

# Assessment of the physiological cost of work for the workers performing kitchen related standing activities in restaurants

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■ **ABSTRACT** : Restaurant workers who spend most of the time in buildings and therefore experience the greatest amount of exposure while performing various activities is at greatest risk. They do the work which is very labour and hand intensive. These result in physiological disorders related to increase in blood pressure, heart rate, pulse rate and total cardiac cost of work. This is mainly due to lack of awareness of the basic principles, poor working conditions and reluctance to change existing and traditional work methods and tools. Besides this awkward posture, the work place and psychological factors are also important aspects for workers health and safety. Therefore, the study was undertaken to find out the physiological cost of work for the workers performing kitchen related standing activities in restaurants. Therefore, the study was undertaken to find out the physiological risk assessment among the workers engaged in an organized restaurants industry. For the present study 120 workers from the four south Indian restaurants *i.e.* Sri nidhi sagar, Raaga the family restaurant, Tamarind and Inchara, the family restaurant, Bangalore city, Karnataka State. Research design used was descriptive-cum-experimental. Purposive sampling was used and data were collected by interview method. The workers were mainly literate and aged from 25-40 years. The data further showed the existing condition of the restaurant workers which were satisfactorily regarding the work environment.

■ **KEY WORDS** : Restaurant industry, Physiological disorders

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The hotels and restaurant sector includes a range of tasks and jobs that pose different risks. The complexity of the sector makes it difficult to present an exhaustive view of the situation. Much attention goes towards working in kitchens. The hotels, restaurants and catering sector employs more than 7.8 million people in India and is characterized by high job demands (in particular due to direct contacts with clients) and high physical workload. Restaurant often specialize in certain types of food or present a certain unifying and often entertaining theme. Kitchen in the restaurant is the place where the job of preparing and serving meals get done. Restaurant work involves considerable degree of manual efforts which are associated with body movements. If such movements are minimized by adopting motion economy and proper working postures, it would reduce fatigue to a considerable extent. While attempting such motion

economy, one can take resource to biomechanical approaches and identify the wasteful movement or awkward body postures. If these are avoided through improvement in the work place layout, one can quantitatively evaluate the advantages gained by using appropriate physiological or psychological indicators.

The efficiency of any activity varies according to the type of activity and the manner in which it is performed. It may be as high as 30 per cent and as low as 3 per cent (Grandjean, 1975). Static muscular contractions or activities which are needed to maintain the positions of certain parts of the body demand an additional expenditure of energy and do not contribute to the measured useful effect. The efficiency of such work is, therefore, very low. Besides this, for the same amount of expenditure of energy, the static work is more tiring and painful than dynamic work.

A number of studies as reported by Singh (1989) showed that there is significant relationship between the fatigue or perceived exertion or discomfort, pulse rate, respiration rate, heart rate, energy expenditure rate, posture and O<sub>2</sub> consumption. They showed that working in any posture increases the load on the heart and therefore a simultaneous increase in blood pressure, heart rate and O<sub>2</sub> consumption.

Space limitation requires workers to use many uncomfortable postures like standing, stooping, squatting, stretching, reaching, bending and twisting during the activities. It can be classified as "Moderately heavy" work because the energy expenditure is more in these activities (Canadian Centre for Occupational Health and Safety, 1998). Moreover, work related musculo-skeletal disorders represent one of the main work-related health problems in many work environments in the most industrialized countries and have attracted a growing interest in recent years due to the suffering caused and due to their associated economic and social costs.

Therefore, the study was designed with the objective to study the physiological cost of work in terms of blood pressure, heart rate, energy expenditure and pulse rate.

#### Limitation of the study :

- The study was limited to the restaurant workers only.
- The study was limited to the metropolitan restaurant workers.
- The study was limited to the family restaurants only.

Faloda *et al.* (2000) compared optimization characteristics during loaded or unloaded walking. Energy cost and strides characters ticks were measured for 10 subjects with and without the load on the trunk of the body at 10 per cent of the body weight during four sessions. Their result showed an effect of the optimal speed for stability. Furthermore, when carrying a load, the subjects did not adopt systematically the speeds that minimize physiological cost. The findings suggested the necessity to consider. This effect to prevent gait disturbance and maintain the health benefits of walking.

Costa (2001) indicates that women can be more vulnerable to shift work in relation to both their more complex circadian and infradian (menstrual) hormonal rhythm and extra demands related to family life. This includes disorders such as menstrual pains abortion interference with fetal development, premature and low birth weight.

Hazarika and Bhatt (2001) studied different posture and musculo-skeletal problems faced by women working in tea industry of Assam. Standing with forward bending posture was found uncomfortable by majority of the respondents. The most comfortable posture reported by the majority of the women workers was squatting on "Pidha" for stalk, Picking (97.88 per cent) and sorting (93.91 per cent). Musculo-skeletal problems were very common especially in the age group of 36-45 years. Acute backache was most frequently occurring

musculo-skeletal problems among the women workers (68 per cent).

Chronobiological knowledge is increasing and the relationship between this knowledge and shift work is becoming clearer. This, in turn, is highlighting a need to facilitate a mix of permanent (day, evening and night) and rotational shift system within individuals units. Is it perhaps time to allow greater flexibility in how individual nurses deal with the profession's need to care for patients throughout the 24 hours period? This review will focus on the 24 hour day night or circadian rhythms and the consequences of the disruption of these rhythms as restaurant workers undertake shift work and other activities which demand efficient functioning at times when an individual's circadian rhythms are expecting them to be at rest as disruption of these rhythms is essentially unavoidable when 24 hours care is required, the choice becomes one of determining a preference for tolerable rhythm desynchronize and shorter more frequently occurring episodes of night work, or some degree of rhythm synchrony and adaptation during slightly longer but less frequent episodes of rhythm disruption (Sandra, 2001).

James *et al.* (2004) studied cardiovascular and metabolic responses in healthy older and younger individuals during downhill and reported older subjects has significantly greater heart rate, systolic blood pressure, diastolic blood pressure and rate of perceived exertion during uphill level and downhill walking compared to younger subjects they observed a curvilinear response for heart rate, systolic blood pressure, diastolic blood pressure and Vo<sub>2</sub> with progressively steeper negative grades. These measured were highest at 5 per cent grades and lowest between -5 and -19 per cent grades.

Vannam and Kher (2008) studied the effects of night shifts working on human circadian rhythm and found that the call centres ranked high for attrition due to health reason, for sleeping disorders 83 per cent compared to industry average of 39.5 per cent, voice loss 8.5 per cent as against 3.9 per cent, other problems were ear problems (8.5 per cent), digestive disorders (14.9 per cent) and eye sight problem (10.6 per cent).

Korompeli *et al.* (2009) reported that mean reduction of cortisol level between the two measurements was statistically greater for the 'rotating' rather than 'morning' shift group. There were no statistically significant differences between the two groups in overall mean change from the first to the second measurement of prolactine, thiodothyronine and thyroid stimulating hormone. Level of thyroxine increased statistically significantly in the 'rotating' group but not in the morning group. The morningness scale score was greater job for 'rotating' group, while greater job satisfaction levels were found in the 'morning' group. Statistically significant correlations were found between thyroid-stimulating hormone, thiodothyronine, thyroxine and prolactine changes and specific scales of the SSI questionnaire. Ergonomic shift schedule sympathetic to the body clock and workers

preferences should be adopted to mitigate the adverse effect on health.

**RESEARCH METHODS**

Four restaurants were purposively selected for the present study namely, Sri nidhi sagar, Raaga the family restaurant, Tamarind and Inchara the family restaurant of Bangalore city, Karnataka state. An exhaustive list of restaurant workers was taken from their respective departments, then from the list, 120 restaurant workers performing group of activities as preparation of food, cooking, serving and dish washing were selected. From each subcategory 20, workers were selected for the experimental data thus, making 120 samples for survey and 20 samples for controlled group. The details of sampling design are presented in Fig. A. Simple random sampling without replacement was used to select the study area and workers. Sample size was determined before the data collection. For the descriptive data, the sample size of 120 was selected and 20 workers of the total sample were selected for experimental data. Descriptive data were collected personally by using the interview schedule method. Experimental data like moisture, temperature, light and noise was also taken while performing the different activities in

restaurant kitchen. All the subjects volunteered for the study. They were informed about the study. The study protocol is presented in Fig. A. The assessment of the physiological cost of work for the workers performing kitchen related standing activities in restaurants were studied for one year among restaurant workers.

**RESEARCH FINDINGS AND DISCUSSION**

The results of the present study as well as relevant discussions have been presented under following sub heads:

**Physiological cost of work of the workers during experiment:**

Table 1 shows the effect of activities performed on physiological cost of work. A total of 5 replications were conducted to observe physiological cost of work in terms of heart rate (HR) and energy expenditure rate (EER).

*Physiological cost of work in terms of heart rate :*

The results on experiments conducted on various workers (as per the activity) were analyzed and presented in Table 1 for mean heart rate and per cent increase in heart rate from its resting level.

Exerting human energy during performance of activities

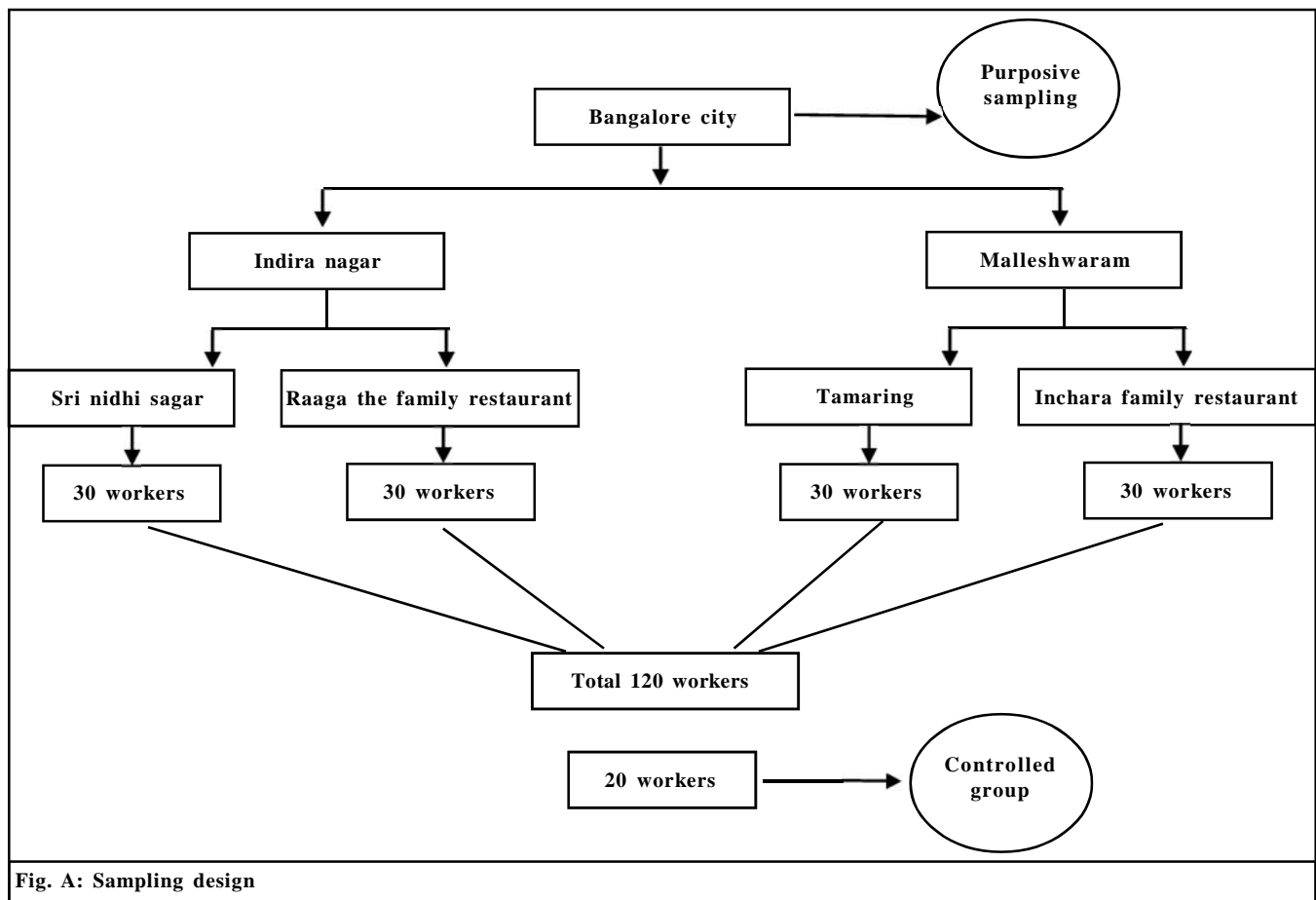


Fig. A: Sampling design

resulted an increase of heart rate. The mean resting heart rate ranged as 82 to 85 beats/minute for various activities. The variations of such responses for different activities are described in succeeding section.

#### Preparation :

The mean heart rate at resting level was 83 beats/minute, which increased up to 128 beats/minutes during performance. Whereas, per cent increase in the heart rate was found to be 18.07, which was maximum in case of preparation work.

#### Cooking :

For cooking, it was found that mean heart rate was 82 beats/minute at resting level, which reached to 124 beats/minute during work with per cent increase of 16.14.

#### Serving :

The mean heart rate during work was recorded as 123 beats/minutes and per cent increase in heart rate was 10.71 from its resting level.

#### Dish washing :

The mean heart rate before work, during work and recovery period was 82, 118, and 95 beats/minute, respectively and per cent increase in heart rate was 15.61 which were also high.

Thus, there was a marked difference in per cent increase

in heart rate for various activities as preparation, cooking, serving and dish washing (Table 1).

$$\text{Percentage increase} = \frac{\text{After activity} - \text{before activity}}{\text{Before activity}} \times 100$$

*Physiological cost of work in terms of energy expenditure :*

Table 2 shows the mean energy expenditure rate (EER) kj/min. and increase in EER from its resting level for various types of activities performed by selected workers.

While preparation activity, the energy expenditure rate before work was 4.48 kj/min. which increased up to 11.60 kj/min. (during work), with per cent increase of 49.11. For cooking activity, EER at resting, work and recovery period was 4.29, 11, and 6.39 kj/min., respectively with per cent increase of 48.95. In case of serving the orders, percentage increase in EER was found to be 30.82 followed by dish washing 46.99, respectively.

In the nutshell, it can be concluded that on the basis of energy expenditure preparation was found to be most strenuous activity, however serving was least exhaustive one.

*Physiological cost of work in terms of blood pressure and pulse rate :*

The data pertaining to information regarding average blood pressure and pulse rate count are presented in Table 3.

- In preparation of food material, the resting mean blood pressure (B.P.mmHg) was 87 which increased upto 106

Sr.No.	Activity profile	Mean heart rate			Per cent increase in heart rate(recovery period)
		resting	During work	Recovery	
1.	Preparation	83	127.8	98	18.07
2.	Cooking	81.8	124	95	16.14
3.	Serving	84	122.8	93	10.71
4.	Dish washing	82	118	94.8	15.61

Sr. No	Activity profile	Energy expenditure rate (kj/min.)			Per cent increase in heart rate (recovery period)
		resting	During work	Recovery	
1.	Preparation	4.48	11.60	6.68	49.11
2.	Cooking	4.29	11	6.39	48.95
3.	Serving	4.64	10.81	6.07	30.82
4.	Dish washing	4.32	10.04	6.35	46.99

Activity profile	Resting (mean value)		During work (mean value)		Per cent increase (during work)	
	Mean B.P.(mmHg)	Pulse rate/min.	Mean B.P.(mmHg)	Pulse rate/min.	B.P.	Pulse rate
Preparation	86.67	83.4	105.90	104.8	22.18	25.65
Cooking	88.67	75.8	107.00	98	20.67	29.28
Serving	91.33	79.4	104.93	99.8	14.89	25.69
Dish washing	89.00	77.00	105.53	102.4	18.57	32.98

(during activity), with a change in pulse rate from 83 to 105.

- For cooking, mean blood pressure and pulse rate (before activity) were 89 and 76 mmHg which increased upto 107 and 98 mmHg, respectively.
- In case of serving, the mean blood pressure recorded was 91.33 mmHg (before work) and 104.93 mmHg (during work) with a change in mean pulse rate from 79.4 to 99.8.
- When dish washing work was performed, the mean B.P. and pulse rate was 89 mmHg and 77 per min. (before activity), 105.53 mmHg and 102.4 per min. (after work), respectively.

Thus, it is evident from the data that on the basis of blood pressure and pulse rate, preparation work was most demanding activity and serving was least tiring.

#### Summary and conclusion :

Data regarding physiological cost of work showed per cent increase in heart rate, energy expenditure rate and blood pressure which were maximum in preparation and cooking activity and minimum in serving and dish washing activity. Percentage increase in heart rate, energy expenditure rate and blood pressure were somewhat higher in different activities like preparation, cooking, and dishwashing and it was found normal in serving activity.

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