



Research Article

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AN OPEN LABELLED CLINICAL STUDY TO EVALUATE THE OCCUPATIONAL STRESS OVER WRIST JOINT (MANIBANDH SANDHI) AMONG INDIAN AUTO RICKSHAW DRIVERS

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ABSTRACT

Auto rickshaw drivers are more prone to musculoskeletal injuries related to their occupation when a vehicle is in motion the body is subjected to different forces: accelerations and decelerations lateral swaying from side to side, and whole-body up and down vibrations. In Auto rickshaws driver's wrist joint are under optimum usage as there will be frequent flexion and extension of wrist joint especially of left hand because he must change the gears frequently. Therefore, due to over use of joints there may be a stress which may lead to structural changes in those joints. By considering the above information current study was taken into consideration to evaluate the influence of occupation on the structural changes of both the wrist joints in auto rickshaw drivers. 70 samples of auto drivers were randomly taken in study that were working in the same posture for 8– 10 hours and having minimum of 15 years of work experience. Study has revealed that there is positive correlation between total period of work in years and duration of complaint also there is positive correlation between daily working hours and duration of complaint, Stress revealed that it effects various functional and structural changes in auto rickshaw drivers. The presence of pain and swelling helps to conclude the stress on soft tissue like muscle and tendon i.e. involvement of musculoskeletal system. They can affect nearly all tissues, including the nerves and tendon sheaths, and most frequently involve the arms, wrist and back in auto rickshaw drivers.

Keywords: Occupational stress, Manibandha sandhi, Wrist Joint, Auto rickshaw drivers

INTRODUCTION

Wrist joint is a synovial bi-axial ellipsoid joint. The proximal articular surface presents an elliptical socket formed by the distal articular surface of the radius and the articular disc of the inferior radio-ulnar joint the movement it permits is around two axes.¹ Wheels make machine to move in the same way joints helps man for locomotion. The movements of wrist joint are flexion, extension, adduction, and abduction.² Occupational disorders are important because they affect many workers.³⁻⁴ there is no internationally accepted definition for the term occupational stress or disorders. However, occupational stress or disorders are usually defined as disease/disorders arising out of or in the course of employment.⁵ Professional drivers have a higher prevalence of occupational disorders than other groups.⁶ Driving as a task involves prolonged sitting, a fixed posture and vibration, any of which could directly lead to musculoskeletal trouble.⁷ Auto rickshaw drivers are more prone to musculoskeletal injuries related to their occupation when a vehicle is in motion the body is subjected to different forces: accelerations and decelerations lateral swaying from side to side, and whole-body up and down vibrations. Also, when the feet are active [i.e. when they are actively being used -the right foot on the gas (accelerator) pedal, the left on the brake, and in a stick shift also on the clutch], they cannot be used to support and stabilize the lower body as it normally happens when they are placed on the floor during normal sitting in a chair. Exposure to vibration is the cause of some occupational injuries and diseases.⁸ In Auto rickshaws drivers wrist joint are under optimum usage as there will be frequent

flexion and extension of wrist joint especially of left hand because he has to change the gears frequently. Therefore, due to over use of joints there may be a stress which may lead to structural changes in those joints. By considering the above information current study was taken into consideration to evaluate the influence of occupation on the structural changes of both the wrist joints in auto rickshaw drivers.

MATERIALS AND METHODS

Study Design

An accessible population of Auto drivers who were working in the same posture for 8 – 10 hours and having minimum of 15 years of work experience in and around district of study who were representative of target population participated in the study by simple random sampling technique using lottery method. Total 90 subjects were screened 20 subjects were excluded whereas 70 subjects have completed study after permission being obtained institutional ethics committee vide SDMCARD/HS/2013 Hence current study was analyzed with 70 subjects.

Inclusive criteria

Age group of 20-60 years, as drivers

Exclusion criteria

Subjects with

- Rheumatoid arthritis
- Diabetes
- Fracture, dislocation,

- Congenital deformity
- Hormonal imbalance was excluded from the study.

Source of data

Auto rickshaw drivers in and around Hassan district.

Assessment criteria

Assessment was done by analyzing subjective and objective criteria

Subjective criteria

- Restricted movement
- Wrist joint signs and symptoms

Objective criteria

- X-Ray finding
- Movement of wrist measured by goniometer

Statistical Analysis

In current study, Descriptive statics was used to analyze the data by using Statistical Package for social science (SPSS) version 16. Cross tabulation along with Chi square test and Cramer’s V correlation was done to correlate duration of complaints with working hours, duration of complaints with total period of work in years and duration of complaints and age of the subjects. The obtained results were interpreted as

- Not significant (NS): $P > 0.05$
- Significant (S): $P < 0.05$ or $P < 0.01$
- Highly significant (HS): $P \leq 0.001$

Cramer's Value

Used to measure the strength of the association between one nominal variable with either another nominal variable, or with an ordinal variable. Both variables can have more than 2 categories. (It applies to either nominal X nominal crosstabs, or ordinal X nominal crosstabs, with no restriction on the number of categories.)

Table 1: Description of Crammers value’s and level of association

Level of association	Verbal Description	Comments
0.00	No Relationship	Knowing the independent variable does not help in predicting the dependent variable.
.00 to .15	Very Weak	Not generally acceptable
.15 to .20	Weak	Minimally acceptable
.20 to .25	Moderate	Acceptable
.25 to .30	Moderately Strong	Desirable
.30 to .35	Strong	Very Desirable
.35 to .40	Very Strong	Extremely Desirable
.40 to .50	Worrisomely Strong	Either an extremely good relationship or the two variables are measuring the same concept
.50 to .99	Redundant	The two variables are probably measuring the same concept.
1.00	Perfect Relationship	If we know the independent variable, we can perfectly predict the dependent variable.

OBSERVATIONS AND RESULTS

In the current study, it was observed that 46% were between 36-40 years, 38% were 31-35 age, and 13% were between 41-45 with least about 2% were ranging from 46-50 years. According to religion 54 subjects accounting for 77% were Hindus, 14 subjects or 20% subjects were Muslims and 2 subjects or 3% were Christian. Among 70 subjects 16% were not attended school, 58% had studied up to primary school and 26 % had studied up to middle school. While assessing economic status 59% subjects were of lower middle class, 40% subjects were poor class whereas only 1% subjects were in very poor class. Major subjects in the current study represented in the lower middle class society.

Present study showed that there is a significant difference in distribution of duration of the complaints among Auto rickshaw

drivers in relation to daily working hours. (Chi- Square p 0.000) whereas on analyzing the Data shows that there is positive association between daily working hours of driving with duration of complaints with Cramer’s Value 0.488 & p value is < 0.000 . There is a highly significant difference in distribution of duration of the complaints among Auto rickshaw drivers in relation to duration of the work with Chi- Square p value is < 0.000 . Whereas on analyzing Data reveals that there is positive association between Duration of Compliant and daily working hours of auto rickshaw drivers with highly significant level with Cramer’s Value 0.44& p value is < 0.000 . However, there is a no significant difference in distribution of Age of the subjects among Auto rickshaw drivers in relation to duration of the complaint as it reveals that there is no association between Duration of Compliant and Age of the auto rickshaw drivers with Cramer’s value 0.20.

Table 2: Chi-Square results and significant level of Daily working hours and duration of the complaints

Duration of the complaints	Daily working hour of the subject	Total			
		8- 10 h	11-13 h	14-17 h	
C		11	8	1	20
	EC	12.6	6.5	0.9	20
No pain	C	27	3	0	30
	EC	18.9	9.8	1.3	30
0-12 Months	C	6	11	1	18

13-24 Months	EC	11.8	5.9	0.8	18
	C	0	1	1	2
25-36 Months	EC	1.3	0.7	0.09	2
Total	C	44	23	3	70
	EC	44	23	3	70
Chi-Square Tests	Value	df	P Value		
Pearson Chi-Square	33.387	6	0.000		
Likelihood Ratio	31.546	6	0.000		
Linear-by-Linear Association	18.717	1	0.000		
N of Valid Cases	70				
Nominal by Nominal	Phi	0.691	0.000		
	Cramer's V	0.488	0.000		
	Contingency Coefficient	0.568	0.000		

Table 3: Chi-Square results and significant level of total period of work in hours and duration of the complaints

Duration of the complaints	Duration of the work	Total			
		13-15 h	15-17 h	17 h	
No pain	C	14	5	1	20
	EC	5.7	9.7	4.6	20
0-12 months	C	3	21	6	30
	EC	8.6	14.6	6.9	30
13-24 months	C	3	8	7	18
	EC	5.1	8.7	4.1	18
25-36 months	C	0	0	2	2
	EC	0.6	1	0.5	2
Total	C	20	34	16	70
	EC	20	34	16	70
Chi-Square Tests	Value	df	P Value		
Pearson Chi-Square	28.228	6	0.000		
Likelihood Ratio	25.076	6	0.000		
Linear-by-Linear Association	4.363	1	0.037		
N of Valid Cases	70				
Nominal by Nominal	Phi	0.63503	0.000		
	Cramer's V	0.44903	0.000		
	Contingency Coefficient	0.53607	0		

Table 4: Chi-Square results and significant level of Age of the subjects and duration of the complaints

Age	Duration of complaints	Total				
		no pain	0-12 months	13-24 months	25-36	
31-35	Expected Count	9	14	5	0	28
	Count	8	12	7.2	0.8	28
36-40	Expected Count	9	11	11	1	32
	Count	9.1	13.7	8.2	0.9	32
41-45	Expected Count	2	5	1	1	9
	Count	2.6	3.9	2.3	0.3	9
46-50	Expected Count	0	0	1	0	1
	Count	0.3	0.4	0.3	0	1
Total	Expected Count	20	30	18	2	70
	Count	20	30	18	2	70
Chi-Square Tests	Value	df	P value			
Pearson Chi-Square	9.6584	9	.379			
Likelihood Ratio	9.5641	9	.387			
Linear-by-Linear Association	2.2825	1	.131			
N of Valid Cases	70					
Nominal by Nominal	Phi	0.371	0.379			
	Cramer's V	0.204	0.379			
	Pearson's R	0.182	0.132			
	Spearman Correlation	0.16	0.186			

DISCUSSION

Occupational stress is a major hazard for many workers. Increased workloads, downsizing, overtime, hostile work environments, and shift work are just a few of the many causes of stressful working conditions. Acute, or short-term, stress causes an immediate reaction in the body. If the threat or demand passes quickly, the body generally returns to normal. However, with prolonged stress, many physical health problems can develop.

Occupations such as driving may cause physical stress; Study shows that those who spend more than half their working lives driving have high probability to suffer back trouble than the rest of the population. Sitting is a source of postural, spinal stress which can be disabling for those who have had serious back and sciatic pain. Whereas alternate usage of escalator involves the wrist joint and brake involve the foot. The muscular exertion of driving also adds to spinal stress.

It is believed that the mechanical while driving commercial vehicle 'conditioning' of the spine increases its susceptibility to minor injury which, if repeated, leads to an early onset of degeneration. This shows the involvement of the spinal stress directly involves the various joints⁸

Occupational stress over the joints in auto rickshaw drivers

Auto rickshaw drivers are generally considered one of the groups having to deal with a highly demanding job. Auto rickshaw drivers often criticize their open seating place. The open seating place creates inconvenience caused by draft, wind, dry air, cold, noise and heat. There is the high level of vibration and the forced seating position (trouble with sitting and working in an uncomfortable body posture). It is more and more common for auto rickshaw drivers to have problems with disorderly and troublesome passengers. Physical harm is increasingly becoming an occupational risk for auto rickshaw drivers especially during night hours.

The auto rickshaw drivers are found with musculoskeletal disorders of lower back, knee, neck, wrist and ankle. The prevalence of musculoskeletal disorders is in association with risk factors. Work experience, maximum working hours per week, and less shoulder to handle distance are associated with knee troubles. Driver's seat on right side vibration is associated with lower back troubles; working experience and lower cabin space are associated with ankle troubles.

The involvement of the wrist joint shows its utility in frequently changing the gear which requires flexion and extension. These findings indicate the obvious need of ergonomic considerations while designing the vehicle and providing ergonomic education for auto rickshaw drivers.⁹

Occupational stress over wrist joint

Even on wrist joint also occupational stress is seen. There are mainly two types of stress seen on wrist joint

1. Sprain
2. Strain

In auto rickshaw driver's main type of stress on wrist joint is strain. It is due to the over exertion, long duration of work.

Sprain and Strain

Ligaments are responsible for the held together and supported by tough bands of connective tissue for joints. A sprain is a joint injury that typically involves small tears (micro-trauma) of the ligaments and joint capsule. Injury to these tendons or the muscle themselves is called a strain. Symptoms of strain

observed are pain, swelling and tenderness which are present in the current study.

Muscles and tendons can become painful with repetitive movements and awkward postures. This is known as 'overuse injury' and typically occurs in the elbow, wrist or hand of auto rickshaw drivers. Symptoms of these overuse injuries include pain, swelling, stiffness of the joints, weakness and numbness. If these conditions are not given medical attention in the early stages then it may lead to certain grave pathological conditions such as carpal tunnel syndrome, tenosynovitis, bursitis and ganglion etc.

Carpal tunnel syndrome

Carpal tunnel syndrome is a condition that occurs when the median nerve is pressed or squeezed at the wrist¹⁰⁻¹². The median nerve controls sensations to the palm side of the thumb and fingers as well as impulses to some small muscles in the hand that allow the fingers and thumb to move. The Symptoms include numbness and pain (particularly at night). Anything that causes swelling inside the wrist can cause carpal tunnel syndrome, including repetitive hand movements and in the auto rickshaw drivers there were bend/twist of the wrist frequently, force, work speed and vibration.

In the present study, the influence of occupation on the wrist joint of auto rickshaw drivers was observed. Study shows that maximum of middle age person in this study 46% were between 36-40 years. As occupational stress, can be seen in almost all the classes of the society, a relation between socio economic status and occupational stress is hard to define from such a small sample size.

Working Hours and Stress

Among all the subject's maximum of 63 % was seen those who were working 8-10 hours per day, working with 11-13 hours of duration were 33% and 14-17 hours of work were least of 4 %.

Complaints are more in the group 11-13 hours & 14-17 hours compare to 8-10 hours this shows that the occupational stress over the wrist joint is associated with working hours. Ojoawo et al. also stated that prolonged driving was reported to be a major cause of musculoskeletal pain¹³.

Relation of Work Shift

19% of subjects were working extensively in night hours; however, 81 % were only working during the day hours. Present study shows that night shift volunteers suffer more stress compare to day shift.

Relation of Total Period of Work

29% of the subjects were having 12-15 years of working period, 15-17 years were 49%, and 22 % had working duration more than 17 years. It shows that the total period of work has an association to occupational stress

Work experience and working hours per week showed a significant positive association with wrist problems¹⁴

Pain and Swelling

In the current study subjects present with swelling were 43% and 57 % were free from swelling. Pain was present in 71% of the subjects and however it is absent in 29%. Driver's seat vibration showed strong significant positive association with pain Movement of wrist is restricted due to the pain and swelling which are caused by the soft tissue involvement, soft tissues are damaged by the repeated occupational stress on the wrist joint. Based on statistical assessment chi-square test

reveals that there is an association between the number of years of work and duration of pain. It was found that there is an association between those two variants with significant p value 0.000. This indicates there is a stress due to occupation over the wrist joint. The correlation between the daily working hours of work and duration of pain was also calculated and it was found that there is a positive correlation was present with p value 0.000. This also indicates stress over the joint.

Range of Motion of Wrist Joint

In the current study, it was observed that mean value of flexion of right wrist joint is 68 degree and left wrist is 66 degrees in comparison to normal range of flexion is 85 degree, whereas extension is 60 degree but mean value of extension in right wrist is 50 degrees and left wrist is 49 degrees, this signifies that present study reveals significant change in the angle of flexion and extension in consideration to the range of movement.

Due to the repetitive tasks, vibrations and awkward position of the drivers leads to inflame the tissues around the joint it will lead the stiffness on the muscles which finally results decreased range of motion. The slowing of functional responses of drivers reflects a decline in wrist mobility, which accompanies advancing duration. Joint flexibility, which is an essential component of driving skill, has been estimated to decline due to calcification of cartilage, and joint deterioration.

Normally Flexion is taking place in the mid carpal joint then at the wrist joint and extension is taking place in the radio carpal joint. The carpal flexion and extension is diminished due to increased tension in the extensors and flexors but there is a restriction of wrist joint due to repetitive use of the joint which is seen in the study.

In Radiological evaluation, it was observed that joint space was reduced among 26 % of subjects. In our study the influence was seen on the auto rickshaw drivers were aged 36-40 years however this group doesn't fall under the category of degenerative disorders which shows that these changes are due to the occupational stress.

By above discussion it is revealed that there is an influence of auto rickshaw driving occupation on the structures and functions of the wrist joint.

The age, daily working hours, total period of work, socio economic status etc. is having the significant effects on the status of the wrist joint.

CONCLUSION

In current study stress evaluation was limited to the physical stress which is responsible for the changes at wrist joint therefore further stress can be evaluated with special consideration to both physical and mental stress. Investigation like MRI and CT may be helpful in determining the soft tissue involvement.

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