

INVESTIGATING THE KNOWLEDGE ON INDOOR AIR POLLUTION, HEALTH HAZARDS, AND RURAL READINESS FOR GREEN ENERGY

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Abstract: The study focuses on the day-to-day operations within rural and semi-urban homes concerning their energy consumption, air quality indoors, and general health care practices. Interviews were carried out with 100 people from varied social groups, such as the local farmers, security guards, housewives, and industrial workers. The study focused on understanding the extent of influence of the government's campaign for renewable energy (solar panels and LPG cylinders) on the lives of these people and how they relate to their overall well-being. In order to obtain the necessary information, we used a simple conversation-based survey consisting of 32 questions. We did not rely solely on yes-no questions, but rather sat down with each family to understand their everyday activities. Methodology included direct primary data collection through a door-to-door survey, followed by a thorough analysis of the responses obtained concerning fuel sources, energy generation sources, and expenditure incurred on medical care. Our results yielded overwhelmingly positive outcomes, but there were several surprising revelations. First, the high adoption rate of solar energy (personal or communal) reached 64%, indicating the community's willingness to adopt advanced technologies. Second, although most families use LPG, 40% of them practice fuel stacking, using wood and cow dung to cut costs. Moreover, a covert crisis was identified, where people were being led into a trap by trusting the services of local RO water suppliers who sell water with a dangerously high 150-200 TDS. Moreover, low health expenditure per family below ₹500 per month is not an indication of healthy behaviour, but instead indicates that families rely upon cheap medication in order to save money from traveling to expensive cities for hospitalization.

Keywords: Green Energy, Indoor Air Pollution, LPG Stacking, Rural Health, Solar Adoption, Water Quality

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I. INTRODUCTION

In our common perception of rural development, the big government plans and large-scale infrastructural projects come to mind. However, real development takes place within the kitchen, beneath the electric bulb, and in the glass of water used by an ordinary household. This Community Connect project was conceptualized as a way to look beyond the numbers and into the reality of what goes on within rural and semi-urban households.

In the last few years, there has been a large-scale effort towards shifting rural households from their traditional mud stoves and unsafe kerosene lights to cleaner LPG gas and solar energy. The situation is well known. Burning of firewood, dung cakes, and crop residue creates air pollution, leading to persistent cough, asthma, and conjunctivitis, mainly suffered by women doing household work and the kids playing around them.

But while buying an LPG gas cylinder may not be much of a problem, filling it regularly certainly becomes difficult for most people. What would people do if faced with an economic crisis? Would they switch to complete dependency on LPG, or would they still keep a wood fire alive somewhere?

Moreover, health and the environment are intricately linked. When a family decides to use renewable energy, will they see a drop in their medical costs? Also, how do they get their drinking water? Do they depend on their own groundwater, or do they purchase those big blue water jugs everyone seems to have nowadays?

This research takes an intensive look at the lives of 100 individuals – security personnel, manufacturing employees, local vendors, and homemakers – to explore how they move from being part of the problem to becoming part of the solution by embracing sustainable living practices.

II. NEED OF THE STUDY

A large body of academic studies has emphasized the risks of using traditional cookstoves. As pointed out by Smith et al. (2014), indoor pollution due to the burning of biomass in households is one of the most important determinants for COPD and pneumonia among children. When a woman cooks on an open fire using wood in her house, she inhales PM_{2.5} particles at levels significantly higher than the WHO recommended threshold. The consensus is that shifting to cleaner fuel sources is the only option available.

Many papers have been written on the Pradhan Mantri Ujjwala Yojana (PMUY), a huge effort by the government to provide free connections for LPG usage in poor households. Despite the success reported by the government in millions of connections, there is a trend that has been pointed out by scholars such as Kar et al. (2019). This implies that although the

family owns an LPG stove, they do not dispose of the mud stove. Since the refills of the LPG cost money, they opt to use the LPG stove to cook fast foods such as morning tea and resort to using wood or animal waste to cook other heavy meals. Regarding electricity, the research conducted by international organizations such as the International Energy Agency (IEA) indicates an optimistic view about how the use of decentralized solar energy, which entails the use of either personal solar panels or communal grids, is revolutionizing rural areas in India by removing the need for using kerosene as fuel, which posed health risks through indoor pollution.

Although there is ample research available on air pollution, hardly any links the decision on energy use with personal health costs and drinking water sources in the same villages. We understood that in order to paint a complete picture, we needed to inquire about both how much villagers use and how much they pay for medications, as well as their drinking water sources.

III. RESEARCH METHODOLOGY

3.1 Population and Sample

The cluster of villages that we have chosen may be referred to as “a transitioning community,” where residents do not live in absolute isolation from the city, yet are not considered to be urbanized enough. The sample of 100 interviewees consists of those who represent this kind of environment: some of them engage in agriculture, while others work in factories or as security guards.

3.2 Data and Sources of Data

Primary Data Collection was used as a method in our research, and a questionnaire with 32 questions was prepared. Yet it should be noted that interviews were held in a face-to-face manner since some questions needed clarification (e.g., Green Energy, Biogas). A 32-item questionnaire was divided into three main categories: Energy Use, Health Risks, and Environmental Readiness. The interviews were conducted among the community members over a span of two weeks, preferably in the afternoons or evenings, after they have returned from work. Specifically, the head of the family, or whoever is responsible for the preparation of the food (which is usually the females), were interviewed.

3.3 Problems Faced in Execution and Solutions

Problem 1: People were initially apprehensive about us because they thought we were government employees coming to monitor their meters and/or cut their subsidies.

Solution: We would start by sitting down with them, sipping some tea, and informing them that we are merely college students conducting our college assignment.

Problem 2: Women, who actually know everything about cooking, often felt uncomfortable giving us their views when there were men around.

Solution: We made sure that our group interacted with the women separately in the kitchens to get their genuine inputs.

Final Outcome: We managed to carry out thorough discussions with exactly 100 respondents.

IV. RESULTS AND DISCUSSION

4.1 Results of Demographics in the Village (Univariate Analysis)

The total number of respondents in our group was 100, which provides an ideal representation of the village population.

Gender: 52% Male, 48% Female. We made a sincere effort to maintain the balance between genders to ensure that we receive the point of view of both the breadwinner and the housewife (Figure 4.1).

Respondents:

Average Age: 39.4 years. Our youngest respondent was 26 years old, and the eldest was 60 years old.

Profession:

Housewives: 32%

Farmers / Field Workers: 28%

Factory / Company Workers: 15%

Security Guards: 12%

Small Shop / Medical Store Owners: 8%

Others: 5%

House Type:

Pukka (Brick/Cement): 55%

Semi-Pukka: 35%

Kutchra (Mud/Thatch): 10%

Visual Data Analysis: The Survey Results

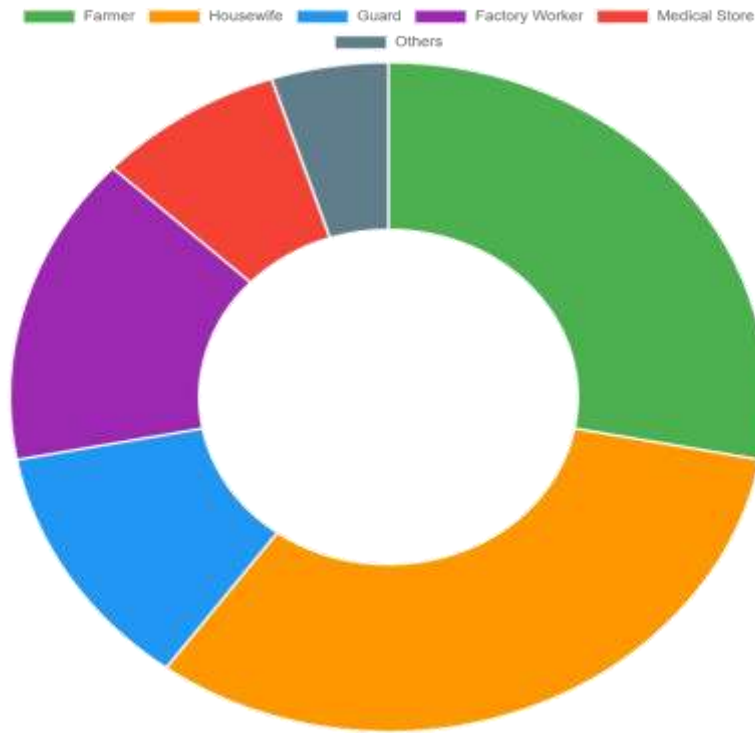


Fig. 4.1 Profession of respondents in the village.

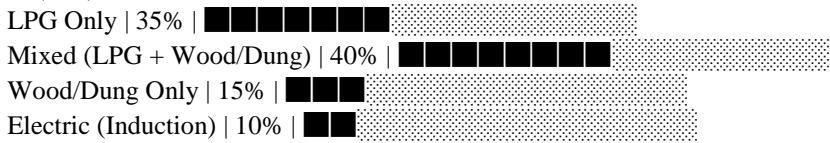
4.2 Results of Questionnaire Survey

1. The Shift in Cooking Fuels

We asked what their primary cooking fuel was. The results show a community in transition (Figure 4.2).

Fuel Used | Percentage of Households | Visual Representation

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Observation: Though a good portion has switched to LPG, 40% have adopted the “Fuel Stacking” approach, where they utilize LPG for fast activities like making tea but burn wood for slow tasks such as boiling milk and cooking rotis.

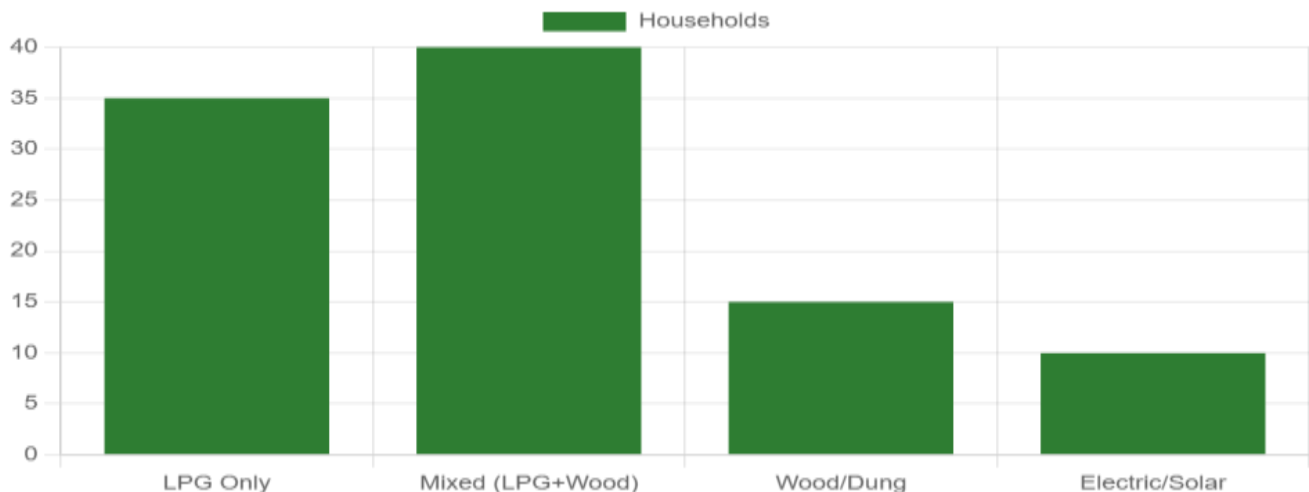


Fig. 4.2 Type of cooking fuels used by the village respondents.

2. The Solar Success Story

With respect to lighting during power failures, the practice of using deadly kerosene lamps has been fully eradicated.

- Solar Panel Users (Personal & Community): 64%
- Electric Inverters: 20%
- Torches/Candles: 16%
- Kerosene: 0%

Observation: This is a huge success. People are very enthusiastic about solar power. Even semi-pukka families pay a little fee to access a bigger community solar panel that they can share with their neighbours for charging phones and lighting up bulbs (Figure 4.3).

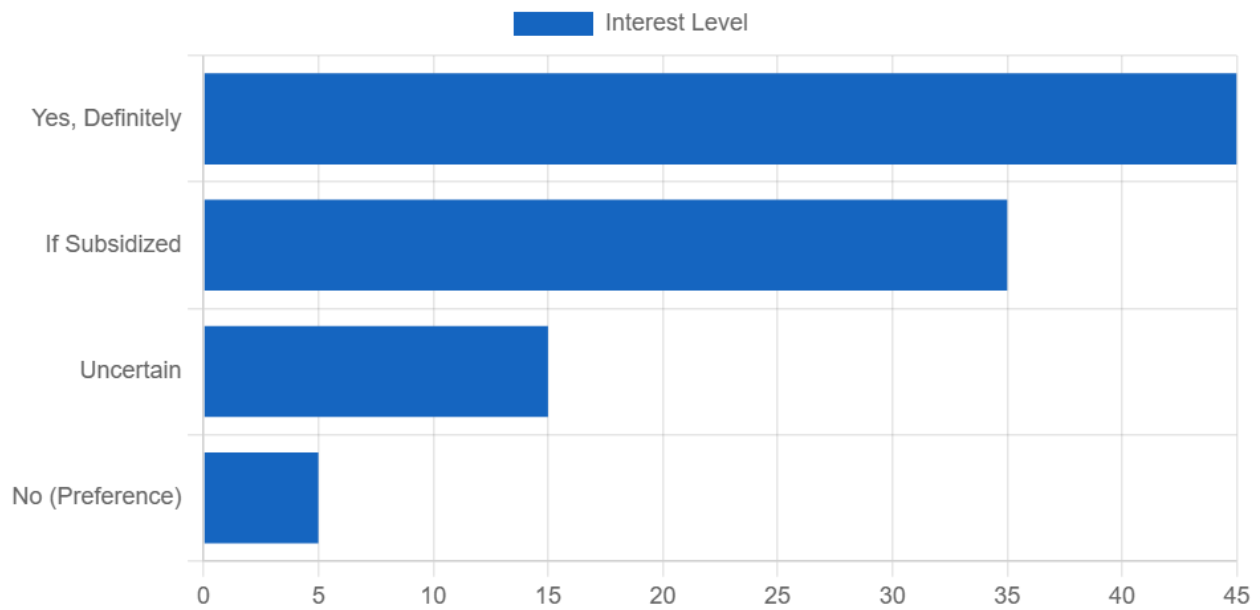


Fig. 4.3 Willingness of respondents to use solar panels.

3. Respiratory Health Hazards

The respondents were probed about any symptoms of coughing or irritation in the eyes within the last six months (Figure 4.4).

- No Issues: 48%
- Chronic Cough/Wheeze: 25%
- Eye Irritation/Sore Throat: 17%
- Asthma/Allergies: 10%

Conclusion: In summary, out of the 52% of households that have any kind of respiratory or eye issues, they are directly tied to the 55% of people who still use wood/dung for burning.

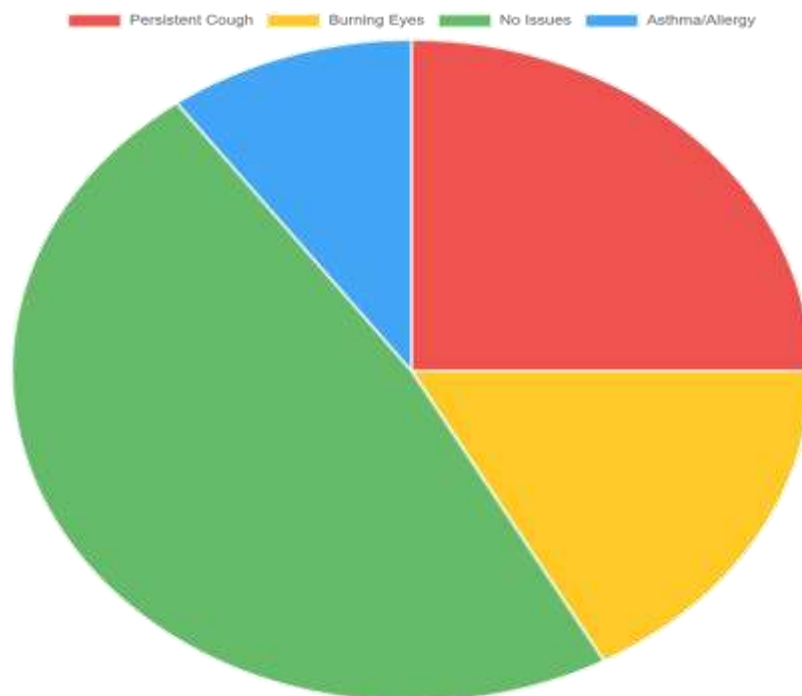


Fig. 4.4 Respiratory health hazards faced by the respondents in last six months.

4. The Healthcare Strategy

We were interested in knowing the cost incurred by them for such ailments (Figure 4.5).

Average Medical Expense Per Month:

- Less than ₹500: 75% of the respondents
- ₹500 – ₹1000: 15% of the respondents

- More than ₹1000: 10% of the respondents

Observation (“Pharmacy First” Practice): To begin with, spending below ₹500 suggested that they are all healthy individuals. However, what was unearthed from the interviews gave us a different impression. Good hospitals are simply out of reach in terms of location and price. Upon contracting a serious cough as a result of the smoky air, one simply does not go to a hospital. Instead, they visit their nearest medical shop, describe their symptoms, and purchase cheap cough medicine.

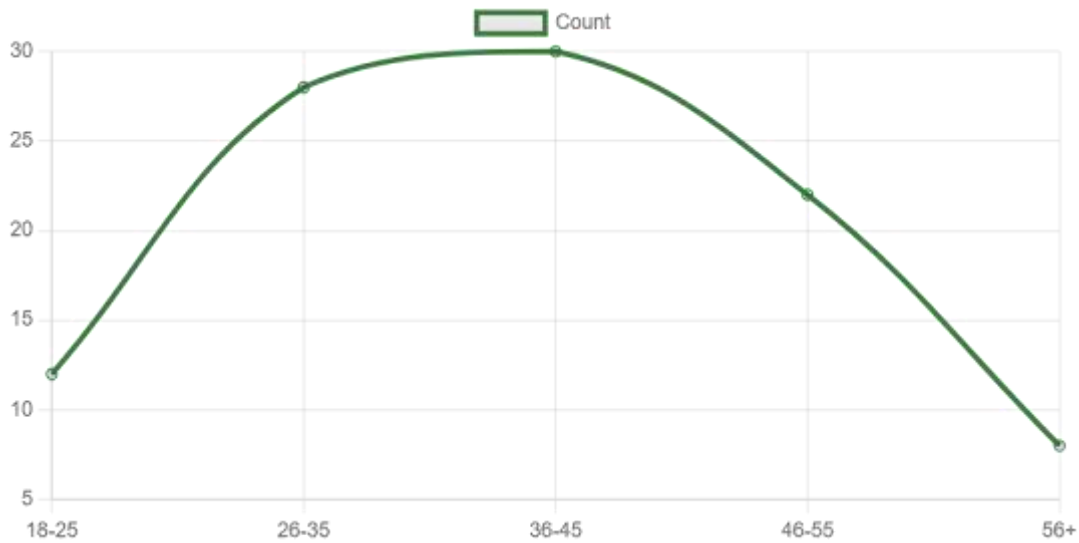


Fig. 4.5 Average medical expense of respondents per month.

Hidden Water Crisis (Observation Data)

During the survey process, we made observations and asked about the sources of drinking water for the families (Figure 4.6).

- From Local RO Dealers (Blue Bottles): 92%
- From Groundwater/Water Hand Pump: 5%
- From Government Distribution: 3%

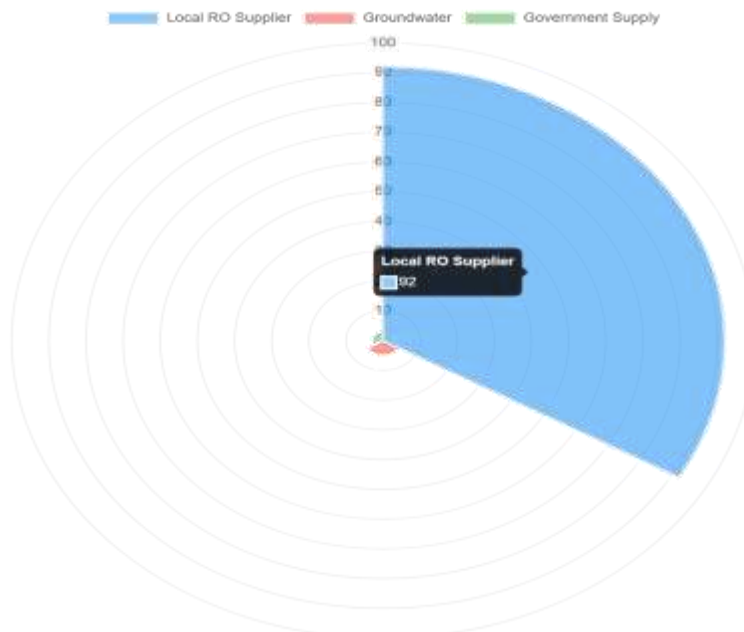


Fig. 4.6 Sources of drinking water for the respondents’ families.

Observations: The villagers are scared of contamination of groundwater. Therefore, 92% of them spend daily money purchasing 20 litres of RO water in blue bottles from local suppliers. But when we tested the quality of this purchased water, we found the TDS level highly inconsistent, fluctuating between 150 and 200 TDS. They have been doing so without realizing how impure the water really is. Health is one of their major concerns, but they do not have the means of checking its purity.

V. ACKNOWLEDGMENT

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