Journal of Mines, Metals and Fuels, *73(5): 1441-1461; 2025. DOI: 10.18311/jmmf/2025/48746*

Print ISSN : 0022-2755

Journal of Mines, Metals and Fuels

Contents available at: *www.informaticsjournals.co.in/index.php/jmmf*

Pradhan Mantri Ujjwala Yojana and its Effectiveness: A Qualitative Study of Mayurbhanj District of Odisha

Aruna Kumar Dash[1*] and Debajani Sahoo[2]

[1]Department of Economics, ICFAI School of Social Sciences, IFHE University, Shankerpally Road, Dontanapally - 501203, Telangana, India; arundash06@gmail.com

[2]Department of Marketing and Strategy, IBS Hyderabad, IFHE University, Shankerpally Road, Dontanapally - 501203, Telangana, India

Abstract

This qualitative study examines the awareness, adoption, and impact of the Pradhan Mantri Ujjwala Yojana (PMUY) on tribal women in the Mayurbhanj district of Odisha, India. Using a Focus Group Discussion (FGD) methodology, the study collected data from diverse stakeholders, including LPG distributors, sarapanch, head of the tribal family and tribal female households and beneficiaries. The findings reveal four key themes: Economic and practical barriers, Adoption and utilization of LPG, Impact of PMUY, and Sustainability and long-term use. The findings highlight four key themes that hinder consistent LPG usage: Economic barriers (high refill costs, subsidy delays, and reliance on biomass), adoption challenges (awareness gaps and cultural preferences), impact (increased access to LPG but inconsistent usage), and sustainability (reliance on traditional fuels due to lack of continuous support and education). The study concludes that PMUY has empowered tribal women with cleaner cooking solutions, but economic, cultural, and knowledge barriers limit its full potential. The study findings reveal both the potential benefits, and the persistent challenges associated with LPG adoption, highlighting the need for targeted interventions to enhance the program's effectiveness. The financial implications of regular LPG usage often force households back to traditional biomass fuels. This aligns with existing literature that underscores the importance of affordability in energy transitions, particularly in low-income settings where financial constraints are prevalent. Recommendations include targeted educational awareness, better subsidy systems, and income-based pricing to improve adoption and sustainability, offering valuable guidance for policymakers to enhance PMUY's impact on marginalized communities.

JEL Classifications: *I38, O13, Q48*

Keywords: *Awareness and Knowledge, Cultural Resistance, Clean Cooking Solutions, Economic Barriers, LPG Adoption, Pradhan Mantri Ujjwala Yojana (PMUY), Tribal Women*

1.0 Introduction

Indoor air pollution in India is a growing health concern for older adults, largely due to traditional cooking practices that involve burning solid biomass fuels like wood, animal dung, charcoal, agricultural waste, and kerosene[1]. These fuels are burned in open fires or inefficient stoves, leading to high levels of household air pollution, especially during meal preparation. This pollution poses significant health risks, particularly for vulnerable populations such as the elderly. Household sources, including burning wood and cow dung, are the primary contributors to air pollution in many developed countries[2,3]. Air pollution is a significant public health concern globally, in developing nations[4]. Around 2.1 billion people worldwide use inefficient stoves, fuelled by kerosene, biomass, and coal, causing

**Author for correspondence*

harmful household air pollution[5]. Air pollution is a significant global environmental risk factor that poses a significant threat to human health. Household air pollution has become a global threat to human health and over 3.2 million people die prematurely each year from diseases caused by household air pollution[6]. Most of the pre-mature deaths due to household air pollution are mostly in low and middle-income countries. Exposure to household air pollution can lead to noncommunicable diseases such as stroke, heart disease, Chronic Obstructive Pulmonary Disease (COPD), and lung cancer[5]. Out of 3.2 million deaths, 32% are from ischaemic heart disease, 23% are from stroke, 21% are due to lower respiratory infection**,** 19% are from Chronic Obstructive Pulmonary Disease (COPD) and 6 % are from lung cancer[5]. Every year, 6.7 million premature deaths are linked to the combined impacts of household and ambient air pollution. According to a World Health Organization report, the smoke inhaled by women using these fuels can be equivalent to smoking 400 cigarettes per hour[7]. In India, 0.61 million deaths were reported from household air pollution in 2019[8]. Household air pollution is primarily used in rural areas for cooking due to its easy accessibility and affordability compared to cleaner fuels like LPG. In India, cooking exposure to household air pollution is the second leading cause of death, causing approximately 925,000 premature deaths annually[9]. The absence of affordable, clean cooking energy is a commonly neglected issue that profoundly affects the survival of millions of women.

Sustainable Development Goal (SDG) 7 focuses on ensuring universal access to clean fuels and technologies, emphasizing the need to reduce reliance on harmful energy sources for cooking, heating, and lighting[10,11]. The way people cook can play a significant role in achieving several Sustainable Development Goals (SDGs), including good health and well-being (SDG 3), gender equality (SDG 5), affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and climate action (SDG 13).

India's government initiated several schemes to combat household air pollution, including the "National Programme on Improved Chulhas" in the 1980s, the "National Biomass Cookstoves" program in 2010, and the "Give It Up" and "Smokeless Village" campaigns in 2014 to encourage clean cooking via LPG in rural households.

The Pradhan Mantri Ujjwala Yojana (PMUY), a flagship energy policy initiative started by Prime Minister Narendra Modi in May 2016, aims to provide five crore free Liquefied Petroleum Gas (LPG) connections to underprivileged women by March 2019. The PMUY, India's largest clean fuel access program, reached 72 million low-income families from April 2016 to June 2019. As of November 1, 2024, India has 32.83 crore active domestic LPG consumers, including 10.33 crore beneficiaries of the PMUY[12]. The immediate and most noticeable benefit of adopting LPG is its positive impact on women's well-being, as it leads to: (a) less time spent on fuel collection and preparation, (b) shorter cooking times, and (c) more convenient cooking arrangements. The literature hasn't given much attention to these advantages of using LPG. Promoting clean household fuels is a key strategy for mitigating climate change and enhancing public health. PMUY is a significant initiative that provides clean cooking fuel to millions of below-poverty families, improves health by reducing indoor air pollution, empowers women, promotes environmental sustainability, and enhances economic opportunities in rural areas. Internationally, PMUY aligns with the UN Sustainable Development Goals, promoting health, clean energy access, and climate action, and has made India a leader in promoting clean energy solutions.

The PMUY is a significant government initiative providing free LPG connections and subsidized refills to BPL families in rural India. Initially, the government bears the costs of setting up connections, including cylinder, regulator, and installation fees. Despite the subsidized refills, the ongoing LPG supply costs add to the financial burden. PMUY addresses health, environmental, and economic challenges on a large scale, making it a critical intervention in India's development strategy. The Government can reduce the cost of the PMUY by partnering with private players, improving subsidy efficiency, introducing micro-financing options, and encouraging local production of LPG cylinders. A long-term solution could involve phasing in income-based subsidies, ensuring sustainability, and expanding awareness programs to promote LPG use. Improving distribution networks in rural areas will also ensure greater reach and cost-effectiveness in the long run.

The PMUY initiative is particularly significant in states like Odisha, where LPG penetration has historically been low compared to national averages[13]. It is crucial to research the PMUY in Mayurbhanj district because this district is located in rural Odisha and has a high

percentage of Below Poverty Line (BPL) families who rely on traditional cooking methods. By evaluating PMUY's effects, we can determine how well it works to empower women in these marginalized communities, improve health outcomes, and supply clean cooking fuel. The study can identify regional challenges like LPG infrastructure access and refill affordability, providing insights for enhancing the scheme's sustainability in similar rural areas across India.

In this context, a qualitative study conducted among tribal households, particularly in the Mayurbhanj district of Odisha, to evaluate the multifaceted impact of PMUY on tribal women's lives, focusing on various dimensions such as cooking practices, health status, financial implications, and overall contentment. The objectives outlined in this study seek to explore personal and health challenges faced by these tribal women due to traditional cooking systems, assess economic benefits derived from PMUY, and understand its influence on social interactions and environmental conditions[14].The study also analysed the awareness levels of PMUY among tribal women and its effectiveness in achieving sustainable development goals related to health, clean energy access, and climate action. By examining these aspects, the study aims to provide comprehensive insights on how PMUY can serve as a catalyst for positive change within tribal women communities in Odisha.

The current study is unique as it tries to address the effectiveness of PMUY scheme among tribal women, which was overlooked by the earlier researchers. The present study tries to capture the challenges faced by households during and after the implementation of the PMUY scheme, as well as any social, economic, and cultural changes in their living style. To our knowledge, no research has specifically examined the Indoor air pollution through a focus group discussion data from diverse stakeholders, including LPG distributors, sarpanch, head of the tribal family, tribal female households, and beneficiaries. To the best of our knowledge, earlier researchers have overlooked the PMUY impacts on tribal women. This study aims to fill this gap and provide insights for environmentalists, healthcare professionals, and policymakers to improve household environmental conditions and shape health policies, particularly for this vulnerable demographic. The study's findings have implications for clean fuel adoption well beyond India's LPG program. From a policy perspective, our results indicate complementarity between improving health awareness and loosening financial constraints. The study findings hold significant contributions to the society. It focuses on three out of 17 Sustainable development goals: SDG 3 (Good health and well-being), SDG 7 (Affordable and clean energy), and SDG 13 (Climate action).

2.0 Review on Pradhan Mantri Ujjwala Yojana

The primary source of household air pollution is incomplete combustion of dirty fuels, such as wood burning in kitchens, cow dung cakes, and agricultural leftovers. The exposure to household air pollution depends on multiple factors[15] such as (i)the characteristics of the houses, (ii)geographic location, (iii)exposure time, (iv)socio-economic condition of the households, (v) ventilation and design of the kitchen, (vi)and the fuel type used.

Clean fuels are crucial for reducing indoor air pollution and promoting public health, while access to clean energy is essential for a high-quality life. The PMUY scheme seeks to empower women by offering them deposit-free LPG connections, thereby alleviating the health risks associated with traditional cooking methods that rely on biomass fuels such as firewood and dung cakes. The program aims to offer deposit-free LPG connections to adult women aged 18 and above from poor households across the country. The scheme aims to decrease indoor air pollution, enhance the health of women and children, and empower women from BPL families to contribute to a healthier environment. PMUY aims to mitigate these health hazards by promoting the adoption of cleaner cooking technologies, thereby improving the overall health and well-being of women and their families. The scheme also addresses broader socio-economic issues, including reducing health expenditures and enhancing financial savings for beneficiaries[16].

Consensus believes that low usage of LPG, of course, is poverty in developing countries. Though subsidized LPG is available, the cost is high for the rural tribal households. LPG, instead of wood and cow dung, poses significant financial challenges for poor households due to its recurring expenditure requirement. As a result, they prefer to use traditional fuel as it is freely available when they have irregular income and financial constraints.

Literature has indicated attributes like wealth, income, fuel price, education, gender, and preferences to be among the major determinants of household fuel choice[17-19]. Irrespective of their income, there is a low awareness of the long-term health hazards of solid fuel combustion. The program requires women in rural, socio-economically disadvantaged households to obtain an LPG account without any upfront cost.

Few studies have examined the impact of PMUY on a national level in India[20-22], and even fewer focus specifically on Odisha[23]. For instance[20] investigates the impact of PMUY on rural households and the socio-economic changes of rural women after obtaining LPG connections in the Jammu region. Snowball technique, semi-structure interviews, focus group discussions, and case studies were used in this study. Results show that PMUY schemes have positively impacted rural women's lives, improving education, health status, economic empowerment, and lifestyle changes, including a shift in lifestyle.

The impact of the PMUY on LPG accessibility among poor households in India is examined by[21]. Using advanced statistical methods and NFHS data, study found a 2.1 percentage point increase in LPG consumption and a decrease in firewood use. Regional and social group differences show stronger benefits in the North, West, South, and among Scheduled Caste households. However, usage sustainability remains a challenge, especially in the East and Northeast. The study suggests targeted policies to address regional and community-specific disparities for long-term LPG adoption.

A study[23] on LPG adoption in rural Odisha under PMUY reveals that education and subsidy amount positively influence LPG use, while general category households show lower adoption. Kerosene availability limits adoption, but income doesn't. The study suggests policies should improve LPG pricing, awareness, and delivery mechanisms for a cleaner energy transition. These studies are not sufficient enough to address the effects of PMUY. Hence any new study will add to the review of existing literature.

3.0 Research Methodology

This qualitative study employed a Focus Group Discussion (FGD) approach to gather insights from various stakeholders involved in the implementation and impact of the Pradhan Mantri Ujjwala Yojana (PMUY) in the Mayurbhanj district of Odisha. The participants included village LPG distributors, Delivery boys, Sarpanchs (village heads), House heads (males)/ Head of the tribal family, and housewives, ensuring a comprehensive understanding of the scheme's effects on different demographics.

The head of the tribal family and household head from our research respondent perspective are the same. In many tribal families, the husband serves as the household head, while in some families, the in-laws (father-in-law/ mother-in-law) hold the position of head and participate in household decision-making. So, in our present study, we try to capture both as they are involved in the successful implementation of PMUY scheme. The PMUY scheme benefits tribal women only with the approval of the house head, who spends the money, handles the procedure, and refills the cylinder, while women are the consumers. If the house head could not afford and comfortable with the traditional cooking fuel, then the women face challenges to avail the scheme as they are not the main decision-makers in the family.

3.1 Sampling Design

Participants were selected based on their roles and experiences related to PMUY. The study aimed to conduct 10 FGDs across different blocks, with each group comprising individuals within a 5 km to 15 km radius to facilitate accessibility. The selection criteria included:

- Village LPG Distributor/Delivery Boy: Individuals responsible for distributing LPG and providing training to users.
- Sarpanch: Village leaders who can provide insights into community-level impacts and challenges.
- House Head (Male): Male heads of households who can share perspectives on family dynamics and economic impacts.
- Housewife: Female beneficiaries who directly experience the benefits and challenges of using LPG.

Focus Group Discussion (FGDs) is a qualitative research method where a moderator leads a small group of participants in a conversation about a specific subject. They provide researchers with a deeper understanding of participants' motives, thoughts, and feelings, revealing details not found in one-on-one interviews. FGDs

Table 1. Summary of qualitative study respondents

Field Investigator	No. of Villages surveyed	Name of the Villages surveyed	No. of housewife interviewed	No. of Male head interviewed	No. of distributors interviewed	No. of Sarpanchs/Ward Members/Agents/ Ujjwala Didi interviewed
Field Investigator (FI 1)	5	Ranipal, Purnapani, Kontabani, Patepani, Dandhbose	5	5	2	3
Field Investigator (FI 2)	4	Khejuripada, Bhalupahadi, Angarapada, Kherna	12	5	4	3
Field Investigator (FI 3)	7	Purasattampur, Dhobanijoda, Kandalia, Chakdar, Pundbad, Tila, Bhuasuni	5	4	4	4
Field Investigator (FI 4)	4	Gopalbandh, Mahisa neda, Laxmipasi, Ruma pahadi	8	6	4	3
Field Investigator (FI 5)	6	Chandri, San Narini, Matkamdihi, Sindrighutu, Bad Narini, Lupung	6	4	3	4
		Total	**36**	**24**	**17**	**17**

Source: Authors' computation.

also offer businesses insights into customer wants, requirements, and pain areas, saving time and money by collecting multiple perspectives simultaneously.

According to Table 1, there were 36 housewives interviewed, 24 male heads interviewed, 17 distributors interviewed, and 17 sarpanchs, ward members, agents, and Ujjwala didi interviewed. There were 94 responders in all.

3.2 Data Collection

Data was collected through semi-structured interviews guided by a questionnaire tailored for each participant group. The questionnaire included demographic information (name, Aadhaar card number, mobile number, gender, age) followed by specific questions designed to elicit detailed responses regarding:

- Training Difficulties: Challenges faced by distributors while training rural women on safety measures.
- Comfort Levels: Perceptions of women's comfort and hesitation regarding LPG use.
- Sales Impact: Changes in LPG sales post-PMUY implementation.
- Long-term Use: Sarpanch perspectives on the sustainability of LPG usage among women.
- Empowerment Assessment: Views on whether PMUY contributes to women's empowerment.
- Cooking Practices: Insights from housewives about their cooking methods and kitchen ventilation.

The FGDs were conducted in local languages to ensure participants could express themselves freely and comfortably.

4.0 Data Analysis and Results

The data analysis for this qualitative study was guided by a thematic framework that identified key themes and subthemes related to the impact of the Pradhan Mantri Ujjwala Yojana (PMUY) on tribal women in the Mayurbhanj district of Odisha. The analysis involved coding participants' responses and extracting insights that reflect their experiences and perceptions regarding LPG adoption and utilization. The following themes emerged from the data: (Table 2). In addition, the study adhered to the Consolidated Criteria for Reporting Qualitative

Research (COREQ) guidelines to enhance the rigor and transparency of the qualitative research process[7].

4.1 Ethical Considerations

Informed consent was obtained from all participants prior to their involvement in the study. Participants were assured of confidentiality and anonymity regarding their responses. The research was conducted with sensitivity to cultural norms and practices prevalent in the tribal communities of Mayurbhanj district. This methodology aims to provide a comprehensive understanding of PMUY's impact on tribal women's lives, contributing valuable insights for policymakers and stakeholders involved in similar initiatives.

4.2 Result

The results of this qualitative study reveal several key themes regarding the impact of the Pradhan Mantri Ujjwala Yojana (PMUY) on tribal women in the Mayurbhanj district of Odisha. The thematic framework outlined below highlights the main themes, subthemes, and key insights derived from participant responses.

Conceptual Model for PMUY Impact on Tribal Women

Central Theme: Empowerment through Clean Cooking Solutions (LPG Adoption)

This model illustrates how various factors influence the adoption, utilization, and sustainability of LPG among tribal women in Odisha, highlighting barriers and enablers.

According to Table 2, the main themes are economic and practical barriers, adoption and utilization of LPG, Impact of PMUY, and sustainability and long-term use.

4.3 Relationships Between Themes

4.3.1 Economic Barriers

- High costs associated with LPG refills directly impact its consistent use.
- The availability of free biomass fuels creates a preference for traditional methods, especially among economically disadvantaged households.

4.3.2. Awareness Gaps

- Limited knowledge about PMUY benefits and safety leads to misconceptions that hinder adoption.
- Cultural attachments to traditional cooking practices further complicate the transition to LPG.

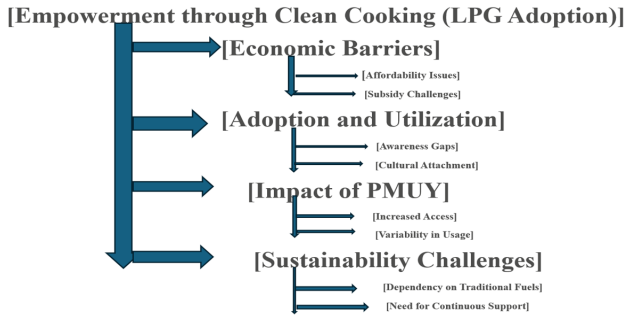


Figure 1. Conceptual model.
Source: Compiled by authors.

4.3.3 Impact of PMUY

- While PMUY has increased access to LPG, economic factors still limit its regular use.
- The variability in usage reflects the ongoing challenges faced by households, particularly during adverse weather conditions.

4.3.4 Sustainability Challenges

- Dependency on traditional fuels remains strong due to cultural practices and economic realities.
- Continuous support from distributors is essential for fostering long-term adoption and addressing safety concerns.

4.4 Analysis: Economic and Practical Barriers

4.4.1 Affordability and Subsidy Challenges

As per most of the participants, the high cost of LPG refills is the primary barrier to its regular usage. Many housewives and male heads mentioned that their limited and irregular incomes make it challenging to afford refills, despite acknowledging the convenience and benefits of LPG. According to women working as agricultural labourers, their seasonal incomes further exacerbate this issue, forcing them to rely on biomass fuels, which are free and easily accessible.

"The high cost remains a significant barrier for Jano's family, making biomass the more practical option for their cooking needs." (Housewife FGD)

Most participants highlighted that accessing subsidies is a significant challenge due to issues with documentation, such as Aadhaar not being linked to bank accounts, or delays in payments. According to gas distributors, these

Table 2. Thematic Framework for PMUY Impact on Tribal Women

Theme	Subtheme	Key Insights	Quotes/Attributions
Economic and Practical Barriers	Affordability and Subsidy Challenges	High refill costs prevent regular usage; subsidy delays and documentation issues create mistrust and discourage adoption.	"The high cost remains a significant barrier for Jano's family." (Housewife FGD) "Subsidy money is not piped as Aadhaar is not linked to the account." (Gas Distributor)
Economic and Practical Barriers		Availability of free and affordable biomass fuels limits LPG adoption.	"Some people said they didn't care because they know the wood and leaves were available." (Housewife FGD)
Economic and Practical Barriers	Workforce Challenges	Dependency on free government schemes reduces motivation to work; need for workforce training and job creation initiatives.	"Some individuals expect all necessities to be handed to them without effort." (Gas Distributors)
Adoption and Utilization of LPG	Awareness and Knowledge	Limited awareness about PMUY benefits; reliance on second-hand information creates misconceptions.	"Most of the people were not aware of PMUY." (Sarpanch)
Adoption and Utilization of LPG		Cultural attachment to traditional cooking methods and fear of gas leaks hinder adoption.	"Hesitation to adopt LPG due to fears of gas cylinder leaks and explosions." (Sarpanch)
Adoption and Utilization of LPG	Transition to LPG	Households use LPG selectively due to cultural practices, affordability issues, and seasonality (e.g., rainy weather).	"The chulha is what we are used to; gas feels strange, and we save it for special occasions." (Housewife FGD)
Impact of PMUY	Health Benefits	LPG reduces health risks linked to indoor air pollution and decreases physical labor for women.	"LPG usage has reduced indoor pollution and the associated need for frequent house cleaning." (Housewife, Champa Marndi) "PMUY is effective in promoting good health." (Male Head)
Impact of PMUY	Lifestyle Improvements	Time savings from LPG enable women to focus on family, leisure, and household management; high refill costs remain a barrier.	"Using LPG has saved her time, allowing her to spend more time with her family." (Housewife, Basanti Naik) "LPG cooking saved time, enabling her to manage her household." (Housewife, Sangita Naik)
Sustainability and Long-Term Use	Sustained Use of LPG	Dependency on free goods fosters reluctance to invest in LPG; committed users view LPG as essential for their households.	"Many villagers are waiting for the government to provide gas for free." (Gas Distributors) "Women expressed strong commitment to continued use." (Sarpanch)
Sustainability and Long-Term Use	Economic Empowerment and Self-Sufficiency	Direct financial support like cash transfers and workforce training could empower households; LPG use saves time for productive activities like education and work.	"Cash transfers could empower people to invest in cleaner cooking options." (Gas Distributors) "Families using LPG contribute to economic growth." (Sarpanch)

Source: Compiled by authors.

delays create mistrust in the system and discourage beneficiaries from adopting LPG consistently. Many villagers, as per the sarpanch, initially misunderstood PMUY as providing free LPG, leading to confusion and reluctance to engage with the scheme.

"Now subsidy is provided to Aadhaar-linked accounts, but subsidy money is not piped as Aadhaar is not linked to the account." (Gas Distributor)

"The villagers initially misunderstood the PMUY promise of free LPG connections and struggled with rising gas prices and delayed subsidies." (Sarpanch)

According to the majority of housewives, the availability and affordability of biomass fuels like wood, agricultural waste, and cow dung make them a more practical option compared to LPG. This sentiment was widely shared across rural households, where participants explained that these resources are freely available and fit better within their limited budgets. Even during adverse weather conditions, participants like Bangi Majhi mentioned that biomass is often the default option when LPG refills are unaffordable.

"Some people said they didn't care because they know the wood and leaves were available at the facility." (Housewife FGD)

"Biomass fuels remain the primary option due to their affordability and availability." (Male Head)

As per most women participants, the economic barriers to consistent LPG usage disproportionately impact women, who are primarily responsible for cooking. Although PMUY has empowered many women by providing access to cleaner cooking options, the high cost of refills limits its potential to fully alleviate the burden of traditional cooking methods. According to housewives like Karmi Murmu, the inability to afford LPG forces them to continue relying on time-intensive and laborious alternatives.

"Housewives highlighted that the high cost of LPG refills, coupled with irregular income, makes regular use unaffordable." (Housewife FGD)

Most participants, including gas distributors and sarpanches, emphasized the need for more accessible pricing models to encourage wider LPG adoption. According to gas distributors, reducing LPG prices directly, rather than relying on subsidies, would be more effective in encouraging refills. Many participants suggested introducing income-based pricing, instalment payment plans for stoves and subsidized first refills to make LPG more affordable for economically disadvantaged families.

"If the price of LPG is reduced directly instead of the subsidy received by the government, it could be convenient for people to refill." (Gas Distributor)

"Lowering gas prices would encourage more widespread use." (Sarpanch)

4.4.2 Workforce Challenges

According to gas distributors, while government programs like PMUY, free rice distribution, and medical check-ups have improved living standards, they have also unintentionally created dependency among some beneficiaries. This dependency, as per the distributors, leads to a lack of motivation to seek employment, even for well-paying positions. They emphasized that targeted support could help incentivize individuals to work and achieve greater self-sufficiency.

"Some individuals expect all necessities to be handed to them without effort, which reflects a broader issue in motivating workers." (Gas Distributors)

As per the sarpanch, the prevalence of seasonal labor and irregular income streams exacerbates the affordability challenges of LPG refills. This instability often pushes households to revert to traditional, free resources like firewood, as they are unable to commit to the recurring costs of LPG.

"Seasonal labor and unstable incomes exacerbate affordability issues, influencing decisions to revert to free resources like firewood." (Sarpanch)

4.5 Adoption and Utilization of LPG

4.5.1 Awareness and Knowledge

Gas distributors conduct safety training programs 2-3 times a year in village areas, often at community centres like Anganwadis. These sessions typically involve 10-30 participants, indicating some efforts toward creating awareness. However, the limited reach of these campaigns restricts broader understanding of LPG safety and benefits.

"We conduct safety training programs 2-3 times a year, but they are attended by only a few beneficiaries." (Gas Distributor)

Despite these efforts, there remains a significant gap in awareness about the Pradhan Mantri Ujjwala Yojana (PMUY) scheme and its specific benefits. Many villagers rely on second-hand information from agents, neighbours, or ward members, leading to partial understanding or misconceptions about the scheme.

"Most of the people were not aware of PMUY when they collected the documents; they were told what the plan was at the time." (Sarpanch)

Housewives in rural areas generally know about LPG provision under government schemes but have limited knowledge about the details of PMUY. This lack of clarity often leads to confusion during the adoption process.

"They had heard about the scheme and also heard that the government was providing gas but did not know what PMUY actually meant." (Housewives)

Local leaders suggest that better-targeted education and clear communication about the costs and benefits of LPG could bridge this knowledge gap. Misunderstandings about the subsidy mechanism and associated expenses discourage households from consistently using LPG.

"Villagers need clearer information on the long-term health and economic advantages of LPG over traditional methods." (Sarpanch)

Information about PMUY predominantly comes from informal networks such as neighbours, agents, and ward members. Media, including TV and mobile phones, also play a role in spreading awareness but are underutilized for structured educational efforts.

"Information about PMUY was acquired from neighbours, ward members, and government officials." (Male Head)

"The role of media like TV and mobile phones in spreading awareness about PMUY and LPG usage has contributed to adoption in some areas." (Sarpanch)

Cultural attachment to traditional cooking methods, coupled with safety concerns such as fears of gas leaks and explosions, creates hesitation in adopting LPG. These challenges are further compounded by a lack of familiarity with LPG usage among new beneficiaries.

"Some stakeholders submitted documents but didn't know how to use the gas." (Sarpanch)

"Hesitation to adopt LPG due to fears of gas cylinder leaks and explosions." (Housewife)

4.5.2 Transition to LPG

According to most participants, resistance to changing traditional cooking practices is a significant barrier to adopting LPG. Many households continue to use chulhas alongside LPG, particularly outside their homes, to mitigate smoke inside while preserving familiar habits. Women participants often expressed that they find comfort in traditional methods, even as they acknowledge the convenience of LPG.

"The chulha is what we are used to; gas feels strange, and we save it for special occasions." (Housewife FGD)

Gas distributors mentioned that despite awareness campaigns, people hesitate to transition fully due to entrenched habits and cultural attachment to traditional cooking. Additionally, there is a misconception among some villagers that LPG will eventually be provided for free, further delaying full adoption.

"Many still believe the government will supply gas cylinders for free, so they hold on to old methods." (Gas Distributor).

Gas distributors play a crucial role in facilitating the transition to LPG. According to Mr. Dashrath Singh, a distributor with Makilighati Ganesh Gas Agency, the launch of the Pradhan Mantri Ujjwala Yojana (PMUY) has significantly boosted LPG sales. He shared those personal interactions with beneficiaries, including house visits and training sessions, have increased awareness and confidence among women.

"Going door-to-door and educating women about LPG has made them feel safer and more comfortable using it." (Gas Distributor)

Distributors highlighted that affordability issues remain a significant hurdle, but consistent usage is observed among households with stable incomes. Regular interaction and assistance from distributors have also built trust and encouraged first-time users to adopt LPG.

As per most housewives, economic constraints heavily influence LPG usage. While the initial connection through PMUY is a welcome change, many families

revert to traditional methods due to the recurring cost of refills. Women like Sakramani Murmu explained that while they recognize the health and time-saving benefits of LPG, limited incomes compel them to rely on biomass fuels for daily cooking.

"LPG is helpful, but we can't afford to refill it regularly, so we still collect wood for most meals." (Housewife FGD)

Additionally, sarpanches observed that hesitation to adopt LPG often stems from fear of leaks and explosions. This fear is compounded by a lack of familiarity with handling gas cylinders, especially among first-time users.

"Some villagers are hesitant because they worry about gas leaks; they feel firewood is safer and more reliable." (Sarpanch)

Households often adopt a hybrid approach, using LPG selectively during certain seasons or situations. For instance, during the rainy season, when firewood becomes scarce, families like Pama Soren's increase their LPG usage. However, the affordability issue re-emerges once the season changes.

"We use gas only when wood is wet or hard to find, mostly in the rainy season." (Housewife FGD)

According to most participants, collaborative efforts between distributors, government officials, and local leaders are essential to ensure the smooth transition to LPG. Stakeholders emphasized the need for consistent training programs and follow-ups to address hesitations and challenges during the transition.

"Regular training and awareness campaigns help build confidence among users and ensure they understand the benefits of LPG." (Gas Distributor)

4.5.3 Cultural Factors in the Adoption of LPG

The adoption of LPG in rural areas is significantly influenced by cultural factors, particularly the strong attachment to traditional cooking methods like the chulha. For many households, the chulha is not just a cooking tool but a symbol of self-reliance and cultural identity. This cultural attachment often creates resistance to change, even when there is awareness of the benefits of cleaner cooking technologies. According to a gas distributor from the Indhan center in Baliasahi village, many women, particularly from remote forest areas, show hesitation in fully embracing LPG. The distributor explained that although women users are becoming more comfortable with LPG, they do not feel compelled to use it consistently, indicating that cultural factors continue to influence their cooking choices.

"Women users are getting very comfortable benefits, and they do not feel compelled to use LPG cylinders." (Gas Distributor)

On the other hand, women from households like that of Pama Soren, a 45-year-old agricultural labourer from Kherna village, demonstrate how traditional fuels like wood and agricultural waste remain a culturally ingrained practice. Pama's family uses both LPG and biomass fuels for cooking, but their reliance on firewood and dry leaves is mainly due to their affordability and availability. This pattern is common in rural areas, where biomass fuels are deeply entrenched in local customs and are seen as more practical for everyday use, despite the availability of LPG.

"Apart from using LPG, all of them also use firewood and dry leaves for cooking, and their kitchens do not have ventilation." (Housewife FGD)

From the perspective of male heads of households, the preference for traditional cooking methods is further reinforced by the ready availability of natural resources like firewood. Many male participants emphasized that the accessibility and low cost of firewood and other biomass materials make traditional cooking methods a more viable and convenient option. This reflects a broader trend where, even with the introduction of cleaner technologies like LPG, the economic and practical benefits of traditional fuels continue to outweigh the advantages of switching to LPG.

"Natural resources are more readily accessible, making traditional cooking methods a viable alternative." (Male Head FGD)

4.6 Post-Pmuy Impact Of LPG Usage

The introduction of the Pradhan Mantri Ujjwala Yojana (PMUY) has had a significant impact on the adoption of LPG in rural areas. According to a gas distributor, there has been a noticeable increase in LPG sales and the number of consumers, with 5-10 % of people in the core Simlipala belt now using LPG regularly. This shows that PMUY has played a crucial role in increasing access to LPG and encouraging its use among rural populations.

"Since the introduction of PMUY, LPG sales have significantly increased, and consumer numbers have also gone up, with 5-10 % of people from the core Simlipala belt now using LPG." (Gas Distributor)

However, despite the increase in LPG connections, the extent of usage still varies. As described by housewives like Suni Barda and Pama Soren, while they are aware of the benefits of LPG and have received connections under PMUY, their usage remains limited. Suni, for instance, uses LPG infrequently due to financial constraints, and Pama's family has used it only four times over the years. This indicates that while the provision of LPG connections has made cooking fuel more accessible, economic factors, such as the cost of refills, still pose significant barriers to regular use.

"Despite receiving benefits from PMUY, her usage remains limited, primarily due to financial constraints." (Housewife - Pama Soren)

On the other hand, housewives like Mira Hembram, Sunita Naik, and Saraswati Beshra have reported significant time savings and increased convenience with the use of LPG. These women mentioned that using LPG not only improved their cooking efficiency but also freed up time for other household responsibilities or leisure activities. The advantages of LPG, especially in terms of timesaving, were particularly highlighted during rainy weather, when traditional methods like firewood and dry leaves become less effective.

"Using an LPG cylinder for cooking has been very advantageous, saving time and allowing her to focus on her family and other activities." (Housewife - Sunita Naik)

However, the use of LPG appears to be situational, particularly during adverse weather conditions. Male heads of households acknowledged that some families only use LPG during the rainy season, when gathering firewood becomes difficult and traditional methods are less practical. This situational reliance on LPG is also evident from the observations of the sarpanch, who noted that while PMUY has increased LPG connections, the ongoing reliance on traditional fuels indicates limited overall progress in LPG usage.

"Some families have adopted LPG, particularly during the rainy season when gathering firewood becomes difficult." (Sarpanch)

4.6.1 Health Benefits

The Pradhan Mantri Ujjwala Yojana (PMUY) has had a noticeable impact on the health and daily lives of rural families, particularly housewives. Many housewives are aware of PMUY and appreciate its benefits, such as improved health, time savings, and pollution-free cooking. For example, Sakramani Murmu from Angarapada village mentioned that using LPG saves time and reduces the physical strain previously required to collect biomass, though this was not explicitly stated as a health benefit. Similarly, Pama Soren shared that LPG has decreased the physical labor involved in cleaning soot-laden vessels and gathering firewood, easing her daily workload and indirectly improving her quality of life.

"The saved time and convenience of LPG use indirectly reduce physical strain associated with collecting biomass" (Housewife, Sakramani Murmu).

"LPG reduced the physical labor associated with collecting wood and cleaning soot-laden vessels, positively impacting her daily life" (Housewife, Pama Soren).

Champa Marndi, a 61-year-old from Kherna, highlighted that LPG usage significantly reduces indoor pollution, which in turn decreases the need for frequent house cleaning caused by soot from traditional cooking methods. Mira Hembram from Gopal Bandh Village noted that, while not explicitly mentioned, reduced reliance on biomass through LPG likely mitigates indoor air pollution and health risks in her household.

"LPG usage has reduced indoor pollution and the associated need for frequent house cleaning due to soot from traditional cooking" (Housewife, Champa Marndi).

"Reduced biomass usage would have mitigated indoor air pollution and health risks during LPG use" (Housewife, Mira Hembram).

Male heads of households also recognized PMUY's effectiveness in promoting health and reducing health costs. They acknowledged that the scheme enables pollution-free cooking, saves time and money, and reduces respiratory and other health issues caused by indoor air pollution. This agreement across households underscores the scheme's wide-reaching impact.

"PMUY is effective in saving time and money, enabling pollution-free cooking, promoting good health, and reducing health costs" (Male Head).

"They acknowledged the scheme's impact in promoting health by reducing indoor air pollution and health costs" (Male Head).

The Sarpanch emphasized that the shift to LPG has significantly reduced health risks associated with indoor air pollution, particularly respiratory issues. He also noted the potential for educational campaigns to further highlight these health benefits, using real-life stories to showcase improvements in community health after transitioning to LPG. Additionally, he linked the reduced reliance on firewood to decreased environmental degradation, emphasizing the long-term sustainability and ecological advantages of LPG adoption.

"The shift from traditional cooking methods to LPG has reduced health issues linked to indoor air pollution" (Sarpanch).

"Showcasing the reduction in health risks, particularly respiratory issues, from indoor air pollution through educational campaigns" (Sarpanch).

"Linking the use of LPG to reduced reliance on firewood and decreased environmental degradation" (Sarpanch).

4.6.2 Lifestyle Improvements

The Pradhan Mantri Ujjwala Yojana (PMUY) has brought noticeable improvements to the lifestyle of rural households, particularly housewives, by enhancing convenience and saving time. Housewives across villages unanimously recognized that LPG has significantly reduced the physical effort involved in cooking, such as cleaning soot-laden vessels and collecting firewood. This saved time has allowed many women to manage household responsibilities more effectively and engage in leisure activities, such as watching television or spending time with their families.

"Using LPG for cooking has been advantageous in several ways; it has saved her time, allowing her to spend more time with her family" (Housewife, Basanti Naik).

"LPG cooking saved time, enabling her to manage her household and care for her children more effectively" (Housewife, Sangita Naik).

For some, the benefits extend to seasonal advantages. Suni Barda and Sakramani Murmu noted that LPG cooking is particularly useful during the rainy season, when collecting firewood becomes challenging. This highlights how LPG can alleviate weather-dependent inconveniences tied to traditional cooking methods.

"Using LPG for cooking has been very advantageous, saving time and allowing her to focus more on her family and other activities, particularly during rainy weather" (Housewife, Suni Barda).

"LPG significantly aids cooking during rainy weather and saves time, which she can spend with her family or use for other tasks" (Housewife, Sakramani Murmu).

Despite these benefits, many housewives, including Sunita Naik, Lalita Naik, and Basanti Naik, expressed concerns over the high cost of LPG refills, which limits their usage. These families, often with limited incomes, could only afford to use LPG a few times a year, reverting to biomass for the rest of their cooking needs. While they appreciated the convenience, they stressed that subsidies or discounts on refills would make LPG usage more sustainable.

"Her family could only use LPG about four times over the years due to the high cost of refills" (Housewife, Basanti Naik).

"LPG has been beneficial in terms of convenience and reducing effort, but expense remains prohibitive for Sunita's family" (Housewife, Sunita Naik).

From the perspective of male heads of households, the scheme was seen as neutral in its overall lifestyle impact but effective for cooking-related tasks. They acknowledged that while PMUY saved time and effort in cooking, it did not significantly influence other aspects of their daily lives.

"The scheme played a neutral role, i.e., it had no significant impact on lifestyle" (Male Head).

"The scheme was effective for cooking-related tasks but perceived as neutral in terms of overall lifestyle improvement" (Male Head).

The Sarpanch offered a broader perspective, noting that families using LPG experience more time for activities like work and education, which contributes to economic growth and enhances quality of life. This observation highlights the potential for PMUY to drive long-term community benefits beyond individual households.

"Families using LPG experience more time for activities like work and education, contributing to economic growth and enhancing quality of life" (Sarpanch).

4.6.3 Sustainability and Long-Term Use

The sustainability of LPG usage under PMUY faces both promising indicators and significant challenges. According to the distributors of the Bharat Gas agency in the Bamanghati area, a major issue is the dependency mindset fostered by government assistance programs. Many villagers perceive schemes like PMUY as entitlements rather than temporary support, leading to reluctance in taking personal initiative. This mindset is evident in the expectation that gas cylinders should be provided for free, even though they are subsidized or available for purchase. The distributors noted that this dependency on free goods, influenced by programs like free rice distribution and medical care, hampers the adoption and sustained use of LPG.

"Many villagers are waiting for the government to provide gas for free, even though it's available with subsidies or at a cost" (Gas Distributors).

"The mindset of dependency is a real concern, especially when free schemes like rice distribution, medical care, and gas supplies are seen as entitlements" (Gas Distributors).

In contrast, the Sarpanch highlighted a more optimistic perspective, observing that women who have adopted LPG are committed to its continued use. He mentioned that LPG has become a common household resource, reflecting a positive outlook on its long-term adoption. This indicates that, once households experience the benefits of LPG, such as time savings and cleaner cooking environments, they are likely to sustain its use, provided affordability and access are maintained.

"When inquired about the long-term use of LPG, the women expressed a strong commitment to its continued use, noting that LPG has become a common household resource" (Sarpanch).

4.6.4 Economic Empowerment and Self-Sufficiency

The sustainability of PMUY's impact can be bolstered by fostering economic empowerment and encouraging self-sufficiency among rural communities. According to gas distributors in the Bamanghati area, transitioning from free goods to direct financial support, such as cash transfers or vouchers, could empower individuals to make independent choices. This shift would encourage households to prioritize their needs, such as investing in cleaner cooking options, healthcare, or education, while fostering a sense of responsibility and ownership. However, they emphasized the importance of ensuring that assistance is targeted to genuinely vulnerable populations.

"Cash transfers could empower people to invest in cleaner cooking options, healthcare, or other necessities, fostering a sense of responsibility and ownership over their decisions" (Gas Distributors).

"A shift in the approach of government programs to provide direct support while encouraging work and self-reliance could instil a sense of personal responsibility and sustainability in the community" (Gas Distributors).

The distributors also suggested integrating workforce development and job creation into the PMUY framework to enhance self-sufficiency. Training programs in trades or skills relevant to businesses like Bharat Gas could help build a skilled and motivated workforce. This initiative would not only create employment opportunities but also reinforce the value of hard work, helping to break the cycle of dependency.

"Offering training programs, particularly in trades or skills needed for businesses like Bharat Gas, could help develop a more motivated and skilled workforce" (Gas Distributors).

"It's crucial to emphasize the value of hard work and personal responsibility, helping to break the cycle of dependency" (Gas Distributors).

The Sarpanch highlighted that PMUY has economically benefited lower-income families, particularly those classified as Below Poverty Line (BPL). By saving time previously spent on collecting firewood, families using LPG can now dedicate more hours to work or education, contributing to their economic growth and improved quality of life.

"Families classified as BPL have particularly benefited from this initiative" (Sarpanch).

"Families using LPG experience more time for activities like work and education, contributing to economic growth and enhancing quality of life" (Sarpanch).

4.7 PMUY Program Implementation and Challenges

4.7.1 Administrative and Logistical Challenges in the Implementation of PMUY

The Pradhan Mantri Ujjwala Yojana (PMUY) has significantly increased LPG access in rural areas.

However, its implementation faces several administrative and logistical challenges that hinder its effectiveness.

Gas distributors report that many subsidy recipients have not submitted their documents properly, leading to delays or non-receipt of subsidies. Issues such as Aadhaar not being linked to bank accounts, incomplete Know Your Customer (KYC) details, and incorrect or unregistered phone numbers prevent beneficiaries from receiving subsidies. As one distributor noted, "Those whose papers were properly linked were benefiting, but mainly for the rest, they were not able to get the subsidy."

"Those whose papers were properly linked were benefiting, but mainly for the rest, they were not able to get the subsidy." (Gas Distributor)

Distributors also face challenges related to equipment and facilities for regular safety checks of cylinders. The lack of proper infrastructure hampers the ability to ensure the safety and quality of LPG cylinders, posing potential risks to users.

"There is currently a lack of equipment and facilities to regularly check cylinders for safety or leaks." (Gas Distributor)

The distribution network's limited reach, with centres only at the block level, makes it difficult for distant households to access LPG services. The sarpanch highlighted that "Distribution centres are only available at the block level, making accessibility difficult for distant households." Additionally, the absence of local Distribution Points (DPOs) at the panchayat level further complicates access for rural populations.

"If government-initiated plans to make DPO at panchayat level, it would become more accessible for the locals." (Sarpanch)

Irregular income and lack of clarity on subsidy provisions create barriers to consistent LPG usage. Housewives and male heads of households' report that financial constraints and delayed subsidies discourage regular use of LPG. The sarpanch noted that villagers express a need for lower gas prices or free gas to make LPG usage more feasible, indicating a gap in program outreach and subsidy effectiveness in addressing local economic realities.

"Villagers express a need for lower gas prices or free gas to make LPG usage more feasible." (Sarpanch)

Community members, such as Ujjwala Didis, play a crucial role in assisting with document collection and submission, facilitating the gas application process for households. One individual mentioned, "He has helped many families in document collection and submission to facilitate the gas application process for households." This support is vital in overcoming administrative hurdles and ensuring wider adoption of LPG.

"He has helped many families in document collection and submission to facilitate the gas application process for households." (Community Member)

4.7.2 Documentation and Subsidy Challenges in the Implementation of PMUY

The Pradhan Mantri Ujjwala Yojana (PMUY), which aims to provide subsidized LPG connections to low-income households, faces significant challenges in documentation and subsidy disbursement, which affects its overall effectiveness.

Gas distributors, such as Mr. Gopal, highlighted that many beneficiaries fail to understand the documentation process. One key issue is the linking of subsidies to Aadhaar-linked bank accounts. When people submit account numbers for subsidy transfers, the payment goes to the person whose account is linked to Aadhaar, even if that person is not the intended beneficiary. This misalignment is a major cause for many not receiving the subsidy.

"Many people aren't able to understand the documentation procedures properly." (Gas Distributor)

Further complications arise from issues like incomplete Know Your Customer (KYC) details, incorrect or unregistered phone numbers, and the improper linkage of Aadhaar numbers to bank accounts, all of which hinder subsidy disbursement.

"Bank account linkages, such as Aadhaar numbers being properly linked, incomplete KYC, or incorrect or unregistered phone numbers, also prevent people from receiving subsidies." (Gas Distributor)

Housewives reported that the absence of subsidies or delayed disbursements is a recurring issue, reducing the scheme's impact on low-income households. Without timely subsidies, many find it challenging to continue using LPG, especially since the costs still remain a financial burden even with the subsidy.

"The absence of subsidies is a recurring issue, making the scheme less impactful for low-income households." (Housewife)

Male heads of households also noted that delays in receiving subsidies add to their financial stress, further reducing the sustainability of LPG use.

"Delayed subsidies were a recurring issue." (Male Head)

The Sarpanch (village leader) pointed out that the complexities surrounding subsidy receipt add to the financial strain on beneficiaries, contributing to low and inconsistent adoption of LPG, especially in rural and semi-urban areas.

Many people are aware of PMUY but do not fully understand the financial responsibilities it entails. While the government subsidizes the cost of cylinders, it does not cover the entire cost of fuel or installation. Some beneficiaries expect free or unlimited gas without realizing they still need to pay for refills, the stove, and maintenance. This mis understanding compounds the issue of affordability and accessibility.

"Complications with receiving subsidies add to the financial burden and contribute to low sustained adoption of LPG." (Sarpanch)

Bureaucratic hurdles, such as documentation errors and delays in the approval process, also create significant challenges. In some cases, local agencies collect documents from villagers, but their applications remain unapproved. This issue, as noted by Mr. Gopal and others, prevents many from accessing the benefits of the PMUY.

"Local agencies collected documents from villagers, yet their applications remained unapproved." (Gas Distributor)

4.7.3 Bureaucratic Challenges in the Implementation of PMUY

The Pradhan Mantri Ujjwala Yojana (PMUY), designed to provide LPG connections to low-income households, has faced several bureaucratic hurdles in its implementation, particularly impacting rural and tribal populations.

One of the key issues, as pointed out by the gas distributor, is the complexity of the application process, especially for women who marry and move to a new location. Since PMUY is linked to Below Poverty Line (BPL) cards, women in this situation cannot access the scheme unless they are added to their husband's BPL card and removed from their parental card. This process is often complicated and delayed by bureaucratic procedures, preventing eligible individuals from benefiting.

Similarly, complications arise when a beneficiary passes away. This delays the transfer of benefits to new members of the household. The bureaucratic inefficiency in handling such cases further complicates the situation, often leaving the household without access to the intended benefits.

"Women who marry and move to a new location cannot avail of the scheme unless they are added to their husband's BPL card and removed from their parental one." (Gas Distributor)

Another significant bureaucratic challenge is the improper linkage of bank accounts to Aadhaar numbers. Incomplete Know Your Customer (KYC) details, unregistered phone numbers, and incorrect Aadhaar card information often led to difficulties in receiving subsidies. These issues create frustration among beneficiaries, particularly in rural areas, who find it difficult to navigate the paperwork and technicalities involved in securing the subsidy.

"Issues with bank account linkages, such as Aadhaar not being properly linked, incomplete KYC, or incorrect or unregistered phone numbers, also prevent people from receiving subsidies." (Gas Distributor)

These challenges are especially pertinent for rural and tribal households, who may have limited access to technology and financial institutions, making it even harder for them to correct or complete the required documentation.

Due to these bureaucratic challenges and delays in subsidy distribution, many rural and tribal households revert to traditional cooking methods, which are often less efficient and more harmful to health and the environment. The slow and complicated process of accessing subsidies discourages consistent adoption of LPG, and some households opt to rely on firewood or other traditional fuels instead, undermining the goals of PMUY.

"These complications, often delayed by bureaucratic processes, lead many rural and tribal people to revert to traditional cooking methods." (Gas Distributor)

In light of these bureaucratic barriers, Mr. Hembram, the gas distributor, suggested an alternative to the

current subsidy model. Instead of providing subsidies, he proposed directly reducing the price of LPG to make it more affordable. This solution would bypass the bureaucratic hurdles associated with documentation and subsidy disbursement, offering a more straightforward and immediate benefit to low-income households. By directly reducing the cost of gas, the program could improve access and adoption, particularly in rural areas where beneficiaries often face significant challenges in accessing subsidies.

"Instead of providing subsidies, reducing the gas prices directly would make the PMUY more effective." (Gas Distributor)

Additionally, the scheme's reliance on Below Poverty Line (BPL) cards for eligibility further limits access for those who may not have the proper documentation or who face difficulties in acquiring BPL cards.

"The scheme is linked to BPL cards, so the beneficiaries who have BPL cards submitted their documents for the scheme. But some people could not get the document due to some problem." (Sarpanch)

Mr. Gopal proposed an alternative solution: rather than providing subsidies, the government could consider directly reducing the price of gas to make it more affordable for rural and low-income households. This could help streamline the process and improve accessibility.

"Instead of providing subsidies, reducing the gas prices directly would make the PMUY more effective." (Gas Distributor)

4.7.4 Practical and Logistical Challenges

Access to LPG in rural and semi-rural areas faces several logistical and practical barriers. The gas distributor highlighted that a lack of coordination between main distribution centres and local agencies significantly impacts the timely availability of LPG in remote areas. Furthermore, many rural residents do not own smartphones, complicating the gas booking process and creating delays. To address this, smaller distributors like Mr. Gopal store LPG cylinders locally to sell, but such stop-gap measures have limited reach.

"Lack of coordination between main distribution centres and local agencies impacts the availability of LPG in rural and remote areas" (Gas Distributor).

"The main branch of the gas office does not deliver to rural areas, so Mr. Gopal stores the LPG cylinders and sells them" (Gas Distributor).

Housewives like Birdi Purty and Mira Hembram shared that while they could place LPG refill orders by phone and typically receive deliveries within two to three days, affordability was a major issue. For example, Pama Soren, an agricultural labourer, explained how her family could not afford regular refills, forcing them back to traditional biomass fuels. Housewives unanimously suggested that subsidies or discounts on refills would ease financial constraints, along with stable work opportunities to support household incomes.

"The LPG refilling process was straightforward; she would call the gas station, and the distributor typically delivered the gas within three days" (Housewife, Birdi Purty).

"Regular refills are unaffordable, pushing her family back to biomass fuels" (Housewife, Pama Soren).

"If they could be provided with subsidies or at least discounts on refills, it would have become much easier for them" (Housewives).

Th Sarpanch highlighted that the widespread availability of free forest products like firewood and dry leaves poses a significant challenge to LPG adoption. These traditional alternatives are not only free but also culturally ingrained, making LPG usage financially unattractive for many. The Sarpanch also pointed to logistical challenges, such as limited distribution points, delays in processing applications, and a lack of awareness about the scheme's enrolment process. These issues further deter potential beneficiaries from adopting LPG.

5.0 Suggestions for Improvising PMUY Policy Implications

5.1 Awareness Campaigns and Training

Gas distributors have been proactive in organizing safety training sessions to educate beneficiaries about LPG usage. For instance, Mr. Kartik Lahar from Hairband mentioned organizing multiple safety camps with significant participation, stating, "We do not face any problems during training sessions or delivery." Similarly, Mr. Nilarattan Barik observed increased interest among women in adopting LPG after attending these sessions,

noting, "Women are showing interest in using LPG." These efforts are crucial in building confidence and ensuring safe practices among new users.

Community leaders, such as sarpanches, emphasize the need for culturally sensitive awareness campaigns. They point out that traditional cooking methods are deeply ingrained, and without adequate information on the health and environmental benefits of LPG, communities may be reluctant to transition. One sarpanch remarked, "Not enough awareness programs and campaigns regarding women's knowledge in PMUY and environment were held." This highlights the necessity for tailored communication strategies that resonate with local customs and address specific concerns.

Despite these initiatives, challenges persist. Some distributors report reluctance among the elderly to adopt LPG, as noted by Mr. Jatin Hembram: "Most women in the area, especially the younger generation, are comfortable using LPG, though some elderly individuals remain reluctant." Additionally, logistical issues, such as the need for better coordination between distribution centers and local agencies, have been highlighted. Mr. Manoj Kumar Patra suggested, "The government should organize awareness programs more frequently in the region."

5.2 Misconceptions and Knowledge Gaps

The gas distributor highlighted a prevalent misconception among villagers that LPG gas is entirely free under the PMUY scheme. This misunderstanding stems from a lack of clarity about the subsidy structure, leading many to assume the government will cover all costs, including stove purchases and cylinder refills. As a result, adoption is hindered, and there is reluctance to make the required financial investment.

"Many villagers think the gas is free. They don't realize the costs of stoves and refills and assume the government will cover everything." (Gas Distributor)

The distributor suggested that targeted educational campaigns could help clarify subsidy policies, emphasizing the long-term benefits of LPG use, such as health improvements and reduced fuel costs.

"Clear communication on subsidies is crucial. Highlighting savings and health benefits could encourage them to switch." (Gas Distributor)

The Sarpanch noted that villagers often downplay the health risks associated with traditional cooking methods and smoke exposure. Myths about LPG, such as gas taking longer to cook or preferring free natural resources like firewood, further compound resistance to adoption.

"Many villagers believe that firewood is better because it's free and think gas takes too long to cook." (Sarpanch)

Additionally, the Sarpanch observed gaps in knowledge about the environmental and health impacts of firewood usage and the proper use of LPG.

"Those using LPG had some awareness, but others were unaware of the damage firewood causes to their health and the environment." (Sarpanch)

Stakeholders submitting documents without understanding the process or how to use LPG reflect a broader need for education on proper utilization.

"Some people submitted documents but didn't know how to use the gas once they received it." (Sarpanch)

5.3 Safety and Usage Training

Both the Gas Distributor and the Sarpanch identified significant challenges in promoting LPG adoption due to deeply rooted traditional cooking practices and safety concerns. They emphasized the necessity of community-based education programs to address these issues.

- Resistance to Change: Traditional cooking methods are deeply ingrained, making the transition to LPG challenging. Educational initiatives that demonstrate the health benefits of cleaner cooking technologies and the dangers of indoor air pollution from traditional chulhas are essential.

"Demonstrating the health benefits of gas stoves and sharing success stories can help convince people." (Gas Distributor)

- Safety Concerns: Fears about potential gas leaks and explosions are prevalent among villagers. Both the Sarpanch and Gas Distributor highlighted the need for safety awareness campaigns to alleviate these fears and educate users on proper LPG usage.

"Fears about gas leaks and explosions highlight the need for safety campaigns." (Sarpanch)

- Accessibility Issues: The Sarpanch suggested that establishing Distribution Points (DPOs) at the panchayat level would enhance accessibility, reducing the travel burden for beneficiaries and encouraging adoption.

"If the government starts DPOs at the panchayat level, it will be more accessible to local people." (Sarpanch)

5.4 Safety Awareness and Health Impact

The gas distributor, Saroj Kumar Dash, emphasized that regular safety training sessions are conducted 5-6 times annually, especially in larger villages, to educate rural women on the safe use of LPG. According to him, women in the area are quite comfortable using LPG and do not exhibit hesitation in adopting it. However, the Sarpanch observed that some individuals hesitated to submit documents required for LPG connections due to fears of gas cylinder leaks and explosions. This contrasting perspective reveals that while structured safety campaigns have had a positive impact, deeper psychological fears remain unaddressed in certain groups. Strengthening the safety messaging through personalized demonstrations could alleviate these concerns.

"They didn't face any such problems while giving training to rural women on safety measures and conducted safety campaigns regularly 5-6 times a year," (Gas Distributor)

"Some individuals hesitated and refrained from submitting them, driven by fears such as potential gas cylinder leaks and explosions," (Sarpanch).

Saroj Kumar Dash highlighted the severe health hazards associated with traditional cooking methods, stating that smoke from firewood in a single day is equivalent to inhaling the smoke from 40 cigarettes. He suggested that if communities were made aware of this fact, they would focus more on switching to LPG. Despite the rising adoption of LPG, with even 5-10 % of households in the remote Simlipal belt now using it, the Sarpanch pointed out that many individuals prioritize safety fears over health benefits. This indicates the need for campaigns to present a balanced narrative, addressing both safety and health benefits. By focusing equally on these aspects, campaigns could further encourage LPG adoption and overcome lingering resistance.

"The smoke generated is equivalent to inhaling as equal as 40 cigarettes, which is tremendously hazardous to health," (Gas distributor).

"Some individuals hesitated and refrained from submitting them, driven by fears such as potential gas cylinder leaks and explosions," noted the Sarpanch.

6.0 Discussion

The findings from this qualitative study provide significant insights into the multifaceted impacts of the Pradhan Mantri Ujjwala Yojana (PMUY) on tribal women in the Mayurbhanj district of Odisha. The analysis reveals both the potential benefits, and the persistent challenges associated with LPG adoption, highlighting the need for targeted interventions to enhance the program's effectiveness.

The study identified economic barriers as a primary obstacle to the consistent use of LPG among beneficiaries. High refill costs, coupled with delays in subsidy disbursement, create a significant burden for families, particularly those with irregular incomes. Participants expressed that while PMUY has improved access to cleaner cooking fuel, the financial implications of regular LPG usage often force households back to traditional biomass fuels. This aligns with existing literature that underscores the importance of affordability in energy transitions, particularly in low-income settings where financial constraints are prevalent[8].

Additionally, the availability of free biomass fuels further complicates the adoption of LPG. Many participants indicated that traditional fuels remain a practical choice due to their accessibility and zero cost. This reflects a broader trend observed in rural India, where reliance on traditional cooking methods persists despite government efforts to promote cleaner alternatives. The challenge lies not only in providing LPG but also in addressing the socio-economic factors that perpetuate dependency on biomass.

The study also highlighted significant gaps in awareness and knowledge regarding PMUY and its benefits. Despite some training initiatives conducted by gas distributors, many participants reported limited understanding of the scheme and its advantages. This lack of awareness is critical, as it leads to misconceptions that can hinder adoption and consistent use of LPG. Effective communication strategies are essential to ensure that beneficiaries fully understand the benefits of transitioning to cleaner cooking methods.

Cultural attachments to traditional cooking practices also emerged as a barrier to LPG adoption. Participants

expressed fears related to safety, particularly concerning gas leaks and explosions, which were compounded by a lack of familiarity with LPG technology. This cultural resistance is not unique to this study; similar findings have been documented in other regions where traditional practices are deeply ingrained. Addressing these concerns through targeted education and community engagement is crucial for fostering trust and encouraging wider acceptance of LPG.

7.0 Conclusion

In conclusion, while PMUY has made significant strides in improving access to clean cooking fuel among tribal women in Odisha, substantial challenges remain. Addressing economic barriers, enhancing awareness and education about PMUY, and fostering cultural acceptance are critical steps toward maximizing the program's impact. Future interventions should focus on creating supportive frameworks that empower women economically while ensuring their health and well-being through cleaner cooking practices. This discussion synthesizes our findings with existing literature, emphasizes key themes from results, and suggests actionable recommendations based on participant insights. It provides a comprehensive overview of how PMUY affects tribal women's lives while identifying areas for improvement within the program framework.

The health benefits associated with LPG use were prominently acknowledged by participants, who reported reductions in indoor air pollution and associated health risks. This finding is consistent with previous research indicating that switching to cleaner cooking fuels can significantly improve health outcomes for women and children[24,25,26]. However, while participants recognized these benefits, they also emphasized that economic barriers must be addressed to sustain long-term usage.

Moreover, participants noted improvements in lifestyle due to time savings from using LPG for cooking. The ability to allocate more time for family and leisure activities represents a significant shift in daily life for many women. However, this positive impact is tempered by ongoing financial constraints that limit regular access to LPG refills.

The study revealed a complex relationship between sustainability and dependency on government support. While PMUY has empowered many women by providing access to cleaner cooking options, there remains a reluctance among some beneficiaries to invest in LPG due to expectations of receiving free goods. This dependency can undermine efforts toward self-sufficiency and economic empowerment.

To foster long-term sustainability of LPG use, it is essential to implement strategies that encourage financial independence among beneficiaries. Suggestions from participants included income-based pricing models for LPG refills and cash transfer programs aimed at enhancing economic resilience. These approaches could help mitigate financial barriers while promoting greater investment in cleaner cooking technologies.

8.0 Limitations and Future Research Directions

Considering the time and budget constraints the study was confined only with one geographical area of Odisha's tribal community. The respondents were quite reluctant to share the information as the study was about the government ongoing scheme. It was quite challenging to explore their real feelings about the scheme and the challenges faced by them to avail the scheme. The accuracy of the data may also be limited by respondent bias in surveys or interviews and logistical challenges in reaching rural places.

Future research on PMUY in the Mayurbhanj district may concentrate on evaluating the program's long-term effects on environmental sustainability, economic growth, and health. The efficiency of microfinance options for refills and the potential for income-based subsidies to increase affordability could be the subject of future research. Furthermore, studies could examine improving LPG infrastructure, raising community awareness, and assessing fuel usage behaviour changes. Future research can explore factors influence the sustained adoption of LPG over traditional fuels, regional variations in LPG usage among different tribal groups, financial barriers (e.g., high refill costs) preventing regular LPG use, alternative financial models (e.g., microfinance, subsidies) which could improve affordability. The study can be extended from environmental perspective like: What is the difference between using LPG and conventional biomass fuels in terms of carbon emissions and deforestation? ; What logistical challenges exist in remote or forested areas; Can alternative distribution models

(e.g., mobile LPG refill units) improve access? The study also can be extended to: In what ways does PMUY differ from other clean cooking programs at the national or worldwide level? the potential lessons that can be learned from the experiences of other countries in promoting LPG among indigenous communities; the potential policy modifications that could enhance adoption rates and ensure long-term sustainability; strategies to improve community participation for better policy outcome. A more comprehensive grasp of PMUY's difficulties and achievements might be obtained by extending the study to additional rural districts, which would yield insightful information for better implementation tactics and policy changes.

Implications for Policy and Practice

The findings underscore the need for a multi-pronged approach to enhance PMUY's effectiveness:

- Economic Interventions: Introducing flexible pricing models or instalment plans for refills could alleviate affordability challenges.
- Awareness Campaigns: Expanding safety training programs and leveraging media platforms can address knowledge gaps and cultural resistance.
- Targeted Support: Providing direct financial assistance tied to household income levels can promote sustained use while reducing dependency on free provisions.
- Community Engagement: Strengthening local networks through sarpanchs and community leaders can foster trust and encourage broader adoption.

9.0 Author Contributions

Aruna Kumar Dash: Design of draft, Literature Review, Implication, Discussion

Debajani Sahoo: Idea conceptualization, Methodology and Conclusion

9.1 Data Availability Statement

Data will be available from the corresponding author upon a reasonable request.

9.2 Funding Acknowledgment

The current research was sponsored by a minor research project by ICSSR, 2024.We are thankful to the Indian Council of Social Science Research (ICSSR) for sponsoring this project. This article is a part of our PMUY, ICSSR project.

10.0 References

1. Shakya S, Choosong T, Techato K, Gyawali S, Panthee B, Shrestha N, Dangal MR. Indoor Air pollution (IAP) traceable to household fuel consumption and its impact on health. Kathmandu Univ Med J. 2021; 19(1):123-31. https://doi.org/10.3126/kumj.v19i1.49597
2. GBD-MAPS. Burden of disease attributable to major air pollution sources in India. Boston: Health Effects Institute; 2018. Available from: https://www.healtheffects.org/publication/gbd-air-pollution-india
3. Liu J, Mauzerall DL, Chen Q, Zhang Q, Song Y, Peng W, Klimont Z, Qiu X, Zhang S, Hu M, Lin W. Air pollutant emissions from Chinese households: a major and underappreciated ambient pollution source. Proc Natl Acad Sci U S A. 2016; 113(28):7756-61. https://doi.org/10.1073/pnas.1604537113
4. Cohen AJ, Brauer M, Burnett R, Anderson HR, Frostad J, Estep K, Balakrishnan K, Brunekreef B, Dandona L, Dandona R, Feigin V. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. Lancet. 2017; 389(10082):1907-18. https://doi.org/10.1016/S0140-6736(17)30505-6
5. World Health Organization. Household air pollution. Geneva: WHO; 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health
6. World Health Organization. Air quality, energy and health. Geneva: WHO; 2025. Available from: https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/sectoral-interventions/household-air-pollution/health-risks
7. Economic Times. Pradhan Mantri Ujjwala Yojana launched in Odisha. 2016. Available from: https://economictimes.indiatimes.com/news/economy/policy/pradhan-mantri-ujjwala-yojana-launched-in-odisha/articleshow/52838393.cms
8. Pandey A, Brauer M, Cropper ML, Balakrishnan K, Mathur P, Dey S, Turkgulu B, Kumar GA, Khare M, Beig G, Gupta T. Health and economic impact of air pollution in the states of India: the Global Burden of Disease Study 2019. Lancet Planet Health. 2021; 5(1):25-38. https://doi.org/10.1016/S2542-5196(20)30298-9
9. Smith KR, Pillarisetti A. Household air pollution from solid cookfuels and its effects on health. In: Disease

control priorities, third edition (volume 7): injury prevention and environmental health. Washington (DC): World Bank; 2017; 133-52. https://doi.org/10.1596/978-1-4648-0522-6_ch7
10. Cukic I, Kypridemos C, Evans AW, Pope D, Puzzolo E. Towards sustainable development goal 7 "universal access to clean modern energy": national strategy in Rwanda to scale clean cooking with bottled gas. Energies. 2021; 14(15):4582. https://doi.org/10.3390/en14154582
11. Jayachandran M, Gatla RK, Rao KP, Rao GS, Mohammed S, Milyani AH, Azhari AA, Kalaiarasy C, Geetha S. Challenges in achieving sustainable development goal 7: affordable and clean energy considering nascent technologies. Sustain Energy Technol Assess. 2022; 53:102692. https://doi.org/10.1016/j.seta.2022.102692
12. Ministry of Petroleum & Natural Gas. Distribution of LPG connections to eligible beneficiaries. New Delhi: Press Information Bureau; 2024. Available from: https://pib.gov.in/pressrelesedetailm.aspx?prid=2082375
13. Economic Times. Pradhan Mantri Ujjwala Yojana launched in Odisha. 2016. Available from: https://economictimes.indiatimes.com/news/economy/policy/pradhan-mantri-ujjwala-yojana-launched-in-odisha/articleshow/52838393.cms; https://pib.gov.in/PressReleseDetailm.aspx?PRID=2082375
14. International Crops Research Institute for the Semi-Arid Tropics. Empowering tribal women farmers: ICRISAT's International Women's Day celebration in Odisha; 2025. Available from: https://pressroom.icrisat.org/empowering-tribal-women-farmers-icrisats-international-womens-day-celebration-in-odisha; Government of India. Economic survey 2023-24. New Delhi: Ministry of Finance; 2024. Available from: https://www.indiabudget.gov.in/budget2023-24/economicsurvey/doc/echapter.pdf
15. Sahu V, Tripathi SN, Sutaria R, Dumka N, Kotwal A, Ghosh K, Singh RK. Assessment of a clean cooking fuel distribution scheme in rural households of India—"Pradhan Mantri Ujjwala Yojana (PMUY)". Energy Sustain Dev. 2024; 81:101492. https://doi.org/10.1016/j.esd.2024.101492
16. Drishti IAS. Impact of PMUY in Jammu and Kashmir. 2024. Available from: https://www.drishtiias.com/state-pcs-current-affairs/impact-of-pmuy-in-jammu-and-kashmir; Swain SS, Mishra P. Adoption of clean energy in rural India: the case of Pradhan Mantri Ujjwala Yojana. Int J Asian Bus Inf Manag. 2023; 14(1):1-15. https://dl.acm.org/doi/abs/10.4018/IJABIM.315752
17. Behera B, Ali A, Marenya P. A ladder within a ladder: understanding the factors influencing a household's domestic use of electricity in four African countries. Energy Econ. 2017; 66:167-81. https://doi.org/10.1016/j.eneco.2017.05.020
18. Muller C, Yan H. Household fuel use in developing countries: review of theory and evidence. Energy Econ. 2018; 70:429-39. https://doi.org/10.1016/j.eneco.2018.01.024
19. Rahut DB, Ali A, Mottaleb KA, Aryal JP. Understanding households' choice of cooking fuels: evidence from urban households in Pakistan. Asian Dev Rev. 2020; 37(1):185-212. https://doi.org/10.1162/adev_a_00146
20. Aryan S. Unhygienic to hygienic environment: a sociological study on Pradhan Mantri Ujjwala Yojana in Jammu region. Jharkhand J Dev Manag Stud. 2022; 20(2):9313-30.
21. Asharaf N, Tol RS. The impact of Pradhan Mantri Ujjwala Yojana on Indian households. Econ Anal Policy. 2024; 84:878-97. https://doi.org/10.1016/j.eap.2024.09.026
22. Suresh Kumar. Impact of Pradhan Mantri Ujjwala Yojana (PMUY): a study in Koppal district. Int J Early Child Spec Educ. 2023; 15(2):722-6.
23. Swain SS, Mishra P. Determinants of adoption of cleaner cooking energy: experience of the Pradhan Mantri Ujjwala Yojana in rural Odisha, India. J Clean Prod. 2020; 248:119223. https://doi.org/10.1016/j.jclepro.2019.119223
24. Fang LM, Lu N. Can the middle-aged and the elderly achieve their health improvement from domestic energy consumption structure optimization in rural China. China Popul Resour Environ. 2019; 29:40-9.
25. Nie P, Sousa-Poza A, Xue J. Fuel for life: domestic cooking fuels and women's health in rural China. Int J Environ Res Public Health. 2016; 13(8):810. https://doi.org/10.3390/ijerph13080810
26. World Health Organization. Clean cooking for health, urban health initiative: a modern process for catalysing change. Geneva: WHO; 2018. Available from: 20213_UHI Health and household energy briefing For Web