AJHS
Asian Journal of Home Science
Volume **12** | Issue 1 | June, 2017 | 94-98

DOI: 10.15740/HAS/AJHS/12.1/94-98
e ISSN-0976-8351 ■ Visit us: *www.researchjournal.co.in*

Research Paper

Occupational health hazards of the female construction workers

■ KUMARI AMRITA SINHA, APRAJITA KUMARI **AND** RITU GUPTA

Received: 09.01.2017; **Revised:** 01.04.2017; **Accepted:** 18.04.2017

■ **ABSTRACT :** Construction work involves several manual material handling tasks including both skilled and unskilled activities. Females are generally engaged in the unskilled works where as skilled works are completely done by male workers. Females are engaged in carrying different construction materials like brick, sand, cement and concrete. They use to carry all these materials on their head putting undue stress on their body. Present study was focused on studying the activities profile of women on construction site and assessing their health hazards and musculoskeletal problems. For the purpose of study, 10 female construction workers working within the campus of Punjab Agricultural University's were selected. Their activity profile and health hazards were studied with the help of questionnaire whereas their musculoskeletal discomforts were studied with the help of REBA and the risk assessment scores for musculoskeletal discomfort in different body parts. Results revealed that the female workers work for an average of 9.2 hours per day with a continuous working hour of 4.1 hour. REBA analysis revealed that brick lifting was the most tedious activity as its activity score was 12 followed by brick landing (11) and brick carrying (9). Further the risk assessment scale depicted that pain was felt in the upper arms, neck, thighs, head, shoulders, wrists, low back, feet, lower arms, ankles, mid back, legs, upper back, fingers, buttock and palm. Numbness was felt in fingers and palms; Stiffness in neck and feet; tingling sensation in palms and weakness in upper arms, thighs, feet, legs, shoulder and upper back. Therefore, it can be concluded that female construction workers face high level of physical stress due to their occupation. They have to perform several hazardous activities among which brick carrying is the most frequent and most tedious task.

■ **KEY WORDS:** Brick carrying, Female construction workers, Occupational health hazards, REBA, Risk assessment

■ **HOW TO CITE THIS PAPER :** Sinha, Kumari Amrita, Kumari, Aprajita and Gupta, Ritu (2017). Occupational health hazards of the female construction workers. *Asian J. Home Sci.,* **12** (1) : 94-98, **DOI: 10.15740/HAS/AJHS/12.1/94-98.**

See end of the paper for authors' affiliations

KUMARI AMRITA SINHA
Department of Family Resource Management, College of Home Science, Punjab Agricultural University, LUDHIANA (PUNJAB) INDIA
Email : amrita.sinha726@gmail.com

The activities associated with construction industry have a potential risk area (Snook, 1982). According to the US Department of Labor (1992), this industry is having the highest injury rate among major US industry divisions. The UK Government's Health and Safety Executive (HSE) reported in 2003, the illness rate among construction workers were 5600 in 100,000 cases (HSE, 2003). The constant use of machinery and power tools, working on elevated work surfaces, manual handling of heavy construction materials, etc. are

important contributing factors to make this construction industry as one of the most hazardous industries (Hsiao and Stanevich, 1996). In addition to these factors, ever changing work environment, work to be completed and continuous change in composition of workers expose the workers to unforeseen and unfamiliar hazards at construction sites. At construction site, Women are primarily engaged as unskilled labours, generally as load carriers. They may have to carry single loads of upto 51 kg, far more than the weight limit recommendation by occupation safety and health standards for women. Because the level of mechanization in India is low, such workers endure great physical stress (Bharara, 2012). Different studies have reported various health hazard conditions of these construction workers (Wickstrom, 1978; Stubbs and Nicholson, 1978; Grandjean, 1983; Damlund *et al.*, 1982; Wickstrom *et al.*, 1983; Burdorf *et al.*, 1991; Sillanpa¨ a¨ *et al.*, 1999; Hsiao and Stanevich, 1996; Chi *et al.*, 2005; Sorock *et al.*, 1993; Vedder and Siemers, 2003; Haslam *et al.*, 2005). However, a minimum effort is made so far by management group toward improving occupational health and safety in this industry (Gyi *et al.*, 1998; Gervais, 2003 and Koningsveld and Van Der Molen, 1997). The attention towards health and safety aspects of these construction workers is relatively poor compared to other industries. Not only they have to work in harsh conditions, their living conditions are equally bad. Without own dwelling, they live adjacent to the construction sites or in slums without basic minimum facilities like safe drinking water, electricity, toilets and so on. The poor and unhygienic living conditions also affect the health of the workers badly. As the wage received is insufficient, it is quiet natural that the expenditure on health care will be much less resulting in poor health. Over and above, construction workers due to low level of awareness, suffers from more health related issues. In the light of above, a study was planned with the following objectives:

Objectives :

– Studying the activities profile of women on construction site.

– Assessment of health hazards and musculoskeletal problems of female workers.

■ RESEARCH METHODS

The study was conducted on the construction sites in PAU Campus of Ludhiana city as per the convenience. A total of 10 physically fit female workers belonging to the age group of 25-40 yrs, working on construction sites were selected for the study. The study was conducted in two phases as follow:

Phase I:

In this phase self design questionnaire was used to study the personal as well as activity profile of the selected 10 women working on construction site. The activity that was performed more frequently and for longer duration was selected for the ergonomic evaluation in second phase.

Phase II:

In this phase, some low cost tools like REBA and Risk assessment scale were used to assess the risk factor and musculoskeletal discomforts faced by the female workers while performing the selected activity on construction site.

■ RESEARCH FINDINGS AND DISCUSSION

Table 1 depicts that the average women working on construction site were having the age of 30 years, weighing 56 kg and having a height of 154.7 cm. On an average they spent 9.2 hours on the construction site among which they worked continuously for 4.1 hours without any break.

Table 1 : Personal profile of the respondents (n=10)

Parameters	Mean±SD
Age	29.8±3.8
Weight	56.6±2.1
Height	154.7±7.8
Total working hr.	9.2±0.7
Work continuously	4.1±0.73

Table 2 gives the details of rest taken by the respondents on weekly as well as daily basis. Maximum of them (70%) were getting only one weekly off. On the daily basis, maximum number of respondents (70%) was taking rest for one hour followed by less than one hour (20%) and more than one hour (10%).

Table 3 describes the time and frequency of performing different activities by women at construction site. It was found that mainly three types of activities were performed by them *viz*., load carrying, sand sieving and mixing concrete. Load of different types like brick,

sand, cement and concrete were carried from one place to another. To calculate the time duration and frequency, the weighted mean score was calculated on the three point continuum and it was found that carrying of brick was done for maximum time (2.4) and had maximum frequency (2.2). Therefore, brick carrying was selected for the second phase of study.

Average weight of bricks carried by all the 10 respondents was found to be 24.8 kg. The brick carrying activity was composed of three stages namely brick lifting, carrying and landing. REBA analysis was done for all the three stages of brick carrying activity and the results are displayed in Table 4. Results revealed that brick lifting was the most hazardous activity (12), followed by brick landing (11) and brick carrying (9).

Table 5 reveals the discomforts in the form of pain, numbness, stiffness, tingling sensation and weakness felt by the respondents in different body parts while carrying the bricks. Weighted mean score of the responses are presented in the given table. It was evident that pain was felt in the upper arms (2.4), neck (2.3), thighs, head, shoulders (2.2), wrists, low back, feet (2.1), lower arms, ankles (2.0), mid back, legs (1.9), upper back (1.8), fingers (1.7), buttock (1.5) and palm (1.3). Numbness was felt in fingers (1.9) and palms (1.8); stiffness in neck (1.9) and feet (1.8); tingling sensation in palms (2.0) and weakness in upper arms, thighs (2.1), feet (2.0), legs, shoulder and upper back (1.9).

Table 2 : Details of rest taken by the respondents **(n=10)**

Category	Variables	Frequency	Percentage
Holidays per week	1	7	70.0
	2	3	30.0
Rest period (hr/day)	< 1hr	2	20.0
	1hr	7	70.0
	>1hr	1	10.0

Table 3 : Details of time duration and frequency of different activities **(n=10)**

Activities		Time duration* (WMS)	Frequency** (WMS)
Load carrying	Brick	2.4	2.2
	Sand	1.7	1.7
	Cement	1.2	1.6
	Concrete	1.5	1.9
Sand sieving		1.4	1.5
Mixing concrete		1.8	1.8

* Time: 1=<4hr 2= 4-6hr 3= >6 hr
**Frequency: 1= Rarely 2=Alternate days 3= Daily

Table 4 : REBA analysis of bricks carrying activity **(n=10)**

Analysis parameters	REBA scores		
	Lifting	Carrying	Landing
Posture score A (neck+trunk +leg+adjust)	5	2	5
Load score	2	2	2
Score A	7	4	7
Posture score B (upper arm+adjust+lower arm+wrist+adjust)	7	5	5
Coupling	3	3	3
Score B	10	8	8
Score C	11	8	10
Activity score	1	1	1
Final score	12	9	11
Action required	Very high risk, implement change	High risk, investigate and implement change	Very high risk, implement change

Table 5 : Risk factors leading to MSDs among respondents while carrying brick (n=10)

Body parts	Weighted mean score of discomforts				
	Pain	Numbness	Stiffness	Tingling sensation	Weakness
Head	2.2	0	0	0	0
Neck	2.3	0	1.9	0	0
Shoulders	2.2	0	0	0	1.9
Upper arms	2.4	0	0	0	2.1
Lower arms	2.0	0	0	0	0
Wrists	2.1	0	0	0	0
Palms	1.3	1.8	0	2.0	0
Fingers	1.7	1.9	0	0	0
Upper back	1.8	0	0	0	1.9
Mid back	1.9	0	0	0	0
Lower back	2.1	0	0	0	0
Buttocks	1.5	0	0	0	0
Thighs	2.2	0	0	0	2.1
Legs	1.9	0	0	0	1.9
Ankles	2.0	0	0	0	0
Feet	2.1	0	1.8	0	2.0

Conclusion :

Present study was focused on the assessment of activity profile and work related musculoskeletal problems of females working on construction sites. It was evident from the study that they used to work for an average of 9.2 hours per day with a continuous working hour of 4.1 hour after that they took a break of one hour and again started working. The break of one hour was not sufficient for them to take rest as in that time they also had to take their lunch. Maximum of the (70%) were getting one holiday in a week. The activity performed by them for maximum time and with maximum frequency was the carrying bricks which involved three stages namely brick lifting, carrying and landing, REBA analysis revealed that brick lifting was the most tedious activity as its activity score was 12 followed by brick landing(11) and brick carrying (9). Further the risk assessment scale depicted that pain was felt in the upper arms (2.4), neck (2.3), thighs, head, shoulders (2.2), wrists, low back, feet (2.1), lower arms, ankles (2.0), mid back, legs (1.9), upper back (1.8), fingers (1.7), buttock (1.5) and palm (1.3). Numbness was felt in fingers (1.9) and palms (1.8); stiffness in neck (1.9) and feet (1.8); tingling sensation in palms (2.0) and weakness in upper arms, thighs (2.1), feet (2.0), legs, shoulder and upper back (1.9). Therefore, it can be concluded that brick carrying is a strenuous activity and should not be performed manually. Mechanization of brick carrying activity is required so that females working at the construction site could be saved from getting WMSDs.

Recommendations :

Following are some of the recommendations that should be followed to safeguard the females at construction site:

– Avoid manual lifting of bricks.

– Trolleys or load lifter should be used.

– If there is no mechanization and women are compelled to lift then, they should not lift more than six bricks at a time.

– Some exercises and yoga could be done to train the muscles so that fatigue could be reduced.

– Working hour should be reduced and proper rest time should be given.

– Proper body posture should be maintained while lifting the materials manually.

Authors' affiliations:
APRAJITA KUMARI AND RITU GUPTA, Department of Family Resource Management, College of Home Science, Punjab Agricultural University, LUDHIANA (PUNJAB) INDIA (Email : aprajieeta@gmail.com; rgupta@pau.edu)

■ REFERENCES

Burdorf, A., Govaert, G. and Elders, E. (1991). Postural load

and back pain of workers in the manufacturing of prefabricated concrete elements. *Ergonomics*, **34** : 909–918.

Bharara, K. (2012). Occupational health hazards faced by unskilled women working at construction sites. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, PUNJAB (INDIA)

Chi, I., Yip, P.S., Chiu, H.F., Chou, K.L., Chan, K.S., Kwan, C.W., Conwell, Y. and Caine, E. (2005). Prevalence of depression and its correlates in Hong Kong's Chinese older adults. *American J. Geriatric Psychiatry*, **13** (5) : 409-416.

Damlund, M., Gøth, S., Hasle, P. and Munk, K. (1982). Low back pain and early retirement in Danish semi-skilled construction workers. Scand. *J. Work Environ. Health*, **8** (Suppl. 1) : 100–104.

Gervais, M. (2003). Good management practice as a means of preventing back disorders in the construction sector. *Saf. Sci.*, **41** : 77–88.

Grandjean, E. (1983). Occupational health aspects of construction workers. World Health Organization (WHO), Geneva.

Gyi, D.E., Haslam, R.A. and Gibb, A.G. (1998). Case studies of occupational health management in the engineering construction industry. *Occup. Med.*, **48** : 263–271.

Haslam, R.A., Hide, S.A., Gibb, A.G.F., Gyi, D.E., Pavitt, T., Atkinson, S. and Duff, A.R. (2005). Contributing factors in construction accidents. *Appl. Ergon.*, **36** (4) : 401–415.

Health and Safety Executive (HSE) (2003). *Health and Safety Highlights* 2002/2003. National Statistical Publications, London, UNITED KINGDOM.

Hsiao, H. and Stanevich, R.L. (1996). Biomechanical evaluation of scaffolding tasks. *Internat. J. Ind. Ergon.*, **18** : 407–415.

Koningsveld, E.A.P. and Van Der Molen, H.F. (1997). History and future of ergonomics in building and construction. *Ergonomics*, **40** : 1025–1034.

Maiti, R. (2007). Workload assessment in building construction related activities in India. Centre for Product Design and Manufacturing (CPDM), Indian Institute of Science (IISc), Bangalore (KARNATAKA) INDIA.

Sillanpa¨a¨, J., Lappalainen, J., Kaukianen, A., Viljanen, M. and Laippala, P. (1999). Decreasing the physical workload of construction work with the use of four auxiliary handling devices. *Internat. J. Ind. Ergon.*, **24** (2) : 211–222.

Snook, S.H. (1982). Low back pain in industry, symposium on idiopathic low back pain. In: White, A.A., Gordon, S.L. (Eds.), Mosby Company. St. Louis, MO, pp. 23–38.

Sorock, G.S., Smith, E.O. and Goldoft, M. (1993). Fatal occupational injuries in the New Jersey construction industry, 1983–1989. *J. Occup. Med*., **35**, 916–921. in the construction industry: an investigation. *J. Occup. Accidents*, **2** : 179–190.

Stubbs, D.A. and Nicholson, A.S. (1978). Manual handling and back injuriesnin the construction industry: an investigation. *J. Occup. Accidents*, **2** : 179–190.

US Department of Labor (1992). Occupational injuries and illnesses in the United States by industry, 1990. Bureau of Labor Statistics Bulletin 2399, US Department of Labor, Washington, D.C., U.S.A.

Vedder, J. and Siemers, M. (2003). Accidents and safety in the construction industry. Proceedings of the 15th Triennial Congress of the International Ergonomics Association, Seoul, Korea, vol. 6, pp. 19–22.

Wickstrom, G. (1978). Symptoms and signs of degenerative back disease in concrete reinforcement workers. *Scand. J. Work Environ. Health*, **4** (Suppl. 1), 54–58

Wickstrom, G., Hanninen, K., Mattsson, T., Niskanen, T., Riihimaki, H., Waris, P. and Zitting, A. (1983). Knee degeneration in concrete reinforcement workers. *Br. J. Ind. Med.*, **40** : 216–219.