Original Article

# WORK RELATED MUSCULOSKELETAL DISORDERS AMONG UNSKILLED INDIAN WOMEN CONSTRUCTION WORKERS

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## ABSTRACT

**Background:** The nature of work in construction industry puts workers at high risk for acute and cumulative work related musculoskeletal disorders.

**Aim:** The aim of the investigation is to understand workers exposure to risk factors, prevalence of work related musculoskeletal disorders (WRMSDs), workers knowledge on the role of ergonomic factors and coping strategies to reduce the risk of development of WRMSDs.

**Methods:** Nordic musculoskeletal symptoms questionnaire was adopted to identify the musculoskeletal symptoms in nine anatomical body regions. Workers exposure to risk factors continuously for a period of more than two hours at a stretch and more than two such types of work spells in a work day was considered as risk factor.

**Results:** The risk of WRMSDs is about 4 times more among workers with greater than 20 years of work experience than those with 11-20 years and is about 2 times more in those with 1-10 years of work experience respectively.

**Conclusions:** Education programmes on ergonomic principles must be made mandatory for to reduce the rate of WRMSDs and to promote occupational health.

**Key Words:** Construction workers, Work related musculoskeletal symptoms, coping strategies

## INTRODUCTION

The inflammatory and degenerative conditions that affect the muscles, tendons, ligaments, joints, peripheral nerves and supporting blood vessels with consequent ache, pain or discomfort are termed as musculoskeletal disorders. Work related musculoskeletal disorders (WRMSDs) are defined as musculoskeletal disorders that results from work related events[1].WRMSDs are common health problems among construction workers apart from number of fatalities occurring due to the nature of work. Construction hazards are rated as eight times more risky than those from manufacturing sector[2].WRMSDs that develop due to the nature of construction work effect the quality of life of the workers, causes lost time or absenteeism, increase work restriction or disability than any other group of diseases with a considerable economic toll on the individual and society.

The women workers in the construction industry mainly involve in unskilled work consisting of lifting heavy loads, carrying heavy loads, climbing ladders and so on. These work tasks put women mazdoors at high risk for acute and cumulative WRMSDs. Repetitious movements, awkward postures and high force levels are the three primary risk factors that have been associated with WRMSDs[3]. The WRMSDs develop over a period of time and these are not curable, however, suitable coping strategies can help in controlling the development of WRMSDs. Workers performing strenuous work can cope with musculoskeletal symptoms by changing their working techniques and following certain ergonomic principles.

The objectives of the present investigation are to study the (i) workers exposure to risk factors that may contribute to the development of work related musculoskeletal disorders (ii) prevalence of WRMSDs in different body regions (iii) workers knowledge on the role of ergonomic factors in controlling WRMSDs (iv) coping strategies adopted to reduce the risk of devel-

opment of WRMSDs (v) association of WRMSDs ,age and years of work experience.

## MATERIALS AND METHODS

Interview method was adopted to collect data. Initially 125 women workers willing to participate in the study were selected for the study. Seven respondents absent for the work during the data collection were eliminated and finally remaining 118 women workers from Hyderabad city formed the sample for the investigation. Descriptive information of the respondents like age, height and weight, number of years of work experience and number of hours worked per week was collected. The Nordic Musculoskeletal Symptoms Questionnaire [4] consisting of questions referring to nine body areas was used to find out the musculoskeletal symptoms. There are 3 upper limb segments (shoulder, elbows, wrists/hands/thumbs) 3 lower limb segments (hip/thighs, knees, ankles/feet) and 3 trunk segments (neck, upper back and lower back).

Workers exposure to risk factors at work that may contribute to development of WRMSDs was studied. The researcher observed the daily work of women mazdoors in construction work for a period of five consecutive days and identified 17 activities as risk factors that may contribute in developing WRMSDs. Workers exposure to risk factors continuously for a period of more than two hours at a stretch and more than two such type of work spells in a work day was considered as risk factor. An attempt was made in the present investigation to find out whether the workers had knowledge about ergonomic factors that can help in reducing the incidence of exposure to risk factors and develop WRMSDs. The knowledge scale consisted of ten questions. The respondents were given one mark for correct answer and zero mark for wrong answer. The respondents immediately to reduce the pain or feeling of tiredness may resort to some sort of coping strategies in between the work. These coping strategies can help in reducing the risk of development of WRMSDs. The respondents were asked to indicate the coping strategies they would resort to when exposed to risk factor for a long duration.

Descriptive statistics of mean and standard deviations were used. Pearson's chi-square analysis was used to determine the association of prevalence of self reported musculoskeletal symptoms with personal characteristics and job risk factors. Using 2X2 contingency tables odds ratios (OR) and upper and lower 95% confidence intervals (CI) are calculated to estimate the relative risk of WRMSDs, The statistical significance level was set at 0.05.

## RESULTS

**Personal characteristics:** Women aged between 22 to 58 years were found working in construction industry. The body mass index of the respondents ranged between 15.6 kg/m2 to 43.4 kg/m2. Women were with one year to 33 years of work experience and the actual working hours ranged between 10 hours per week and 58 hours per week. The mean age ,height, weight and body mass index of the respondents were 36.4 ± 7.75 years, 1.60±0.07m, 66.8 ± 11.2kg26.2 ± 4.63 kg/m2 respectively (table 1).

**Table 1.Discriptive information of the Respondents**

| Variable | Range | | Mean ± S.D |
|---|---|---|---|
| | Min. | Max. | |
| Age(yrs) | 22.0 | 58.0 | 36.4 ± 7.75 |
| Height(m) | 1.40 | 1.90 | 1.60±0.07 |
| Weight( kg) | 45.0 | 100.0 | 66.8 ± 11.2 |
| Body mass index (kg/m2) | 15.6 | 43.4 | 26.2 ± 4.63 |
| Years of Experience( yrs) | 1.00 | 33.0 | 11.8 ± 7.56 |
| Working hours per week( hrs) | 10.0 | 58.0 | 40.4 ± 6.51 |

**Prevalence of work related musculoskeletal disorders (WRMSDs):** The 12-month prevalence rates of WRMSDs was highest in the low back (44.1%), followed by the neck(28.0%) and then knees(22.4%)and least in hips/thighs(3.4%).Of all the respondents that indicated WRMSDs only 30.3 % reported that they had treated themselves or had sought treatment from other health practitioners. Of all the respondents who reported WRMSDs, a variable number reported having visited a doctor for treatment, with 40% of those with shoulder, 60% of those with upper back, 40.4% of those with low back, 50% of those with wrist/hands, 25% of those with knees and 25% of those with ankles/feet problems.

**Table 2: Respondents by Prevalence of work-related musculoskeletal disorders in different body regions**

| Body region | Frequency (%) |
|---|---|
| Low back | 52 (44.1) |
| Neck | 33 (28.0) |
| Knees | 26 (22.4) |
| Upper back | 20 (16.8) |
| Wrist/Hands | 19 (16.2) |
| Shoulder | 15 (12.6) |
| Ankle/Feet | 12 (10.2) |
| Elbow | 8 (7.1) |
| Hips/Thighs | 4 (3.4) |

**Exposure to risk factors at work:** Workers exposure to risk factors at work was recorded (table 3). Major risk factors were working in the same position for long periods either standing, bend over, sitting, or kneeling (55.1%), lifting the loads (50.8%), bending or twisting the back in awkward way (45.8%), working over time (44.9%), carrying, lifting, or moving heavy material or equipment (42.4%), performing manual work involving joint mobilization or soft tissue mobilization (40%), not enough rest breaks or pause during the workday (39%), working in awkward and cramped positions (33.1%), continuing to work while injured or hurt (32.2%) and reaching or working away from body (31.6).

**Table 3 Respondents by exposure to risk factors at work**

| Job risk factor | Frequency (%) |
|---|---|
| Working in the same position for long periods(standing, bend over, sitting, kneeling) | 65 (55.1) |
| Lifting the loads | 60 (50.8) |
| Bending or twisting the back in awkward way | 54 (45.8) |
| Working over time | 53 (44.9) |
| Carrying, lifting, or moving heavy material or equipment | 50 (42.4) |
| Performing manual work involving joint mobilization or soft tissue mobilization | 47 (40.0) |
| Not enough rest breaks or pause during the workday | 46 (39.0) |
| Irregular shifts, long working days | 40 (33.9) |
| Working in awkward and cramped positions | 39 (33.1 |
| Continuing to work while injured or hurt | 38 (32.2) |
| Reaching or working away from body | 37 (31.6) |
| Unanticipated sudden movement or fall | 34 (28.8) |
| Inadequate training on injury prevention | 32 (27.1) |
| Working near or at your physical limits | 28 (23.7) |
| Working with confused or agitated patients | 19 (16.0) |
| Performing the same task over and over | 17 (14.4) |
| Assisting others during gait activities | 15 (12.7) |

**Knowledge on ergonomic principles:** Respondents' knowledge on ergonomic principles to control muscular strain while carrying out the work was assessed. Respondents were asked to answer ten questions. The right answer was given one mark and wrong answer was given zero mark. Sixty six per cent of the respondents scored zero, 14 per cent scored two marks, and the remaining 20 per cent scored three marks. The women construction workers were ignorant of work simplification techniques to reduce the muscular strain.

**Coping strategies adopted by respondents:** The data in the table 4 is showing the percentage indicating the coping strategies of the respondents toward reducing the risk for development of WRMSDs.Getting help in handling heavy weights (50.4%), modification of work procedure in order to avoid stressing an injury(45.4%), and modifying work posture (40.3%) were the top three coping strategies indicated by the respondents in ameliorating the risk of WRMSDs.

**Table 4: Respondents by coping strategies adopted towards reducing the risk for development of work- related musculoskeletal disorders**

| Strategies | Frequency (%) |
|---|---|
| I get someone to help me handle a heavy weight | 59 (50.4) |
| I modify work procedure in order to avoid stressing an injury | 54 (45.4) |
| I modify my work posture | 48 (40.3) |
| I stop working if it causes or aggravate my discomfort | 40 (33.6) |
| I warm up and stretch before performing my duties | 39 (32.8) |
| I select techniques/procedures that will not aggravate my discomfort | 36 (30.5) |
| I make necessary changes so that I can stretch and change posture | 26 (21.8)) |
| I use different parts of my body for ease in administering work | 24 (20.2) |
| I pause regularly so I can stretch and change posture | 17 (14.3) |

**Association between self reported WRMSDs and age:** The prevalence rate of WRMSDs increased with increasing age but was lowest in the respondents who were over 50 years of age. Highest percentage of the respondents (24.4%) experienced their first episode of WRMSDs in the first five years of work. Most of the respondents (54.6%) reported WRMSDs of gradual onset, 20.2% reported WRMSDs of sudden onset while only 2.5% implicated a known accident. The association between self reported WRMSDs and age was found to be non significant.

**Table 5: Association of self reported 12-months prevalence of work- related musculoskeletal disorders and age**

| Age category(yrs) | Frequency (%) | χ | p-value |
|---|---|---|---|
| 21-30(n=32) | 19 (59.4) | 3.732 | 0.292 |
| 31-40(n=57) | 39 (68.4) | | |
| 41-50(n=21) | 15 (71.4) | | |
| >50(n=8) | 3 (37.5) | | |

**Association between self reported WRMSDs and years of work experience:** The number of hours per week a worker spent in construction work is on an average 40.4 ± 6.51 hours. The rate of WRMSDs was not significantly associated with age (x2 =33.919: p=0.329) number of years in construction work (x2= 36.83:p=0.295) or number of hours worked per week (x2 =22.905:p=0.262).Table 6 shows the association of the difference in number of years of work and the risk for WRMSDs among all the respondents with the odds ratio (OR) and 95% confidence interval (CI). The OR and 95% CI for WRMSDs among women construction workers with>20 years of work experience compared those with 11-20 years and those with 1-10 years of work experience were OR 3.81:CI 1.08-13.4 and OR 1.78:CI 0.58-5.53 respectively. However, the association between number of years of experience and the prevalence of WRMSDs among all the respondents was not significant (p>0.05).

## DISCUSSION

The highest prevalence of 12 months period WRMSDs in unskilled women workers in construction industry according to body sites in the study was low back pain (44.1%), followed by neck (28.0%) and then knees (22.4%). This distribution pattern is consistent with

literature. Low back pain (LBP) is the most common musculoskeletal disorder in adult and about 60-80% of all individuals will experience the condition at some stage in their life time[5]. Lifting and transferring heavy loads were the job activities most commonly reported as sources of back pain among women mazdoors. Studies in biomechanics have also implicated factors such as physical loading, body flexion, rotation and weight loading in the aetiology of prevalent occupational LBP. The findings of the study on the high prevalence of work related neck and knee pain among construction workers is consistent with the pattern reported in literature. [6,3]

**Table 6: Association of the difference between categories of years of work experience and the risk of WRMSDs among the respondents**

| Group | Frequency (%) | $\chi$ | p-value | Odds Ratio(95%Confidence Interval) | | |
|---|---|---|---|---|---|---|
| | | | | A-B | A-C | B-C |
| A - 1-10 years (n=64) | 39 (60.9) | 5.060 | 0.080 | 0.47 (0.19-1.15) | 1.78 (0.58-5.53) | 3.81 (1.08-13.4) |
| B - 11-20 years (n=39) | 30 (76.99) | | | | | |
| C - >20 years (n=15) | 7 (46.7) | | | | | |

Level of significance was set at $p<0.05$

A high percentage of workers in the study experienced their first episode of WRMSDs in the first five year of work experience. The results suggest that WRMSDs increase with age and duration of employment respectively. It was observed that after 50 years of age and at greater than 20 years of work experience the prevalence of WRMSDS declined. This may be attributed to less load handling that often come with advance in age. Another explanation might be that experienced and older workers have increased level of knowledge about injury prevention, avoid harmful physical load, and have developed better coping strategies for musculoskeletal problems than the less experienced and young workers. However to draw a conclusion the number of respondents above 50 years of age and above 20 years of experience in the study are less in number.

From the study the OR and 95% CI results indicate that the relative risk of WRMSDs is about 4 times more among workers with greater than 20 years of work experience than those with 11-20 years and are about 2 times more in those with 1-10 years of work experience respectively. Working in the same position for long periods, lifting heavy loads, working for long hours were the most perceived job risk factors precipitating WRMSDs among the workers participated in the study.

From this study, getting some one to help in handling heavy loads, modification of work procedure in order to avoid stressing an injury, and modification of work posture were the three coping strategies in ameliorating the risk of WRMSDs. These coping strategies among construction workers were seem similar to previous findings. Workers performing strenuous work are often advised to prevent problems and to cope with musculoskeletal symptoms by changing their working technique, using lifting equipment, taking breaks, and avoiding strenuous work tasks[7].

## CONCLUSION

A high proportion of unskilled women workers in construction industry reported WRMSDs at some body site in their occupational lives with the low back being injured most often. The knowledge of ergonomics was generally poor among the workers. Working in the same position for long periods, lifting or transferring heavy loads, working for long hours were the most perceived job risk factors for WRMSDs. While handling work load, getting help in handling heavy loads, modification of work procedure in order to avoid stressing an injury, and modification of work posture were the three coping strategies. Education programmes on prevention and coping strategies for musculoskeletal disorders must be made mandatory for construction workers to reduce the rate of WRMSDs and to promote occupational health.

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