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## RESEARCH ARTICLE

### IMPORTANCE OF ANTHROPOMETRIC MEASUREMENT FOR DESIGNING RELAXING CHAIR FOR RESTAURANT WORKERS

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#### ABSTRACT

Restaurant workers, who works in the kitchen, doing the different activities in continuous standing posture and spent most of the time inside the buildings and therefore experience the greatest amount of exposure while performing various activities and at greatest risk. The workers working in the restaurants withstand the pressure, string of working for long hours, suffering from high blood pressure due to prolong standing posture, lifting heavy pots and kettles and working near hot ovens and grills. An occupational hazard includes slips and falls, cuts and burns. Restaurant relaxing chair is one of important furniture design that cause people especially who work in the restaurant feel comfortable after prolong stand. Each parts of chair should be designed properly so that it can have more ergonomics characteristics to ensure the user to get a good posture. It also can assist the user to minimize fatigue and injury by fitting the chairs to the body size, and also suggest the strength and range of movement. Correct sitting and standing posture is an important factor for the prevention of musculoskeletal symptoms. Therefore, the study was undertaken design of ergonomically functional and aesthetically sound relaxing chair for kitchen related standing activity. For the present study 120 workers were selected from the four south Indian restaurant i.e. Sri nidhi sagar, Raaga the family restaurant, Tamarind and Inchara the family restaurant, Bangalore city, Karnataka State. Descriptive cum experimental research design was used for the present study. Purposive sampling procedure was followed to select the sample and data was gathered by interview method. It was found that the restaurant workers faced lot of problems due to non availability of relaxing chair at their work unit. Hence due to prolong standing posture and, continuous working hours and absence of relaxing of body they suffered with arthritis problem, lower and upper back problem, headache, swelling on ankles, stiffness in leg and hand joints, numbness in body, reduced grip strength, limiting movement of fingers etc.

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#### INTRODUCTION

The hotel, restaurant and catering sector covers a wide range of different Businesses, including hotels, pubs and restaurants, contract caterers in various industrial and commercial premises, fast-food ,cafes and bistros. It plays an important role as a job creator in the service sector and in the economy as a whole in many States. 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. A common pain that related to this situation is Musculoskeletal Disorder (MSD). The pain is related to the damage or defect happen to any parts of the worker's body especially the thoracic area which is at the back side body part of the worker. This could happen if the restaurant worker does not practice the right position during work. This pain can be a permanent pain if there is no action

or research taken to help restaurant workers in increasing the level of comfort while working. Those actions can be summarized to be the change in the way of seating or in other words the design of chair used by the restaurant workers. Restaurant relaxing chair is one of important furniture design that cause people especially who are work in the restaurant feel uncomfortable after prolong stand. Each parts of chair should be designed properly so that it can have more ergonomics characteristics to ensure the user get a good posture. It also can assist the user to minimize fatigue and injury by fitting the chairs to the body size, strength and range of movement. Correct sitting and standing posture is an important factor for the prevention of musculoskeletal symptoms. Nowadays in the market there are many resources that can produce the restaurant relaxing chair in various shapes, sizes and types. According to the Vishwanathan (1991) a functionally designed restaurant kitchen is much more than merely a food storage and place for cooking, its main objective being to increase the work output with least utilization of the human resources. The restaurant kitchen must be designed as per the needs of the restaurant workers to reduce physiological

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cost of work and fatigue to the minimum as well as which maintain a good working posture. A good working posture reduces the physiological cost of work to the minimum whereas, static muscular efforts and incorrect posture for longer duration during kitchen activities may cause tiredness and may increase the energy expenditure in proportion to the physical efforts involved, leading to irreparable damage to the body (Sangwan, *et al.*, 2003). In the present study we evaluated the exposure of the restaurant workers in the kitchen related standing activities such as preparation, cooking, serving and dish washing. Four restaurants were purposively selected for the present study namely- Sri nidhi sagar, Raaga the family restaurant, Tamarind and Inchara the family restaurant, Bangalore city, Karnataka State, India. Health effects of occupational exposure due to prolong standing posture in restaurant workers, including backache, muscles pain, pain in lower leg, pain in lower back, pain in joints, shoulders, high blood pressure, increased heart rate etc. the objective for the present study was:

- ✓ Introduction of relaxing chair to enhance enterprising ability.

#### 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.

#### Delimitation

- ✓ The sample was selected from various restaurants of Bangalore city of Karnataka state.

## MATERIALS AND METHODS

Four restaurants were purposively selected for the present study namely- Sri nidhi sagar, Raaga the family restaurant, Tamarind and Inchara the family restaurant, Bangalore city, Karnataka State. An exhaustive list of restaurant workers were 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 figure.

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 was 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 figure. The assessment of the need for relaxing chair for kitchen related standing activities in restaurants were studies for one year among restaurant workers in for restaurants.

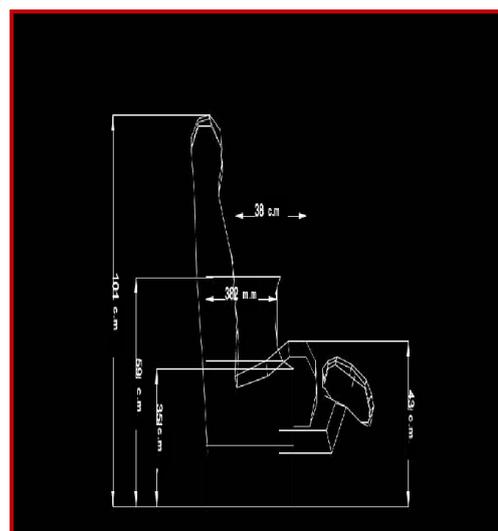
## RESULTS

### Designing through Auto CAD ergonomically functional and aesthetically sound relaxing chair

All the anthropometric measurement of workers was analyzed and on the basis of that, the final dimensions shown in the table 1 were used for the design and development of relaxing chair for restaurant workers.

**Table 1. Dimensions of designing of relaxing chair for workers**

Measurements	5 <sup>th</sup>	50 <sup>th</sup>	95 <sup>th</sup>
	percentile	percentile	percentile
Sitting height	89	90.6	96.5
Sitting eye level height	72.89	79.5	85
Buttock popliteal ht.	43.9	49.5	54.86
Buttock to knee	54	59	64.77
Sitting popliteal ht.	39.37	43.9	49
Sitting knee ht.	49	54.3	59.4
Thigh clearance	10.9	14.47	17.5
Waist depth	18	24.6	31.24
Elbow rest ht.	18	24	29
Sitting hip breadth	31	35.56	40
Forearm to forearm breadth	35	42	50.5
Hand thickness at meta carpals	2.79	3	3.3
Hand length	17.6	18.62	19.02
Palm length	10.13	10.43	10.73



**Plate 1. Side view of relaxing chair through the CAD sketching**



**Plate 2. Front view of relaxing chair in solid work**

**Comparisons between existing furniture for relaxation and ergonomically designed relaxing chair**

When the dimensions of the existing used furniture for relaxation and ergonomically sound relaxing chair were calculated for comparison then it was found that there was a measurable difference in dimensions and other features. Where it was calculated statistically, the significant difference was found in all dimensions of existing and ergonomically designed relaxing chair.

**Table 2. Comparison between the dimensions of existing chair and ergonomically designed relaxing chair**

Measurements	Dimensions of ergonomically designed relaxing chair (cm)	Dimensions of existing furniture (cm)
Sitting height	96.5( 95 <sup>th</sup> percentile)	68.3
Sitting eye level height	85( 95 <sup>th</sup> percentile)	52
Buttock popliteal ht.	54.86( 95 <sup>th</sup> percentile)	51.3
Buttock to knee	64.77( 95 <sup>th</sup> percentile)	59.1
Sitting popliteal ht.	49( 95 <sup>th</sup> percentile)	43.4
Sitting knee ht.	59.4( 95 <sup>th</sup> percentile)	55.2
Thigh clearance	17.5( 95 <sup>th</sup> percentile)	13.3
Waist depth	31.24( 95 <sup>th</sup> percentile)	23
Elbow rest ht.	29( 95 <sup>th</sup> percentile)	-
Sitting hip breadth	40( 95 <sup>th</sup> percentile)	37
Forearm to forearm breadth	50.5( 95 <sup>th</sup> percentile)	42.6
Hand thickness at meta carpals	3.3( 95 <sup>th</sup> percentile)	-
Hand length	19.02( 95 <sup>th</sup> percentile)	-
Palm length	10.73( 95 <sup>th</sup> percentile)	-

As the existing furniture was not properly comfortable for foot rest, back rest, hand rest and head rest, therefore, employees were reluctant to regular use of there. In the present investigation design and development of relaxing chair was done on the basis of anthropometric data of users which need to be tested on the basis of relevant standards.

**Conclusion**

The restaurant industries are not ready to compensate with employees having partial and full injuries and are not covered by life insurance. Adequate relaxing equipment like relaxing chair should be provided to the restaurant workers so that they can relax their foot, hand, head and neck and workers can work comfortably. The data showed that 30.83 percent worker’s lower back and 23.33 percent worker’s leg and feet were the main affected body part from pain or discomfort. The mean height of the restaurant workers was 165.13 cm and average weight was 57.36 kg. mean value of standing eye height, standing overhead reach, standing forward reach, sitting height, sitting eye level height, buttock popliteal height, buttock to knee height, sitting knee height, thigh clearance, waist depth, elbow rest height, sitting hip breadth, forearm to forearm breadth, hand thickness at metacarpals are of restaurant workers were 164.34cm, 222.78 cm, 88 cm, 91 cm, 80 cm, 50 cm, 59 cm, 44 cm, 54 cm, 14 cm, 25 cm, 24 cm, 36 cm, 42.2 cm, 3.12 cm respectively. The anthropometric measurement required for designing the relaxing chair for the restaurant workers were taken on controlled group. The relaxing chair was designed through auto cad. On the basis of anthropometric data recorded of the restaurant workers by calculating 5th, 50th and 95th percentile. The relaxing chair was designed in such a manner so that the workers can relax and support their hand, back, leg and head.

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