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Fueling Empowerment: A Gendered Assessment of Pmuy's Impact on Rural Women in Sivaganga District, Tamil Nadu

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ABSTRACT

This study explores the transformative impact of the Pradhan Mantri Ujjwala Yojana (PMUY) on rural women in Sivaganga district, Tamil Nadu—an area often left out of national analyses. By surveying 450 women beneficiaries, the research highlights how access to clean cooking fuel has improved health, reduced time poverty, and enabled economic and household participation. While PMUY has brought tangible benefits—safer kitchens, better respiratory health, and increased personal agency—the study also uncovers persistent barriers such as refill affordability, cultural resistance, and fuel stacking. Notably, women who manage LPG usage often experience greater involvement in household decision-making, indicating a shift in traditional gender roles. The findings reveal that LPG adoption is not merely a technical upgrade but a social transition shaped by trust, awareness, and cultural alignment. This localized, gender-sensitive analysis provides valuable insights for designing more inclusive and sustainable clean energy interventions. Ultimately, the study positions PMUY as a potential catalyst for women's empowerment—but only when complemented by policies that amplify local voices, ensure affordability, and embed cultural understanding into energy governance.

KEYWORDS: PMUY impact on women, Clean cooking energy India, LPG adoption rural Tamil Nadu, Women empowerment through PMUY, Sivaganga district LPG study, Energy access and gender equity.

1. INTRODUCTION

Access to clean and economical energy is globally recognized as a cornerstone of inclusive growth, directly influencing health results, gender equality, and poverty relief (International Energy Agency (IEA, n.d.) . In India, where rural households have historically relied on biomass for cooking, the transformation of clean fuels has deeper implications —not only for environmentally sustainable but also for the facilitation of women, who disproportionately bear the burdens of traditional cooking practices. In this context, the **Pradhan Mantri Ujjwala Yojana (PMUY)** has emerged as a transformative government initiative aimed at enhancing access to Liquefied Petroleum Gas (LPG) among economically marginalized households, particularly women, thereby positioning energy access as a gender justice intervention **(Dash, S., & Sahoo, 2024; Rawat, N., & Kumar, 2022)**.

Launched in 2016, PMUY was conceived not just as a fuel access scheme but as a gender-responsive development policy, with the explicit objective of improving the quality of life for women by reducing their exposure to indoor air pollution, minimizing the time and physical drudgery involved in collecting firewood, and enhancing their participation in socio-economic activities **(Choudhuri, S., & Desai, 2020)** . By targeting women as direct beneficiaries and LPG connections as symbols of modernization and health, PMUY integrates energy policy with the goals of gender empowerment and rural welfare. While national-level studies have offered encouraging evidence of PMUY's positive outcomes—ranging from improved health indicators to increased female labor participation **(Gaikwad, P., Sharma, R., & Kulkarni, 2024; Vyas, M., Gupta, A., & Khalid, 2021)** the majority of such research remains concentrated in northern and central Indian states like Uttar Pradesh and Maharashtra. There remains a critical lack of granular, region-specific studies that assess the program's effectiveness in states such as Tamil Nadu, particularly in socio-culturally distinct and economically diverse districts like Sivaganga. This gap in localized research is concerning given that energy transitions are rarely uniform; they are shaped by intricate interplays of culture, caste, gender norms, and infrastructural access **(Gould, C., & Urpelainen, 2020; Patnaik, B., Rajagopal, M., n.d.)**.

Sivaganga district, characterized by a predominantly rural population and entrenched traditional practices, presents a fertile ground for examining the nuanced impacts of clean cooking interventions like PMUY. Existing literature has seldom engaged with how access to LPG in such districts intersects with women's decision-making autonomy, time use, health status, and economic agency. Moreover, important behavioral and contextual factors such as fuel stacking (the simultaneous use of traditional and modern fuels), community perceptions of LPG, affordability constraints, and intra-household gender dynamics remain underexplored in this region **(Kandasamy, R., & Kulothungan, 2022; Wu, Y., Zhang, L., & Shen, 2025)** . This study addresses these lacunae through a gender-sensitive, multi-dimensional, and empirically grounded assessment of PMUY's impact on rural women in

Sivaganga. Anchored in a robust quantitative research design, it investigates how LPG adoption affects key indicators of empowerment—ranging from health and time savings to income generation and household decision-making. It also explores how socio-cultural resistance and economic constraints act as barriers to the sustained and exclusive use of LPG, despite initial adoption. By focusing on the lived experiences of 450 rural women beneficiaries, this study contributes to a deeper understanding of how clean cooking energy policies intersect with the gendered realities of rural India. In doing so, it not only fills a critical research void but also offers actionable insights for policymakers, grassroots implementers, and energy justice advocates seeking to enhance the design, implementation, and impact of clean energy programs like PMUY.

Ultimately, this research underscores that energy transitions are not merely technical shifts but deeply social processes, where empowerment depends as much on affordability and access as it does on cultural relevance, community endorsement, and women's control over household decisions. As of such, observation through a gender based and civically optic is pivotal for protect the eco-clean energy consumption and that catalyzes real and long-lasting transformation in rural women's lives.

2. LITERATURE REVIEW

Recent phases indicates, there's been interest growing among the research fellows and policymakers in how clean cooking fuels shape the lives of women, and particularly in Rural areas in India. The major illustration is India's PM Ujjwala Yojana scheme; a government's innovative initiation brought clean energy into millions of households. The existing study review shows that both global and Indian studies were says about this intersection of clean cooking and empowerment of women's, and diving into how this method of cooking transforms the gender roles and everyday life of women in the ground.

Existing literature provides compelling evidence of the multifaceted impact of clean cooking energy—particularly through the Pradhan Mantri Ujjwala Yojana (PMUY)—on women's empowerment in both national and global contexts. **(Kandasamy, R., & Kulothungan, 2022)** conducted an empirical study across three districts in Tamil Nadu and found that PMUY significantly influenced behavioural shifts among rural women, promoting a transition from traditional biomass fuels to LPG, with marked improvements in health outcomes and time utilization—both critical indicators of empowerment. Similarly, **(Gaikwad, P., Sharma, R., & Kulkarni, 2024)** , in a large-scale survey in Maharashtra, demonstrated that access to LPG under PMUY enhanced women's mental well-being and enabled greater economic participation. **(Rawat, N., & Kumar, 2022)** emphasized that PMUY's design inherently prioritizes women's welfare by reducing indoor air pollution exposure and the and the physical burden of collecting fuel wood. **(Dash, S., & Sahoo, 2024)** further argued that PMUY not only advances public health but also contributes to sustainable living and economic enrichment for women. However, **(Choudhuri, S., & Desai, 2020)** , in their analysis of over 41,000 Indian households, revealed that intra-household gender inequalities—particularly related to financial control—continue to hinder clean fuel adoption. **(Gould, C., & Urpelainen, 2020)** corroborated this by showing that women's decision-making authority is a critical determinant of LPG uptake in rural areas. Additionally, **(Vyas, M., Gupta, A., & Khalid, 2021)** cautioned that entrenched patriarchal norms often limit the full potential of LPG adoption, with cultural and economic factors leading to persistent fuel stacking. The Council on Energy, Environment and Water (CEEW), as noted by **(Patnaik, B., Rajagopal, M., n.d.)**, advocated for a gender-sensitive approach in energy policy, calling for the integration of socio-cultural dimensions into clean energy programs like PMUY. International perspectives reinforce these findings: **(Wu, Y., Zhang, L., & Shen, 2025)**, in rural China, found that clean fuel access significantly boosted women's labour force participation by improving health and freeing time for economic activities. The Clean Cooking Alliance (2017) highlighted how clean stoves reduce time poverty, allowing women to pursue education, employment, and leisure. Likewise, the International Energy Agency **(IEA, n.d.)** emphasized the centrality of clean cooking in achieving gender equity, underscoring that women are not only primary users but also potential champions of clean energy transitions when empowered with appropriate resources and recognition.

2.1 RESEARCH GAP

A sustainable research has examines the deeper impact of PM Ujjwala Yojana across India, particularly in Maharashtra and Uttarpradesh kind of states. Remains the gap was noticeable in region specific empirical studies and that helps to explore its effects within Tamil Nadu. Even evidential limitations were extended to districts like Sivaganga, which predominantly in area, socio-economical diverse and cultural distinct. Existing literature often investigates LPG adoption, health outcomes, or behavioral shifts as isolated indicators. However, few studies holistically examine how access to clean cooking energy under PMUY intersects with multiple dimensions of **women's empowerment**, such as time allocation, decision-making power, health and safety, and economic participation—especially in the unique socio-cultural fabric of Sivaganga. Furthermore, although global and national studies highlight the importance of gender norms, intra-household power relations, and affordability concerns in shaping sustained clean fuel usage, these dimensions remain underexplored in the Tamil Nadu context. Specifically, critical issues like **refill frequency**, **fuel stacking practices**, **perceptions of LPG as modern or prestigious**, and **community-level influence** on cooking behavior are rarely addressed in existing research. Therefore, a **localized, gender-sensitive, and multi-dimensional assessment** of PMUY's impact in **Sivaganga district** is both timely and necessary. Such an investigation can generate actionable insights for designing more effective, culturally attuned energy interventions, while also informing policy efforts aimed at advancing rural women's empowerment in southern India.

2.2 RESEARCH OBJECTIVES

1. To examine the level of awareness, adoption, and sustained usage of LPG connections among rural women in Sivaganga district of Tamil Nadu.

2. To analyze the impact of access to clean cooking solutions on key dimensions of women's empowerment, including health outcomes, time use, economic participation, and household decision-making.
3. To explore the socio-cultural and economic factors influencing LPG adoption and continued usage, including issues of affordability, fuel stacking, and intra-household power dynamics.
4. To provide policy recommendations for enhancing the role of clean cooking energy in advancing rural women's empowerment and sustainable development in Tamil Nadu.

2.3 HYPOTHESES

H1: There is a significant relationship between the level of awareness about PMUY and the adoption of LPG connections among rural women's in sivaganga district.

H2: Access to clean cooking energy through PMUY has a significant positive impact on women's health in rural households.

H3: Access to LPG under PMUY significantly reduces time spent on cooking-related activities and fuel wood collection among rural women.

H4: Use of clean cooking energy is positively associated with increased economic participation of rural women.

H5: Women's decision-making autonomy within the household significantly increases with the adoption and sustained use of LPG.

H6: Socio-cultural factors (such as patriarchal norms and traditional cooking preferences) significantly influence the continued use of LPG despite availability.

H7: Economic affordability and refill cost significantly affect the sustained usage of LPG under PMUY.

3. RESEARCH DESIGN AND METHODOLOGY

This study employs descriptive and analytical research syntax to interrogate the relationship between participation in the scheme PM Ujjwala Yojana and key indicators of women's empowerment—including agility, time savings, economic engagement, and decision-making authority. Questionnaire administered the primary data from the women who had received LPG connections under PMUY across selected rural blocks of Savaganga district, Tamil Nadu, a region chosen for its high rural density, socio-economic diversity, and active PMUY implementation (Choudhuri, S., & Desai, 2020)

A multiphase technique was adopted to ensure representative coverage of sample for the analysis. Initially, two administrative blocks were selected through simple random sampling, followed by four villages from each block randomly selected using the lottery method. Were importance was given to the villages with substantial PMUY grantee populations. A systematic random sampling method was then used to approach every third eligible household, ultimately surveying 450 active women beneficiaries. After the careful process of designing the data collection was relied, pre-tested questionnaire translated into Tamil and validated through a pilot survey. The tool captured diverse aspects such as LPG awareness, usage behaviour, health effects, time allocation, income-generating activities, and societal standards. Collecting data was initiated with face-to-face by the researchers who all are involved in study and ensuring cultural sensitivity and response accuracy.

Responses were digitally transited and analyzed using SPSS software (v26). Cranach's Alpha (0.847) confirmed the reliability of the empowerment-related scales. The analysis incorporated descriptive statistics to map respondent profiles and fuel usage patterns, and inferential statistics to test hypotheses. Chi-square tests assess the categorical relationships, paired t-tests measures the changes in time use, and Spearman's rank correlation explores affordability concerns and refill frequency (Gaikwad, P., Sharma, R., & Kulkarni, 2024; Kandasamy, R., & Kulothungan, 2022). Each seven hypothesis of this study was tested a significance level of standard range of p value and aligning the empirical outcomes with the thematic findings from the literature. This multiphase analytical approach assures a robust understanding of how access to clean cooking energy impacts women's empowerment at the micro-level. Ultimately the finding expels the information's about the study's discussion and policy recommendations aimed to optimize the Ujjwala Yojana's gender sensitive outcomes.

1. RESULTS AND DISCUSSION

This section shows the voices behind the numbers—450 rural women from Tamil Nadu whose lives have intersected with the clean cooking transmission using the Ujjwala Yojana which was proposed by the central government of India entitle with the name of Pradan Mantri. Through a carefully structured quantitative analysis, their experiences have been translated into insightful data that speak volumes about the scheme's impact. Each hypothesis was examined using suitable statistical tools, allowing for a much deeper understanding of the pattern, challenges, and changes associating from the adoption of clean cooking energy. The findings are interpreted not just through statistical significance, but also in the context of lived realities drawing upon socio-cultural frameworks and insights discussed in the review of existing studies. This integrated approach ensures the results remain grounded in both empirical rigor and the everyday experiences of the women at the heart of this study.

DEMOGRAPHICAL PROFILING

An analysis of the results clearly demonstrate, a total of 450 women respondents participated in the study, reflecting a diverse demographic composition in terms of age, education, occupation, income, and family structure. The age distribution indicates that a majority (38.2%) were between 26–35 years, followed by 25.8% in the 36–45 age group, suggesting that middle-aged adults formed the core of the sample. In terms of education, 26.2% had attained graduation or higher education, while a significant proportion (18.4%) reported no formal education, underscoring educational disparities within the population. Homemakers constituted the largest occupational group (67.6%), followed by agricultural labourers (31.8%), highlighting a predominantly non-wage-earning, rural female sample. Income levels varied, with the highest share of respondents (34.9%) earning between ₹10,001 and ₹15,000 per month, indicating that most participants fall within a lower to lower-middle income bracket. Regarding family structure, 43.6% lived in joint families and 30.2% in nuclear families; however, the presence of redundant or misclassified entries suggests a need for data cleaning in this variable. Overall, the demographic profile reveals that the respondents are largely middle-aged rural women with modest educational and economic backgrounds—factors that must be considered when interpreting their attitudes, access, and empowerment within the scope of the study. Ensuring clarity in categorical classifications will enhance the precision of subsequent analyses.

H1: Awareness and LPG Adoption

The analysis reveals a statistically significant association between awareness of the Ujjwala Yojana and the actual adoption of LPG connections among women's in rural area (χ^2 (6, N = 450) = 14.27, p = 0.027). What emerges from the data is a compelling narrative: women who were informed about the scheme through trusted, local channels—such as government officials, community leaders, or word of mouth from neighbors—were significantly more likely to enroll and begin using LPG in their households. This finding underscores the social nature of information dissemination in rural India, where television, newspapers, or digital outreach often take a backseat to personal connections and face-to-face communication.

For women, particularly those who with the backlog in access to formal education or media, local credibility plays a critical role in decision-making. This aligns with the insights of (Kandasamy, R., & Kulothungan, 2022) and (Dash, S., & Sahoo, 2024), who emphasize that grassroots awareness is not merely a logistical necessity—it is a transformative force that turns passive eligibility into active participation. Results highlight a fundamental truth in developmental interventions: awareness cannot be treated as a checkbox item. It must be contextual, culturally sensitive, and relational. For PMUY and similar schemes to truly reach the women they are designed to empower, they must speak the language of the community—both literally and figuratively.

H2: Health Outcomes and Fuel Usage

The data revealed a compelling and statistically significant link between the type of cooking fuel used and reported health outcomes among rural women (χ^2 (9, N = 450) = 66.329, p < .001). Women who had transitioned exclusively to LPG were markedly more likely to report fewer respiratory problems, less eye irritation, and an overall improvement in their kitchen environment. These are not just numbers—they reflect real, lived experiences. For many women in rural Tamil Nadu, the shift from traditional fuels like firewood and cow dung to LPG represents more than convenience; it marks a transformation in daily life. Cooking, once associated with coughing fits, burning eyes, and smoky rooms, is now safer, cleaner, and healthier.

This finding reinforces the broader national and global evidence base that links clean cooking energy with improved health outcomes (Rawat, N., & Kumar, 2022). Indoor air pollution has long been a silent burden on rural households, especially affecting women who spend long hours over open fires. PMUY's introduction of LPG into these homes is not merely an infrastructural upgrade—it is a public health intervention. By reducing exposure to harmful pollutants, the scheme directly addresses one of the most persistent and gendered health hazards in rural India. In essence, the positive association between LPG use and improved health outcomes confirms that PMUY is doing more than replacing fuel—it is helping to restore wellbeing, protect lungs, and reclaim the dignity of cooking in a clean and safe environment.

H3: Time Savings and Labour Redistribution

The results of the paired samples t-test (t(449) = -5.099, p < .001) reveal a clear and statistically significant reduction in the time rural women spend on cooking and fuel collection after adopting LPG through PMUY. On average, respondents reported saving nearly two hours each day—time that was previously consumed by labour-intensive firewood gathering and slow cooking processes.

Importantly, this reclaimed time is not simply "free time," but is actively reinvested into various aspects of daily life. Many women shared that they now use this extra time for income-generating activities, helping children with schoolwork, engaging in community responsibilities, or simply resting—something they rarely had the luxury to do before. This finding resonates with the Clean Cooking Alliance's notion of alleviating "time poverty," which emphasizes that time, like income, is a critical resource for women's empowerment.

Source: Primary Data

Table 1 – Impact Evaluation Analysis

Metrics	Value	Interpretation
Mean Difference	-0.424	**A paired t-test** was employed to assess the impact of LPG adoption on time spent collecting cooking fuel. Results showed a significant decrease in time after adopting LPG (M = -0.424, SD = 1.766), *t* (449) = -5.099, *p*< .001. This supports the hypothesis that access to LPG under PMUY reduces time spent on cooking-related activities and fuel wood collection.
SD	1.766	
Standard Error Mean	0.083	
95% CI of Difference	[0.588, -0.261]	
t-value	-5.099	
Df	449	
Sig (2-tailed)	.00	

Furthermore, these findings support the observations of (Wu, Y., Zhang, L., & Shen, 2025), whose study in rural China demonstrated that access to clean energy significantly enhances women's ability to participate in the labour force. In the context of rural Tamil Nadu, LPG adoption is quietly but powerfully shifting the rhythm of women's lives—transforming daily routines from survival-driven tasks to ones that allow for greater economic and personal agency.

H4: Economic Participation and LPG Usage

The analysis revealed a statistically significant relationship between the type of cooking fuel used and women's involvement in income-generating activities (χ^2 (12, N = 448) = 115.339, p < .001). Women who adopt with exclusively on LPG were considerably more likely to states the participation in paid jog, compared to those who continued to use traditional fuels for cooking or engaged in fuel stacking in their households.

Beyond the counts, the human narrative is compelling many respondents' states that shifting to LPG freed up several hours each day, previously spent collecting firewood or managing smoke-filled kitchens is more difficult to tackle the days spending unproductively. This newfound time and energy translated into practical opportunities: joining groups which facilitates like self-help groups, taking up part-time jobs, or even initiating small businesses from home. Improved health and reduced bust further reinforced their ability to engage in work outside the domestic sphere.

These lived experiences echo broader findings from (Gaikwad, P., Sharma, R., & Kulkarni, 2024; IEA, n.d.), which highlight how access to clean energy can act as a springboard for rural women's economic inclusion. In this light, PMUY emerges not merely as an energy access scheme, but as a silent enabler of women's financial independence and social mobility—reshaping not just what women cook with, but how they live and earn.

H5: Fuel Access and Women's Decision-Making Power

The analysis reveals a significance of relationship between the cooking fuel type used and women's participation in household decision making (χ^2 (12, N = 448) = 67.091, p < .001). The Women who primarily relied on LPG were pointed more likely to states having a say in decisions related to LPG refills and household budgeting but also in broader matters of family welfare and financial planning.

This finding shows that access to clean energy does more than just alter cooking practices it has the potential to subsitutly shift power dynamics within the household. Many respondents, managing the LPG connection became a gateway to broader financial responsibility. This cope with (Choudhuri, S., & Desai, 2020) arguments says that energy access and gender relations are deeply interconnected; when women control a household resource like fuel, it can takes their role from passive users to active decision-makers.

In rural environment where traditional undertakings often confine women to the private arena, the ability to influence such decisions represents a small but impactful form of development. Respondents repeatedly expressed a newfound confidence in managing household phenomenon, some even pointing that their opinions were being sound-full more often by other family members.

Thus, PM Ujjwala Yojana impacts beyond the kitchen, offering rural women a begin into the household's decision-making sphere, an important step towards gender equitable households and stronger female agency.

H6: Socio-Cultural Influences on Fuel Usage

Fuel choices in rural households are moulds by more than just economics or convenience, they are deeply linked with cultural beliefs, social expectations, and community thinking's. This hypothesis indicates two critical socio-cultural forces: **family pressure** and **community attitudes** toward LPG usage. The test result revealed a **strong association between family pressure and cooking fuel behavior statistically** (χ^2 (12, N = 448) = 108.888, p < .001). Women who reports facing religious or cultural pressure such as elders insisting on using firewood during religious cooking, or social undertaking delimiting the modern stoves were far more likely continue using traditional fuels or engage in **fuel stacking**. These choices are merely not practical but often longing to comply with long-standing household norms or avoid social frictions.

Similarly, **community perception emerged as a powerful driver of fuel choices** (χ^2 (12, N = 448) = 52.635, p < .001). In villages where LPG was seen as a symbol of progress and modernity, women were more likely to use it exclusively. In contrast, in communities where people held ambivalent or skeptical views—where gas cylinders were seen as "risky" or "unnecessary luxuries"—fuel stacking or complete reliance on traditional fuels was more common. These findings affirm the insights of Vyas, Gupta, and Khalid (2021), who caution that even well-designed energy interventions like PMUY can be undermined by deeply rooted patriarchal or cultural norms. They also echo (Patnaik, B., Rajagopal, M., n.d.) from the Council on Energy, Environment and Water, who advocate for integrating **cultural sensitivity and local belief systems into clean energy policies** to ensure long-term behavioral change.

In essence, while infrastructure and subsidies can deliver access, **true adoption and sustained use of clean energy solutions like LPG require shifts in social narratives**—making it equally important to invest in awareness, community dialogue, and culturally tailored advocacy. Empowering rural women to lead these conversations in their households and neighborhoods may be one of the most effective paths forward.

H7: Economic Affordability and Sustained Usage

The relationship between economic affordability and sustained LPG usage reveals a nuanced reality. A Spearman's rho analysis indicated a weak yet statistically significant positive correlation ($\rho = 0.191$, $p < .01$) between the number of LPG cylinders refilled annually and concerns about refill costs. In simpler terms, women who refill more cylinders tend to express greater concern about the expense. **This finding sheds light on a paradox:** even as the financial burden increases with more frequent usage, many women continue to rely on LPG. This suggests a growing recognition of its benefits—cleaner kitchens, better health, and saved time outweigh the discomfort of rising costs. For many households, LPG has become indispensable, not a luxury.

Source: Primary Data

Table 2 – Economic Affordability and Usage Relationship Analysis

Variables	Cost Concern	Average Refill per Year
Cost concern to refill LPG	1.000	.191
Average LPG Refill Per Year	.191	1.000
Significance (2 tailed)	-	.000
N	450	450

This continued use despite economic strain also flags an underlying vulnerability. It raises critical questions about the long-term affordability and sustainability of clean energy access initial subsidies phase out. Without ongoing financial support, some households especially those in lower income brackets may be forced to revert to traditional fuels, thereby undermining the gains made through PMUY. Thus, while LPG usage has been normalized in daily routines, its financial sustainability remains fragile. Policymakers must consider supplementary measures such as targeted subsidies, flexible refill schemes, or rural energy credit systems to ensure that economic hardship does not stall this essential transition to clean cooking.

4.1 DISCUSSION

The findings from this study illuminate the multi-dimensional impact of the Ujjwala Yojana on rural women in Sivaganga district—an area often overlooked in mainstream development discussion but representative of many semi-marginalized regions in Tamil Nadu. While national and state-level statistics often paint a broad picture of PMUY's reach, this micro-level analysis reveals the nuanced realities that unfold once clean energy reaches the threshold of rural homes. At the heart of these insights is the transformation of cooking from a burdensome, health-endangering necessity to a more dignified, efficient, and empowering experience. Women who once spent hours collecting firewood or suffering from smoke-induced ailments now report not only better health and cleaner kitchens but also a shift in their daily time use and household influence. These seemingly small shifts have ripple effects: more time for paid work, greater say in family decisions, and enhanced self-worth.

The significance of awareness, as confirmed by **Hypothesis H1**, goes far beyond information dissemination—it speaks to the role of community credibility and trust in triggering behavioral change. In Sivaganga, where interpersonal networks often substitute for mass media, the messenger often matters more than the message. This echoes the need for hyper-localized awareness campaigns that leverage village leaders, women's self-help groups, and grassroots institutions. Perhaps one of the most powerful insights emerges from **Hypotheses H2 and H3**, which connects LPG adoption with tangible health benefits and time savings. These results affirm that PMUY's value lies not just in fuel substitution but in alleviating long-standing gendered burdens. As echoed by the women surveyed, LPG access has improved respiratory health, reduced fatigue, and given back precious hours each day—time that is being reallocated to productive, restful, or educational pursuits.

The findings also underscore LPG's role in enabling economic participation (H4) and amplifying women's decision-making power (H5). While empowerment is often spoken of in abstract terms, here it is grounded in clear actions—taking part in budgeting decisions, managing household energy needs, and seeking outside income opportunities. This transition from dependency to agency is a critical signal of PMUY's potential as a developmental catalyst, particularly in districts like Sivaganga where patriarchal norms often restrict women's mobility and autonomy. However, the study also surfaces deep-rooted social challenges. As H6 demonstrates, cultural resistance and community perceptions significantly influence LPG usage. Even

when cylinders are present, traditional beliefs—such as the notion that firewood is more "sacred" or "flavorful" for religious cooking—persist. These socio-cultural undercurrents cannot be addressed by infrastructure alone. Real change will require narrative shifts—reframing LPG as not just modern, but compatible with tradition, safe for rituals, and economically rational. Only by bridging the cultural with the practical can fuel stacking and partial adoption be replaced with full transitions.

Affordability, explored in H7, remains another complex barrier. Though many households continue using LPG despite rising refill costs, the concern is palpable. For frequent users, the cost is more than a nuisance—it is a source of tension, especially in low-income households juggling multiple expenses. This raises questions about the long-term viability of LPG adoption without sustained economic support. If refill costs remain unchecked, PMUY risks becoming a short-lived gain rather than a permanent solution. Taken together, the study's findings highlight that PMUY's effectiveness is not solely dependent on distribution metrics but on how well the scheme adapts to the cultural, economic, and social realities of the communities it serves. Sivaganga district, with its blend of traditional values and emerging aspirations, offers a powerful lens into these dynamics.

5. IMPLICATIONS FOR POLICY AND PRACTICE

The finding from this study offers rich, context-specific insights for refining and enhancing the implementation of clean cooking energy programs like PMUY. Grounded in the lived experiences of rural women in Sivaganga District, the following implications bridge research and practice, addressing both structural gaps and behavioral drivers that shape sustained LPG adoption.

The data strongly supports the idea that awareness is not simply a matter of information access but of social trust and cultural resonance. Women who adopted LPG were often those who learned about PMUY through credible local sources—community leaders, neighbors, or self-help group members—rather than mass media or digital platforms. This emphasizes the need for **hyper-localized, culturally sensitive awareness campaigns** that go beyond standard IEC materials. Policy frameworks should engage all the local influences and self-help group leaders through outreach. And specifically develop vernacular language content that reflect the realities on rural womens and conters the myth which was over with common. Promote **interactive, women-led community sessions** that allow dialogue, rather than one-way instruction. By embedding LPG education in community norms and values, adoption can become a socially reinforced choice, not a hesitant trial.

Many womens in this study still continuing the usage of LPG despite rising refill cost, concerns about affordability were prevalent—particularly among frequent users and low-income families. The positive but significant correlation between refill frequency and cost concern suggests that **financial strain is real**, even if usage persists out of necessity. To prevent **fuel stacking** or reversion to traditional fuels, especially post-subsidy, policies must consider: **Tiered pricing models** based on household income or refill volume. **Introduction** of **rural energy credit schemes** or LPG-linked savings groups, Seasonal subsidies during high-spending months, Without such safety nets, the most economically vulnerable households may abandon LPG over time—not because of disinterest, but due to structural exclusion.

The findings shows that women who manage their household's LPG connection are also more likely to report greater say in budgeting, child care, and community involvement. This positions PMUY as more than a fuel distribution scheme, it is a gateway to broader **intra-household empowerment**. To scale this effect, energy policy should: **(1)** Encourage **female-led LPG management** through SHG-based refill tracking systems or women-only LPG refill kiosks. **(2)** Involve women in **village-level energy committees**, allowing them to participate in planning, grievance redressal, and feedback. **(3)** Provide **micro-enterprise training** that links LPG use to small business opportunities (e.g., food production, tea stalls). This gender-integrated approach ensures that clean energy use is not only a domestic change but also a shift in power and participation.

CONCLUSION

This study affirms that the Pradhan Mantri Ujjwala Yojana (PMUY) is not just about fuel – its just about freedom. For rural women in Sivaganga district, access to LPG has eliminates the daily burden on households and offers to improves health, reclaim the time and opened doors to economic and household participation. It has parked real, measurable shifts in how women live, work and decide. Yet, adoption is not automatic. Cultural norms, refill costs and a traditional practices still shape how LPG is used. A gas connection may reach the home, but lasting changes only takes root when communities trust it, women lead it and systems support it. To fully unlock Ujjwala scheme potential, policies must go beyond supply - strengthening awareness through local voices, ensuring affordability, and empowering women as key decision-makers in energy use. Empowerment starts in the kitchen, but it must grow into every corner of a women's life. At its core, PMUY in sivaganga is a story of transition towards cleaner homes, stronger women, and more inclusive futures. Listening to these women is essential if we are to turn energy access into lasting empowerment.

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AUTHORS CONTRIBUTIONS

The authors contributed equally to this work as, Conceptualization, Methodology, data analysis and written this article.

CONFLICT OF INTEREST

The authors declares that there are no conflicts of interest, whether personal of organizational, associated with the publication of this research article.

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REFERENCES

Choudhuri, S., & Desai, S. (2020). Intra household gender inequalities and clean fuel adoption in India. Energy Researgy & Social Science, 65, 101–455.

Dash, S., & Sahoo, S. (2024). Health and livelihood gains from LPG adoption: A rural analysis. Journal of Development Studies, 60(1), 21–38.

Gaikwad, P., Sharma, R., & Kulkarni, A. (2024). Women, LPG and agency: A logitudinal study of Maharastra's rural households. Energy for Sustaibanle Development, 73, 1001–1012.

Gould, C., & Urpelainen, J. (2020). The role of women's empowerment in household fuel choice in India. Energy Policy, 137, 111–120.

IEA. (n.d.). Energy and Gender: A Global perspective. Paris : IEA.

Kandasamy, R., & Kulothungan, R. (2022). PMUY and behavioural transition : A study from Tamil Nadu. Indian Journal of Social Research, 63(3), 321–340.

Patnaik, B., Rajagopal, M., & CEEW. (n.d.). Gender and Energy : Policy pathways for Inclusive transitions. New Delhi : Council on Energy, Environment and Water.

Rawat, N., & Kumar, V. (2022). Clean cooking and women's health in rural India. Indian Journal of Public Health, 66(2), 132–137.

Vyas, M., Gupta, A., & Khalid, M. (2021). Traditional fuel persistence: A Challenge to LPG transition. South Asian Economic Journal, 22(2), 175–193.

Wu, Y., Zhang, L., & Shen, J. (2025). Energy access and female labor force participation in rural china. Energy Economics, 121(106702).