Abstract

Background: Chulha is a traditional Indian cooking stove. Fuel used in this stove can be firewood, animal dung cake (‘upla’), kerosene, crop residue, etc. It may lead to increase in the indoor air pollution affecting the health of the family members. Prolonged exposure to smoke from traditional chulhas is a risk factor for many lung and eye infections.

Aim and Objectives: To assess the use of traditional chulhas and its health effects among the residents of village Dighal.

Materials and Methods: The survey was conducted from May-June, 2018 among 100 families in village Dighal who were selected by purposive sampling.

Results: It was observed that the majority of families were using traditional chulhas (77%) and LPG (23%) was used by smaller number of families. Fuel consumed by most of the households were animal dung cakes (62%) and firewood (45%). Maximum duration of exposure to the traditional chulha by 43% families is for 3-4 hours. Among the families using traditional chulhas, 54% were suffering from health-related problems like lung (29%), eye (24%) infections, etc. Main reasons stated by participants for using traditional chulhas were it is cheaper than other sources (52%) and food cooked is much tastier (42%).

Conclusion: The efforts should be made towards encouraging the use of safer methods of cooking such as LPG or smokeless chulha to prevent the health of the people.

Keywords: Indoor air pollution, Health problems, Traditional chulha

Introduction

Nearly half of the world’s population use traditional chulha. Around 50% of the world population, that is nearly 3 billion people, use biomass fuels as their primary source of domestic energy for cooking, home heating and light, ranging from nearly 0% in developed countries to more than 80% in developing countries (China, India, sub-Saharan Africa, etc).1-3

The traditional chulha produces high carbon emission which causes indoor air pollution and health problem in family members specially among females who are maximally exposed to the chulha smoke. Hence, most of the families have their kitchen in outside area of the house in order to avoid smoke filled rooms. In rural India, nearly 90% of the energy is derived from biomass (wood 56%, crop residues 16%, dung cake 21%). Solid fuels release noxious pollutants including particulate matter, carbon monoxide, nitrogen dioxide, sulphur dioxide, formaldehyde, carcinogens.1, 4

Indoor air pollution due to traditional chulha, ranks 10th among preventable risk factors contributing to global burden of disease. According to Bruce N et al. and Hong C, nearly 1 million deaths among children (less than 5 years of age) are due to acute respiratory infections (ARI), in women due to chronic obstructive pulmonary disease (COPD) and...
According to WHO, 36% of acute lower respiratory infection is attributed to Indoor Air Pollution from the use of biomass fuels used for cooking, heating and light. Studies have shown that Chronic Obstructive Pulmonary Disease (COPD) in women above 45 years has a strong and consistent association with indoor air pollution. COPD is estimated to claim 1,06,000 Indians every year.7 There are evidences of association between cataract/blindness and exposure to indoor smoke from the use of traditional chulhas. In a study by Zodpey S, Ughade S, they found an association between cataract and cheaper cooking fuels (coal, cow dung, wood, etc). Some studies found an association between biomass fuel use and partial/complete blindness.1,4,9

Other health related issues caused by these smoky emissions include otitis, asthma, low birth weight, tuberculosis, cataract, parental prenatal mortality, increased blood pressure, nasopharyngeal cancer, laryngeal cancer, lung cancer.4,7,10 The exposure to chulha smoke causes 3-4% of the global burden of disease.2,5,11-15

Viswanath D, Kumar K concluded income as one of the main determinants of biofuel consumption.16 Chaudhuri S, Pfaff A in a study on cooking fuels analysed that there is relationship with the increase in pollution and decrease in economic growth.17 In urban households, women are using liquefied petroleum gas (LPG) or electricity for cooking food. It makes cooking easier but it is costly for rural households. Most of the rural families have limited income and they cannot afford LPG or electronic stove for cooking food.18

One of the solutions to this can be adoption of smokeless chulhas. The smokeless Chulha is similar to the traditional chulhas used by most of the families except that it has a chimney. Its fuel efficiency is also high thus reducing the quantity of fuels. There are environmental, health as well as economic benefits of using a smokeless chulhas. Smokeless chulha are trending in terms of time saving, low cost, healthy environment in the kitchen and keeps food hot for longer time.7,18

The establishment of “Oorja” stove in India is another step taken to control the indoor air pollution. Between 2006 and 2010, over 4,00,000 Oorja stoves were sold in India. Oorja was the first advanced, “micro-gasifier” stove sold at a large scale. It was fuelled by biomass pellets sold by Bottom of the Pyramid/First Energy Company. By gasifying biomass and burning the resulting gases in a controlled way, such stoves performed more like modern LPG stoves and offer the potential improvements in efficiency and emissions.19

Although exposure to chulha smoke is one of the major health problems specially in developing countries, still there is paucity of studies relating health issues and indoor air pollution. The following study was conducted to assess the use of traditional chulhas and its health effects among the residents of village Dighal, district Jhajjar, Haryana.

Material and Methods
To assess the use of traditional chulha, smoke exposure and its effect on health, a cross-sectional study from May-June, 2018 was conducted in village Dighal, district Jhajjar, Haryana. Purposive sample of 100 families were taken to collect the data by means of a self-administered semi-structured questionnaire after taking the consent and making good rapport with the family. The questionnaire consisted of questions about what types of traditional cook stoves or fuels are used by the villagers, how long do the women or the one who cooks food is exposed to smoke in a day, what all types of methods of cooking and fuels are they using and what are the health-related problems these people are suffering with. One questionnaire was filled to collect the information of one family and most of the respondents were women who are generally responsible for cooking food. The data was analysed using SPSS software.

Results

Table 1. Types of cooking devices (stoves) available in the families (n=100)

| S. No. | Type of cooking stove | Number | Percentage (%) |
|-------|-----------------------|--------|----------------|
| 1.    | Traditional chulha only | 27     | 27             |
| 2.    | Traditional chulha and LPG | 51     | 51             |
| 3.    | Traditional chulha, LPG and kerosene oil stove | 1      | 1              |
| 4.    | LPG only | 21     | 21             |
| 5.    | Electric stove | 0      | 0              |
| 6.    | Smokeless chulha | 0      | 0              |
| **Total** | **100** | **100** | **100** |

Figure 1 is the pie chart showing percentage of families using traditional chulha, which depicts that 77% of families were still using traditional chulhas. Other households (23%) use only LPG which is a clean and safe method of cooking while others use both depending upon the availability of the fuel. According to table1, 79% families still have traditional chulhas.

Figure 1.Families using traditional chulha
Table 2. Types of fuel consumed by families for cooking

| S. No. | Type of fuel     | Number | Percentage (%) |
|-------|-----------------|--------|----------------|
| 1.    | Crop residue    | 14     | 19             |
| 2.    | Animal dung cake| 47     | 62             |
| 3.    | Firewood        | 34     | 45             |
| 4.    | Kerosene oil    | 1      | 1              |
| 5.    | Others          | 0      | 0              |

Table 3. The exposure time (hours per day) (n=77)

| S. No. | No. of hours per day exposed to chulha smoke | Number | Percentage (%) |
|-------|---------------------------------------------|--------|----------------|
| 1.    | Less than 3 hours per day                   | 29     | 37             |
| 2.    | 3 - 4 hours per day                         | 33     | 43             |
| 3.    | More than 4 hours per day                   | 15     | 20             |
|       | Total                                        | 77     | 100            |

Table 4. Families having problems due to smoke exposure (n=77)

| S. No. | Health related problem                      | Number | Percentage (%) |
|-------|---------------------------------------------|--------|----------------|
| 1.    | Families with Lung problems                 | 23     | 29.87          |
| 2.    | Families with Eye problems                  | 19     | 24.67          |
| 3.    | Other health problems (Cardiac, Low birth weight, etc.) | 0 | 0 |
| 4.    | Environmental problems                      | 2      | 2.59           |
| 5.    | No problem at all                           | 33     | 42.85          |
|       | Total                                       | 77     | 100            |

Table 5. Reasons given by the villagers for still using traditional chulha

| S. No. | Reasons stated                | Number | Percentage (%) |
|-------|------------------------------|--------|----------------|
| 1.    | Easily available             | 18     | 24             |
| 2.    | Cheap                        | 40     | 52             |
| 3.    | Traditional                  | 16     | 21             |
| 4.    | Easy to use                  | 15     | 20             |
| 5.    | Food cooked is much tastier  | 32     | 42             |
| 6.    | No other source available    | 0      | 0              |
| 7.    | Other reasons                | 1      | 1              |

Table 6. Families having knowledge about smokeless chulha (n=77)

| S. No. | Knowledge about smokeless chulha | Number | Percentage (%) |
|-------|----------------------------------|--------|----------------|
| 1.    | Present                          | 9      | 11.68          |
| 2.    | Absent                           | 68     | 88.31          |
|       | Total                            | 77     | 100            |

The results of this study showed that 77% families are still using the age old traditional chulhas for cooking and 27% households lack any other source of cooking apart from traditional chulha. Only 21% families are exclusively using LPG and do not have traditional chulha. According to NFHS-4, 80.6% urban and only 24% rural households are using clean fuel (electricity, LPG, natural gas, biogas) for cooking in India. Also, in Haryana, similar results were seen i.e. 84.9% urban and only 28.9% rural families are using clean fuel. Similarly results given by Singh R, Simon R in a study in Belvai village (Banda District) shows 80.66% use of traditional chulha and very less use of LPG (3.33%). Also, the fuel used by participants for cooking were mainly wood (67.98%), dung cake (19.35%) and agricultural waste (10.10%). In our study fuel consumed for cooking by most of the villagers were animal dung cake (62%), firewood (45%) and crop residue (19%). In another study by Dwivedi N et al., the results showed that 40% families are still using traditional chulhas and only 20% are using LPG. Easy availability of wood/animal dung cake/ agricultural residue might be the reason for using traditional chulha at such a large scale. Biomass fuels in India according to National family health survey 2005 - 06 NFHS (IIPS 2007) is the dominant source of cooking. Use of such a high demand of fuel-wood may decrease the fauna and flora from the earth leading to increase in the environmental problems. The use of solid fuels is associated with an increased risk of different infections and diseases. Bloom Z stated that use of traditional cookstoves is significantly and positively associated with child and infant mortality, crude birth rate and total fertility population growth rate.1,21
The partially burned fuel releases many toxic particulate materials which are harmful for health of the living beings as well as for the environment. Among the studied population 54.54% were suffering from health-related problems due to the smoke exposure. Singh R, Simon R showed 5.88% people suffering from lung infection and 31.37% suffering from eye infection due to chulha smoke.\(^7\) Another study by Dwivedi N et al. stated that 63% people agreed to the ill effects of using traditional chulha. According to 45% participants, hazardous health problems can occur and 30% complained of fatigue after the use of traditional chulha. 85% respondents stated that the chances of accidents due to use of traditional chulha is more. 28% and 60% stated that it is more fuel consuming and more time taking, respectively.\(^7\)

Health problems are also directly related to the duration of smoke exposure i.e. females exposed for longer duration have more chances of suffering from health problems as compared to those women who are exposed for less duration. From this study we found that 20% of females are exposed to chulha smoke for more than 4 hours per day, 37% are exposed for less than 3 hours per day and maximum i.e. 43% females are exposed to the smoke for 3-4 hours per day. Results by Singh R, Simon R showed that 33.33% and 6.66% females are exposed for 2-3 hours and 3-4 hours per day, respectively.\(^7\)

Main reasons given by the villagers for still using traditional chulha as the source of cooking are cheaper source (52%) and food cooked is much tasty (42%). Other reasons were easy availability, traditional method of cooking and easy to use. Although the fuel used for traditional chulha is cheaper but it has poor effects on the health of family members which further effects the family economy. According to Dwivedi N et al., 95% respondents agreed that ill health ultimately effects family income.\(^7\)

The participants knowledge about smokeless chulha is really poor. Only 11.68% participants were aware of smokeless chulha. Lack of education/ illiteracy could be the reason behind poor knowledge of smokeless chulha. Dwivedi N et al. stated that only 30% people were aware of smokeless chulha and 20% were actually using them.\(^7\) According to another study by Singh R et al., 86.67% participants had poor knowledge, whereas 13.33% participants had knowledge about smokeless chulha.\(^8\) 90% of the respondents agreed that less carbon emission for the environment increases hygiene in the kitchen. 83.33% of beneficiaries accepted that due to smoke free environment there is no burning sensation and irritation in their eyes.\(^9\) There is need of imparting more knowledge to women about smokeless chulha and its usefulness like its non-hazardous effect on health of all family members.

**Conclusion**

The study concluded that more efforts are needed to make people aware about smokeless chulha, its benefits over traditional chulha, its non-hazardous effect on health of all family members. The establishment of smokeless chulha helps to provide safe and healthy environment in the kitchen, time saving in fetching fire woods, reduce drudgery of farm women and ultimately has positive effects on economic status of the family. Only a healthy society can progress, so people must be healthy to build a healthy society. To achieve this more programme are needed to be launched by government for adoption of smokeless chulha. People should be made more aware mainly in rural areas to avoid the use of solid biomass fuels, because this not only affects our health but also our environment, economy and is indirectly responsible for afforestation.

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