Heart Rate and Energy Expenditure of Women Employed in Small Scale Seafood Processing Units

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ABSTRACT

Heart rate is a popular means to determine the degree of physical exertion. Fluctuations in heart rate occur due to changes in breathing rate, blood pressure, hormones, various actions of the sympathetic and parasympathetic nervous systems and emotional states, as well as working postures, environmental influences and health status. This study portrays the heart rate and energy expenditure of women employed in small scale seafood processing units at Tuticorin district of Tamil Nadu. In these study thirty five women workers were selected for assessment of heart rate. The energy expenditure, minimum, maximum and average heart rate were assessed using S-410 Polar Heart Rate Monitor for the women workers employed in three sections namely peeling, grading and setting. The working heart rate was recorded for a period of two hours. The average heart rate was high for the women workers in peeling section (106.0 ± 7.1 b.min^{-1}) when compared to that of the women workers in grading (94.8 ± 8.6 b.min^{-1}) and setting sections (90.1 ± 7.8 b.min^{-1}). Energy expenditure (2 hours) showed that the women workers in the peeling section expended 15.6 ± 4.1 kj.min^{-1}, while the women working in grading section expended 13.3 ± 3.8 kj.min^{-1} and the women in setting section expended 8.7 ± 4 kj.min^{-1}.

Key words: Heart rate, women workers, seafood processing unit

INTRODUCTION

The International Labour Organization at its 262nd session (Tomoda, 1995) emphasized that the work stress and health hazards in fish processing works are considerably high due to the productivity demand and low levels of technology used. Work tasks in the food-processing industry are usually repetitive and monotonous, and workers are expected to perform their tasks at a high rate of speed while the ergonomics factors are not always the most favourable. Exposure to both unpleasant work environment and high repetitiveness is assumed to increase the risk for health problems (Chiang *et al.* 1990 and Oksa *et al.* 2002).

A cold environment may be a significant health risk factor (Tochihara *et al.* 2005). Many types of chronic health problems, such as cardiovascular diseases, respiratory symptoms, musculoskeletal diseases, peripheral circulation problems, and skin diseases, are associated with cold exposure (Hassi 2005). The main features associated with occupational cold comprise four stages: 1) thermal discomfort and pain sensation due to excessive heat loss from the body, 2) decrement in manual performance due to cooling, 3) the risk for cold injuries, initiation

and aggravation of health symptoms or accidents, and 4) protection against cooling calls for special ergonomic requirements (Holmér, 1994). Heart rate monitoring is a popular means to determine the degree of physical exertion. Vuori (1998) found that the constant fluctuations in heart rate occurs due to changes in breathing rate, blood pressure, hormones, various actions of the sympathetic and parasympathetic nervous systems and emotional states, as well as working postures, environmental influences and health status. Kapitaniak (2001) explained that despite the great variations in heart rate due to intra-individual differences, the majority of people display average resting heart rates between 60 and 90 beats per minute (b.min^{-1}). The present study is an attempt to assess the heart rate and energy expenditure of women workers employed in small scale seafood processing units.

MATERIAL AND METHOD

Job description

The workers were employed in three sections namely peeling, grading and setting. The nature of activity in the peeling section was peeling, deveining shrimp, removal of head from shrimp and cleaning of cuttlefish. Grading involved categorising the types of seafood into different varieties and grades, which required higher technical skills. This task was generally carried out by women who were well experienced in the seafood processing unit. Setting section included preparation of final products such as individual quick freezing (IQF) of shrimp and cuttlefish, frozen shrimp and frozen cuttlefish. These products were packed as per the buyer's requirements.

Data collection

A questionnaire was used to collect information regarding, age, current and previous employment, exposure to seafood. Thirty five women workers were selected for assessment of heart rate. They were selected based on their willingness to co-operate for the study. Hence the energy expenditure, minimum, maximum and average heart rate were assessed using S-410 Polar Heart Rate Monitor for thirty five women worker employed in three different sections. The working heart rate was recorded for a period of two hours. The workload of an individual was categorized based on the energy expenditure and heart rate. The table below gives the classification based on the energy expenditure and heart rate (Vuori, 1998).

Table 1. Classification of physiological work load

Physiological work load	Physiological variables	
	Energy expenditure (kj.min^{-1})	Heart rate (b.min^{-1})
Very light	Less than 5	Less than 90
Light	5.1 – 7.5	91 - 105
Moderately heavy	7.6 - 10	106 - 120
Heavy	10.1 - 15	121 - 135
Very heavy	12.6 - 15	136 - 150
Extremely heavy	More than 15.0	More than 150

RESULTS AND DISCUSSION

Thirty one percent of the workers were in the age range between 17 to 20 years, 43 per cent were in the age range of 20 to 25 years of age. This indicates that the industry generally employed young women, as they had less family responsibilities and productivity was more when compared to that of other age groups. Kasim *et al.* (2003) stated that in fishery related activities the most dominant age group among women workers was youth, aged between 17 and 25 years.

Table 2: Socio economic background of the women workers

S.No	Particulars	Number	Per cent
1	**Age in years**		
	15-17	5	14.3
	17-20	11	31
	20-25	15	42.9
	25-30	3	8.6
	Above 30	1	2.9
2	**Education**		
	Can read and write	3	8.6
	Primary school	4	11.4
	Secondary school	16	45.7
	High school level	9	25.7
	Higher secondary school	3	8.6
3	**Marital status**		
	Unmarried	32	91.4
	Married	3	8.6
4	**Family type**		
	Nuclear	22	62.9
	Joint	13	37.1
5	**Total family income/month ***		
	Below Rs.3300	-	-
	Rs.3301-7301	9	25.7
	Rs. 7301-14500	20	57.1
	Above Rs. 14500	6	17.1

*Classification as per HUDCO, 2007

In seafood industries women workers play an important role in quality control of the processed products and work in vital sections of the seafood industry. But the educational status of the women workers in the sea food industries was found to be only upto primary classes. Only 45.7 per cent of women workers had secondary school education followed by 25.7 per cent who had education up to high school level.

Sathiadhas *et al.* (2003) found that 60 per cent of women in all the categories had at least primary level of education and in the case of women engaged in value addition, majority had medium level of education in the seafood industry in Kerala. Kasim *et al.* (2003) stated that

65.6 per cent of women workers involved in fishery related activities were literates.

Ninety one per cent the women workers were unmarried while 8.6 per cent women workers were married. It also indicated that the industry generally employed unmarried women, as they had less household tasks unlike their married co-workers.

Majority of the workers (62.9 %) were from nuclear family and only 37.1 per cent were from joint family. The economic status of workers was based on income status as given by HUDCO (2007). Among the workers, 57.1 per cent belonged to Rs. 7301-14500 and 25.7 per cent belonged to Rs. 3301-7301.

Table 3: Details of the job of women workers

S.No	Particulars	Numbers	Per cent
1	**Age at entry (Yrs)**		
	15-20	31	88.6
	20-30	3	8.6
	30-35	1	2.9
2	**Work experience (Yrs)**		
	Below 1	6	17.1
	1-3	7	20.0
	3-6	12	34.3
	6-9	7	20.0
	Above 9	3	8.6
3	**Awareness about health hazards**		
	No	18	51.4
	Yes	17	48.6
4	**Training in the job**		
	Yes	22	62.9
	No	13	37.1

It was found that 88.6 per cent started work during 15 to 20 years of age. Women of younger age group sought employment in these industries because of their low socio- economic conditions. From the data, it was found that 20 per cent of the women workers had work experience between one to three years, 17.1 per cent women workers had less than one year of work experience, 34.3 per cent of women workers had three to six years of experience and 20 per cent of women workers had six to nine years of experience. Among the women workers, 8.6 per cent had more than nine years of experience in the seafood processing units.

Work experience indicating that women worked in these industries during their young age (i.e. before marriage) and later shifted from this job due to their marriage. During their young age, they were able to work for long hours with considerably higher speed when compared to their senior co-workers. As a result of their increased productivity, the younger women were preferred by the proprietors. The findings of this study are also in conformity with the earlier studies by Nag and Nag (2007).

Table 4: Grouping of women workers based on BMI

Body Mass Index kg.m^{-2}	Numbers	Per cent
Below 18.5 (Under weight)	6	17.1
18.5 to 22.9 (Normal)	22	62.9
23 to 24.9 (Obese grade-I)	5	14.3
25 to 29.9 (Obese grade-II)	-	-
Above 30 (Morbid obesity)	2	5.7

Classification as per WHO, 2004

It was found that 62.9 per cent of the women workers were in the normal category and 17.1 per cent of women workers in the underweight category. However, it was interesting to note that 14.3 per cent of women workers belong to grade one obesity. Majority of women workers being in the normal category may be due to the age and also dietary intake which was lesser than the RDA and work load. The mean BMI of the fisher women was 21.3 kg/m^2 in the coastal region of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu (Dhanapal *et al.,* 2003).

Table 5: Heart rate and energy expenditure of the women workers

S. No.	Particulars	Sections			Chi square value
		Peeling Mean ± SD	Grading Mean ± SD	Setting Mean ± SD	
1	Average heart rate (b.min^{-1})	106.0±7.1	94.8±8.6	90.1±7.8	16.758 *
2	Maximum heart rate (b.min^{-1})	151.8 ± 23.5	132.8±14.1	130.0±12.8	
3	Minimum heart rate (b.min^{-1})	81.0±9.4	73.1±6.8	66.1±12.7	
4	Energy expenditure during working (kj.min^{-1})	15.6±4.14	13.3±3.8	8.7±4	19.621 *

*- p <0.05

The average heart rate was high for the women workers in peeling section (106.0±7.1 b.min^{-1}) when compared to that of the women workers in grading (94.8±8.6 b.min^{-1}) and setting sections (90.1±7.8 b.min^{-1}). Energy expenditure (2 hours) showed that the women workers in the peeling section expended 15.6±4.1 kj.min^{-1}, while the women working in grading section expended 13.3±3.8 kj.min^{-1} and the women in setting section expended 8.7±4 kj.min^{-1}. Women workers in the peeling section had higher heart rate and energy expenditure compared to other two sections. This may be because the women workers in peeling section adopted crouched posture, followed by carrying loads from the point (where the fish is unloaded to the peeling area. The pace of the work was also high, since their wages were based on the

quantity of fish cleaned. Women workers in peeling section worked more to get good earnings per day, which necessitated them to the work as fast as they could and this may be one of the reasons for the increased heart rate. The chi square analysis revealed that average heart rate and energy expenditure significantly differed between the sections.

CONCLUSION

The present study is an attempt to assess the health status of women workers employed in seafood processing units. Most of the women workers were young, unmarried women. Some of the reasons like poor family income, low level of literacy etc coupled with poor financial inputs had left many of the workers in unimproved state of economic condition. This study revealed that 62.9 per cent of women workers had normal level of BMI. The average heart rate and energy expenditure were higher for the peeling workers compared to other sections. This may be due to the personal health condition, accentuated by the work environment. However a study needs to be carried out among large sample to validate the results.

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