

Original Research Article

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Energy Expenditure and Physiological Problems during Household Work in Rural and Urban Kitchen

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ABSTRACT

Ergonomic designed kitchen has become the need of almost all the women keeping into consideration their multifarious activities. Ergonomics contributes to designing and evaluation of task, products, environment and system in order to make them compatible with the needs, abilities and limitations of homemakers. Most of the women are not aware of ergonomic design of kitchen. Keeping these rational in mind the study was conducted in Muzaffarpur district of Bihar State. The main purpose of this research is to evaluate the energy expenditure and physiological problem of respondents in both rural and urban areas for work effectiveness. Various parameters viz. physiological, cardiovascular, energy expenditure and perceived exertion were taken for ergonomic evaluation of kitchen design. The study analysed the energy expenditure, physiological problems of women working in kitchen. Result pertaining to energy expenditure of various selected activities highlighted that in rural area the highest energy required for grinding mashala on stone i.e. 4.887 with ± 0.183 with SD value 1.007, while in urban area the highest energy expenditure was reported by the respondents for their washing utensils i.e. 4.780 with std. error ± 0.138 with SD value 0.757. Such findings highlighted to develop tools of grinding mashala for rural area's women. So far as physiological problems of women is concerned 90 percent respondents of urban area reported severe pain in their shoulder for chapatti making activity while the rural area's respondents (50%) had felt moderate pain in their upper arm during rolling chapatti in their kitchen.

Keywords

Energy expenditure,
Physiological
problems,
Household work

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Introduction

Ergonomic designed kitchen designed has become the need of almost all the women keeping into consideration their multifarious activities. Ergonomics contributes to designing and evaluation of task, products, environment and system in order to make them compatible with the needs, abilities and limitations of homemakers. In any activity

requiring physical effort, work is performed at the expense of energy. The amount of energy spent, however depends on the level of physical activity.

The energy expenditure a physiological parameter has been in extensive use in the evaluation of muscular effort. The efficiency of any physical activity varies according to the type of any physical activity varies

according to the type of activity and the manner in which it is performed.

Muller and Bhattacharya (1984) indicated in their study during light work the pulse rate rise quickly to the appropriate height and remains there as long as the work continue even during heavy work the pulse rate continues to rise up to its maximum about 180 beats per minute. Sindhu *et al.*, (2005) indicated that heart rate and respiration frequently increased from light to heavy domestic work. Hence, all physiological cost increased as work become more strenuous.

Static muscular constrains or activities which are needed to maintain the positions of certain parts of the body, demand additional expenditures of energy and do not contribute to the measured useful effect. Laddha and Shraddha (2007) analysed awkward posture refer to positions of the body (limbs, joints, back) that deviates significantly from the neutral position while job tasks are being performed. Hukka *et al.*, (2008) studied on co-occurrence of musculoskeletal pain among female kitchen workers and they concluded that there is wide spread co-occurrence of musculoskeletal pain among female kitchen workers with slight predominance in the upper body.

The main aim of this study is to ascertain the physical cost of various household task as they are traditionally performed in the rural and urban homes in terms of heart rate and energy expenditure.

Materials and Methods

Study was conducted in Muzaffarpur District of Bihar State. Out of which two Blocks namely Bandra Bock and Musahri Block were randomly selected. From each Block Ratwara Village as rural area and Bhagwanpur city as urban area to make comparative study of rural

and urban areas kitchen design. Further, 30 female respondents from both the rural and urban areas were selected for conducting research. The various anthropometric data viz. Height, weight, BP, Pulse rate etc. were recorded with the use of appropriate tools and machines.

Energy expenditure for selected activities in rural and urban area

Energy expenditure for selected activities in rural and urban area includes various activities i.e. washing and cutting vegetable, preparation of dough, chapatti making, grinding mashala on stone and washing utensils were taken for calculating the respondents' energy requirement of energy consumed for different kitchen activities were derived with the standard formula.

The analysis of data in Table 1 pertaining to energy expenditure for various kitchen activities highlighted that amongst various selected activities in rural area's kitchen the respondents required highest energy for grinding mashala on stone i.e. 4.887 with ± 0.183 with SD value 1.007 followed by washing utensils, having mean energy value.885 with std. error ± 0.240 with SD value 1.315 and lowest energy expent for chapatti making as mean value of energy consumption was found to 4.238 with std error ± 0.192 with SD value 1.052. results indicated that in urban area among all the selected activities energy expenditure were found to be high in washing utensils and preparation of dough i.e. 4.780 with std. error ± 0.138 with SD value 0.757 and 4.666 with std. error ± 0.145 with SD value 0.797 respectively. Whereas energy expenditure in chapatti making activities 4.302 with std. error ± 0.127 with SD value 0.697 was found to be lowest. In case of urban areas respondents required maximum energy required for washing utensils and lowest for

chapatti making as in case of rural area. Hence in nut shell utensils and chapatti making activity observed to be the strenuous and light kitchen activity respectively.

Physiological problems during kitchen activity in rural and urban area

For calculating the physiological problem of respondents various parameters i.e. pain in neck, shoulder, upper arm, mid arm, lower arm, and pain in legs were taken for two selected activities e.g. chapatti making activities and washing utensils. Further the

perceived problems were assessed with the application of 5 point scale and discussed as under following subheads (Fig. 1).

Physiological problems during chapatti making activity in existing kitchen design of rural and urban area

The result in Table 2 highlights the physiological problem of selected respondents observed during chapatti making activity in existing kitchen design in rural and urban area.

Table.1 Energy Expenditure for selected activities in rural and urban area (n=60)

| S.No. | Activity | Rural (30) | | Urban(30) | |
|-------|-------------------------------|-----------------|-------|-----------------|-------|
| | | Mean | SD | Mean | SD |
| 1. | Washing and Cutting Vegetable | 4.421 ±0.178 | 0.976 | 4.367 ±0.130 | 0.716 |
| 2. | Preparation of Dough | 4.751 ±0.175 | 0.962 | 4.666 ±0.145 | 0.797 |
| 3. | Chapatti Making | 4.238 ±0.192 | 1.052 | 4.302 ±0.127 | 0.697 |
| 4. | Grinding mashala on stone | 4.887 ±0.183 | 1.007 | 4.505 ±0.128 | 0.701 |
| 5. | Washing Utensils | 4.885 ±0.240 | 1.315 | 4.780 ±0.138 | 0.757 |

Table.2 Physiological Problems during chapatti making activity in rural and urban area (n=60)

| S.No. | Parameters | Rural (30) | | | | | Urban (30) | | | | |
|-------|-------------------|--------------|---------------|---------------|---------------|--------------|------------|---------------|---------------|--------------|-------|
| | | VS | S | M | L | VL | VS | S | M | L | VL |
| | | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) |
| 1. | Pain in Neck | - | 4 (13.40) | 13 (43.30) | 13 (43.30) | - | - | 2 (06.70) | 20 (66.70) | 8 (26.60) | - |
| | Pain in Shoulder | - | 7 (23.30) | 17 (56.70) | 6 (20.00) | - | - | 27 (90.00) | 2 (06.70) | 1 (03.30) | - |
| 3. | Pain in Upper arm | - | 7 (23.30) | 16 (53.30) | 7 (23.40) | - | - | 13 (43.30) | 16 (53.30) | 1 (03.40) | - |
| | Pain in Mid back | 2 (06.70) | 8 (26.70) | 12 (40.00) | 8 (26.60) | - | - | 14 (46.70) | 15 (50.00) | 1 (03.33) | - |
| 5. | Pain in Low arm | - | 10 (33.30) | 13 (43.30) | 6 (20.00) | 1 (03.40) | - | 8 (26.70) | 21 (70.00) | 1 (03.33) | - |
| | Pain in Legs | - | 7 (23.30) | 14 (46.70) | 9 (30.00) | - | - | 8 (26.70) | 20 (66.70) | 2 (06.60) | - |

Table.3 Physiological problems during washing utensils activity in rural and urban area

| S.No. | Parameters | Rural (30) | | | | | Urban (30) | | | | |
|-------|-------------------|------------|---------|---------|---------|---------|------------|---------|---------|---------|-------|
| | | VS | S | M | L | VL | VS | S | M | L | VL |
| | | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) | (F&P) |
| 1. | Pain in Neck | - | 8 | 16 | 5 | 1 | - | 2 | 20 | 8 | - |
| 2. | Pain in Shoulder | - | (26.70) | (53.30) | (16.70) | (03.30) | - | (06.70) | (66.70) | (26.60) | - |
| | Pain in Upper arm | 3 | 18 | 8 | 1 | - | - | 27 | 2 | 1 | - |
| 3. | Pain in Mid back | (10.00) | (60.00) | (26.70) | (03.30) | - | - | (90.00) | (06.70) | (03.30) | - |
| | Pain in Low arm | 1 | 16 | 12 | 1 | - | - | 13 | 16 | 1 | - |
| 4. | Pain in Legs | (03.30) | (53.30) | (40.00) | (03.40) | - | - | (43.30) | (53.30) | (03.40) | - |
| | Pain in Neck | 4 | 16 | 9 | 1 | - | - | 14 | 15 | 1 | - |
| 5. | Pain in Shoulder | (13.33) | (53.33) | (30.00) | (03.40) | - | - | (46.70) | (50.00) | (03.30) | - |
| | Pain in Upper arm | 2 | 12 | 14 | 2 | - | - | 8 | 21 | 1 | - |
| 6. | Pain in Mid back | (06.70) | (40.00) | (46.60) | (06.70) | - | - | (26.70) | (70.00) | (03.30) | - |
| | Pain in Low arm | - | 11 | 15 | 4 | - | - | 8 | 20 | 2 | - |
| | Pain in Legs | - | (36.70) | (50.00) | (13.30) | - | - | (26.70) | (66.70) | (06.70) | - |

VS-Very, Sever, S-Sever, M-Moderate, L-Light, VL-Very Light

Fig.1 Distribution of respondents according to energy expenditure for selected activities in rural and urban area

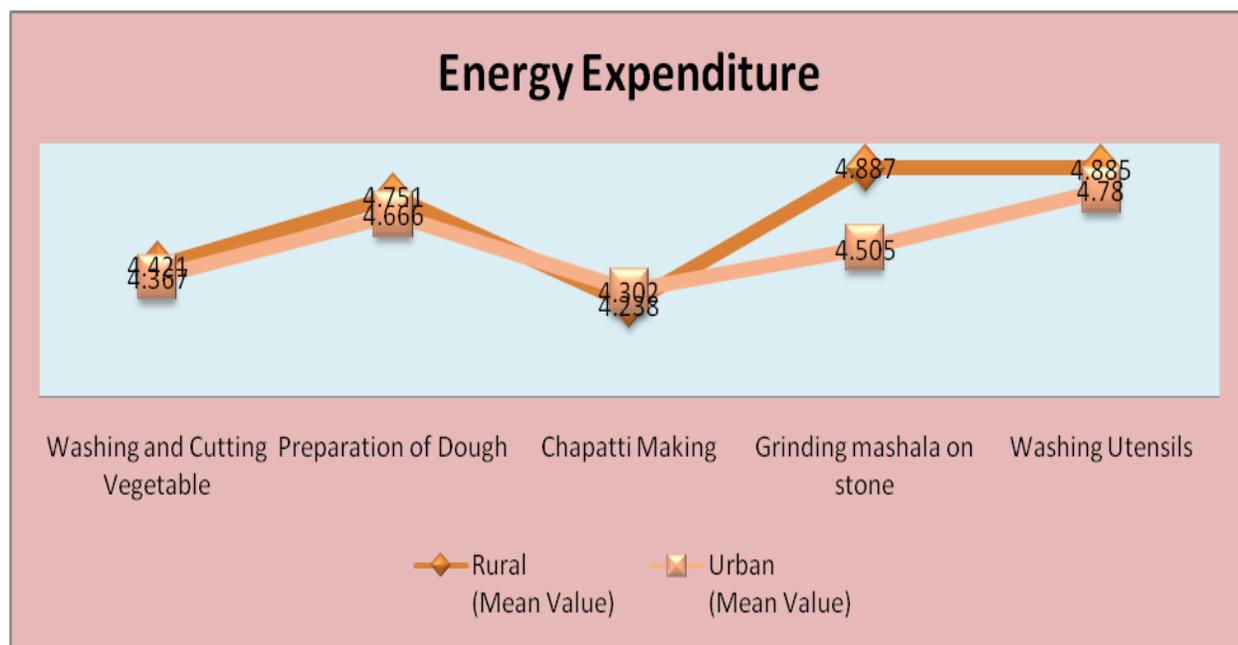


Fig.2 Percentage distribution of respondents according to physiological problem during chapatti making activity in rural and urban area

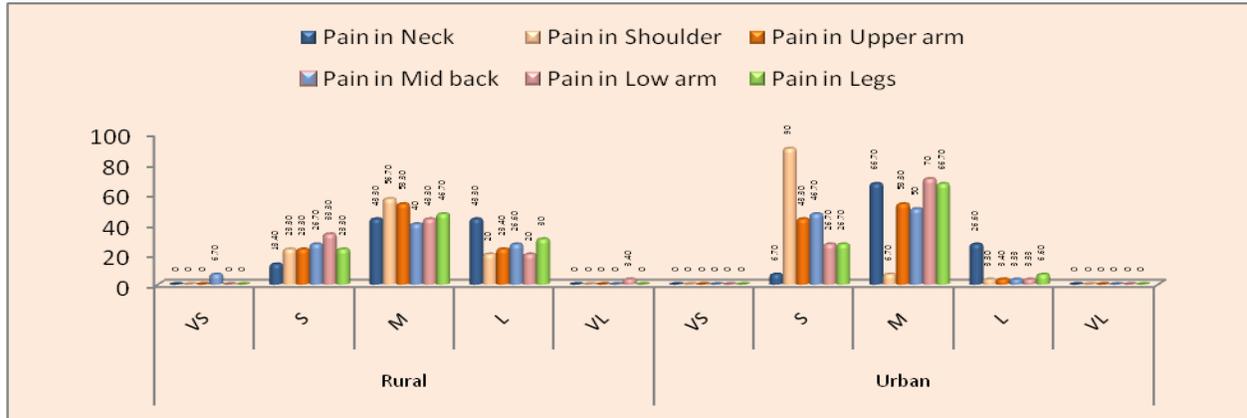
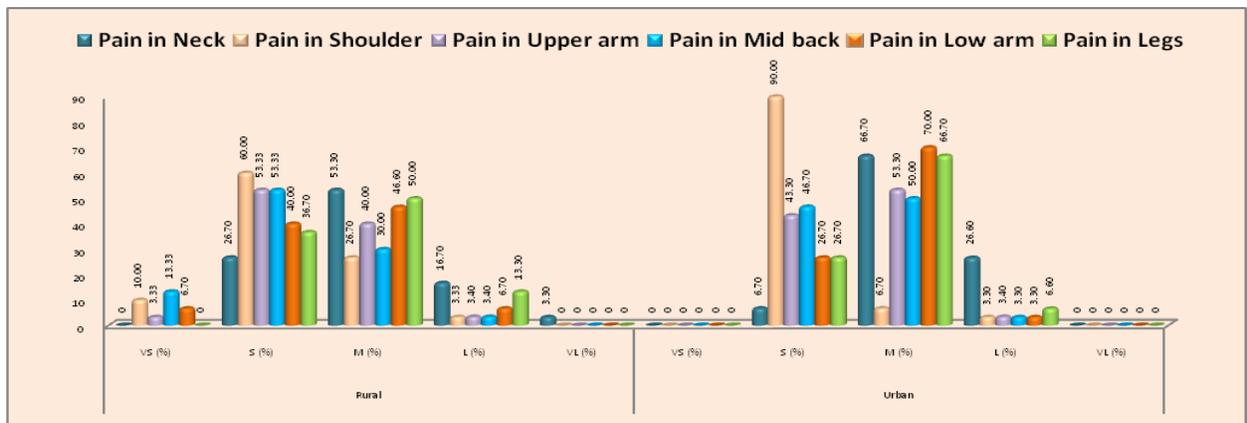


Fig.3 Percentage distribution of respondents according to physiological problem during washing utensils activity in rural and urban area



The result pertaining to the physiological problems of respondents revealed that in rural areas majority of respondents (43.30%) expressed the moderate pain in their neck followed by the selected women reported that they felt sever pain in their shoulder.

Whereas more than half of the respondents (53.30%) told that they had moderate pain in their upper arm, 43.30 percent respondents complained that they had moderate pain in legs. While in case of urban area majority of respondents (66.70%) complained about moderate pain in neck, followed by 90 percent were reported to have severe pain in their shoulder, 53.30 percent were complained

about moderate pain in their upper arm (50%) were complained about moderate pain in mid back whereas 70 percent selected women felt their moderate pain in their lower arm and 66.70 percent women were having moderate pain in their legs (Fig. 2).

Physiological problem during washing utensils in existing kitchen design of rural and urban area

Data in the Table 3 gives the information regarding the physiological problem faced by the selected respondents while washing utensils in their kitchen. It was observed that in rural areas majority of respondents

(53.30%) reported that they were facing moderate pain in their neck during performing washing utensils which was followed by sixty percent respondent felt severe pain in their shoulder, (53.30%) had severe pain in upper arm, whereas (53.30%) respondents reported to have severe pain in their low arm, while fifty percent of the respondents had moderate pain in their legs. In case of urban area majority of respondents (66.70%) were felt moderate pain in their neck followed by a large number of respondents (90%) had moderate pain in their shoulder. While 53.30 percent respondents had moderate pain in their upper arm, half of the respondents (50%) had moderate pain in mid back, moderate pain in their low arm (70%) and 66.70 percent reported that they need to get pain in sitting position for their legs during washing utensils in standing a longer time position (Fig. 3).

In conclusion, research in this area revealed that use of ergonomic science in disposing of day to day work load of house wife worker and workplace relationship which will help the homemakers to minimize the physical and temporal cost of selected household activity. A good working posture reduces the physiological cost of work and fatigue to the minimum, whereas static muscular efforts and incorrect postures for long periods during household activities can damage intervertebral discs. The efficiency of any physical activities varies according to the type of activity and manner in which it is performed.

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