Original Article

Prevalence of Upper ExtremityMusculoskeletal Disorders among workers in an industrial town in Tamilnadu

Anatomy Section

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ABSTRACT

Background: Musculo Skeletal Disorders (MSD) contribute 37% of the disease burden which is attributable to occupational risk factors globally, resulting in substantial disability. Despite mechanization and automation, there is an ever increasing incidence of MSD, which has an adverse impact on the individual and the society. Little information on the prevalence of MSD is available in South India.

Aim: The present study was aimed primarily to evaluate the prevalence of MSD in industrial workers and also secondarily to identify the location specific MSD, to generate guidelines to optimize the work, to minimize the risk of injury development and to maximize the output quality.

Material and Methods: This cross sectional pilot study included 219 subjects of age groups ranging from 18 to 55 years, from three different industries. Questionnaires were administered to assess the work exposure and health. The range of movement of the joints was calculated by using a Goniometer. The postural workload was assessed by using a RULA work sheet. A clinical examination was done to diagnose MSD.

Results: 32.6% of the subjects suffered from MSD. The highest prevalence of MSD was seen among pyrotechnics (44.4 %), followed by match makers (32.7%) and litho offset printers (19.2%). An increased prevalence of symptom severity was observed in women (36.1%) and in individuals who performed moderately strenuous tasks (52.8%).

Conclusion: The present study has estimated the baseline prevalence of MSD in industrial workers, which can be effectively applied for the optimisation of the work system to minimise the risk of injury and to maximise productivity.

Key message: The knowledge of musculoskeletal disorders and its prevalence among industrial workers can be effectively applied for the optimisation of the work system to minimise the risk of injury and to maximise productivity.

Key Words : Industrial workers, work – posture, work load, musculoskeletal disorders

INTRODUCTION

The Federal Bureau of Labor Statistics (BLS) has defined musculoskeletal disorders (MSD) as injuries and disorders to the muscles, nerves, tendons, ligaments, joints, cartilages and the spinal discs 1 (vide their classification 0 Traumatic injuries and Disorders;[1] Systemic Diseases or Disorders;[2] Infectious and Parasitic Diseases;[3] Neoplasms, Tumours and Cancer; [4] Symptoms, Signs and Ill-defined Conditions; 5 Other Conditions or Disorders; 8 Multiple Diseases,Conditions or Disorders; 9 Nonclassifiable) . MSDs are a significant public health problem today, due to their high impact on disability, personal suffering, absence from work and the direct and indirect costs to the health care system. According to the statistics of the Global Burden of Diseases which has been developed by the World Health Organization (WHO), MSD contributes 37% of the disease burden which is attributable to occupational risk factors, in addition to 16% of hearing loss, 13% of chronic obstructive pulmonary diseases (COPDs), 11% of asthma, 8% of injuries, 9% of lung cancer and 2% of leukaemia.[2, 3, 4]. Owing primarily to the lack of data in developing countries like India, such a comprehensive figure has not yet been documented.

The occupational health in India gained momentum only after the tragic Bhopal gas incident in 1984, though the National Safety Council of India was set up by the Ministry of Labour, Government of India in 1966 and the pioneering effort of ICMR was established in 1911 for the formulation, coordination and the promotion of research. The global prevalence of MSD ranges from 14 to 42 % 3. Though India has seen tremendous developments in its economy and industrialization, there is a high incidence of musculoskeletal disorders. The prevalence in Northern India has been reported to be as high as 59.4%[5]. Although several possible methods have been employed to determine the prevalence of MSD, the estimates based on health care resource utilization may underestimate its true prevalence and may probably be biased towards the more severe and symptomatic cases. Moreover, the estimates of the prevalence of MSD can also be hindered by the

Rotator cuff tendinitis	h/o pain in the deltoid region and pain on resisted active movement (abduction – supraspinatus; external rotation – infraspinatus; internal rotation – subscapularis)
Shoulder capsulitis (frozen shoulder)	h/o pain in the deltoid area and equal restriction of active and passive glenohumeral movement with capsular movement (external rotation > abduction >internal rotation)
Lateral epicondylitis	Epicondylar pain and epicondylar tenderness and pain on resisted extension of the wrist
Carpal tunnel syndrome	Pain or paraesthesia or sensory loss in the median nerve distribution, and one of :Phalen's test positive, nocturnal exacerbation of symptoms, motor loss with wasting of abductor pollicis brevis
Non specific diffuse forearm pain	Pain in the forearm in the absence of a specific diagnosis or pathology (sometimes includes: loss of function, weakness, cramp, muscle tenderness, allodynia, slowing of fine movements)

[Table/Fig-1]: Protocol for diagnosis

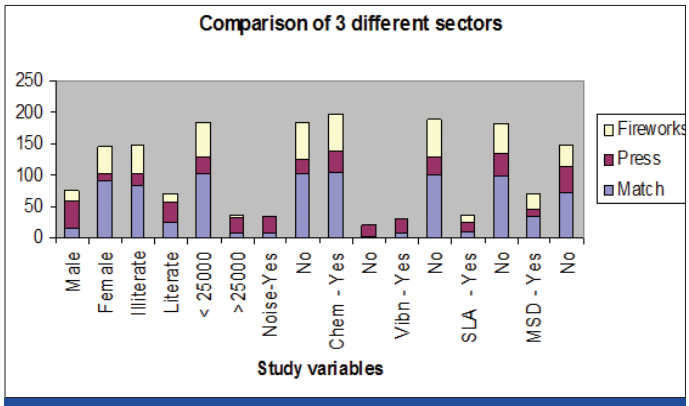
unavailability of the health-care data, inaccuracies in coding, as well as inconsistent physician recognition of the early disease. The limited existing information in the industrial sectors in Southern India stresses the need for estimating the prevalence of MSD in vulnerable sections of the population. Sivakasi, which is called as "A town of three industries", which is home to Printing / Offset Printing Presses and industries of Pyrotechnics (Fireworks) and Crackers and Safety Matches and Color Matches, was chosen for the study. The 2001 census recorded a population of 72,170 (50% males and 50% females)[6]

The purpose of this study was to present an overview of epidemiological evidence on the relationship between MSDs and workplace factors, specifically in manual workers of process industries as the man-machine interaction is high comparatively in those industries. With a more defined relationship between the two, work design practitioners will be able to more easily justify the ergonomic fixes through positive impacts on multiple key measures. Industries can use the data which is collected in this study to optimize the work systems to minimize the risk of injury development and to maximize the output quality. The expansion of these initial findings will provide the data to generate practical guidelines that can be used for the design and evaluation of the work system.

METHODOLOGY

This cross sectional studywas designed to evaluate the prevalence of upper extremity related musculoskeletal disorders in different occupational sectors in an industrial town in Tamilnadu. A sample size of 250 was arrived at, based on the previous prevalence rates of MSD globally and in North India. The study proposal was submitted to the Institutional Ethics Committee and due clearance was obtained from the same (IEC no.002/2006). Two hundred and nineteen individuals who reported to the industrial health care providers were included by a systematic sampling method, over a period of three months. The inclusion criteria were manual labourers with a minimum of a year's work experience and ages ranging from 18 – 55 years, of both sexes, who reported to the Employment State Insurance (ESI) Hospital. Individuals with any acute ailments or systemic diseases, other staff who were not involved in manual labour, pregnant women and nursing mothers were excluded. Informed written consent was obtained from each of the participants.

A standardized questionnaire was administered and data regarding the job title, previous employment, job description, the duration and frequency of work, rest periods, description of injury or illness and information on other known non-occupational risk factors was collected. The workload of the individual was assessed by using the Rapid Upper Limb Assessment (RULA) score. A detailed clinical examination was then done. Goniometry measurements were taken to assess the range of motion in all the upper extremity joints. MSD was diagnosed by following the diagnostic criteria for upper limb disorders which was proposed by the HSE Workshop, which was adapted from Harrington et al, 1998 [Table/Fig-1][7]. The acquired data was analyzed by using the SPSS statistical software 15. The prevalence of MSD in the study population was calculated as percentages and odds ratios were arrived at to denote the comparative prevalence.



[Table/Fig-2] : Descriptive characteristics of the study population across three different occupational sectors

RESULTS

The study group consisted of 74 (33.8%) men and 145 (66.2%) women. Ninety three (42.5%) of them were under 40 years of age. Only 71 were educated above class seven. A majority of them were illiterate (67.6%). The socioeconomic status of more than 80% of the study group was at less than an annual income of INR 25,000/=. All the women of the study population were non smokers. 95% of those who were included in the study, worked for more than eight hours/day and of these, 8.2% were heavy, 85.8% were moderate and 5.9% were light workers. 85.3% were permitted less than two hours of rest. Thirty five of the 219 participants agreed to be exposed to high levels of noise, almost all (90.4%) agreed to be exposed to chemicals and 30% agreed to be exposed to vibrations. 16.9% were found to have periods of absenteeism of more than 48 hours and 58.3% were found to be involved in strenuous work. The descriptive characteristics of the study population in three different industrial sectors are represented in [Table/Fig-2].

Variables		Prevalence rate	OR (95% CI)
Age	18 - 40	32.6%	1.003 (.565 -1.780)
	> 40 - 55	32.5%	
Gender	Male	25.7%	0.611 (.328 - 1.139)
	Female	36.1%	
Smoking	Yes	19.6%	0.416 (.200 - .864)
	No	37.0%	
Alcohol	Yes	21.4%	0.501(.225 - 1.115)
	No	35.2%	
Work load	Strenuous	52.8%	24.288 (8.41 - 70.18)
	Non strenuous	4.4%	

[Table/Fig-3] : Prevalence of MSD

The study revealed an overall prevalence of 32.6% of MSD. More women had severe symptoms (36.1%) than men (25.7%) It was noted that there was an increased prevalence of symptom severity among the women (36.1%) as compared to the men (25.7%). The highest prevalence of MSD (52.8%) was observed to be associated with moderately strenuous tasks and only 4.4% was associated with non strenuous tasks. 32.7% of the prevalence was observed among workers in the match industry, 19.2% was observed among the workers in the litho-offset printing industry and 44.4% was observed among the workers in the fireworks industry. The prevalence of MSD among the several subcategories is depicted in [Table/Fig-3]

DISCUSSION

The prevalence of upper extremity musculoskeletal disorders among the workers in an industrial town in Tamilnadu was found to be 32.6%.It is comparativeto the global prevalence of 37%, but it is much less than the 59.4% prevalence which was observed by Joshi et.al in their study among the workers in North India 5.Ninety seven pyrotechnic workers (44.4%)71 (32.7%) match factory workers and 42 (19.2%) litho-offset printing workers were found to be affected with MSD. The discrepancies in the prevalence rates in different sectors of the industry are due to the differences in the work place factors and variations in the shop floor maneouver."Working in the same position for long periods" was the job factor which was identified as the most problematic for all these sectors. The tendons which provide a link between the muscle and the bone may be inflamed due to repeated loading, especially when working in awkward postures. There can be degeneration on the surface of the tendon. Alternatively, there can be endoneural oedema (swelling around the covering of the nerves) with increased intrafascicular pressure and the displacement of myelin in a dose response manner [8]. Hagberg et al considered that therewas a possible relationship between the local mechanical pressure and the onset of the musculoskeletal problems. Direct mechanical pressure on the tissues may be due to poorly designed tools and handles [9]. Upper limb complaints in the workers with repetitive work manifests as myalgia, which could probably be due to the ischaemia resulting from occlusion or from the impedance of the circulation. The present study did not attempt to establish this causal effect of repetitive injuries, considering the ethical reasons which were involved in taking the muscle biopsies from human subjects.

Faitgue that occurs due to repetitive tasks, as seen in printing and firework industrial workers, can be characterized as subjectiveor objective[10]. Subjective fatigue is characterizedby a decline of alertness, mental concentration, motivation and other psychological factors, whereas objective fatigue is characterized by a decline in the work output. A majority of the study subjects showed signs of fatigue, as they were in stations that involved repetitive cycles. A prolonged exposure to the hand-arm vibration can lead to a condition which is known as the Raynaud's phenomenon of Occupational Origin, Vibration induced White Finger (VWF), or the Hand-Arm Vibration Syndrome (HAVS) [11, 12, 13]. But the present study did not establish any such case, probably because of the nature of the work that did not involve much vibration.

Although the prevalence of occupational skin disease was not substantial enough, skin lesions such as contact dermatitis were seenon the hands of personnel who workedin the fireworks and match industry for a long term without using personal protective equipments. Contact dermatitis was generally confined to the areas which were actually touched. It was by far the most common of all the occupational skin diseases, accounting for one-half to two-thirds of all the cases.The clinical signs in the affected human subjects included one or more of erythema (reddening), scaling and thickening and wereaccompanied by an itch or a burning sensation.

A higher prevalence rate of MSD in women (36.1%)was seen in this study. The prevalence rates of MSD in subjects aged 18-40 years was estimated to be 32.6%. It is observed that young workerswere not sparedfrom MSD. Adequate pre-employment orientation and on the house training can go a long way in preventing MSD, for which there is no treatment, once affected. This study also highlights a higher prevalence of MSD among the pyrotechnic industry workers. These employees should be targeted by the occupational health professionals during the pre-placement medical examination to create awareness about the risk factors, especially awkward postures during work. Prevention strategies should be taught in the induction training program to reduce the potential disability which is associated with work-related MSD by the shop floor managers.

The musculoskeletal symptoms were not significant to the length of the service, unlike the case in most other studies.This can be partly attributed to the fact that child labour abolition was not active until a few years ago and that many of these individuals hadbeen working in these industries for more than 15 years, as most of themwere employed part time from the age of eight. An increased duration of work for more than 12 hours, no rest period, no weekly off, double wages on holidays and 100% attendancewere some factors which fetchedincentives for the individuals with no recuperation period.

CONCLUSION

The overall prevalence of MSD was 32.6%. It is also interesting to note that therewas a gender specific prevalence and an increased prevalence of symptom severity among women (36.1%)as comparedto the men (25.7%). Severity specific prevalence: the highest prevalence (52.8%) was observed for strenuous tasks and only 4.4% prevalence was observed for non strenuous tasks. Sector specific prevalence: 44.4% of the prevalence was observed in the firework industry, 32.7%was observed among the workers in the match industry and 19.2% was observed in the litho-offset printing industry. As workers have a tendency to seek medical help only when the symptoms are severe, the milder forms may be more prevalent and underreported. Therefore, the role of the factory medical officers and paramedical workers is very crucial in educating the workers to properly take care of their health as wellto practice proper work postures. Nevertheless, this study has uneartheda widely prevalent disorder that warrants preventive measures.

LIMITATIONS

This is a hospital based survey and therefore is not a true indicator of community prevalence of MSD. This study had the limitationswhich are associated with cross - sectional studies, unlikethat of case control studies. Cluster sampling from many industries would have been a better representation of the study group rather than the random sampling from a limited number of industries.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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