

## Indoor environmental condition, health and productivity of female workers

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### ABSTRACT

The present paper is an attempt to gather information regarding the various environmental factors including illumination level, noise level, humidity, temperature in the kitchen work station. For this a survey of eighty homemakers from Ludhiana was conducted. Majority of the surveyed kitchens were found having adequate light intensity, but there were also considerable number of kitchens where the illumination level were less than the minimum recommended levels. Amongst the various problems felt with illumination majority faced problems of less natural light in kitchen, followed by respondents who complained of poor visibility, uneven distribution of light, and a few reported absence of task light on the different centres of the kitchen. Results revealed that noise level in the kitchen varied from 40 to 85 dB and humidity from 44 to 56 %. Majority of the kitchens had maximum temperature in the cooking area which ranged from 30 – 31°C.

**KEY WORDS :** Light intensity, Indoor-environment, Ergonomics, Kitchen

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### INTRODUCTION

Being the most important room in a house, environment of the kitchen should be highly conducive when performing daily kitchen activities. Environment in which the worker works, viz., relative humidity, light intensity, noise and temperature etc. greatly affects the productivity, health and ergonomic cost of work. As stated by Chakrabarti (1997) the workstation must be ergonomically designed in accordance with human functions, such as: postural control and distribution of the body weight, visibility ranges for display and control areas, optimal positioning of the hands and foot control, and user's behavioral pattern in performing the tasks. The present study has been planned to fill the gap, and to evaluate the general working conditions of kitchen environment where majority of the time is spent by the homemaker in performing different activities.

### METHODOLOGY

Present study was conducted in Ludhiana city. A representative sample of 80 homemakers 40 each from

east and west zone of Ludhiana district were selected for the study. A self-structured interview schedule was used for collection of data. The interview schedule consisted of socio-economic status of the family which gathered information related to occupation, education, income, family type, family, size and specific information like kitchen noise level, kitchen illumination level, humidity and temperature. Besides that the problems faced by the homemaker due to various environmental conditions were also assessed. Data for the study were collected through personal interview method. Equipments like noise level meter, hygrometer, thermometer and luxmeter were used to record data. The data collected were tabulated and suitable statistical tool such as frequency, averages, percentages, correlation coefficient and standard deviation were used for analysis of data.

### OBSERVATIONS AND DISCUSSION

The findings of the present study as well as relevant discussion have been summarized under following heads:

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**Lighting condition of the kitchen:***Light intensity at different work centres of the kitchen:*

As revealed in Table 1, the maximum intensity of light was on the cooking area *i.e.* 320 lux and minimum *i.e.* 59 lux on the washing area. It could be assumed that in some of the families sink area was not considered important, which otherwise was equally important in comparison to other centres from hygienic point of view. Further, it was found that in majority (55 per cent) of the kitchens cooking area had light intensity from 247 to 320 lux, in preparation area for 41.25 per cent it was from 234 to 310 lux and in sink area majority (48.75 per cent) had light intensity from 139 to 299 lux. While comparing these findings with National Building Code of India (2002), majority of the surveyed kitchens were found having adequate light intensity, but there were also considerable number of kitchens where the illumination levels were less than the minimum recommended levels. And it is a matter of concern as poor vision could reduce task performance and it could be one of the major contributions to accident or injury in the kitchen.

**Table 1 : Light intensity at work centres of the selected kitchens**

Observed value (Lux)	Number	Percentages
<b>Cooking centre</b>		
101 -174	09	11.25
174 -247	27	33.75
247 – 320	44	55.00
<b>Preparation centre</b>		
82 -158	16	20.00
158- 234	31	38.75
234 – 310	33	41.25
<b>Washing centre</b>		
59 – 139	11	13.75
139 – 219	39	48.75
219 – 299	30	37.50

*Source of illumination in the kitchen:*

It is quite clear from Table 2 that the most commonly used source of light during daytime was natural light (37.5

**Table 2 : Source of illumination in the selected kitchens**

Illumination	Daytime				Night time		
	CFLs	Incandescent light	Fluorescent tubes	Natural light*	CFLs	Incandescent light	Fluorescent tubes
Source	31 (38.75)	18 (22.50)	07 (8.75)	30 (37.50)	37 (46.25)	28 (35.00)	36 (45.00)
<b>Location</b>							
Cooking	15 (48.39)	13 (72.22)	-	-	17 (45.94)	12 (42.85)	12 (33.33)
Preparation	16 (51.61)	02 (11.11)	07 (100)	-	14 (37.83)	16 (57.14)	22 (61.11)
Sink	-	03 (16.66)	-	-	06 (16.21)	-	02 (5.55)

\*Only natural light was source of illumination \*\*Multiple responses

per cent) and CFLs (38.75 per cent) and during night time a combination of sources like CFLs (46.25 per cent), fluorescent tubes (45 per cent) and incandescent light (35 per cent) were the source of illumination in the kitchen. It was also observed that mostly the source of illumination was located above the preparation area where task lighting is considered important for different kitchen centres, but as such in none of the kitchen provision of task lighting was there.

**Problems faced due to illumination:**

Data given in Table 3 reveal the information regarding the problems faced due to poor and improper illumination. From the survey it was found that 25 per cent of the respondents had problems related to illumination level. Most of the respondents (70 per cent) faced problems of less natural light in kitchen, followed by respondents who complained of poor visibility (45 per cent), uneven distribution of light (35 per cent), and a few (20 per cent) reported absence of task light on different centres of the kitchen.

**Table 3 : Illumination related problems faced by the respondents**

Comfort able illumination	Number	Percentage
Yes	60	75.00
No	20	25.00
<b>Problems faced*</b>		
Less natural light	14	70.00
Poor visibility	09	45.00
Uneven light distribution	07	35.00
Absence of task light	04	20.00

\*Multiple responses

**Temperature ( $^{\circ}$ C) at different work centres of the kitchen:**

From the Table 4, it can be observed that majority of the kitchens had maximum temperature in the cooking area which ranged from 30 - 31 $^{\circ}$ C. On the other hand in preparation and washing centres temperature range

**Table 4 : Work centre temperature during activity in the selected kitchens**

Centre	Range of temperature (°C )					
	28 -29		29 – 30		30 – 31	
	No.	%	No.	%	No.	%
Cooking	15	18.75	29	36.25	36	45.00
Preparation	33	41.25	28	35.00	19	23.75
Washing	35	43.75	33	41.25	12	15.00

Recommended level : 20-24 °C (Grandjean, 1973)

observed was mostly 28 - 29°C.

In the cooking area, majority of the respondents considered temperature to be too high (65 per cent) and some of the respondent (35 per cent) felt it as tolerable. Whereas in the preparation and washing areas all of the respondents were of the view that temperature is quiet comfortable (100 per cent).

**Noise level at different work centres of the kitchen:**

The perusal of Table 5 indicates that noise level in the kitchen varied from 40 to 85 dB. In cooking area majority (56.25 per cent) of the kitchens had noise level in the range of 40 to 55 dB, whereas in preparation and

**Table 5 : Observed noise values at different work centers of the selected kitchens**

Centre	Range of noise level (dB )					
	40 – 55		55 – 70		70 – 85	
	No.	%	No.	%	No.	%
Cooking	45	56.25	29	36.25	6	7.50
Preparation	27	33.75	43	53.75	10	12.50
Washing	23	28.75	38	47.50	19	23.75

Recommended level : 40 dB (Grandjean, 1973)

washing area, it was between 55 to 70 dB in 53.75 per cent and 47.50 per cent of the kitchens, which is very high as compared to the recommended value, *i.e.* 40dB, given by Grandjean (1973). In this direction, homemakers need to be educated so that higher level causing unnoticeable effects on the worker could be avoided.

Homemakers were further interviewed regarding the noise level tolerance. The majority of respondents were of the view that the noise levels were tolerable (71 per cent), few respondents considered it to be quiet (23 per cent), and only 6 per cent responded saying that noise levels in the kitchen were too high to tolerate. The reason for more noise load in the urban kitchens may be due to more motor driven equipments used by them in the kitchen. Few respondents were of the view that outside noise level was also adding to the noise level produced while working in the kitchen.

**Table 6 : Humidity level of the selected kitchens**

Humidity level (%)	Number (n= 80)	Percentages
44 – 48	28	35.00
48 – 52	30	37.50
52 – 56	22	27.50

Recommended relative humidity 45% (Grandjean, 1973)

**Humidity level in the kitchen:**

From Table 6, it is clear that in majority (37.50 per cent) of the kitchens, the humidity level was 48 to 52 per cent, followed by kitchens where it was 52 to 56 per cent (27.50 per cent) and few where it was observed to be 44 to 48 per cent (35.00 per cent). All the respondents were of the view that the humidity level was quite comfortable (100 per cent).

**Ventilation in kitchen:**

To find the ventilation of the selected kitchens, information was gathered to find the type of ventilation source in the kitchens. From the data presented in Table 7, it can be observed that the source of ventilation was exhaust fan in 35 per cent of the kitchens, windows in 33.75 per cent, ventilator in 22.5 per cent, and electric chimney in 13.75 per cent. There were few kitchens where

**Table 7 : Source of ventilation in the selected kitchens\***

Source of ventilation	Number	%
Exhaust fan	28	35.00
Window	27	33.75
Ventilator	18	22.50
Electric chimney	11	13.75
Only door	6	7.50

\*Multiple responses

no source of ventilation was available except doors (7.5 per cent) of the kitchens. Such a situation can become a serious hurdle in maintaining the ventilation and comfort level for working in such kitchens.

**Ratio of window to floor area of kitchen:**

The ratio of window to floor area for a proper air exchange and ventilation level should be minimum 0.15 (Deshpande, 1965). From Table 8 it can be observed that

**Table 8 : Window and floor area ratio of the selected kitchens**

Ratio of window/ kitchen area	Number (n=80)	%
Less than 0.15	22	27.5
0.15 and more	58	72.5

in majority of the cases, this ratio was more than the minimum recommended ratio (72.5 per cent), indicating that ventilation level was proper in most of the kitchens which can enhance the working of the worker in the kitchen.

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## **LITERATURE CITED**

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