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Corrective Measures to Reduce Physical Work Strain of Dairy Farming

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ABSTRACT

The present investigation was undertaken to study the effect of selected dairy activities on performers in terms of various ergonomic parameters so as to provide suitable remedies to reduce work stress. Descriptive as well as experimental design was chosen for the study. Findings shows that physiological workload of women in terms of heart rate was highest during milking i.e. 124.60 beats/min. and energy expenditure was found highest i.e. 14.37 kJ/min during collection of animal dung. The risk factor observed were squatting posture for the longer period, deviation of angle of backbone from normal and wrist and shoulder muscle pain. Continuous forceful movement of both arms causes mechanical stress on anatomical structure while performing milking operation. Suggestive tools/techniques to reduce work stress included revolving stool for milking, long handle broom and dung collector for cleaning cattle shed, naveen sickle for fodder cutting and trolley for disposing off the dung.

Keywords : Farmwomen, Drudgery, Occupational Health Hazards, Heart Rate

INTRODUCTION

Drudgery is concerned as physical and mental strain, fatigue, monotony and hardship experienced by women (AICRP 1997-98). Women engaged in dairy farming maintain their own convenient posture without realizing the cost of energy and other physiological demands to the body in that particular posture.

Work force of dairy sector is heterogeneous i.e. females and males of various age group are engaged in performing different activities. Males and females have different anatomical body structure as well as different body capacity to perform the work as well as dairy workers of various age-groups also have different body capacity. The purpose of the present study was to find out the effect of selected dairy farming activities on performers in terms of various ergonomic parameters and provide suitable corrective measures to reduce work stress caused by performing dairy farming activities which will be helpful in devising appropriate tools and techniques suitable for increasing the work efficiency. The present study was envisaged with the following objectives-

- 1) Assessment of personal and socio-economic profile of the respondents involved in dairying activity.
- 2) Assessment of physiological workload and postural and musculoskeletal stress while performing dairy activities.
- 3) To suggest corrective measures to reduce the physical strain of the worker involved in dairy farming.

METHODOLOGY

The study was conducted in Tarai region of Uttarakhand. Thirty physically fit respondents belonging to 20-45 years of age were selected for the study. Ergonomic parameters were recorded as under:

Heart rate = Polar Heart Rate Monitor
 Energy Expenditure = $.159 \times \text{HR} - 8.72$
 Grip Strength = Grip Dynamometer
 RPE = RPE scale (Verghese et al., 1994)

Working conditions of selected dairy farming activities were studied by finding out the average distance traveled and time taken to complete the activity, average area (sq ft) of cattle-

shed to be cleaned, average area (sq ft) of the grass land to be cut and brought from field to feed 3 cattle's, average weight of cow-dung handled at a time, vessels or utensils used by respondents for performing activity and height and weight of the broom used for cleaning of cattle-shed. Postural stress was assessed by angle of body deviation in lumbar region from normal frequency of postural changes by using Goniometer. Muscular stress was measured with the help of grip dynamometer and heart rate with the help of polar heart rate monitor. Data were analyzed with the help of various statistical techniques as frequency, percentage, mean and standard deviation.

RESULTS AND DISCUSSION

Personal Profile of the Respondents

Majority of the respondents were from the age group of 30-40 yrs. Most of the female respondents (65.0 per cent) were of 41-50 kgs. of weight. Majority of the respondent belonged to the upper middle class caste having agriculture as their main occupation. Half of the population i.e. 48.33 percent belonged to the medium family having 4-8 members. About 42.0 percent of the respondents possessed pucca houses.

Health status of selected women was assessed on the basis of:

- ◆ Body Mass Index
- ◆ Body Type
- ◆ Physical Fitness Test - using Step-Stool Ergo-meter

On the whole health status of farm women was found to be good. Majority had good body built and physical fitness but there are very small percentage of women who had excellent health status, this may be due to their poor diet and poor work environment.

Time Consumption Pattern

The findings revealed that 55.0 percent of the female respondents and 42.0 percent of the adult male respondents of the family spent more than 2 hours daily on preparing feed for cattle. Beside this the respondents spent nearly 2 hours in taking care of the animal, cleaning of animal shed and on cow dung cake making.

Physiological Stress

The finding shows that value of average heart rate, cardiac cost of work and physiological cost of work were maximum

in all respondents. Average and peak working heart rate was highest during milking i.e.124.60 beat/min. Physiological workload of women in terms of heart rate (Fig.1), energy expenditure (Fig.2), total cardiac cost of work and physiological cost of work for all the selected dairy activities were found high and above the permissible limits of women.

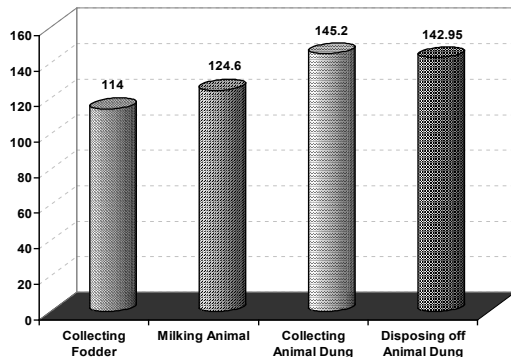


Fig. 1 Heart Rate (b/min.)

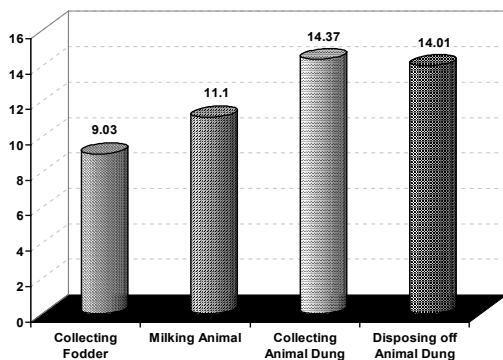


Fig. 2 Energy Expenditure (kj/min.)

Scores of rated perceived exertion for all the selected activities were also found above 4, indicating that the women were perceived these activities as tiring and drudgery prone. (Figure 1 and 2)

Occupational Health Hazards

Finding reveals that 100 percent of women reported very severe pain in thumb/finger and forearm followed by moderate pain in thighs, shoulder joints, ankles and feet, low back, calf muscles, ankle/feet, shoulder, upper arm and wrist/hand were found the most stressed body parts after cleaning of cattle shed. Severe to very severe pain was perceived in low back, buttock, thigh, knee, calf muscles by females, while making cow dung.

Gender differentiation was also found in educational level, height and weight of male and female, social participation, type of involvement and time consumption pattern in dairy activities. Cleaning of cattle shed, cow dung making, milking and milk processing were found main domain of female dairy workers whereas activities related to feeding of animal, medical care, vaccination and marketing of the milk were performed by male respondents. Ergonomic assessment of the dairying activity inferred that among various stages of dairy activity, muscular and physiological stress was higher in milking, cleaning of animal shed and in fodder cutting. At these stages various work related risk factors were observed so, the following suggestions were proposed to reduce the work stress and strain.

Suggestions to reduce work stress of dairy workers

In present investigation various stages of selected dairy farming activities have been studied on the basis of muscular stress, postural stress, physiological stress and feeling of

discomfort in various bodies part of dairy worker. The work related risk factors which may be responsible for the work stress were observed in milking, cutting fodder, cleaning of shed and disposing of dung.

a. Milking

1. Adoption of squatting posture for the longer period:

Adoption of squatting posture for prolonged period induces static muscular strain in lower body extremity. Further in static muscular effort, muscles remain in a contracted state for a long time. Prolonged muscular contraction stops the flow of blood into the muscles lead to the diminished supply of oxygen and a buildup of waste products. The building up of waste products particularly carbon-di-oxide and lactic acid brings about a painful stage of fatigue (Sharma, 1997).

2. Angle of body deviation in lumber region:

Angle of body deviation from its natural alignment due to habitual error can damage the curve of back bone permanently because in pulling and pushing inter vertebral disc which join the vertebrae is torn away, making fluid (viscous fluid) to flow away on sciatic nerve causing the severe sciatic pain. With the going away of discs fluid, the backbone becomes less flexible and continues to pain at the time of work and after work (Oberoi, 1997).

Tools/ techniques for reducing work stress during milking animals

1. Revolving stool can be used contrary to squatting posture of worker engaged in milking operation to reduce the work stress of dairy workers involved in milking, which was designed as per the sitting height measurements of females. Thus the height of revolving stool should be made adjustable to match the sitting height of male and female dairy workers and type of milch animal too. Further tool should be economical, easy to carry, compact and should have no adverse effect on milk quality and on udder of cattle.

b. Occupational Health Hazard While Cleaning Cattle Shed in disposing of dung

1. Inappropriate height of the broom used for sweeping operation of cattle shed compelled the worker to adopt bending/kneeling posture during the work.
2. Mixed and uneven floor of the cattle shed while sweeping of cattle shed requires higher degree of force in pulling and pushing of broom.
3. Collection of cow dung required extreme position of both arm and neck along with squatting posture.
4. Heavy load carrying on head for longer period due to too far off disposal place.
5. Two to three times a worker has to travel for the distance for disposing off dung.
6. Bio-mechanical researches show that high spinal compression forces occur in stooped posture and that sustained or repeated flexion of the spine may disturb the neuromuscular stability of the lower back and increase the risk of fatigue leaving the back more vulnerable to injury. It may be the reason of higher muscular, postural and physiological stress, observed in sweeping and cleaning of cattle shed.

Tools/ techniques to reduce work stress caused by occupational health hazards while cleaning cattle shed

1. Trolley can be used for disposing of cow dung which will eliminate the head load of dairy workers, thus minimize the musculo - skeletal problems. Further it will reduce the time and distances traveled for disposing off dung as well as push and pull force which will also reduce the muscular stress of dairy workers. In addition to this height and grip of the handle of trolley should be according to body measurement.

2. Long handled broom should be used instead of short handled broom for sweeping of cattle shed which will eliminate the bending posture adopted by worker, which in turn reduces postural as well as physiological stress. The circumference of handle of broom should be matched to the grip of both arms of dairy workers for reducing muscular stress caused by performing sweeping operation.
3. Long handle dung collector can be used for the collection of dung which will eliminate squatting posture, extreme position of arms and neck also reduces total time required to finish the task, thus it will reduce muscular, postural and physiological stress among male and female dairy workers of younger and older age groups.
4. As far as possible the floor of the cattle shed should be cemented/pucca with proper drainage system which will reduce the total force, arm motions and steps required to sweep cattle shed floor.

CONCLUSION AND RECOMMENDATIONS

On the whole it was found that the health status of the farm women was good. Physiological work load of women in terms of heart rate, energy expenditure, total cardiac cost of work, physiological cost of work for all the selected dairy activities was found high and above permissible limits of women. That is why some improvements, suggestion and technologies like revolving stool, trolley for disposing of cow dung, low handled broom and dung collector were introduced for selected activities and were found highly suitable and acceptable by the respondents involved in these activities.

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