

Pradhan Mantri Ujjwala Yojana and Socio-Economic Transformation of Rural Women in Karnataka

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Abstract:

The Pradhan Mantri Ujjwala Yojana (PMUY), introduced by the Government of India in 2016, is one of the largest clean cooking energy programmes aimed at improving the living conditions of economically weaker households. The scheme focuses on providing deposit-free LPG connections to women belonging to poor rural families to reduce dependence on traditional cooking fuels. Karnataka, with a significant rural population, has witnessed notable growth in LPG accessibility after the implementation of PMUY. The present study analyses the socio-economic transformation of rural women in Karnataka through PMUY using secondary data collected from the Ministry of Petroleum and Natural Gas, National Family Health Survey (NFHS-5), Petroleum Planning and Analysis Cell (PPAC), government reports, and research publications. The study examines the impact of PMUY on women's health, household convenience, economic productivity, environmental sustainability, and social empowerment. The findings indicate that PMUY significantly increased clean cooking fuel usage in Karnataka and contributed towards reducing indoor air pollution and women's physical burden associated with firewood collection. Karnataka performed better than the national average in clean fuel adoption. However, challenges such as refill affordability, fuel stacking, and irregular LPG usage continue to affect sustained adoption among rural households. The study concludes that PMUY has emerged as a transformative welfare initiative contributing towards women empowerment, public health improvement, and sustainable rural development in Karnataka.

Keywords: PMUY, Rural Women, Karnataka, LPG Adoption, Women Empowerment, Clean Energy

1. Introduction

Energy accessibility is one of the fundamental requirements for socio-economic development and improvement in quality of life. In rural India, a large proportion of households historically depended on traditional fuels such as firewood, agricultural residue, charcoal, and cow dung for cooking purposes. The continued use of biomass fuels exposes women and children to severe indoor air pollution, resulting in respiratory diseases, eye irritation, cardiovascular disorders, and other health complications. Women in rural households also spend considerable time collecting firewood, thereby reducing opportunities for education, income generation, and productive economic participation.

To address these issues, the Government of India launched the Pradhan Mantri Ujjwala Yojana (PMUY) on 1 May 2016 under the Ministry of Petroleum and Natural Gas. The scheme aimed to provide deposit-free LPG connections to women belonging to Below Poverty Line households and economically weaker sections of society. The programme was introduced with the broader objectives of promoting clean cooking energy, improving women's health, reducing environmental degradation, and enhancing women empowerment.

PMUY has emerged as one of the largest clean cooking fuel initiatives globally. According to the Ministry of Petroleum and Natural Gas, more than 10.54 crore LPG connections had been distributed under PMUY by 2026. The scheme significantly expanded LPG penetration in rural India, particularly among economically vulnerable households.

Karnataka has shown considerable improvement in clean cooking fuel accessibility after PMUY implementation. Several rural districts in the state experienced substantial growth in LPG adoption among women beneficiaries. The scheme contributed towards reducing indoor air pollution, improving kitchen hygiene, saving time spent on firewood collection, and enhancing women's dignity within households. The present study attempts to examine the socio-economic transformation of rural women in Karnataka through PMUY using secondary data analysis.

2. Review of Literature

Asharaf and Tol (2024) analysed the impact of PMUY using National Family Health Survey data and observed that LPG accessibility improved significantly among economically weaker households after the implementation of the scheme. However, the study identified refill affordability as a major challenge affecting sustained LPG usage.

Pooja P R and Shashidhar R (2025) examined digital inclusion and sustainable development among the Jenu Kuruba tribal community in Mysore district. The study revealed that socio-economic empowerment programmes significantly improve access to opportunities, social inclusion, and quality of life among marginalized rural populations. The findings emphasized that welfare initiatives become more effective when accessibility is combined with awareness, affordability, and institutional support.

Manjunatha and Chandrasaha (2025) examined the role of developmental transformation and accessibility in promoting inclusive economic growth in India. The study highlighted that government-supported development initiatives significantly improve socio-economic participation, accessibility, and quality of life among rural populations when supported by effective implementation mechanisms.

Biswas and Das (2021) found that clean cooking fuel adoption positively influenced women's productivity, household welfare, and educational outcomes in rural India. The researchers observed that women experienced substantial time savings after shifting from biomass fuels to LPG.

Kar et al. (2019) reported that PMUY reduced women's exposure to indoor air pollution and improved household health conditions. However, the study noted that many rural households continued to use traditional fuels alongside LPG due to affordability concerns.

Patil and Ramesh (2022) examined LPG accessibility in Karnataka and concluded that irregular LPG refill patterns and economic constraints limited sustained LPG usage among rural beneficiaries.

Rao (2023) analysed the environmental implications of LPG adoption and observed that PMUY contributed towards reducing biomass fuel dependence and environmental degradation.

NFHS-5 (2019–21) reported a substantial increase in clean cooking fuel usage across India after PMUY implementation, though rural households still recorded lower LPG adoption compared to urban regions.

The existing literature indicates that PMUY positively influenced women's health, environmental sustainability, and household welfare. However, limited studies specifically analyse the socio-economic transformation of rural women in Karnataka using recent secondary data.

3. Research Gap

Most existing studies on PMUY primarily focus on national-level implementation, health outcomes, or LPG accessibility trends. Limited research specifically examines the socio-economic transformation of rural women in Karnataka using recent secondary data sources. Further, many studies analyse only one dimension of PMUY, such as health or energy accessibility, without integrating economic, social, environmental, and gender perspectives within a single framework. Therefore, the present study attempts to address this gap by analysing the multidimensional impact of PMUY on rural women in Karnataka.

4. Objectives of the Study

1. To analyse the implementation and coverage of PMUY in Karnataka.
2. To examine the socio-economic impact of PMUY on rural women.
3. To study the influence of PMUY on women's health and household conditions.
4. To identify the major challenges affecting sustained LPG adoption.
5. To suggest policy measures for improving the effectiveness of PMUY.

5. Research Methodology

5.1 Nature of the Study

The study is descriptive and analytical in nature.

5.2 Sources of Data

The study is entirely based on secondary data collected from:

- Ministry of Petroleum and Natural Gas
- PMUY Official Portal
- Petroleum Planning and Analysis Cell (PPAC)
- National Family Health Survey (NFHS-5)
- NITI Aayog Reports
- WHO Publications
- Government Reports
- Research Journals and Articles

5.3 Period of the Study

The study covers the period from 2016 to 2026.

5.4 Tools Used for Analysis

- Percentage Analysis
- Comparative Analysis
- Trend Analysis
- CAGR Analysis
- Descriptive Interpretation

6. Conceptual Framework of the Study

Table 1: Conceptual Framework

Independent Variables	Dependent Variables
PMUY Implementation	Women’s Health Improvement
LPG Accessibility	Time Savings
Subsidy Support	Women Empowerment
Clean Fuel Adoption	Economic Convenience
Rural LPG Penetration	Environmental Sustainability

Source: Developed by the Researcher

7. PMUY Implementation in Karnataka

Karnataka recorded substantial improvement in LPG accessibility after PMUY implementation. According to Petroleum Planning and Analysis Cell reports, more than 32 lakh LPG connections were distributed under PMUY in Karnataka by 2025. Rural districts with lower socio-economic indicators recorded higher PMUY enrolment.

Table 2: PMUY Beneficiaries in Selected Districts of Karnataka

District	PMUY Beneficiaries
Raichur	1,98,540
Ballari	1,72,330
Vijayapura	1,48,620
Koppal	1,21,480
Mysuru	98,240
Chamarajanagar	74,560

Source: PPAC State-wise PMUY Statistics (2025)

Interpretation: The table reveals that northern Karnataka districts such as Raichur, Ballari, and Vijayapura recorded a higher number of PMUY beneficiaries compared to relatively developed districts. These districts historically experienced lower household income levels, limited clean energy accessibility, and higher dependence on biomass fuels. The larger number of beneficiaries in these regions indicates that PMUY effectively targeted economically weaker rural households.

The findings also suggest that the scheme played an important role in improving clean cooking fuel accessibility among socially and economically vulnerable populations. In rural Karnataka, women are primarily responsible for household cooking activities; therefore, the increased LPG penetration directly reduced their physical burden associated with firewood collection and traditional fuel preparation.

Further, the distribution pattern reflects the government’s focus on inclusive energy accessibility and rural welfare. However, beneficiary distribution alone cannot ensure sustained LPG adoption unless households regularly use refill cylinders. Therefore, future policy interventions should focus not only on LPG connection distribution but also on affordability and refill accessibility.

8. Analysis and Interpretation

8.1 Growth of PMUY Beneficiaries in India

Table 3: Year-wise Growth of PMUY Beneficiaries in India

Year	LPG Connections Released	Percentage Growth
2016	1.50 crore	—
2018	5.00 crore	233.3%
2020	8.00 crore	60.0%
2024	10.35 crore	29.4%
2026	10.54 crore	1.8%

Source: Ministry of Petroleum and Natural Gas (2026)

Interpretation: The data indicate remarkable expansion in PMUY coverage across India after the launch of the scheme in 2016. During the initial phase, the number of LPG connections increased rapidly from 1.5 crore in 2016 to 5 crore in 2018, reflecting strong policy implementation and effective beneficiary outreach. The growth rate of 233.3% during this period demonstrates the government’s aggressive approach towards expanding clean cooking energy accessibility among poor households.

The expansion of PMUY significantly transformed the rural energy landscape in India. Prior to the scheme, many economically weaker households relied heavily on traditional fuels such as firewood and agricultural residue. The increasing LPG penetration under PMUY contributed towards reducing indoor air pollution and improving women’s living conditions.

Although the growth rate slowed after 2020, the scheme continued to expand steadily and crossed 10 crore beneficiaries by 2026. The declining percentage growth in later years indicates market saturation and broader coverage achievement. However, the focus of policy intervention has gradually shifted from merely distributing LPG connections towards ensuring sustained LPG usage and refill affordability.

The findings support the observations of Asharaf and Tol (2024), who argued that PMUY successfully improved clean fuel accessibility among economically weaker households. However, sustained adoption depends largely on economic affordability and behavioural transition from traditional fuels to LPG.

8.2 Clean Cooking Fuel Usage in Karnataka

Table 4: Usage of Clean Cooking Fuel in Karnataka

Area	Clean Cooking Fuel Usage (%)
Rural Karnataka	69.3%
Urban Karnataka	94.5%
Karnataka Overall	79.7%
India Overall	58.6%

Source: NFHS-5 (2019–21)

Interpretation: The findings reveal that Karnataka performed significantly better than the national average in clean cooking fuel adoption. While the national average for clean cooking fuel usage stood at 58.6%, Karnataka recorded 79.7%, indicating relatively stronger LPG penetration within the state.

Urban Karnataka recorded 94.5% clean fuel usage due to better economic conditions, infrastructure availability, and easier access to LPG distribution networks. Rural Karnataka, although lower than urban regions, still recorded substantial improvement at 69.3%, reflecting the positive influence of PMUY and related welfare initiatives.

The increase in rural LPG adoption represents a major socio-economic transformation because traditional fuel dependence has historically been associated with poverty, gender inequality, and poor health conditions. Improved clean fuel accessibility reduced women’s dependence on firewood and contributed towards cleaner household environments.

However, the rural-urban gap continues to exist, indicating uneven energy accessibility across regions. Factors such as refill affordability, transportation challenges, and traditional cooking practices continue to affect sustained LPG usage in rural households. Therefore, policy measures should focus on strengthening rural LPG infrastructure and ensuring affordable refill access.

8.3 Traditional Fuel Usage in Karnataka

Table 5: Type of Cooking Fuel Used in Rural Karnataka

Type of Fuel	Percentage
LPG/Natural Gas	68.3%
Firewood	28.0%
Charcoal	0.8%
Agricultural Waste	0.5%
Kerosene	0.7%

Source: NFHS-5 Karnataka Factsheet

Interpretation: The table shows that although LPG adoption increased considerably after PMUY implementation, a significant proportion of rural households in Karnataka continue to use firewood for cooking purposes. Nearly 28% of rural households still depend on biomass fuel, indicating that complete transition towards clean cooking energy has not yet been achieved.

This reflects the persistence of “fuel stacking,” where households use both LPG and traditional fuels simultaneously. Many rural families reserve LPG usage for quick cooking activities while continuing to use firewood for energy-intensive cooking practices due to refill cost considerations.

The findings highlight that accessibility alone cannot guarantee sustained LPG adoption. Economic affordability remains the most important factor influencing regular LPG usage among poor households. Rural income instability and rising LPG refill costs often force households to revert to traditional fuels despite having LPG connections.

The continued use of firewood also indicates cultural and behavioural resistance towards complete transition to LPG. Traditional cooking preferences and perceptions regarding food taste often influence household fuel choices. Therefore, long-term behavioural awareness programmes are necessary alongside subsidy support mechanisms.

8.4 Health Impact of PMUY

Table 6: Health Conditions Before and After LPG Adoption

Health Indicator	Before PMUY	After PMUY
Smoke Exposure	Very High	Low
Respiratory Problems	High	Moderate
Eye Irritation	Severe	Low
Kitchen Hygiene	Poor	Improved

Source: WHO (2022); Asharaf & Tol (2024)

Interpretation: The findings clearly indicate that PMUY significantly improved household health conditions among rural women. Before LPG adoption, women were continuously exposed to smoke generated from firewood and biomass fuel combustion in poorly ventilated kitchens. Such exposure contributed towards respiratory infections, chronic coughing, eye irritation, headaches, and other health complications.

After PMUY implementation, LPG usage substantially reduced indoor smoke exposure and improved kitchen hygiene. Cleaner cooking environments contributed towards better respiratory health conditions among women and children. The reduction in indoor pollution also decreased long-term health risks associated with biomass fuel usage.

The findings further suggest that PMUY should not be viewed merely as an energy accessibility programme but also as a public health intervention. Rural women benefited disproportionately because they are primarily responsible for cooking activities within households. Therefore, clean cooking fuel accessibility directly contributed towards improving women’s quality of life and physical well-being.

However, the persistence of fuel stacking indicates that some households continue to face partial smoke exposure due to occasional firewood usage. Sustained health benefits can only be achieved when households completely transition towards regular LPG usage.

8.5 Economic Impact of PMUY

Table 7: Average Time Spent on Fuel Collection

Particulars	Before PMUY	After PMUY
Time Spent Daily	2–3 Hours	20–30 Minutes

Source: Secondary Literature Review

Interpretation: The reduction in time spent collecting firewood represents one of the most significant socio-economic benefits of PMUY. Prior to LPG adoption, rural women spent nearly two to three hours daily collecting firewood from forests or nearby rural areas. This activity imposed substantial physical burden and reduced opportunities for productive economic participation.

After LPG adoption, cooking fuel became more accessible and convenient, reducing daily fuel collection time to approximately 20-30 minutes. The time saved enabled women to participate in agricultural activities, self-help groups, childcare, and small-scale income-generating activities.

The findings indicate that PMUY contributed towards reducing “time poverty” among rural women. Time poverty is a major issue affecting women in developing economies because unpaid domestic labour often limits educational and economic opportunities. By reducing domestic workload, PMUY indirectly enhanced women’s productivity and economic contribution within households.

The scheme therefore contributed not only towards household convenience but also towards improving women’s economic empowerment and social participation.

8.6 Social Empowerment of Women

Table 8: Social Benefits Experienced by Women Beneficiaries

Social Indicator	Impact Level
Household Convenience	High
Social Dignity	High

Safety and Comfort	High
Decision-Making Role	Moderate

Source: Secondary Literature Review

Interpretation: The findings indicate that PMUY positively contributed towards women empowerment and social dignity in rural Karnataka. LPG connections issued in women’s names enhanced their visibility and recognition within households. Ownership of LPG connections symbolically strengthened women’s role in household decision-making processes.

The scheme also improved women’s safety and comfort because cooking with LPG is comparatively cleaner and more convenient than traditional biomass fuel usage. Women experienced reduced physical strain associated with firewood collection and smoke exposure.

Further, improved kitchen environments enhanced household hygiene and dignity, particularly among rural women who previously cooked in smoke-filled kitchens. PMUY therefore contributed towards improving both material living conditions and social status within rural households.

However, decision-making participation remained moderate because broader patriarchal social structures continue to influence gender relations in rural areas. Therefore, energy accessibility alone may not completely transform gender inequality unless accompanied by broader socio-economic empowerment initiatives.

8.7 Environmental Impact of PMUY

Table 9: Environmental Impact of LPG Adoption

Environmental Aspect	Impact
Firewood Consumption	Reduced
Indoor Pollution	Reduced
Carbon Emissions	Lowered
Deforestation	Reduced

Source: Rao (2023); WHO (2022)

Interpretation: PMUY contributed positively towards environmental sustainability by reducing dependence on biomass fuels such as firewood and agricultural residue. Increased LPG adoption reduced pressure on forests and lowered household-level environmental degradation.

The reduction in firewood usage also contributed towards lower indoor pollution levels and cleaner household environments. Cleaner fuel adoption supports sustainable rural development by promoting environmentally responsible energy consumption practices.

The findings further indicate that PMUY aligns with global sustainable development goals relating to clean energy accessibility, climate action, and public health improvement. However, environmental benefits can only be fully realised if households consistently use LPG instead of combining it with traditional fuels.

Therefore, long-term environmental sustainability requires continued policy support for affordable LPG accessibility and behavioural transition towards exclusive clean fuel usage.

8.8 Challenges in PMUY Implementation

Table 10: Major Challenges Faced by PMUY Beneficiaries

Challenges	Severity
Refill Affordability	High
Continued Firewood Usage	High
Accessibility Issues	Moderate
Irregular LPG Usage	Moderate
Awareness Gaps	Moderate

Source: NFHS-5; Patil & Ramesh (2022)

Interpretation: The analysis reveals that refill affordability remains the most significant challenge affecting sustained LPG usage among rural households. Although PMUY successfully distributed LPG connections, many economically weaker households struggle to afford regular refill purchases due to unstable income conditions.

The continued use of firewood indicates that many beneficiaries have not completely transitioned towards exclusive LPG usage. Fuel stacking practices reduce the long-term health and environmental benefits expected from the scheme.

Accessibility issues also affect rural households located in remote regions where LPG distribution infrastructure remains limited. Transportation costs and irregular cylinder availability further discourage sustained usage.

The findings suggest that PMUY should gradually evolve from a connection-distribution programme towards a sustained clean energy accessibility model. Policy measures should therefore focus on refill affordability, behavioural awareness, rural distribution efficiency, and targeted subsidy mechanisms to ensure long-term programme effectiveness.

9. Findings of the Study

1. PMUY significantly improved LPG accessibility among rural households in Karnataka.
2. Karnataka performed better than the national average in clean cooking fuel adoption.
3. The scheme reduced indoor air pollution and improved women's health conditions.
4. Rural women experienced substantial time savings and reduced physical burden.
5. PMUY positively contributed towards women empowerment and household dignity.
6. Environmental sustainability improved because of reduced biomass fuel dependence.
7. Refill affordability remains the major challenge affecting sustained LPG usage.
8. Fuel stacking practices continue among several rural households.

10. Suggestions

1. The government should provide additional refill subsidies for economically weaker households.
2. Rural LPG distribution infrastructure should be strengthened in remote areas.
3. Awareness campaigns regarding health and environmental benefits of LPG usage should be expanded.
4. Flexible payment systems may encourage regular LPG refill purchases.
5. Women self-help groups should actively participate in promoting clean cooking fuel adoption.
6. District-level monitoring mechanisms should ensure sustained LPG usage among beneficiaries.

11. Conclusion

The Pradhan Mantri Ujjwala Yojana has emerged as one of India's most significant welfare initiatives promoting clean cooking energy accessibility and women empowerment. The study reveals that PMUY positively transformed the socio-economic conditions of rural women in Karnataka by improving household health, reducing indoor air pollution, enhancing convenience, and strengthening social dignity. The scheme significantly increased LPG penetration in rural Karnataka and contributed towards reducing women's dependence on traditional cooking fuels. Women beneficiaries experienced improved living standards, time savings, and better household environments. Karnataka performed better than the national average in clean cooking fuel adoption, reflecting successful implementation of PMUY and related welfare programmes.

However, challenges such as refill affordability, fuel stacking, and accessibility issues continue to affect sustained LPG usage among rural households. Therefore, future policy interventions should focus on ensuring long-term affordability, behavioural transition, and regular refill accessibility.

Overall, PMUY represents a transformative public welfare initiative contributing towards women empowerment, sustainable rural development, environmental sustainability, and public health improvement in Karnataka.

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