



Health and Environment Security through 'Ujjwala': A Study of Peri-urban Areas of Uttar Pradesh¹

Moni Chandra*

Department of Sociology, Babasaheb Bhimrao Ambedkar University, Lucknow (U.P.), India

*Corresponding Author: Moni Chandra, Department of Sociology, Babasaheb Bhimrao Ambedkar University, Lucknow (U.P.), India.

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Abstract

Cooking in the absence of clean fuels is not only injurious to health of the household but affects environment as a whole. In India, majority of the households especially in rural areas depend primarily on wood, crop residue and cow dung for cooking. LPG, the modern cooking fuel, is still a distant dream for them. LPG has many benefits like, it eliminates household air pollution, reduces the drudgery of firewood collection and checks deforestation and depletion of forest resources. Besides, those who use it are able to dedicate more time on educational and economic pursuit. And for this purpose, PMUJ was launched in May, 2016 to prevent the negative health implications from traditional cooking fuel. Hence, there is need to study and investigate as to how 'Ujjwala' Yojana is contributing in removing the health hazards involved with traditional cooking methods and is saving the time and cost of cooking apart from improving environmental quality and sustainability.

Keywords: Fuel; Peri-urban; Pollution; Health; Sustainability

Introduction

Cooking on polluting cooking fuels is a major source of disease and environmental degradation in developing countries. In 1990, 53% of the global population mainly used polluting cooking fuels that dropped to 36% in 2020. Biomass combustion releases pollutants such as, carbon dioxide, carbon monoxide sulfur dioxide, nitrogen dioxide, volatile organic compounds and/or hydrocarbons [2,4]. The combustion of solid fuels is not only responsible for gaseous emissions [10] but the resultant smoke leads to IAP [18] and is responsible for 3.3% of all deaths worldwide. Its repercussion is seen in the form of poor health, household air pollution and environmental degradation [22]. [13] argued that cooking on biomass invites eye watering smoke and invokes cough. It also accelerates the effects of climate change, speeding the disruption of monsoon cycles and the melting of glaciers.

Earlier studies show that the inefficient combustion of biomass (firewood, cow dung, crop residue) increases the risk of non-communicable diseases like stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD), TB, bronchial asthma and pneumonia. Since women do most of the household cooking, they are significantly exposed to the harmful effects of the solid fuels compared to men. Moreover, the toxins released while cooking on biomass is highest in the kitchen, and is an important cause behind various respiratory diseases among women and children. It not only affects the health of the households, but their finances as well (WHO, 2009). Taking cognizance of health and environment, the global community has prioritized achieving universal access to clean cooking, enshrined in the 2030 Agenda for Sustainable Development as one of three targets for Sustainable Development Goal (SDG), to 'ensure access to affordable, reliable, sustainable, and modern energy' [14]. The government of India also took the

¹ This paper is based on the Ph.D. thesis of the author

initiative to achieve SDGs in the form of PMUY. However, the success of this scheme in realizing health benefits does not depend solely on providing LPG connections, but on transitioning households away from using solid fuels towards clean fuel like LPG [3]. Though, PMUY has considerably improved the accessibility of clean fuels but its sustained usage is missing in some areas. The high refill cost has hindered a complete switch to modern fuels [5]. Also, low income acts as a catalyst in this situation. Moreover, some houses have a single room which is used as a living room as well as kitchen that increases the probability of respiratory diseases [15]. Besides, accessibility and the affordability issues also affect switch over from solid fuels to clean fuels like LPG and electricity [1]. Hence, a holistic analysis of health data is required to examine the impact of PMUY that will play an important role in framing policies on health and future clean fuel interventions. The present study contributes in this direction and examines the impact of PMUY on health and environment, focusing on peri-urban areas.

Some recent studies on fuel and health

[11] stated that eye irritation, difficulty in breathing, dry cough, and chronic respiratory diseases are associated with IAP. As per [21], the use of solid fuels poses a major burden on sustainable development. For example, in the area of climate change, black carbon particles and methane emitted by inefficient solid fuel use significantly contribute to global greenhouse gas emissions [21] and is a major contributor for lower respiratory infections and a range of non-communicable diseases (NCDs) [8] such as COPD, IHD, stroke, Pneumonia, etc. causing both restrictive and obstructive impairment of the lungs [12]. [17] pointed out that prevalence of acute respiratory infection ARI was related to the combustion of biomass fuels for cooking that mostly affects those children who were from those households where biomass is used as primary cooking fuel. [7] mentioned the list of self-reported health conditions among women caused by cooking on biomass such as eye irritation, diminished vision, cataract, and watering of eyes, respiratory conditions like throat irritation, asthma, ear pain, running nose, cough with/without phlegm, cardiovascular problems like hypertension and stroke; dermatological conditions like blisters due to skin burns, skin irritation, while miscarriages, stillbirth, low birth weight and preterm deliveries were grouped as adverse obstetric outcomes. [19] also reiterated that household air pollution increase the overall risk for indoor airborne infections and

mortality. [2,11] also echoed that air pollutants cause respiratory and infectious diseases such as asthma, acute respiratory infection (ARI), tuberculosis (TB), and eye diseases. They stated that women and elderly have more chances of developing asthma and TB due to exposure to indoor air population whereas children are more prone to ARI, as their lung defense system is not adequately evolved. The airway epithelium of growing children is more permeable to air pollutants and they have a differential ability to metabolize, detoxify, and excrete environmental agents thereby making them more susceptible to the harmful effects of air pollution [2,11].

Material and Methods

The present study is exploratory in nature and is based on a field survey in peri-urban areas of two selected districts of U.P. namely, Hardoi and Lucknow. The districts were chosen on the basis of highest and lowest LPG users in central region of U.P. Lucknow has the highest LPG connections in the central region of UP while Hardoi occupies the last spot. In the second stage, two blocks from each district has been chosen on geographical location criteria due to unavailability of data of Ujjwala beneficiaries at block level. With the help of local key informants, the households where LPG (availed through Ujjwala Yojana) is used as their primary cooking fuel were identified and interviewed. Besides, being in close proximity, these districts were highly similar, in terms of occupations and income and cultural practices. Overall 300 beneficiary households were selected for survey work. Besides, collecting data on the demographic and socio-economic profile of the respondents, the perceptions of women folk regarding household air pollution and on LPG were also taken. The respondents were similar in most respects. For analyzing the quantitative data, use of SPSS software was taken and for qualitative data, thematic analysis approach was adopted. The qualitative replies were coded against more than one answer. After independent coding, results were generated.

Findings from the field survey

Characteristics of the Study Area - Majority of the respondents in the study area were in the age group of 31-50 years while the total number of female respondents was 85 percent. The average household size is five and majority of the household heads engaged in jobs such as non-agricultural labour, mechanic work, general store shop, and private job of guard, etc. and having middle level of education (class 8th). The average monthly income was found

Rs. 8160 indicating that a household subsists on an average of Rs.272 per day. Also, half of the total sampled households (51 percent) have no kitchen facility; around 34 percent were living in one room house while 33 percent of the respondents were found living in semi-pucca houses. Also, fuel stacking was found and use of multiple fuels like wood, cow dung, crop residue and LPG was found in the sampled households.

Health problems

From table 1, the district wise block wise information regarding the various health problems faced by the beneficiaries earlier while using traditional fuels for cooking before getting LPG through Ujjwala yojana. It is evident from the table that majority of the respondents (98 percent) stated that they faced eye related problems like irritation in eyes, redness etc. when they were

regularly cooking on biomass before availing LPG connections through Ujjwala yojana. The second health problem most stated by the respondents is headache (89.7percent). Besides, coughing (85.3 percent) and nose irritation (64.7 percent) were also reported by many respondents.

From table 2, the details of the diseases, faced by the beneficiaries that are cured now after using LPG availed through Ujjwala Yojana, of both the districts under study can be deciphered. Around 79 percent of the respondents stated their eye irritation went away after using LPG. Also, 71 percent of the respondents told that their regular coughing problem vanished after using clean fuel i.e., LPG. The other problems that many beneficiaries reported were cured are nose irritation (57.7 percent), headache (64.7 percent) and burns (49 percent).

District	Block	Eye irritation	Nose irritation	Allergies/ Dermatitis/ Other skin problems	Headache	Watery eyes	Coughing	Burns	Asthma
Hardoi	Sandila	73 (97.3)	43 (57.3)	25 (33.3)	67 (89.3)	44 (58.7)	49 (65.3)	12 (16.0)	0 (0.0)
	Pihani	75 (100.0)	36 (48.0)	30 (40.0)	69 (92.0)	24 (32.0)	66 (88.0)	55 (73.3)	1 (1.3)
	Total	148 (98.7)	79 (52.7)	55 (36.7)	136 (90.7)	68 (45.3)	115 (76.7)	67 (44.7)	1 (0.7)
Lucknow	Bakshi Ka Talab	71 (94.7)	42 (56.0)	6 (8.0)	65 (86.7)	30 (40.0)	69 (92.0)	52 (69.3)	0 (0.0)
	Mohanlalganj	75 (100.0)	73 (97.3)	14 (18.7)	68 (90.7)	56 (74.7)	72 (96.0)	39 (52.0)	0 (0.0)
	Total	146 (97.3)	115 (76.7)	20 (13.3)	133 (88.7)	86 (57.3)	141 (94.0)	91 (60.7)	0 (0.0)
All	Total	294 (98.0)	194 (64.7)	75 (25.0)	269 (89.7)	154 (51.3)	256 (85.3)	158 (52.7)	1 (0.3)

Table 1: Health Problems Faced by Beneficiaries Earlier.

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

District	Block	Eye irritation	Nose irritation	Allergies/Dermatitis/ Other skin problems	Headache	Watery eyes	Coughing	Burns	Asthma
Hardoi	Sandila	48 (64.0)	33 (44.0)	19 (25.3)	36 (48.0)	39 (52.0)	37 (49.3)	13 (17.3)	2 (2.7)
	Pihani	46 (61.3)	31 (41.3)	16 (21.3)	49 (65.3)	24 (32.0)	51 (68.0)	49 (65.3)	0 (0.0)
	Total	94 (62.7)	64 (42.7)	35 (23.3)	85 (56.7)	63 (42.0)	88 (58.7)	62 (41.3)	2 (1.3)

Lucknow	Bakshi Ka Talab	70 (93.3)	41 (54.7)	7 (9.3)	59 (78.7)	31 (41.3)	66 (88.0)	50 (66.7)	2 (2.7)
	Mohanlalganj	72 (96.0)	68 (90.7)	15 (20.0)	50 (66.7)	51 (68.0)	59 (78.7)	35 (46.7)	0 (0.0)
	Total	142 (94.7)	109 (72.7)	22 (14.7)	109 (72.7)	82 (54.7)	125 (83.3)	85 (56.7)	2 (1.3)
All	Total	236 (78.7)	173 (57.7)	57 (19.0)	194 (64.7)	145 (48.3)	213 (71.0)	147 (49.0)	4 (1.3)

Table 2: Details of Diseases that are Cured/Gone after Switching to Clean Fuel through Ujjwala.

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

Table 3 demonstrates the block wise data on the perception of the respondents of Hardoi and Lucknow districts regarding Ujjwala Yojana in solving the problem of 'indoor air pollution' & its significance in promoting environmental sustainability. Around 86 percent of the respondents of both the districts positively agree

on Ujjwala's role in solving household air pollution and its role in protecting the environment. However, in Hardoi district, only 12 percent 'strongly' agree as compared to Lucknow's 44 percent. However, 20 percent of the respondents were neutral on Ujjwala's role in combating indoor air pollution.

District	Block	Strongly Agree	Agree	Neutral	Disagree	Total
Hardoi	Sandila	4 (5.3)	51 (68.0)	19 (25.3)	1 (1.3)	75 (100.0)
	Pihani	14 (18.7)	49 (65.3)	11 (14.7)	1 (1.3)	75 (100.0)
	Total	18 (12.0)	100 (66.7)	30 (20.0)	2 (1.3)	150 (100.0)
Lucknow	Bakshi Ka Talab	16 (21.3)	57 (76.0)	2 (2.7)	0 (0.0)	75 (100.0)
	Mohanlalganj	50 (66.7)	15 (20.0)	8 (10.7)	2 (2.7)	75 (100.0)
	Total	66 (44.0)	72 (48.0)	10 (6.7)	2 (1.3)	150 (100.0)
Total	N	84 (28.0)	172 (57.3)	40 (13.3)	4 (1.3)	300 (100.0)

Table 3: Do you believe that Ujjwala Yojana has helped in solving the problem of 'indoor air pollution' and is beneficial to environmental sustainability?

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

Table 4 illustrates the block wise data on the perception of the respondents of Hardoi and Lucknow districts regarding lessening the cutting of trees in their area after the launch of Ujjwala Yojana.

It can be seen from the table that there is level of agreement on the aforesaid issue. Block wise also, majority of the respondents unanimously agreed on the positive impact of the scheme in the areas under study area.

District	Block	Strongly Agree	Agree	Neutral	Disagree	Total
Hardoi	Sandila	23 (30.7)	43 (57.3)	8 (10.7)	1 (1.3)	75 (100.0)
	Pihani	47 (62.7)	26 (34.7)	2 (2.7)	0 (0.0)	75 (100.0)
	Total	70 (46.7)	69 (46.0)	10 (6.7)	1 (0.7)	150 (100.0)

Lucknow	Bakshi Ka Talab	35 (46.7)	39 (52.0)	1 (1.3)	0 (0.0)	75 (100.0)
	Mohanlalganj	36 (48.0)	36 (48.0)	2 (2.7)	1 (1.3)	75 (100.0)
	Total	71 (47.3)	75 (50.0)	3 (2.0)	1 (0.7)	150 (100.0)
Total	N	141 (47.0)	144 (48.0)	13 (4.3)	2 (0.7)	300 (100.0)

Table 4: Does cutting of trees in your area has lessened/stopped in your region/area after launch of Ujjwala Yojana?

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

Table 5 presents the block wise data on the perception of respondents of Hardoi and Lucknow districts, regarding lessening of incidence of fire and improvement in the quality of air in the surrounding areas after the launch of Ujjwala Yojana. In both districts on the aforesaid issues, there is unanimity in replies of the positive role of PMUY in the study area.

District	Block	Does incidence of fire has lessened due to the launch of Ujjwala Yojana?	Has the quality of air in your surrounding areas improved after increase in LPG use?	Total
Hardoi	Sandila	75 (100.0)	74 (98.7)	75 (100.0)
	Pihani	75 (100.0)	70 (93.3)	75 (100.0)
	Total	150 (100.0)	144 (96.0)	150 (100.0)
Lucknow	Bakshi Ka Talab	75 (100.0)	75 (100.0)	75 (100.0)
	Mohanlalganj	75 (100.0)	75 (100.0)	75 (100.0)
	Total	150 (100.0)	150 (100.0)	150 (100.0)
Total	N	300 (100.0)	294 (98.0)	300 (100.0)

Table 5: Does Incidence of Fire Has Lessened due to the Launch of Ujjwala Yojana And Does the Quality of air in your Surrounding Areas Improved After Increase in LPG Use?

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

Table 6 presents the block wise data on the views of respondents of Hardoi and Lucknow districts, regarding their responsibility in improving and maintaining the environment. Around 93.7 percent of the respondents of both the districts positively agree on the aforementioned issue. Among these respondents, in both the districts under study, 35 percent 'strongly agreed' that it's the duty of people to maintain the surrounding environment.

District	Block	Strongly Agree	Agree	Neutral	Disagree	Total
Hardoi	Sandila	24 (32.0)	45 (60.0)	6 (8.0)	(0.0)	75 (100.0)
	Pihani	39 (52.0)	30 (40.0)	6 (8.0)	(0.0)	75 (100.0)
	Total	63 (42.0)	75 (50.0)	12 (8.0)	(0.0)	150 (100.0)
Lucknow	Bakshi Ka Talab	9 (12.0)	65 (86.7)	1 (1.3)	0 (0.0)	75 (100.0)
	Mohanlalganj	33 (44.0)	36 (48.0)	5 (6.7)	1 (1.3)	75 (100.0)
	Total	42 (28.0)	101 (67.3)	6 (4.0)	1 (0.7)	150 (100.0)
Total	N	105 (35.0)	176 (58.7)	18 (6.0)	1 (0.3)	300 (100.0)

Table 6: Do You Agree that Improving the Environment is the Responsibility of Every Citizen?

Source: Calculated from Primary Data collected during 2019-20, Figure in the parenthesis id the percentage share.

Discussion

Household air pollution, a silent killer, is a global health threat. Gathering of solid fuel is also a time-consuming task which is mostly performed by women and children [23]. Exposure of young women in households that cook with polluting fuels is 18 hours a week on average gathering fuel compared to 5 hours a week that use clean fuels [23], time that could be spent in leisure activities, education and income enhancement. According to WHO (2016), the disastrous health consequences result from household air pollution. Addressing health inequalities and ensuring clean energy access for households globally will not be achieved without more gender responsive programs [23]. Also, empowering women is imperative to check dependence on solid fuels and its deadly health consequences. Though, Ujjwala Yojana has increased the usage of clean cooking fuel, however sustained usage is still missing in some areas. As per report by Council on Energy, Environment and Water (CEEW), more than 70% of the households in Uttar Pradesh (UP) use LPG as their primary cooking fuel and 85% have LPG connections. However, 54% of households continue to use solid fuels (firewood, dung cakes, agriculture residue, and charcoal), either exclusively or by stacking them with LPG [9]. The CEEW study highlighted that 93% of UP households, which use solid fuels along with LPG, cite high cylinder costs as one of the reasons for stacking fuels. Lower household incomes during the pandemic and

the suspension of LPG subsidies in May 2020 have made cooking gas unaffordable for a section of the population. Other reasons for fuel stacking include preference for cooking on chulhas, the availability of free biomass, and the limited availability of LPG refills. This is significant in the context of the ongoing surge in LPG prices, which have risen by Rs. 240/- per cylinder (a 40% hike) over the past one year [6]. The above findings of CEEW echoes the findings of present study that was undertaken to examine the impact of PMUY on health and environment in peri-urban areas of two selected cities of Uttar Pradesh using primary data, since empirical evidence on peri-urban areas of Uttar Pradesh has not been explored. The respondents in the present study reported that the clean cooking stove under Ujjwala yojana has helped in checking health and environmental problems. Majority of the women respondents (beneficiaries) appreciated health benefits including a reduction in burns, coughing, headaches, sore throat and eye irritation. One of the respondents stated that, "Now, my hands don't get burnedearlier while adjusting the fire on chullah, my hands would get burned sometimes....also coughing and irritation in the throat has lessened. Another respondent echoed the economic problems she faced before switching to clean cooking fuel (availed through Ujjwala), "Earlier, I had to visit doctor often for sore throat and itchy eyesthough the doctor charged less but the cost of medicine was sometimes expensive". Although

² CEEW's findings are based on data collected from over 1,500 households in 16 districts of the state from the India Residential Energy Survey (IRES) 2020, conducted in collaboration with the Initiative for Sustainable Energy Policy (ISEP).

people are aware that the combustion of wood fuel not only represent a threat to human health but also to the environment in the form of harmful gaseous emissions but still due to social, economic and cultural reasons, sustained usage of biomass is still not there, especially in Hardoi district. The study found that clean fuel by households in Hardoi is less as compared to Lucknow. Fuel stacking, where a household uses more than one fuel, is still common around the world and is evident in the study area as well [14]. The findings of the present study reverberates that women had number of health issues and most of them were caused due to cooking in smoke filled environment. But, these health issues have considerably reduced when they switched to LPG though Ujjwala. The burden of domestic work is almost wholly shared by female members of the household and a woman spent around 2.53 hours per day in preparation of food and 2.31 hours in cleaning the house [24]. This time also considerable reduce after use of LPG and Ujjwala is playing an important role in it.

Conclusion

As solid fuels poses a multitude of social, health and environmental concerns, it is imperative that society moves towards the use of more sustainable energy alternatives and stop consumption of biomass. Additionally, the alternate sources of clean fuels should be promoted for cooking apart from LPG. Also, there is a need to improve health awareness and bring cultural changes that may help in transition towards clean fuels for cooking. Moreover the government must overcome the hurdles at the implementation level and check the soaring prices of LPG (one of the main barrier in access to clean fuel) so that the subsidized LPG reaches to the potential beneficiaries. Hence, by strengthening PMUY by making it accessible and affordable to poor households especially in rural and peri-urban areas is crucial for good health and sustainable environment. Lastly, though LPG is typically less damaging to health and climate than biomass cooking, it is still a fossil fuel with multiple environmental drawbacks. In the long run, renewable clean energy sources will be increasingly important alternatives, especially as efficiency of solar capture and energy storage increase and costs for these declines [16]. Hence, for environmental sustainability and better health, other sustainable options are required to be explored as well.

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³When one kilogram of wood is combusted, CO₂ emissions and other GHGs are released into the environment (Masera., et al. 2005).

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