



Analyzing the safety implications of the upsurge in domestic usage of liquefied petroleum gas (LPG) in Nigeria

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Abstract

The rapid rise in domestic Liquefied Petroleum Gas (LPG) usage in Nigeria signifies a transformative shift towards cleaner energy. This abstract encapsulates a thorough analysis delving into the safety implications linked to this transition. Through meticulous exploration of LPG usage, safety practices, regulations, and stakeholder perspectives, the study aims to illuminate multifaceted safety dimensions in Nigeria. Employing mixed methods, including surveys and interviews, the research offers a holistic view of LPG safety dynamics. Quantitative data of 200 households across the six geo-political zones indicates increasing LPG adoption, highlighting gaps in safety awareness and compliance. Qualitative insights shed light on challenges faced by users, experts, and regulators, providing a nuanced outlook on safety concerns and potential solutions. Key findings underscore the role of safety awareness in shaping user practices and the need for robust regulations for consistent safety enforcement. Stakeholder input emphasizes collaboration against counterfeit equipment and standardized safety training. Recommendations include targeted awareness campaigns, stronger regulations, and industry-user partnerships to bolster LPG safety. The research holds far-reaching implications for policies, industry practices, and public engagement. Amid Nigeria's pursuit of sustainable energy solutions, addressing safety implications of surging LPG usage becomes crucial. This abstract offers a glimpse into a comprehensive exploration aiming to contribute to a safer LPG landscape, harnessing cleaner energy benefits while prioritizing Nigerian households' well-being.

Keywords: Liquefied Petroleum Gas (LPG); Safety; Awareness; Government regulations; Stakeholder perspectives.

1. Introduction

The adoption of Liquefied Petroleum Gas (LPG) for domestic cooking in Nigeria has witnessed a significant upsurge in recent years. The affordability, convenience, and environmental benefits of LPG have contributed to its popularity as an alternative cooking fuel. However, the rapid increase in LPG usage also raises concerns about safety implications. This paper aims to analyze the safety implications of the growing domestic usage of LPG in Nigeria, addressing the potential risks, regulatory challenges, and measures needed to ensure safe adoption [1,6]. In summation, the historical evolution of LPG's ascendancy as a prominent domestic cooking fuel within Nigeria is punctuated by steadfast governmental initiatives aimed at fostering its adoption. The recent inception of both the NGFCP and NGEP augments the prospects for enhanced LPG production, distribution, and accessibility, thereby substantiating the transition towards LPG as a pervasive and cost-effective energy source. [1, 3].

1.1. LPG Usage in Nigeria

The paper projects an overview of the rise in LPG usage in Nigeria, highlighting government initiatives such as the National Gas Master Plan and the National LPG Expansion Implementation Plan. It also discusses the socio-economic

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factors driving the increased adoption of LPG as a cooking fuel according to world bank reports. [10,11]. The surge in the domestic utilization of Liquefied Petroleum Gas (LPG) within Nigeria has yielded an escalation in LPG-related incidents, entailing grievous loss of both lives and property.[4,5]. A compendium of factors underpinned these incidents, including but not limited to inadequately maintained LPG cylinders: LPG cylinders exhibiting deficient maintenance practices are predisposed to gas leaks, thereby potentially leading to explosive events. Cylinders marked by rust, dents, or impaired valves amplify the vulnerability to hazardous consequences. Another is Mishandling of LPG Cylinders: The considerable weight of LPG cylinders coupled with their intricate handling requirements engenders the prospect of mishandling[15]. Improper handling can lead to cylinder fall, rupture, and subsequent gas leaks or explosions. Others are inadequate Ventilation: Effective ventilation is imperative when deploying LPG, as proper airflow mitigates the buildup of gas.[9] Inadequate ventilation within an enclosed space can foster the accumulation of gas, thus precipitating explosions. Usage of Inferior LPG Equipment: The utilization of substandard LPG cylinders, regulators, and hoses accentuates the likelihood of accidents. Lack of Awareness: A lack of awareness pervades many households concerning the risks associated with LPG usage. [7]. This dearth of awareness can culminate in the improper management of LPG cylinders and appliances, engendering accidents and Regulatory Deficiencies: A prevailing dearth of comprehensive regulation within Nigeria's LPG industry contributes to the proliferation of unlicensed and unregulated LPG suppliers. Such vendors may purvey substandard LPG equipment, amplifying the potential for hazards. In summary, the factors engendering LPG-related domestic incidents in Nigeria encompass a spectrum of dimensions, necessitating a collective endeavor among stakeholders for resolution. The enhancement of governmental regulatory mechanisms aimed at curtailing the propagation of unlicensed LPG suppliers is pivotal. Simultaneously, fostering awareness and education among households regarding proper LPG cylinder and appliance handling is vital for preventing accidents. [2,6]. The Safety Implications and Concerns: The utilization of Liquefied Petroleum Gas (LPG) as a household energy source presents a spectrum of safety concerns that necessitate comprehensive examination and vigilance. This section delves into the multifaceted safety implications stemming from LPG usage, encompassing the potential perils of gas leaks, explosions, fire outbreaks, and the insidious threat of carbon monoxide poisoning. The significance of comprehending these inherent risks and the paramount importance of instituting robust safety measures to avert potentially catastrophic accidents are the pivotal themes explored in this section. [12,13,14]

2. Research Methodology

2.1. Research Design

This study employs a mixed-methods research design, integrating both quantitative and qualitative approaches. The research design consists of three main phases: data collection, data analysis, and interpretation.

2.2. Data Collection

Quantitative Data: A structured questionnaire was developed and administered to a representative sample of 200 households across various regions in Nigeria. The questionnaire as shown in Appendix 1, gathered demographic information, awareness and knowledge of LPG usage, safety practices, perception of LPG safety, and experiences with safety incidents. **Qualitative Data:** Semi-structured interviews was conducted with key stakeholders, including LPG users, government officials, industry experts, and safety regulators. These interviews provided in-depth insights into safety concerns, regulatory frameworks, and recommendations for enhancing LPG safety.

2.3. Sampling

Quantitative Sampling: A stratified random sampling technique was employed to ensure a diverse representation of households across different regions, socio-economic backgrounds, and urban-rural divides. The sample size 200 was determined using appropriate statistical formulas. **Qualitative Sampling:** Purposive sampling was used to select key stakeholders with relevant expertise and experience in the LPG industry and safety practices.

2.4. Data Analysis

Quantitative Analysis and Qualitative Analysis: Descriptive statistics was used to analyze demographic data and assess LPG usage patterns and safety practices. Thematic analysis was conducted on the qualitative interview data to identify recurring themes related to safety implications, government regulations, awareness campaigns, and stakeholder perspectives.

2.5. Integration of Data

The quantitative and qualitative findings were triangulated to provide a comprehensive understanding of the safety implications of the upsurge in domestic LPG usage. Converging evidence from both data sources enhanced the validity and reliability of the study.

2.6. Ethical Considerations

Ethical approval was sought from relevant institutional review boards. Informed consent was obtained from participants, and their confidentiality and anonymity was ensured.

2.7. Research Limitations

Limitations included potential biases in self-reported data, constraints on sample representativeness, and challenges in accessing key stakeholders for interviews.

3. Results and discussion

The analysis of the safety implications arising from the upsurge in domestic LPG usage in Nigeria revealed a complex landscape characterized by a mix of positive trends and safety challenges. The results provided valuable insights into various dimensions of LPG usage, safety awareness, government regulations, and stakeholder perspectives.

3.1. LPG Usage Patterns and Safety Awareness

The study found a significant increase in the adoption of LPG for domestic purposes in Nigeria. While the shift towards cleaner energy sources is commendable, there is a noticeable gap in safety awareness and knowledge among users. A substantial portion of respondents indicated limited awareness of proper safety practices when handling LPG, highlighting the need for targeted educational campaigns as shown in Figure 3.1.

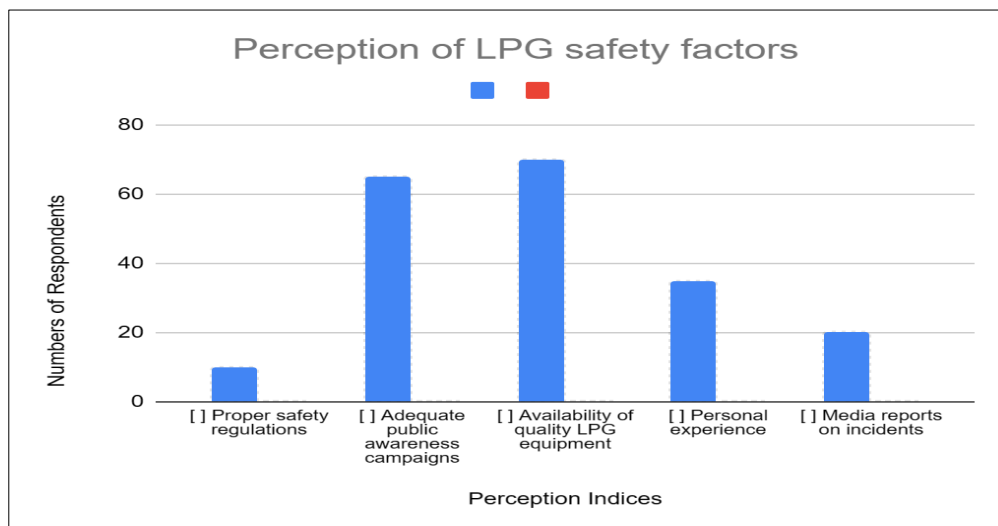


Figure 1 Perception of LPG Safety Factors

3.2. Safety Practices and Compliance

The research uncovered a spectrum of safety practices among LPG users. While some respondents reported diligent adherence to recommended safety practices, others acknowledged occasional lapses. The study revealed a correlation between awareness levels and safety practices, underscoring the pivotal role of knowledge in promoting safe LPG usage.

3.3. Government Regulations and Regulatory Gaps

The analysis of government regulations and their enforcement unveiled a mixed picture. While there are existing regulations in place to ensure LPG safety, the research highlighted challenges in consistent enforcement and regulatory oversight. Stakeholders emphasized the importance of strengthening regulatory frameworks, regular safety inspections, and stringent quality control measures to mitigate safety risks effectively.

3.4. Stakeholder Perspectives

Interviews with key stakeholders provided nuanced insights into the multifaceted nature of LPG safety implications. Industry experts emphasized the need for industry-wide collaboration to combat counterfeit and substandard LPG equipment, which pose significant safety risks. Consumers shared their experiences and concerns, shedding light on issues such as improper installation, lack of maintenance, and inadequate knowledge of emergency protocols.

4. Conclusion

The analysis of safety implications arising from the increased domestic usage of Liquefied Petroleum Gas (LPG) in Nigeria reveals a landscape of progress and challenges. This study illuminates pivotal factors influencing LPG safety dynamics, holding profound implications for policy, industry, and public awareness. The research underscores the significance of awareness and knowledge in mitigating LPG-related safety risks. While the growing adoption of LPG signifies a positive shift towards cleaner energy, addressing the awareness gap is essential. Targeted public awareness campaigns are imperative to address misconceptions and promote responsible LPG usage. Government regulations emerge as key guardians of domestic LPG user safety. The study emphasizes the role of robust regulatory frameworks encompassing quality control standards, safety inspections, and enforcement mechanisms. Bridging regulatory gaps and fostering collaboration among stakeholders are critical for user well-being. Stakeholder experiences emphasize the urgency of addressing challenges related to counterfeit LPG equipment and substandard products. Collaborative efforts among regulatory bodies, industry entities, and consumer advocates are pivotal to curbing unsafe products. Qualitative insights from stakeholders provide a nuanced comprehension of the intricate complexities surrounding LPG safety. Recommendations from experts and users alike offer a roadmap for enhancing safety measures, refining regulations, and amplifying public awareness campaigns. In summation, this study navigates the interplay of safety implications stemming from increased domestic LPG usage in Nigeria. Findings underscore a holistic approach involving awareness, regulations, and collaboration. As Nigeria progresses toward sustainable energy solutions, prioritizing safety is paramount. The insights gleaned from this research contribute to a safer LPG landscape, enabling stakeholders to forge a future where energy and safety coexist harmoniously.

Recommendations and Suggestions

The study's participants, including users and experts, provided a range of recommendations to enhance LPG safety. These recommendations encompassed comprehensive awareness campaigns, improved regulatory enforcement, standardized safety training for users, and the establishment of a robust reporting mechanism for safety incidents.

Compliance with ethical standards

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No conflict of interest.

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Appendix

Appendix 1: A sample structured questionnaire for analyzing the safety implications of the upsurge in domestic usage of Liquefied Petroleum Gas (LPG) in Nigeria:

Section 1: Demographic Information

1. Gender: Male Female
2. Age: _____ years
3. Occupation: _____
4. Educational Background: _____

Section 2: Awareness and Knowledge of LPG Usage

5. Are you aware of the increased usage of LPG in domestic settings in Nigeria?
- Yes No
6. How would you rate your knowledge of the safety practices associated with LPG usage?
- Very Knowledgeable
- Moderately Knowledgeable
- Slightly Knowledgeable

Not Knowledgeable

Section 3: LPG Usage and Safety Practices

7. Do you use LPG for cooking or other purposes at home?

Yes No

8. If you use LPG, do you follow the recommended safety practices when handling and using LPG?

Always Often Sometimes Rarely Never

9. Have you received any formal training or information on LPG safety practices?

Yes No

10. How frequently do you conduct maintenance checks on your LPG equipment (e.g., gas cylinder, regulator)?

Regularly Occasionally Rarely Never

Section 4: Perception of LPG Safety.

11. In your opinion, how safe is the use of LPG for domestic purposes in Nigeria?

Very Safe Somewhat Safe Neutral Somewhat Unsafe Very Unsafe

12. What factors contribute to your perception of LPG safety? (Select all that apply)

Proper safety regulations

Adequate public awareness campaigns

Availability of quality LPG equipment

Personal experience

Media reports on incidents

Section 5: Safety Incidents and Concerns

13. Have you or anyone you know experienced any safety incidents related to LPG usage at home?

Yes No

14. If **yes**, please briefly describe the incident:

15. What safety concerns, if any, do you have regarding the upsurge in domestic LPG usage in Nigeria?

Section 6: Government Regulations and Public Awareness

16. Are you aware of any government regulations or policies concerning LPG usage in Nigeria?

Yes No

17. Do you think there should be stricter government regulations on LPG usage to enhance safety?

Yes No

18. How effective do you think public awareness campaigns have been in educating people about LPG safety?

Very Effective Moderately Effective Slightly Effective Not Effective

Section 7: Suggestions and Recommendations

19. What measures do you believe could enhance the safety of LPG usage in domestic settings?

20. Any other comments or suggestions related to the safety implications of increased LPG usage in Nigeria:

Thank you for participating in this survey. Your responses are valuable for our research on analyzing the safety implications of the upsurge in domestic LPG usage in Nigeria. Your input will contribute to a better understanding of this important issue.