ORIGINAL ARTICLE

Assessment of work-related musculoskeletal morbidity, perceived causes and preventive activities practiced to reduce morbidity among brick field workers

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Abstract

Background: Heavy load transportation, repetitive movements and abnormal posture are prevalent among brick field workers which lead to musculoskeletal morbidity. **Aims & Objectives**: Assessment of work-related musculoskeletal morbidity, perceived causes and preventive activities practiced by brick field workers. **Material & Methods:** It was a cross sectional study from July 2018 to April 2019. National Institute for Occupational Safety and Health recommendations was used to assess preventive activities practiced by workers. **Results**: Most common site of musculoskeletal symptoms was shoulder (82%). Lifting weight for long distance (79%), repetitive gesture (59.5%) and bending trunk for long duration (53%) were the causes of musculoskeletal morbidity. **Conclusion**: Majority of male workers worked in the field for six to seven days per week and minor burns among them was common comparing to female. Most of the workers perceived, lifting weight for long distance was the major cause of musculoskeletal morbidity.

Keywords

Musculoskeletal Pain; Postures; Safety.

Introduction

Brick making industry in India, is a significant unorganized sector. In this unorganized sector, workers usually do not have adequate knowledge on hazards related to work as they are temporarily recruited with insufficient experience. (1) Most of the time, they are at risk of sustaining injuries and accidents. (2) Musculoskeletal morbidity is major occupational problem in India. Individual characteristics, biomechanical stress (repetitive motion & extreme joint positions), type of work, psychosocial factors apart from socioeconomic inequalities, low levels of income, low levels of education and poor working conditions are

important factors affecting the frequency of musculoskeletal morbidity. (3, 4) Musculoskeletal morbidity among brick field workers is generally the outcome of long working hours in awkward postures. It has been reported by the National Institute of Occupational Safety and Health (NIOSH) that the prevalence of low back pain is mainly due to inappropriate workplace. Work related musculoskeletal morbidity among brick workers owes its pathophysiology to unorthodox postures opted by these workers. (5)

None of the study in Wardha district mentions the musculoskeletal morbidity and the corrective measures to prevent and control those among brick field workers in working hours.

Aims & Objectives

1. To study socio-demography and work profile of workers.
2. To assess work related musculoskeletal morbidity among workers.
3. To assess causes of musculoskeletal morbidity as perceived by workers.
4. To assess preventive activities practiced by workers.

Material & Methods

Study Type: A community based cross sectional study. **Study Population:** Brick field workers. **Study Area:** Brickfield areas located in four different Villages (Sindhi Meghe, Umri Meghe, Nagthana and Rotha) of Wardha district, Maharashtra. Purposively these areas were selected for their distance; Sindhi Meghe (3 km), Umri Meghe (3 km), Nagthana (5 km) and Rotha (6 km) from Wardha district railway station. **Study Duration:** July 2018 to April 2019. **Sample Size calculation:** Sample size was calculated by using the formula, n = $Z_{\alpha/2}^2$ p (1-p)/d2 (6)

Z=Level of significance at 5% i.e.95% confidence interval= 1.96

p=Prevalence of musculoskeletal symptoms in brick field workers = 51 % (7)

d= Error of margin = 7%

n= 196 (200)

Inclusion Criteria: (1) Brick field workers in the age group of 18 to 65 years who were willing to participate in the study and gave consent for their participation. (2) Brick field workers with more than one year of experience.

Exclusion Criteria: Brick field workers with history of arthritis, muscular dystrophy and pregnancy.

Strategy for collection: Study areas selected were on the outskirts of villages. In each area there were approximately 50-65 brick field workers. To cover the desire sample size of 200, fifty workers were selected from each study area by simple random sampling (SRS). Data collection was carried out by researcher. Before data collection, rapport was build with participants. They were ensured to maintain confidentiality regarding the use of data. Face to face interview was done at work place. Average time taken for each interview was 30-45 minutes. A pretested questionnaire was used for data collection.

Tools and variables:

(i) Questions on socio-demography profile include age, sex, religious, education, income, number of family members and below five years child.

(ii) Questions on work profile include duration of work in years, working days per week and duration of work in hours per day.

(iii) Multiple response questionnaires were used to assess works related musculoskeletal morbidity (minor cuts, sharp cutting, lacerated Injury, fracture bone, sprain and burn) sustained in last one year. Nordic questionnaire (8) was used to assess musculoskeletal symptoms in different sites of the body for last one year.

(iv) Multiple response questionnaires were used to assess causes (repetitive gesture, sitting posture, standing posture, bent trunk, lifting weights, arms above the height of the shoulders and twisting) of musculoskeletal morbidity as perceived by workers.

(v) NIOSH recommendation (9) in jobs requiring manual handling mentioned below was used to assess preventive activities practiced by workers to reduce musculoskeletal morbidity.

- Work practices, such as lifting loads from appropriate (knuckle) height.
- Keep the travel distance for the lift to less than 10 feet.
- Appropriate engineering controls, such as the brick carriers should carry the bricks in the trolley, and not in the upper extremities.
- The work schedule should be changed by increasing the number of short rest breaks to avoid excessive physical stress.
- Different types of stretching exercises should be practiced during the breaks.
- The brick field workers should frequently change their posture to avoid discomfort.
- Minimize twisting.

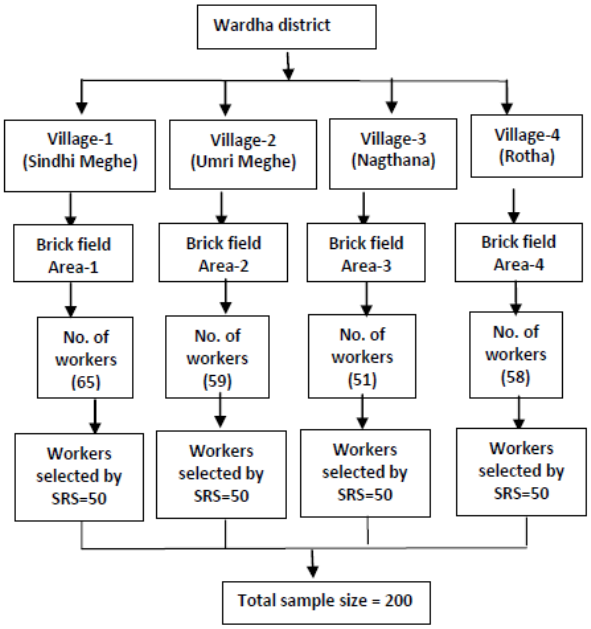
- Administrative controls, such as worker rotation and more task variety.

Ethical Approval: A written permission from the Institutional Ethical Committee was obtained to proceed for the study.

Consent: A written informed consent was obtained from all the participants.

Data Analysis: Data entry and analysis was done by using IMB SPSS Statistics 21 software. Number and percentages were applied. Statistically significant difference (p value ≤ 0.05) between male and female was assessed by applying Chi square test and where ever applicable Fisher exact test was used. Results were presented in the form of tables.

Flow Diagram for sample selection:



Working Definition:

Good posture: It is usually considered to be the natural and comfortable bearing of the body in normal, healthy persons. This means that in a standing position the body is naturally, but not rigidly, straight, and that in a sitting position the back is comfortably straight. Any deviation from the above is abnormal and maintaining this awkward position for prolonged periods of time during working hour decreases the efficiency of the muscles, thereby increasing fatigue.

Knuckle height: It is the vertical distance from the floor to metacarpal III (i.e. the knuckle of the middle finger). Handgrips on portable objects should be at less than knuckle height for less exertion during lifting weight.

Results

It was observed that 71 (35.5%) workers were of age group 18-29 years and most of them were male. It was also observed 91 (45.5%) were belongs to Hindu religion and 98 (49%) were educated up to middle school. Maximum 131 (65.5%) workers were belongs to class-IV socio-economical status according to Modified BG Prasad's classification. (Table 1)

Statistically significant (p=0.012) difference was observed among male and female in relation to working days per week. Majority of the male (94.9%) were working in the field for six to seven days per week against 83.1% female. Most of the female (16.9%) were working in the field for four to five days per week against 5.1% male. Statistically no significant difference was observed among male and female in relation to duration of work in years and duration of work in hours per day. (Table 2)

Statistically significant (p=0.024) difference was observed among male and female in relation to minor burns. Male suffered more (29.1%) than female (14.5%). Statistically no significant difference was observed among male and female in relation to sustained work related musculoskeletal morbidity like pain, numbness, discomfort any time during last one year in shoulder (s) and in lower back. Also, statistically no significant difference was observed for injuries (minor cuts, sharp cutting and lacerated injury), sprains and moderate burns. (Table 3)

Statistically significant (p=0.037) difference was observed among male and female in relation to perception of workers regarding the cause of musculoskeletal morbidity. 49.6% male perceived twisting is the cause of musculoskeletal morbidity against 33.7% female. But statistically no significant difference was observed among male and female in relation to perception of workers regarding the causes of musculoskeletal morbidity like repetitive gesture, sitting posture for long duration, standing posture for long duration, bending trunk for long duration, lifting weight for long distance, walking for long time and many times arms above the height of the shoulders. (Table 4)

It was observed that the various preventive activities like lifting loads from appropriate (knuckle) height (65%), travelling less (≤ 10 feet) distance with heavy load (50%), stretching exercises (45%), changing of posture (45%) and worker rotation among different work stations (55%) were never practiced by workers. Similarly workers often practice the

preventive activities were lifting loads from appropriate (knuckle) height (25%),travelling less (≤ 10 feet) distance with heavy load (35%), carrying the bricks in the trolley and not in the upper extremities (30%), taking short rest breaks (45%), stretching exercises (25%), changing of posture (15%) and rotation among different work stations (5%).(Table 5)

Discussion

In this study majority (91.5%) of the workers were spending 7-12 hours per day in brick kiln. Similar finding observed by Pagar V et al. (10), most (83%) of the workers were working above 8-9 hours against limits of 48 hours per week and Deepti S et al. (11) reported 81.7% were working 6-8 hours per day. In this study it was observed that most (82%) of the workers, who performed the activities of brick making experienced musculoskeletal symptoms any time during last one year in shoulder (s) followed by lower back (71%). Banibrata D (12) reported 76% workers suffered from pain in shoulders. Fernando W et al. (13) reported 65.6% of the workers were having pain and discomfort lasting at least 24 hours during last 12 months, while among them 39.6% were having low back pain. In this study it was observed that 39% of the workers were suffered injury (minor cuts) followed by minor burns (23%) and lacerated injury 34 (17%). Sajan D et al. (14) reported 118 participants had hand injuries among them 50 % had sharp cutting, 44.92% had lacerated injury and 05.08% had fracture bone. 96 participants had leg injuries among them 55.21% had sharp cutting, 35.42% had lacerated injury and 09.38% had fracture bone. Sanjel S et al. (15) reported 29.8% participants had Cuts and bruises, 29.8% participants had Sprains or dislocations and 4.5% participants had burns and frostbite. In this study repetitive gesture (59.5%), sitting posture for long duration (50.5%), standing posture for long duration (48%), bending trunk for long duration (53%), lifting weight for long distance (79%), many times arms above the height of the shoulders (50.5%) and twisting (43%) were the causes of musculoskeletal morbidity as perceived by workers. Fernando W et al. (13) in their study reported, 27% of the workers were holding loads for distances where as 73.8% of the workers lift their loads manually. Deepti S et al. (11) reported, 36.7% working in static posture for longer periods. Sujata P et al. (16) reported, 99% workers had awkward posture because they have to repeatedly bend to dry the bricks. In this study preventive activities like taking short rest breaks (40%), changing of posture (40%), minimize trunk twisting (65%) and worker rotation among different work stations (40%) were sometimes practiced by workers.

Conclusion

Eighty eight percent out of total male brick field workers spend maximum time working in the field. Among them majority belong to 18-39 years with primary to middle schooling. Most of the male brick field workers had pain in the shoulder and low back ache. Low back ache was also most common complain among female workers. According to workers, working in abnormal posture for long duration was the major cause of musculoskeletal morbidity. Few workers practiced preventives activities as per NIOSH recommendation.

Recommendation

Information, education and communication through mass media is required to aware workers to adopt all the below mentioned preventive activities.

- Lifting loads from appropriate (knuckle) height.
- Carrying the bricks in the trolley.
- Taking short rest breaks.
- Stretching exercises.
- Changing of posture.
- Minimize trunk twisting.
- Worker rotation among different work stations.
- Travelling less (≤ 10 feet) distance with heavy load.

Limitation of the study

Study was done only to assess musculoskeletal morbidity. Other morbidities including respiratory morbidity were over looked.

Relevance of the study

This study assessed the percentage of workers following preventive activities (as per recommendations of NIOSH guidelines) in terms of often practiced, sometimes practiced and never practiced. This information may be helpful to public health experts in policy making.

Authors Contribution

NK: Substantial contribution to conception and design. Acquisition of data, analysis and interpretation. Revising the article for intellectual content. Final approval of the version to be submitted. Drafting the article. WV: Substantial contribution to conception and design. Acquisition of

data, analysis and interpretation. Revising the article for intellectual content. AMG: Substantial contribution to conception and design. Acquisition of data, analysis and interpretation. Revising the article for intellectual content. SZQ: Substantial contribution to conception and design. Acquisition of data, analysis and interpretation. Revising the article for intellectual content.

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Tables

TABLE 1 SOCIO-DEMOGRAPHIC PROFILE

Variables		Participants(n=200) (%)
Age in year	18-29	71 (35.5)
	30-39	60 (30)
	40-49	41 (20.5)
	≥ 50	28 (14)
Sex	Male	117(58.5)
	Female	83(41.5)
Religion	Hinduism	91 (45.5)
	Buddhism	84 (42)
	Islamic	16 (08)
	Others	09 (04.5)
Education	Illiterate	47 (23.5)

	Primary school	31 (15.5)
	Middle school	98 (49)
	High school	24 (12)
Socio-economic status	Class II	09 (04.5)
	Class III	33 (16.5)
	Class IV	131 (65.5)
	Class V	27 (13.5)

TABLE 2 WORK PROFILE

Variables ↓		Participants			
		Total n=200 (%)	Male n=117 (%)	Female n=83 (%)	p value
Duration of work in years	1-5	71 (35.5)	39 (33.3)	32 (38.6)	0.059
	6-15	65 (32.5)	33 (28.2)	32 (38.6)	
	16-25	64 (32)	45 (38.5)	19 (22.9)	
Working days per week	4-5	20 (10)	06 (05.1)	14 (16.9)	0.012*
	6-7	180 (90)	111 (94.9)	69 (83.1)	
Duration of work in hours per day	1-6	17 (08.5)	08 (06.8)	09 (10.8)	0.457
	7-12	183 (91.5)	109 (93.2)	74 (89.2)	
* Statistically significant.					

TABLE 3 PARTICIPANTS SUSTAINED WORK RELATED MUSCULOSKELETAL MORBIDITY

Musculoskeletal morbidity	Participants			
	Total n=200 (%)	Male n=117 (%)	Female n=83 (%)	p value
Symptoms* in Shoulder (s)	164 (82)	100 (85.5)	64 (77.1)	0.183
Symptoms* in Low back	142 (71)	89 (76.1)	53 (63.9)	0.085
Minor cuts	78 (39)	46 (39.3)	32 (38.6)	0.969
Sharp cutting	14 (07)	09 (07.7)	05 (06)	0.861
Lacerated injury	34 (17)	25 (21.4)	09 (10.8)	0.078
Sprains	32 (16)	24 (20.5)	08 (09.6)	0.061
Minor burns	46 (23)	34 (29.1)	12 (14.5)	0.024 **
Moderate burns	10 (05)	05 (04.3)	05 (06)	0.817
*Symptoms (pain, discomfort, numbness) ** Statistically significant.				

TABLE 4 PERCEPTION OF WORKERS REGARDING THE CAUSES OF MUSCULOSKELETAL MORBIDITY

Cause (s) ↓	Participants			
	Total n=200 (%)	Male n=117 (%)	Female n=83 (%)	p value
Repetitive gesture	119 (59.5)	70 (59.8)	49 (59)	0.973
Sitting posture for long duration	101 (50.5)	56 (47.9)	45 (54.2)	0.458
Standing posture for long duration	96 (48)	57 (48.7)	39 (47)	0.922
Bending trunk for long duration	106 (53)	62 (53)	44 (53)	0.888
Lifting weight for long distance	158 (79)	92 (78.6)	66 (79.5)	0.980
Walking for long time	47 (23.5)	28 (23.9)	19 (22.9)	0.998
Many times arms above the height of the shoulders	101 (50.5)	57 (48.7)	44 (53)	0.649
Twisting	86 (43)	58 (49.6)	28 (33.7)	0.037*
* Statistically significant				

TABLE 5 PREVENTIVE ACTIVITIES PRACTICED TO REDUCE MUSCULOSKELETAL MORBIDITY

Preventive activities		Participants		
		Male n=117 (%)	Female n=83 (%)	Total n=200 (%)
Lifting loads from appropriate (knuckle) height.	Never	73 (62.4)	57 (68.7)	130 (65)
	Sometimes	13 (11.1)	07 (08.4)	20 (10)
	Often	31 (26.5)	19 (22.9)	50 (25)
Travelling less (≤ 10 feet) distance with heavy load.	Never	61 (52.1)	39 (47)	100 (50)
	Sometimes	15 (12.8)	15 (18.1)	30 (15)
	Often	41 (35)	29 (34.9)	70 (35)
Carrying the bricks in the trolley, and not in the upper extremities.	Never	46 (39.3)	24 (28.9)	70 (35)
	Sometimes	36 (30.8)	34 (41)	70 (35)
	Often	35 (29.9)	25 (30.1)	60 (30)
Taking short rest breaks.	Never	16 (13.7)	14 (16.9)	30 (15)
	Sometimes	51 (43.6)	29 (34.9)	80 (40)
	Often	50 (42.7)	40 (48.2)	90 (45)
Stretching exercises.	Never	54 (46.2)	36 (43.4)	90 (45)
	Sometimes	38 (32.5)	22 (26.5)	60 (30)
	Often	25 (21.4)	25 (30.1)	50 (25)
Changing of posture.	Never	52 (44.4)	38 (45.8)	90 (45)
	Sometimes	47 (40.2)	33 (39.8)	80 (40)
	Often	18 (15.4)	12 (14.5)	30 (15)
Minimize trunk twisting.	Never	45 (38.5)	25 (30.1)	70 (35)
	Sometimes	72 (61.5)	58 (69.9)	130 (65)
Worker rotation among different work stations.	Never	63 (53.8)	47 (56.6)	110 (55)
	Sometimes	48 (41)	32 (38.6)	80 (40)
	Often	06 (05.1)	04 (04.8)	10 (05)