

# Heat Burn Injuries in Indian kitchen: A Cross Sectional Study in Udupi City

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**Abstract:** Burn injuries are a serious global health problem worldwide and still very common in developing countries. These are the most severe types of injuries suffered by the human body that may require long hospitalization and large sums of money. Most of the burn injuries occur in kitchens. The purpose of this study was to find out the prevalence of unintentional burn injuries in Indian kitchens and its associated factors. A population based cross-sectional study was conducted in Udupi city between February 2013 and July 2013. The prevalence of burn injuries was 47 %. The most common type of burn injuries were contact (65.6%) and scald (60.8%) burn injuries. The most affected body part was upper extremities (77.6%). In the winter, 48.8 % reported burns and the most common time when burn injuries occurred was between 5 pm to 11 pm. It was found that illiteracy, socio-cultural and behavioural factors led to unsafe behaviour, placing individuals at risks of unintentional injuries, which can be targeted as a first step towards prevention. The knowledge about cooking appliance maintenance and using safe cooking appliances including Liquid Petroleum gas could play major role in reducing burn accidents.

**Keywords:** Burn injuries, domestic injuries, kitchen safety, Chulha, Liquid Petroleum gas etc

## 1. Introduction

A burn is an injury to the skin or other organic tissue primarily caused by thermal or other acute trauma, according to the International Society of Burn Injuries. It occurs when some or all of the cells in the skin or other tissues are destroyed by hot liquids (scalds), hot solids (contact burns), or flames (flame burns). It is a major public health problem worldwide.<sup>2</sup>

Viewed globally, burn injury is one of the leading causes of trauma death and one of thirty leading causes worldwide of loss of life years due to premature mortality and years lived with disability.<sup>1</sup>The global burden of burn injuries is very high with an incidence of 11 million in 2004.<sup>2</sup>It is the fourth most common type of trauma worldwide, following traffic accidents, falls and interpersonal violence<sup>3, 4</sup> and this is higher than the combined incidence of tuberculosis and HIV infection.<sup>5</sup> An estimated 195,000 deaths annually occurs because of burn.<sup>2</sup> Burn related problems in third world countries are thus both greater than and different from problems encountered in the western world.<sup>6,7,8,9</sup> It is because of lack of awareness among people and lack of availability of good health care services in low and middle income countries.<sup>3,10,11,12,13</sup>

Developing countries have a high incidence of burn injuries<sup>2</sup>, affecting a large number of populations. The epidemiology of burn injuries is different from that in the developed world. Burns occur mainly in the home and workplace. There are few studies in different part of world i.e. in Bangladesh and Ethiopia show that 80–90% of burns occur at home<sup>2</sup> and in Iran, it was found that more than 90% of burns occurred at

home.<sup>14</sup> The home, which is considered to be a safe place by most people, can be a dangerous place where injuries frequently occur. Most burn injuries are sustained by women aged 16-35 years because females are mainly responsible for cooking and most work at floor level in relatively unsafe kitchens.<sup>15</sup> The other various socio-cultural factors present in the country may be high population density, poor housing conditions, poor maintenance of electric appliances, customs of wearing sarees or dupatta while cooking, dowry, illiteracy, ignorance and poverty.<sup>2</sup>

Every year, more than 2 million people sustained burns in India, with about 500,000 people treated as outpatients. About 200,000 were admitted in hospitals and 5000 died.<sup>16</sup> In India, during 2007, 20,772 persons lost their lives in a burn injury and 2793 were seriously injured indicating extreme under reporting of nonfatal injuries. In Karnataka, during the same year, 1,587 deaths and 30 serious burn injuries were reported. The number of burn injuries in Bengaluru is not clearly known<sup>17</sup> but the approximate figure was 360 persons who lost their lives and 2,517 persons were admitted in different 21 hospitals for burn injuries. So the estimated ratio of deaths to hospitalization and to minor injuries in Bangalore was found around 1: 10: 30.<sup>19</sup>

It is known that most of the time the exact picture of all data for physical injuries in a community is not available because hospital data shows only a fraction of complete picture.<sup>20,21,22,23</sup> The actual numbers could be much higher as many receiving care in nearby clinics or nursing homes and in other institutions have not been included. Minor burns represent a great impact in sick leave and their sequel are sometimes no less burdensome to the patient but most of the studies are hospital based and they provide data

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for major injuries.<sup>12</sup> But both major and minor burn injuries are important from public health point of view. Epidemiology of minor burns is not well defined worldwide.<sup>24</sup> This study focuses on both the major and minor burn injuries.

## 2. Objectives

- 1) To find out the prevalence of burn injuries during cooking process at home
- 2) To assess different types, mode and pattern of burn injuries
- 3) To find out major factors related to burn injuries and association between them

## 3. Subject and Method

The study was conducted in Udupi city in Karnataka in Southern India. It was a community based cross sectional study conducted between February 2013 to July 2013. According to census 2011, Udupi city has 45413 households in all 35 wards. Every ward was considered as a geographically defined cluster. Proportional allocation method was used to calculate the number of households to be interviewed from each ward, and one house was taken as one unit in the study. The selection of households was random. In each selected household, only one individual, aged 18 and above and was cooking regularly at their home was interviewed. The same method was applied until the sample size achieved.

The estimated sample size was 257 with 95% confidence interval and 15 % relative precision. The prevalence of burn injuries while cooking was taken as 50 % because of unavailability of community based data for burn injuries. Interview started with explaining the purpose of the study and obtaining informed written consent of each participant. Participants were included until the desired sample was achieved from that cluster. All 35 wards were covered. Ethical clearance was obtained from the concerned. Data was analysed using the Statistical Package for the Social Sciences (SPSS) version<sup>15</sup>. Descriptive statistics and univariate analysis were performed.

## 4. Results

This chapter is divided into three parts namely socio-demographic, cooking practices in kitchen and prevalence of burn injury and its associated factors.

### 4.1 Socio-demographic characters

The socio-demographic factors revealed that most of the (54.5%, 145/266) participants were in age group 18 to 44 years. Females were predominated (95.1%, 253/266) over males in this sample. Most participants (83.1%, 221/266) were married. The majority (59%, 157/266) lived in nuclear or extended nuclear families. The larger majority of individuals (45.1%, 120/266) had secondary education followed by higher education (31.2%, 83/266) and mostly were unemployed (67.7%, 180/266).

### 4.2 Cooking practices

Kitchen was the exclusive place of cooking in most of the households (90.6 %, 241/266). The majority of participants (85.3%, 227/266) were using Liquid Petroleum gas with 2 or more burners followed by Chulha (28.6 %). More than half (54.1 %, 144/266) of the participants get repaired their cooking appliance by expert. Only 1.5 % participants were using apron and the common method for holding the hot dishes used by participants was cloth (85 %).

### 4.3 Burn injuries

Out of a total of 266 respondents only 125 respondents had burn injuries during last one year and thus the prevalence of burn injuries was found 47 which include both major and minor burn injuries. In burn respondents majority of participants (56%, 70/125) belongs to the age group 18 to 44 year with female predominance (92.8%, 116/125). Most the burn respondents (82.4%, 103/125) were married.

Burn characteristic data shows that majority of burn injuries were contact burn injuries (65.5%, 82/125) followed by scald burn injuries (60.8%, 76/125). The most affected body part from burn was upper extremities (77.6%, 97/125). Most of the burn injuries occur during winter season (48.8 %, 61/125) and 5 pm to 11 pm was the peak time for the majority of burn injuries (46.4%, 58/125).

The present study results shows that people with higher education level have good knowledge about safety measures and practices and found statistically significant association between education level and periodically checking of cooking appliances ( $P < 0.001$ ) and also with regular gas tube replacement ( $P < 0.001$ ).

The people who were using only Chulha (60 %) are having more burn injuries than those who are using only gas burner (42.7 %) but the association was found to be statistically non-significant ( $P = 0.107$ ).

Our study revealed that burn injuries are more common (52.9 %,) where working condition of cooking appliances were improper than those where cooking appliances were working properly (46.1 %) but the association was found to be statistically non-significant ( $P = 0.457$ ).

Participants who used to cook at floor level, 51.8 % are having more burn injuries as compared to 45.3% in those who cook at standing level. However the association was statistically non significant ( $P = 0.405$ ).

First response toward burn injuries was different for different peoples depending upon their knowledge and practice. Most of the participants (62.4 %, 78/125) were using either cold water or ice following home-remedies 27 (21.6 %).

Figure

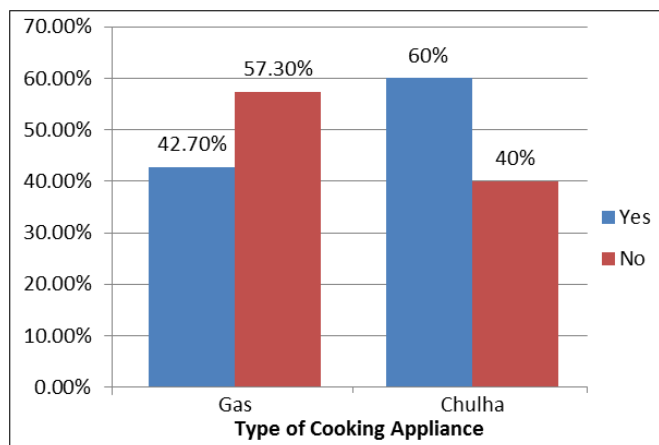


Figure 1: Distribution of percentage of burn victims according to cooking appliances used (N = 125)

## 5. Discussion

Burn injuries and its consequences like morbidity, mortality and disabilities are major public health problem. These burn injuries are the most severe injury a person can suffer. In developing countries like in India this condition is more severe. Age and sex are very important epidemiological determinants for any burn injury. More than half of people were in age group 18 to 44 years (productive) which concurs with other reports from other studies of India<sup>25</sup> Jordan<sup>26</sup> as well as other Egyptian studies<sup>27, 28</sup> and some hospital data also shows up to 70% in the same age group. Most of the participants working in the Indian kitchen were females. This is because of socio-cultural factors where females are mainly responsible for domestic activities like cooking at home. In most of the families kitchen was the exclusive place for cooking followed by corridor and then living room. The almost same pattern is also found in Iranian study<sup>29</sup>, where mostly people were using separate kitchen for cooking followed by living room. Liquid Petroleum gas was the commonest cooking appliance used by the participants followed by Chulha. There were few families who were using Liquid Petroleum gas and Chulha for cooking. It is directly related to socio-economic status of the family. People with good socio-economic status have separate room for cooking as kitchen and use all safe and sophisticated cooking appliances while people with poor socio-economic status don't have separate room for cooking and still using open fire for cooking.

People who were using open fire like Chulha or kerosene stove are more prone to get burnt than those who were using Liquid Petroleum gas. Some other studies also show the similar observation that use of open fire for cooking particularly when placed at ground level, chulha and kerosene stove are major risk for burn injuries in developing countries.<sup>30,31,32,33,34</sup> In this present study we also found that cooking at floor level is risky. People who used to cook at floor level get more burn injuries. Some other studies findings also suggest that people cooked at floor level are more prone for burn injuries.<sup>13,35,36,37</sup>

We observed that where cooking appliances were not working properly the burn injuries were more. These results suggest that if they maintain their cooking appliances and go for periodical check up of cooking appliances by experts then it can reduce the incidence of burn injuries. Few other studies in other developing countries also suggest the same data. A Nepal Bhumistan study showed that use of smokeless Chulha cooking reduced the incidence of burn injuries in rural settings.<sup>38</sup> So few such interventions may help in people with low socio economic status who still relies on open fire.

First aid or first treatment for burn injuries various person to person. Most of the people used cold water or ice for applying followed different home remedies i.e. toothpaste, coconut oil, any cold cream, tamarind and some herbs. Only few were using proper allopathic medicines i.e. SOS, silverx and bernol. Most of the people were not aware of the first aid for burn injuries. While for the proper treatment maximum people used to apply herbal remedies. An Ethiopian study results showed that only 13.5 % applied cold water, 20 % applied some oil or Vaseline and majority of people used home remedies like herbs, mud or urine.<sup>39</sup>

## 6. Conclusion

Cooking appliances i.e. Liquid Petroleum gas was safe and easy to handle while Chulha was unsafe to use. So people should be motivated to use safe cooking appliances (Liquid Petroleum gas) or if not possible then should use other safe and cheap appliances. Floor level cooking was risky and contributing to a large number of burn injuries. Contact and scald burn injuries were the main type of burn injuries. Most of the time pot holding instrument was not properly used. The knowledge regarding adequate first aid has been dismally poor among the community. Most of the burn injuries were preventable and having proper safety knowledge while cooking can reduce this burden.

## 7. Other Recommendations

Health and safety education, safer forms of heating and cooking devices may help. The regular maintenance of cooking appliances and safety practices will be extremely beneficial for them. Sometimes "Domestic burn prevention program" and "Community awareness program" for the target group of ladies and teenage girls should be conducted periodically. Appropriate health education should be given for first aid to abolish harmful practices.

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**Table 1:** Distribution of participants according to their socio demographic profile and cooking practices in kitchen (N= 266)

Characteristic	N (%)
<b>Age in years</b>	
Between 18 to 44	145 (54.5%)
Between 45 to 64	99 (37.2%)
Above 65	22 (8.3%)
<b>Gender</b>	
Male	13(4.9%)
Female	253 (95.1%)

<b>Marital status</b>	
Single	15(5.6%)
Married	221(83.1%)
Widow	28(10.5%)
Separated/Divorced	2 (0.8%)
<b>Family type</b>	
Nuclear	157 (59%)
joint	109 (41 %)
<b>Education</b>	
Illiterate 6(2.3%)	6(2.3%)
Read and write	11 (4.1%)
Elementary	46 (17.3%)
Secondary	120 (45.1%)
Higher education	83 (31.2%)
<b>Occupation</b>	
Employed	86 (32.3%)
Unemployed	180 (67.7%)
<b>Characteristic</b>	<b>N (%)</b>
<b>Cooking place</b>	
Separate kitchen	241 (90.6 %)
Living room	13 (4.9 %)
Corridor	25 (9.4 %)
Outside	1 (0.4 %)
<b>Cooking appliances used</b>	
Gas burner (Multiple)	227 (85.3 %)
Gas burner (Single)	3 (1.1 %)
Stove	15 (5.6 %)
Electronic heater	9 (3.4 %)
Chulha	76 (28.6 %)
Microwave	15 (5.6 %)
Induction cooker	15 (5.6 %)
<b>Cooking appliance repaired by</b>	
Expert	144 (54.1 %)
Family member, friend, neighbour	97(36.5%)
Both	19 (7.1 %)
<b>Use of apron</b>	
Always	4 (1.5 %)
Never	253 (95.1 %)
Sometimes	9 (3.4 %)
<b>Holding instrument for hot dishes</b>	
Potholder	145 (54.5 %)
Cloth	226 (85.0 %)
Gloves	3 (1.1 %)
Newspaper	1 (0.4 %)
Barehanded	3 (1.1 %)

**Table 2:** Distribution of respondents (burn victims) according to their socio demographic profile and burn characteristics (N= 125)

Characteristic	N (%)
<b>Age in years</b>	
Between 18 to 44	70 (56 %)
Between 45 to 64	49(39.2 %)
Above 65	6 (4.8 %)
<b>Gender</b>	
Male	9 (7.2 %)
Female	116(92.8%)
<b>Marital status</b>	
Single	10 (8 %)
Married	103(82.4%)
Widow	11(8.8 %)
Separated/Divorced	1 (0.8 %)
<b>First response towards burn</b>	
Cold water & water	78 (62.4 %)
Home remedy	27 (21.6 %)

Medicine	16(12.8%)
Visit the doctor	3 (2.4 %)
Do nothing	1 (0.8 %)
Characteristic	N (%)
<b>Types of burn injury</b>	
Contact	82 (65.6 %)
Scald	76 (60.8 %)
Flame	6 (4.8 %)
Flash	2 (1.6 %)
<b>Parts of body affected</b>	
Upper extremities	97 (77.6 %)
Lower extremities	13 (10.4 %)
Head & Neck	3 (2.4 %)
Front & back	4 (3.2 %)
Multiple	22 (17.6 %)
<b>Season</b>	
Summer (Feb. to May)	54 (43.2 %)
Rainy (June to Sept)	10 (8.0 %)
Winter (Oct. to Jan.)	61 (48.8 %)
<b>Time of Occurrence</b>	
5 am to 11 am	44 (35.2 %)
11 am to 5 pm	14 (11.2 %)
5 pm to 11 pm	58 (46.4 %)
11 pm to 5 am	9 (7.2 %)

**Table 3:** Distribution of respondents (burn victims) according to their educational status, knowledge and safety measures (N= 125)

Cooking appliances checked periodically				P value (P < 0.001)
Category	Yes	No	Don't know	
Illiterate	2 (33.3 %)	1 (16.7 %)	3 (50 %)	
Read and write	5 (45.5 %)	1 (9.1 %)	5 (45.5 %)	
Elementary	27 (58.7 %)	1 (2.2 %)	18 (39.1 %)	
Secondary	96 (80 %)	1 (0.8 %)	23 (19.2 %)	
Higher education	75 (90.4 %)	3 (3.6 %)	5 (6 %)	
Knowledge about gas tube replacement				P< 0.001)
Category	Yes	No	Don't know	
Illiterate	3 (50 %)	1 (16.7 %)	2 (33.3 %)	
Read and write	5 (45.5 %)	0 (0 %)	6 (54.5 %)	
Elementary	29 (63 %)	2 (4.3 %)	15 (32.6 %)	
Secondary	104 (86.7 %)	2 (1.7 %)	14 (11.7 %)	
Higher education	72 (86.7 %)	1 (1.2 %)	10 (12 %)	

**Table 4:** Distribution of respondents (Burn victims) according to the cooking practices in kitchen

Variable	Burn injuries		Total	P value
	Yes	No		
Cooking Appliances (n= 175)				
Gas	64 (42.7%)	86(57.3 %)	150(100.0%)	0.107
Chulha	15 (60.0%)	10(40.0 %)	25 (100.0 %)	
Cooking appliance working condition (n= 266)				
Proper	107 (46.1%)	125(53.9%)	232(100.0%)	0.457
Improper	18 (52.9%)	16 (47.1%)	34 (100.0%)	
Cooking level (N= 217)				
Floor	29 (51.8%)	27 (48.2%)	56(100.0%)	0.405
Standing	73 (45.3%)	88 (54.7%)	161(100.0%)	