

## Ergonomically Evaluation of Occupational Problems of Women Workers in Agricultural Tasks

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**Abstract: Background & Objectives:** In the present investigation efforts have been made to assess the occupational problems including musculoskeletal disorders (MSD) and other job related problems in relation to different rice cultivation tasks. **Method:** About 375 women workers are selected at random from the different districts in West Bengal state (India). MSD and other problems of the agricultural workers are evaluated by the basis of Nordic questionnaire method. **Results:** The results of the MSD in agricultural workers reveal that the shoulder problem is highly prevalent (97.6%) among the rice cultivation workers. This is followed by the problems in low back (95.2%), in thigh (91.6%) and in neck (88.4%). It has been noted that MSD is related to the inappropriate working postures, duration of jobs and repetitive movement of the body parts. The results of the other health hazards reveal that digestive disorders (66.8%) are also prevalent among the women agricultural workers. About 56% of female agricultural workers have different types of menstrual problems. **Interpretation & Conclusion:** The MSD is more prevalent in uprooting and transplantation jobs than in other rice cultivation jobs. It can be concluded that job related problems may be reduced by modifying work methods, work rest cycle and by providing some hand tools for different rice cultivation jobs.

**Key words:** Agricultural workers, Low back pain, menstrual problems, MSD.

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**Introduction:** Rice is the major crop in West Bengal State of India. Women workers are involved in different phases of rice cultivation, such as, sowing of seeds, uprooting, transplantation, weeding, reaping, binding of straw, carrying of straw bundles, threshing and collection of crops and straw bundles. Investigations of male subjects predominated, although it is actually women that comprise the majority of subsistence farmers in developing countries<sup>1</sup>. According to the census report<sup>2</sup> it has been found that in West Bengal 45.84% of female population are involved in agriculture. They have to face many job related problems during work. They are exposed to postural stress due to adopting different inappropriate postures during performing different agricultural jobs. They may suffer from pain in their limbs as well as in other parts of body. Women are engaged in repetitive tasks with high postural load in different steps of paddy cultivation, which may be strainfull to the musculoskeletal structure of the workers. The musculoskeletal load in the hand and wrist (exposure of applicable soft tissues) during manual tasks related to a number of chronic muscle strain, tenosynovitis and carpal tunnel syndrome or cumulative trauma disorder<sup>3,4</sup>. Working conditions of agricultural workers are extremely difficult due to severe

environmental conditions, long working hours, strenuous work and the use of improper equipment. The ignorance of the majority of ergonomics principles in the design of agricultural equipment makes the condition more difficult<sup>5</sup>. Posture is recognized as an important aspect of work loading, often acting to limit the time and effectiveness of the workers performance. It is also well recognized by Grandjean and Hunting<sup>6</sup>, that inadequate posture, when adopted for long periods, cause bodily damage and ill health. High repetition, excessive forces and awkward postures are major cause of musculoskeletal disorder and complaints in industry and industrializing countries<sup>7,8,9</sup>. The present Investigation is aimed to assess the occupational health hazards of the women agricultural workers. Efforts have been made to evaluate different musculo-skeletal disorders (MSD) and reproductive problems of women during performing different agricultural activities.

**Material and Methods :** The present investigation is carried out on women agricultural labourers only. The subjects are selected from different districts (PurbaMedinipur and PaschimMedinipur) in the state of West Bengal (India). About 375 women (200 from

PurbaMedinipur and 175 from PaschimMedinipur) have been selected at random for the study. The age range of the subject is 19 years to 68 years. The occupational health problems of the workers who are engaged in different agricultural tasks of rice cultivation have been evaluated by questionnaire technique. Questions are asked to the subjects during work, just after finishing the work, and in the evening after returning to their home from the field.

**Statistical analysis:** The body composition of the subject is also determined. From the measures of height and weight the body mass index (BMI) has been calculated and from the skin fold thickness different body composition parameters are computed<sup>10</sup>. The formulae used for the same are as follows:

1. Body mass index= Weight (Kg) / Height<sup>2</sup> (meter)
2. Body density (gm/cc) =  $1.0994921 - 0.0009929$  ( sum of triceps , supra-illium and thigh skin folds) +  $0.0000023$  (sum of the same three skin folds )<sup>2</sup> -  $0.0001392$  (age in years)
3. Fat % = { (4.95 / Body density) -4.50} X 100
4. Total body fat = (weight (kg) X fat % )/ 100
5. Lean body mass ( Kg)= Total body weight - Total body fat

The nutritional status of the subject has been evaluated by twenty four hours recall method. The amount of food intake has been recorded from the subjects for three consecutive days.

**Results:** The prevalence of musculoskeletal disorders (MSD) is very high among the women agricultural workers. The occurrence of MSD in different agricultural activities has been presented in Table 1. The result reveals that lower back; lower limb and upper limb are the most affected body parts of women. The women workers also report neckache and it is more prevalent in reaping job than that in other jobs.

It has been noted that in rice cultivation jobs the most affected body part of the woman workers was the upper limb (100%). A detailed study of the work related problems of upper limb have been made and the results are presented in Table 2. It has been reported by the subjects that the major parts of the upper limbs, viz., shoulder,

finger, wrist and upper arm are affected in most of the subjects whereas palm, forearm and elbow joint are the less affected parts of hand arm system.

The prevalence of lower limb problems has been also noted (Table 3). The most affected part of lower limb is thigh. All women workers reported the occurrence of pain in the thigh during performing transplantation, reaping and threshing jobs.

The women agricultural workers also have job related problems other than musculoskeletal disorders. Among them fatigue, digestive disorder, and headache are prevalent (Table 1). The most striking disorder is acidity. They have also reported about the indigestion and pain in the abdomen. The diurnal variation of digestive disorders of the workers has been also studied (not shown in the table) and it has been noted that the complaints of acidity increases in the afternoon (28.1%) and in the night (34.1%). Different types of eye related problems such as pain in eyes, burning sensation in the eyes, watering and blurred vision have been found in this investigation.

The women-related problems have also been studied among the female agricultural workers. It includes the problems of reproductive cycle, problems related to pregnancy etc. From the results it has been found that 56% of women workers have menstrual problems (Table 4). They have reported different kinds of menstrual problems such as amenorrhoea, dysmenorrhoea, menorrhoea, and leucorrhoea. Among these, leucorrhoea (30.5%) is the most prevalent problem among the workers.

**Discussion:** Women agricultural workers are engaged most of the rice cultivation jobs. The workers do all the rice cultivation jobs manually. Most of the workers (98%) report pain in right shoulder but the problems in left shoulder are less prevalent. This difference may be due to fact that all workers used their right hand more actively than that of left hand during performing different tasks. In most of agricultural operation the shoulder has been found to remain abducted for long time and as a result static load has been imposed on the shoulder. In addition to that

frequent movement of shoulder takes place in all agricultural tasks. The arm rose to some extent that cause shoulder muscle tenderness disorder. This is due to the static fatigue of trapezius muscle<sup>12</sup>. Working tasks with repetitive arm movements may evoke shoulder tendonitis or tendovaginitis probably due to friction<sup>13</sup>.

In case of reaping and binding jobs a large number of women have pain/discomfort in their upper arm. In reaping operation the workers have to cut rice straws by a sickle. During this process there may be frequent contraction of biceps and triceps leading to the development of pain in the upper arm after some time. Similarly, in case of binding job the above muscles are contracted frequently due to exerting pressure for making straw bundle.

The workers also report pain in their right and left wrist. There are dorsiflexion, ventriflexion and lateral movements of wrist joint during different operations. The problem is highly prevalent in left wrist during reaping of rice straw. The left hands of the workers were required to hold a bundle of rice straw during cutting them by the right hand. The left wrist usually remained in dorsiflexed condition during the whole operation imposing static load on it. In case of binding operation the problems of right wrist is more pronounced than that in left wrist probably because of greater movement at right wrist joint during making knots.

The occurrence of finger pain has been reported by 100% of women workers in case of performing transplantation and binding of straws. It is also prevalent in case of other rice cultivation jobs also where fingers are actively involved. The transplantation of rice seedlings is made by piercing the fingers in to the mud, which caused friction with solid and hard Materials present in the mud causing the problem in fingers. In case of binding of straws the fingers have frictions with the straws during making knot in the bundle, which might be the reason for developing pain in the fingers. The occurrence of pain gradually increases with the time and the maximum numbers of workers are found to be affected after finishing the work in all kinds of rice cultivation jobs. This may be due

to the cumulative effect of repeated finger movement during work.

During performing transplantation, reaping and threshing jobs the movement of lower limb is very less. Therefore a great amount of static load is imposed on the upper leg muscles during working under bend (uprooting, transplantation and reaping) or erect posture (threshing). The problems are not much severe in other parts of lower limb.

The low back pain is also highly prevalent among women agricultural workers and it is predominant in most of the rice cultivation tasks. In different tasks the workers have to adopt stooping posture for major time of the work. This leads to chronic low back pain among the workers. In some of the cases they are compelled to twist their trunk frequently. The spinal rotation may cause chronic strain as when the workers twist their waist during work. Male agricultural workers were also reported that low back pain was extremely prevalent in reaping job and transplantation job<sup>14</sup>. Other investigators also reported such problems among the workers. Maeda et al<sup>15</sup> reported that low back pain is related to bowing posture of greenhouse farmers. Van Dieen and Hildebrandt<sup>16</sup> also reported health risks concerning the low back in agricultural workers. The low back pain might be associated with the damage of the intervertebral discs. The occurrence of pain occurs in greater number of subjects with the progress of the working hours and it became highest after finishing the job.

The occurrence of neck problem is very high. About 88% of the women reported the problem when all rice cultivation jobs were considered. It has been noted that more than 90% of the workers are affected by neck pain during performing uprooting, transplantation and reaping jobs. Flexion of the head and neck causes neck pain. The prolonged static muscle load has appeared as the major risk factor in the development of load-related problems. The risk of different levels of static load on trapezius muscles in term of the development of musculoskeletal illness located in shoulder and neck<sup>17</sup>. From the results it has been revealed that

the neck problem becomes enhanced with the time and the maximum number of workers (66.5%) is affected after finishing the job.

Indigestion and pain in the abdomen are mainly related to the food habit and personal hygiene. Usually they take the first meal (breakfast) within 9-10 am but they take the second meal (lunch) after finishing the job (within 3.00-4.00 pm). This long gap between the two meals might lead to these digestive problems. Digestive disorders are found to be the maximum in the threshing operation (80%) and the minimum in binding operation (40%). In addition to that acidity is regarded as psychosomatic disorder. The women workers are exposed to psychological stress because of their own household work and children. This may be an additional reason for the development of acidity.

In rice cultivation there is static as well as dynamic contractions of muscles in different parts of the body. The working muscle becomes fatigued and as a result whole body fatigue has been caused at the end of the day. Agricultural workers become fatigue due to one or more reasons together. It may be the general body fatigue that is physical overloading of the entire organism or may be the mental fatigue that is induced by the mental work or may be the nervous fatigue which is caused by overstressing one part of the psychomotor system, as in skilled work or might be the monotony of either occupation surroundings<sup>18</sup>. The occurrence of fatigue among the workers has been found to be increased with the time and a large number of workers (56.1%) become very much fatigue after finishing the rice cultivation job. The fatigue may also be attributed to the low lean body mass and nutritional status of the workers. Table 5 shows that the subjects have low lean body mass. The subjects also have poor nutritional status. The BMI value indicates that they have chronic energy deficiency (Grade I). The nutrient intake of the women also supports the energy deficiency of the workers.

The problems in eye are found to be the maximum in the reaping operation (40%), which is followed by the threshing, uprooting, transplantation and binding. During reaping the

dust particles and small fragments of straws have been evolved in the air and probably come in to contact with the eyes of the workers. This might be the reason for the maximum occurrence of eye problems in the workers during reaping job. The results show that the problems are gradually increased with the time of work and about 45.1% of the workers report the problem after finishing the work as the concentration of dust particles increases with the time.

Watering from the eye (23.32%) is the most prevalent eye related problems among the workers. Watering from the eye might be occurred as a result of irritation of the lachrymal glands due to entry of dust particles in to the eyes. The other eye related problems might be related to the entering of evolved dust particles from the straws and fine fragments of dried straws in to the eyes.

Different type of menstrual problems might be related to the bad personal hygiene and lack of awareness of reproductive health of the workers. Menstrual irregularities seem to be reported with greater frequency as women become more involved in high intensity, year round training programs. The study of Bonen and Keizer<sup>19</sup> shows a relatively high incidence of athletic menstrual cycle irregularity associated with heavy training activities. These findings have also been confirmed in other reviews<sup>20, 21</sup>. The women agricultural workers are also required to exert hard labour and they have a low percentage of fat in their body<sup>22</sup>. Table 5 shows the body composition parameters of female agricultural workers and from the results it appears that the subjects have low percentage of fat and total fat. These factors may be related to the menstrual abnormalities among the female agricultural workers. In addition to the hard physical activity the workers consume lower calories than they required. Although rice cultivation job is very stressful yet the women workers have to continue the work during the pregnancy because of their very low economic status.

**Conclusion:** It can be concluded that the occurrence of musculoskeletal disorder (MSD) is very common among the women agricultural

workers. The MSD is more prevalent in uprooting and transplantation jobs than in other rice cultivation jobs. The occurrence of MSD in upper limb is the highest in reaping job whereas MSD in lower limb is most prevalent in transplantation job. The occurrence of other job related health hazards is greater in reaping job than that in other rice cultivation tasks. The problems of upper limb and lower back are the most prevalent among all body segments. The low back pain is associated with the postural stress. Modifying the work-rest cycle can reduce the MSD and postural stress. The workers should be aware of bad working posture. The muscle mass of the workers is low which may be related to the MSD hazards. The percentage of fat in women workers is remarkably low. The muscle mass and the amount of fat in the body of the women agricultural workers can be improved by providing good nutrition. The strenuous posture is one of the major problems in rice cultivation jobs. The best solution of this problem is to devise new equipment, which can relieve them from adopting harmful bend postures. Avoiding loads during acute pain and performing some special types of exercises can reduce the low back pain.

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