Questionnaire regarding affects and reasons of work related musculoskeletal problems

RESULTS

The overall prevalence of musculoskeletal problems in the present study was found to be 56.1%. The mean age of total 28 respondents was 53.6 years. 32% reported lack of rest, 46% maintenance of same position for long time and remaining reported both the reasons for the occurrence of this disorder. The areas affected by musculoskeletal pain and discomfort (table 4 and Figure-1) was neck in 74% cases, shoulder 37%, hands or wrists 24%, elbows 39%, upper back 46%, low back 32%, knees 2%, hips and thighs 2%, ankles and feet 4%.

Table 5 shows that 17% respondents had taken self administered medicines for relief and 3% had consulted the orthopaedicians for discomfort. 63% experienced musculoskeletal pain after a day of surgery. 39% reported that they take care of correct working distance between body and the table. 72% reported that they lack coordination of all the arrangements around operation table during operation. 43% reported that they accommodate themselves to fit the surgical microscope in place of finding most comfortable working position by defining free space zone. After one month, only 12 respond-

S. No	**Recommendation to implement ergonomics at work place**
1	The most comfortable working position by defining your "free space" zone.
2	The body should be in a perpendicular line, i.e. ear, shoulder joint and hip joint have to be in vertical alignment.
3	The operation table has to be set at the right height keeping in view of working distance between the surgeon and the operation table.
4	Good quality optics can help to avoid problems like fatigue and headaches, which may occur after many hours spent looking through a microscope.
5	Microscope should be adjusted accordingly to comfortable working position that minimizes leaning in at an awkward angle.
6	An apochromatic multifocal lens and high-quality optics must be utilized provide smooth lighting, excellent depth of focus, and advanced color correction

Table-3: Recommendation to implement ergonomics at work place[6]

Pain and discomfort in various locomotor organs	**Percentage prevalence N=28**
Neck	74%
Shoulders	37%
Upper back	46%
Low back	32%
Elbows	39%
Wrists/ Hands	24%
One or both hips and thighs	2%
One or both knees	2%
One or both ankles/feet	4%

Table-4: Evaluation of prevalence of musculoskeletal problems among neurosurgeons

Question	Response
Administration of medicines for relief	17%
Consulted the orthopaedicians for discomfort	3%
Experienced musculoskeletal pain after a day of surgery	63%
Correct working distance between your body and the table	39%
Lack of co-ordination during operation among all the arrangements around operation table	72%
Accommodate themselves to fit the surgical microscope	43%
Adapted ergonomics to avoid work related musculoskeletal pain	N=12, p=0.002

Table-5: Evaluation of reduction of musculoskeletal problems among neurosurgeons

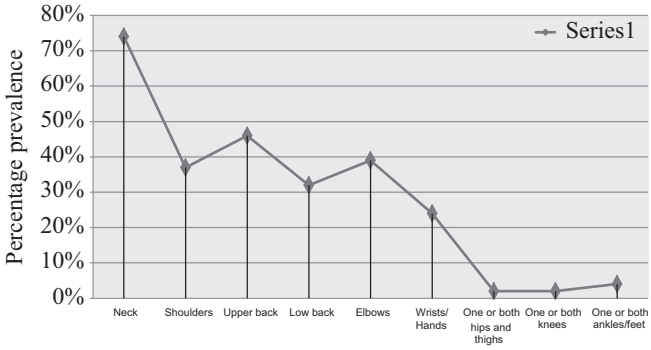

Figure-1: Prevalence of musculoskeletal problems among neurosurgeons

ents applied ergonomics at their work place, and reported decrease in fatigue, pain and discomfort. The p value was significant with $p< 0.05$

63% experienced musculoskeletal pain after a day of surgery. 39% reported that they take care of correct working distance between body and the table. 72% reported that they lack coordination of all the arrangements around operation table during operation. 43% reported that they accommodate themselves to fit the surgical microscope in place of finding most comfortable working position by defining free space zone. After one month, only 12 respondents applied ergonomics at their work place, and reported decrease in fatigue, pain and discomfort. The p value was significant with $p< 0.05$

DISCUSSION

Long craniotomy procedures necessitate a performance with outstretched arms. Moreover, many procedures in neurosurgery engages standing for an extensive amount of time. All these compromising positions increases burden on the surgeon's musculoskeletal system which results in aches and pains which may be localized or may radiate down the arms or may cause chronic pain, headaches and further exhaustion.[6]

Even the most experienced medical professionals can only deliver their best services if their body is disease or pain free. Musculoskeletal disorders (MSD) can cause illnesses, discomfort and pain that can result in disruption or impairment in the routine practice of the professional.[5] The term musculoskeletal disorders consists of a number of inflammatory and degenerative conditions that affects the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels with consequent ache, pain or discomfort. Work-related musculoskeletal disorders (WMSDs) are defined as musculoskeletal disorders that results from a work related event.[7]

A comfortable posture is very critical to avoid such illnesses. In medical care providers musculoskeletal disorders due to poor ergonomics is a common problem. Literature reports several surveys regarding health discomfort due to absence of application of ergonomics at work place. Ergonomics is the study (or science) of the interaction between humans and their working environment. Also known as human factors, it has had a long and successful history of influencing the uptake of human centred design processes in different domains, such as the automotive industry and defence, and to a lesser extent, medicine and surgery. Ergonomics can also be looked on as a bridge between human behaviour and technology, striving to guarantee the usability of future devices.[8]

Recently, this term ergonomics is becoming popular and is being widely used with most professions. It is a discipline that studies workers and their relationship to their occupational environment. This includes many different concepts such as, how medical professionist position themselves and their patients, how they utilize equipment, how work areas are designed and how all of this impact the health of professionist.[3]

However, very limited data is available regarding ergonomic risk factors threatening neurosurgeons. Thus, the present study was conducted among neurosurgeons of North India to evaluate the risk of musculoskeletal disorders in this group of medical professionals involved in such noble cause saving large patients from dying due to cranial injuries and tumors, etc.

In the last few years many new instruments and devices have been developed and introduced into the operating room. A debate has been ongoing about the optimal ergonomic posture for the operating staff. From practical experience, it is obvious that the operating tables cannot be adjusted adequately to allow surgeons of different stature to maintain a comfortable posture.[9]

The present study reported 63% of neurosurgeons experienced musculoskeletal pain after a day of surgery. 72% reported that they lack coordination of all the arrangements around operation table during operation. 43% reported that they accommodate themselves to fit the surgical microscope instead of finding most comfortable working position by defining free space zone.

Abrishamkar S et al[2] evaluated 20 standing and 20 sitting positions of neurosurgeons during craniotomy surgery and the risks of exposure to musculoskeletal disorders was calculated and concluded that during craniotomy surgery, neurosurgeons either in standing or in sitting position have moderate exposure levels in different areas of the body such as the shoulders/arm, wrist/hand and neck and the risk is higher in standing position. The relation between the neurosurgeon's position and the position of the patient's head is a sensitive that is often impaired, and then the surgeon's art seems to

be handicapped as ergonomics considerations were not taken into consideration.[10]

Neurosurgeons should intervene ergonomic recommendations made by the occupational therapist to avoid health injuries. Occupational therapists working in the specialty of ergonomics may be involved with conducting assessments and developing interventions for individual workers, or providing health promotion and injury prevention education programs for groups of workers. Designing and modifying workplace tools, equipment, and behaviors to prevent injury. Consulting with employers and insurance companies on developing programs to reduce workers' compensation costs (e.g., strategies to address the needs of aging workers).[11-17]

CONCLUSION

Further studies are required to reveal the impact of occupational related health disorders on the efficiency of the medical professionals. The factors of occupational health problems affecting medical professionals particularly musculoskeletal disorders need to be evaluated with greater accuracy, along with occupational safety methods to help decrease their prevalence.

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