



Assesment of Improved Chullah in Rural Settings of Hisar

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ABSTRACT

Rural population in India depends on traditional *chullah* for the cooking purpose. They depend on biomass inputs since it is obtainable free of cost. This practice can be harmful to the respiratory health of human beings, as well as contribute to climate change. The present study was conducted on 30 households of adopted village *Budak* of *Hisar* district under NASF- ICAR project. An observation sheet was used to collect the data regarding health effects of traditional *chullah* and impact of improved *chullah*. Study found the various health related problems viz: irritation in eyes, respiratory problems, backache, low visibility, headache etc. faced by the respondents while using traditional *chullah*. Irritation in eyes was the most reported problem by the respondents as it got highest mean score (2.6 and 1st rank). Average saved time in preparing the meal by the improved *chullah* was 13.16 minutes and technical benefits got first rank (overall mean score 2.9). Improved *chullah* could save biomass input, human health and environment by reducing the time in cooking and creating less smoke or no smoke while cooking.

INTRODUCTION

Around 40 per cent of the world's population, lack current fuels for cooking while 1.6 billion people have no access to electricity, majority of them (75%) living in rural areas (Litovsky, 2007). They depend on traditional fuels such as crop residues, charcoal, wood, animal dung and other biomasses for cooking purpose. Due to high cost and low accessibility of commercial fuels such as LPG and kerosene, rural people are unable to swing to commercial fuels. Urban people with low income group (25-30% urban populations) are also heavily dependent on bio fuel due to limited availability of commercial fuel like kerosene and LPG (Balakrishnan et al., 2003; Kumar et al., 2012). Approximately 1/3 of all energy consumption in developing countries derives from burning of wood, crop residue and animal dung for their livelihood. In India, rural population contributes 68.84 per cent of the total population, census of India, 2011. About 74 per cent of rural population use fuel wood to carry out cooking in traditional *Chullah* (Mohan and Kumar, 2011). In India, women constitute half of the population. Their contribution to development has become obvious

that they are the spin around whom the family, the society and world (Kumari et al., 2009). The large numbers of women in India are engaged in farming operations either as cultivators/supervisors/ agricultural laborers as well as homemakers (Yadav et al., 2021). Women spend more than 20-30 per cent of their time every day on cooking food. Majority of rural families were using traditional *chulhas* (77%) while LPG (23%) was used by lesser number of families of the Haryana state (Agrawal et al., 2018). Traditional *Chullah* is combustible and environmentally inefficient also and more over is easily breakable because it is made from mud which is a good insulator. At the same time, it requires to be very solid as mud can crack after few times and allowing heat to escape that way and hence creating high amount of heat and drudgery problems. In general a family of 5-6 members requires about eight kg of fuel per day. The domestic fuel used comprises of agricultural waste, twigs, cattle dung and wood particles which constitute about 40 per cent of the total mass (Valentina, 2015). Dufflo et al., (2010) mentioned that burning solid fuels results in huge amount of contaminated pollutants, a major risk factor for lung cancer, cardiovascular and respiratory diseases. Indoor air pollution in

selected houses was high. Smoke levels in the lungs found that primary cooks had an average carbon monoxide (CO) reading of 7.77 ppm, while children had an average reading of 6.48 ppm. This shows that children had CO levels similar to smoke about seven cigarettes. The inefficient way to use biomass fuel releases a high amount of air pollutants, including fine particles (PM10 and PM 2.5) and gaseous pollutants (CO, SOX and NOX) that present a high ecological risk (GBD Risk Factors Collaborators, 2017; Arora et al., 2013; Suresh et al., 2016). Exposure to indoor air pollution causes serious health risks, especially to women, who cook food and children who spend much time around their mothers while cooking (Singh et al., 2014). Improved *chullah* is a best alternative and beneficial for rural peoples that do not have optimum resources (cattle, land, and water) for biogas plants. Improved *chullah* with good ventilation can solve the problem of health and indoor pollution to some extent. Use of improved *chullah* is only alternative, which is permanent solution of smoke and also consumes less fuel than traditional *chullah*. The improved *chullah* has double walls made up of mud with grate and flame concentration plate during cooking. Grate was provided for supply of air for smooth burning of wood and a flame concentration plate was used for proper supply of heat to the pot. It is economically affordable also as it can be constructed by locally available materials. Therefore, a study was planned to assess the improved *chullah* for cooking purpose.

METHODOLOGY

The study was undertaken in Hisar district of Haryana state to assess the benefits of modified *chullah* developed by the FRM department of College of Home Science, Hisar. *Budak* village of Hisar district was selected purposively as it was adopted village under NASF-ICAR project and 30 households were selected purposively who were using traditional *chullah* for household cooking. Rural women were selected as the respondents as they were the actual users of *chullah*. Thirty improved *chullahs* were installed in the already selected households to assess the impact of improved *chullah* over the traditional *chullah*.

A questionnaire was prepared to find the health hazards faced while using the traditional *chullah* and benefits perceived by rural

women after the use of improved *chullah*. An observation sheet was prepared to calculate the saved time in cooking by the use of improved *chullah* over the traditional *chullah* and to observe the environmental parameters *i.e.* SPM level, temperature and humidity around both of the *chullahs* while cooking. Data was collected by personal interview and observation methods. To calculate the saved time, a day time meal was observed of the selected families and to assess the environmental parameters three replications were taken while cooking for the one week. Percentage, mean score, rank and t-test were computed to assess the different parameters or as per the requirement of the study.

RESULTS AND DISCUSSION

Health related problems while using traditional *chullah*

It is clear from Figure 1 that women were reported several health problems while using traditional *chullah* for cooking. The various health related problems reported by the rural women were, irritation in eyes, respiratory problems, backache, low visibility, headache etc. Irritation in eyes was the most reported problem by the respondents as it got highest mean score (2.6 and Ist rank) followed by respiratory problem (2.57), backache (2.53), low visibility (2.5), dry cough (2.37) and decreased working efficiency & headache (2.4). Skin irritation was least reported problem by the respondents. Grover and Kaushik (1996) also reported that coking activity in rural homes was generally carried out on traditional *chulha*. Women suffered from eye and respiratory diseases by the constant exposure to smoke and dust. Among the families using traditional *chullahs*, 54 per cent were suffering from health-related problems like lung (29%), eye (24%) infections, etc. (Agrawal et al., 2018).

Time saved by using improved *chullah* in comparison to traditional *chullah* for cooking

Saving of time was calculated while cooking the meal (*chapatti* and *sabji*) on traditional *chullah* and improved *chullah*. It is evident from Table 2 that the time taken in preparing the meal on traditional *chullah* varied from 45 minutes to 65 minutes, with an average of 53.83 minutes. The time taken in preparing the same meal on

Figure 1. Health related problems while using traditional *chullah*

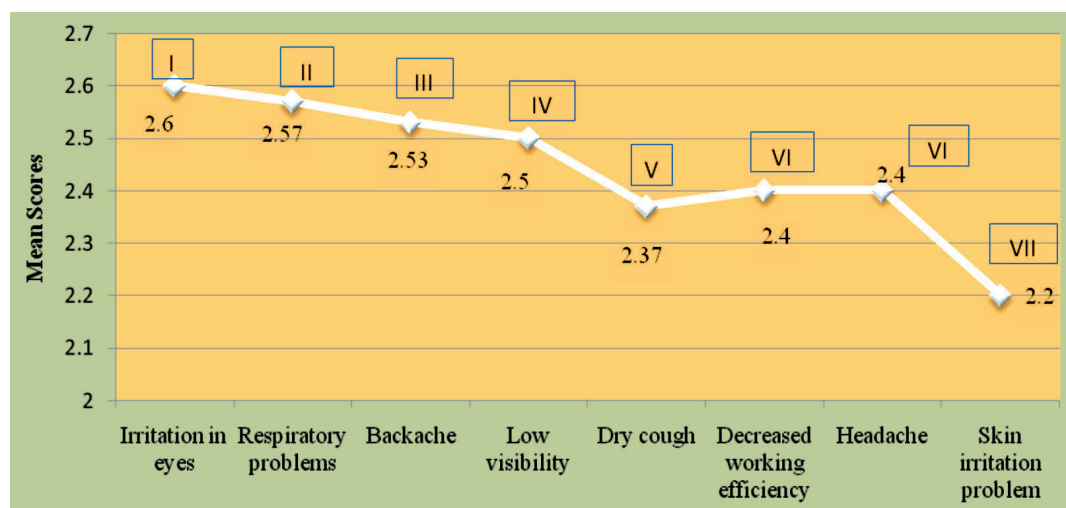


Table 1. Time saved by using improved *chullah* in comparison to traditional *chullah* for cooking

Respondents No	Time spent (min)		Time saved	
	Traditional <i>Chullah</i>	Improved <i>Chullah</i>	(min)	(%)
1	55	40	15	27.27
2	52	41	11	21.15
3	54	40	14	25.93
4	53	42	11	20.75
5	51	41	10	19.61
6	50	39	11	22.00
7	54	38	16	29.63
8	55	39	16	29.09
9	56	40	16	28.57
10	54	39	15	27.77
11	45	35	10	22.22
12	51	36	15	29.41
13	49	31	18	36.73
14	57	39	18	31.58
15	58	41	17	29.31
16	60	50	10	16.67
17	65	51	14	21.54
18	53	42	11	20.75
19	58	41	17	29.31
20	48	29	19	39.58
21	64	51	13	20.31
22	63	49	14	22.22
23	59	43	16	27.12
24	46	38	8	17.39
25	48	37	11	22.92
26	46	38	8	17.39
27	49	35	14	28.57
28	52	43	9	17.31
29	52	45	7	13.46
30	58	47	11	18.97
Average time	53.83	40.67	13.16	27.85
't' value			9.63*	

*Significant at 5% level

improved *chullah* varied from 29 minutes to 51 minutes with an average of 40.67 minutes. Thus, the average time saved in cooking on improved *chullah* was found to be 13.16 minutes. It is, further, evident from statistical examination that the significant reduction of 27.85 per cent in time was observed with t value 9.63 while cooking on improved *chullah*.

Environmental parameters were measured while using traditional and improved *chullah* and it was observed that SPM was (825 $\mu\text{g}/\text{m}^3$) in the traditional *chullah* whereas, in the improved *chullah*, it was 543 $\mu\text{g}/\text{m}^3$. SPM was decreased 34.18 per cent by the use of improved *chullah*. Permissible value was 500 $\mu\text{g}/\text{m}^3$. Baqir et al., (2019) also recorded a major reduction in indoor pollutants viz. PM10 (45%), PM2.5 (73%), CO (51%), SOX (22%), NOX (36%) for IMC over the TMC. Data also show that the mean temperature was 37.7°C near by the traditional *chullah*, whereas,

36.5°C temperature was recorded nearby the improved *chullah*. Average relative humidity was least in the household where cooking was carried out on traditional *chullah* i.e. 46.7 per cent whereas i.e. 48.3 per cent in the household where cooking was carried out on improved *chullah*. Sinha (2007) reported that pollution levels in rural kitchens were 30 times higher than recommended levels and six times higher than air pollution levels of New Delhi.

Benefits received by respondents by using improved *challah*

Data enfolded in Table 3 reveals the benefits of improved *chullah* which is easy to use, economical in use, simple to construct and health friendly. It is found that technical benefits got first rank (overall mean score 2.9). Second most received benefits was usability of *chullah* as it scored 2.4 followed by health related benefits (2.0) and economical (1.9). Bala (2016) also observed the benefits of improved *chullah* and found that the advantage 'simple to construct' got first rank with overall mean score 3.0. Advantages 'related to use' got second rank with 2.4 mean score "easy to operate and handle" because it was very simple and similar to traditional *chullah* and all type of locally available fuel can be used in it. Thakur (2017) also found change in personal PM_{2.5} and CO exposure over a period of 1 year for the primary cook, incidence of respiratory symptoms, including cough, phlegm, wheeze and shortness of breath over a period of 1 year for the primary cook, prevalence of other related symptoms, including headache and burning eyes over a period of 1 year for the primary cook and change in behavior and attitudes of user and adoption of the improved *chullah* over a period of 1 year as part of a process evaluation.

Table 3. Benefits received by respondents by using improved *chullah*

Benefits	Mean score	Rank
<i>1. Usability</i>		
Convenient to use	3.0	I
Easy to operate & handle	2.8	II
Save time	2.7	III
Easy to clean	2.2	IV
Initial burning is easy	1.9	V
<i>Chullah</i> remain warmer for longer time	1.8	VI
Mean	2.4	
<i>2. Economical</i>		
Save time, energy	2.0	I
Less fuel consumption/less expensive	1.8	II
Mean	1.9	
<i>3. Technical</i>		
Can be constructed with locally available materials	3.0	I
No special training is required for construction	2.8	II
Mean	2.9	
<i>4. Health related</i>		
Less smoke is generated	2.3	I
No ill effect on health	2.0	II
Less or no irritation in eyes	1.7	III
Mean	2.0	

Table 2. Comparison of environmental parameters in household while using traditional and improved *chullah*

Parameters	Permissible limit	Traditional <i>Chullah</i>	Improved <i>Chullah</i>	Differences in percentages
SPM ($\mu\text{g}/\text{m}^3$)	500	825	543	34.18
Temperature (°C)	25-30	37.7	36.5	3.05
R.H. (%)	40-60	46.7	48.3	3.43

CONCLUSION

It is concluded that improved cooking stoves may be a way to reduce exposure to indoor pollution and risk to the health. Rural women were suffered from irritation in eyes, respiratory problems, backache, low visibility and headache like health issues while using traditional *chullah*. Improved *chullah* also showed meaningful reduction *i.e.* 34.18 per cent in SPM level and time of cooking (27.85%) over the traditional *chullah*.

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