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Technological Barriers to Adoption of Induction Stoves in Bhaktapur, Nepal

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Abstract

The relevance of providing access to clean cooking solutions is linked to several associated co-benefits that contribute to a wide range of Sustainable Development Goals (SDGs). Most of the households in urban areas of Nepal use liquefied petroleum gas (LPG) for cooking purposes along with a gradual introduction of electric induction stoves. The main objective of this research is to identify the technological barrier to the adoption of induction stoves. Primary data were collected from 300 households of Bhaktapur Municipality and Madhyapur Thimi Municipality in March 2021. The result shows that a total of 27 percent of households use induction stoves. Twenty six percent of households did not know about induction stoves and 47 percent of household were aware of induction stove despite not owning one themself. The finding suggest that the need for special utensil and unable to cook multiple foods at a time are the major technological barrier to the adoption of induction stoves. The research also identifies that elevated initial costs and an inconsistent electricity supply pose significant barriers to the widespread adoption of induction stoves. The chi-square test further established a statistically significant relationship between ranking of barriers and the adoption of induction cooking. An awareness program should be launched to penetrate the use of induction stoves in Nepalese society. The study also suggests a reliable supply of electricity so that the consumer can rely completely on induction stoves for household cooking.

Keywords: *Induction Stoves, Adoption, Barriers*
JEL Classification: O13, O14 & Q42

1. INTRODUCTION

Fossil fuel-dominant cooking practices have been a longstanding norm in many households, contributing to health hazard and environmental impact. In developing nations, the predominant use of biomass fuels contributes to a challenging energy scenario, resulting in widespread air pollution and health issues for nearly 3 billion

people (World Bank, 2020). The combustion of fossil fuels for cooking releases harmful pollutants, including particulate matter, carbon monoxide, and volatile organic compounds. These pollutants are known to cause respiratory and cardiovascular diseases, with vulnerable populations, such as women and children, being particularly affected (Smith et al., 2014). The environmental implications of fossil fuel-based cooking are profound. Additionally, deforestation for fuel extraction further depletes natural resources, disrupting ecosystems and biodiversity. Increased carbon dioxide emissions contribute to climate change, exacerbating global warming (Edenhofer, 2014).

The energy ladder concept illustrates the transition from traditional to modern energy sources, particularly in urban areas experiencing increased urbanization and per capita income (Hosire, 2004; IEA, 2004). The transition to clean energy in household cooking is gaining momentum as a crucial aspect of global efforts to combat climate change and enhance sustainability. Adoption of cleaner technologies, such as electric cooking or renewable energy sources, has the potential to mitigate health risks, reduce environmental impact, and improve socio-economic conditions (IEA, 2019; World Bank, 2017).

Nepal heavily relies on imported fossil energy for household cooking. Despite the progress in electricity accessibility and production in Nepal, there remains a notable reliance on traditional Liquefied Petroleum Gas (LPG) for cooking (MOF, 2019, 2022). The import of LPG was 181,411 MT in 2011/12, which reached 536,028 MT in 2021/22, indicating a significant increase of 2.95 times over the last decade (NOC, 2022). Importantly, the recent surge in induction stove imports signifies a potential shift towards cleaner cooking technologies (Department of Customs, 2020).

The Government of Nepal is determined to promote green energy usage, discouraging reliance on conventional and imported fossil fuels. The goal is to achieve net zero carbon emissions by 2045. The government supports clean technologies such as biogas, biodiesel, ethanol, solar energy, and electric stoves, including induction stoves.

The adoption of induction cooking, considered a more efficient and environmentally friendly option, is essential for sustainable energy transitions. However, its slow uptake raises questions about the underlying technological barriers hindering widespread acceptance. While existing studies have delved into household energy choices and barriers to induction cooking, a significant gap persists in the examination of these barriers using primary data directly from induction stove users.

This study focuses on urban households in Bhaktapur, Nepal, aiming to unravel the energy use patterns and technological barriers that influence cooking practices. The primary objective is to scrutinize the factors impeding the transition from conventional LPG cooking to advanced alternatives, specifically induction cooking. The research question seeks to address this gap by exploring and ranking the technological barriers to the adoption of induction cookers, relying on firsthand data from households. In the unique context of Nepal, where LPG consumption is surging, and induction cooking is a relatively recent introduction, this research endeavors to enhance our understanding of the impediments to induction stove adoption and their prioritization based on direct user experiences.

2. LITERATURE REVIEW

Numerous studies have explored household cooking energy consumption and its determinants. Income significantly influence fuel choices (Ozcan et al., 2013). Higher education correlates with increased use of modern fuels (Alem et al., 2016), while developing countries face supply constraints for electricity (Mottaleb et al., 2017). Ownership of Information and Communications Technology (ICT) systems positively influences the shift towards cleaner fuels (Acharya and Marhold, 2019). Female education plays a pivotal role in adopting modern fuels (Ahmad and De Oliveira, 2015). Younger individuals prefer sustainable cooking systems (Vigolo et al., 2018). Electric cooking is deemed desirable, but tariff structures need adjustment for competitiveness (Vaidya, 2020). Factors affecting cooking transitions encompass income, health, literacy, household size, age, and access to technology and renewable energy (Sharma, 2019).

The literature review reveals several barriers hindering the widespread adoption of induction stoves. Sweeney and Dols (2014) emphasize the predominant obstacle as the high initial cost associated with induction cooking technology. Additionally, the necessity for ferromagnetic cookware, such as cast iron and specific alloys of stainless steel, poses a substantial challenge, requiring users to replace their existing cookware. Lynch (2019) supports these findings, highlighting the limited compatibility of induction cooktops with certain types of cookware. The high initial cost, insufficient marketing efforts, and a general hesitancy among consumers to embrace new cooking technologies further contribute to the low adoption rates. The findings from Induction Cooktops Analysis Report (Fishnick, 2020) suggests that gas cooktops may endure longer due to their simple and robust design.

In a comparative study focused on South Africa, Ugye et al. (2019) identify specific utensil requirements and the high purchase cost of induction cookers as significant barriers. Policy-related issues, including the absence of subsidies, coupled with limited

access to electricity and prevailing perceptions that associate electricity primarily with lighting rather than cooking, compound the challenges.

Cultural and behavioral barriers are emphasized by Couture and Jacobs (2019), who point to long established cooking habits, traditions, and taste preferences. The high upfront cost, the availability of cost-free wood fuel in rural areas, and a general lack of familiarity with electric cooking technologies further impede adoption. Similarly, Livchak (2019) underscores consumer unfamiliarity with induction technology, the higher price point, and fears associated with the special cookware required. The lack of information regarding the benefits of induction cooking for homeowners further contributes to the barriers.

Vigolo et al. (2018) adopt a broader perspective, identifying economic factors, socio-demographic influences, fuel availability, attitudes toward technology, awareness of risks, and location (urban versus rural) as drivers and barriers to clean cooking, with implications for induction stove adoption.

While many literature exists in the global context, only a handful studies are conducted in Nepal. For instance, the paper by Sharma (2018) examined the state of fuel transition and determinants of firewood dependence in Nepal. This study aimed to fulfill this knowledge gap in a highly transitory economy like Nepal which had remained economically stagnant internally but had been subjected to rapid social changes induced by external factors such as remittance, income, and technological penetration brought about by expansion of transportation and communication networks. The author recommended encouraging the uptake of induction cooking by providing subsidies on induction cooking and providing awareness and training. Vaidya (2020) explores challenges in promoting electric cooking in Nepal, revealing issues such as unreliable distribution networks, a restrictive tariff structure for domestic consumers, and a lack of awareness among supply chain actors and consumers regarding system requirements and quality standards for electric cooking appliances.

These literatures and evidences around the globe underscores a complex interplay of technological barriers, including cost, cookware requirements, marketing strategies, consumer hesitancy, policy-related issues, and socio-cultural factors, which collectively impact the adoption of induction stoves. Addressing these challenges necessitates a holistic approach that considers both technological and contextual factors.

Within the existing literature, studies have explored technological barriers to the adoption of induction cooking and other obstacles hindering the adoption of induction stove; however, these barriers lack examination through firsthand data collected from

actual users of induction cooking. This gap in research is particularly noteworthy in the context of Nepal. LPG consumption is increasing drastically and the introduction of induction cooking is relatively new, a study is required to identify the technological barriers hindering the adoption of induction cookers, including the ranking of these barriers by particularly referencing primary data obtained directly from households.

3. DATA AND METHODOLOGY

Population

The study was conducted in Bhaktapur Municipality and Madhyapur Thimi Municipality situated in the Bhaktapur district. Comprehensive primary data were gathered through structured schedules administered across all the wards in these municipalities totaling 9 wards in Madhyapur Thimi Municipality and 10 wards in Bhaktapur Municipality. As per population census 2011, the district's total population stood at 304,651, with an average household size of 4.4. Bhaktapur Municipality recorded a population of 81,748, while Madhyapur Thimi Municipality had a population of 83,036 during the same census period (CBS, 2017). So the total households in study area was 37,451.

Data collection method and strategy

Primary data were collected through a structured questionnaire administered at household level. The survey questionnaire were designed to collect information on fuel types, cooking methods, associated costs, daily operational hours, and the year of acquisition along with major socio-economic information of the household. Additionally, it included inquiries aimed at identifying technological barriers to the adoption of induction cooking based on the user's opinion and experiences. Kobo Toolbox web application was used to record interview. The data collection process involved direct personal interviews with either the household head or a member responsible for cooking.

According to Kothari (2011), sample size for infinite population is given by:

$$N = \frac{z^2 p q}{e^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

And the sample size for finite population:

$$n = \frac{z^2 p q N}{e^2(N-1) + z^2 p q} \quad \ldots\ldots\ldots (2)$$

The total sample taken for this study was 300 so that using value of $p = q = 0.5$, with 95% confidence level, the margin of error of this study is 5.64%.

The data collection within the study area adopts a stratified sampling method. Each ward in the municipalities was treated as a distinct stratum, and random sampling was conducted within each ward. The sample size collected from each ward was determined based on the proportional representation of the population distribution within that particular ward. Households within the ward were sampled using the snowball sampling method, specifically employing the respondent sampling or referral sampling technique.

Method of analysis

The respondent were asked the barrier of adoption of induction cooking. Frequency distribution analysis was conducted through a frequency table, revealing the percentage of households experiencing the specified barriers.

Similarly, households provided rankings for technological barriers associated with the adoption of induction stoves. The study employed the cross-tabulation method, where the barriers to the adoption of induction stoves were placed on one axis, their corresponding ranks on another axis, and the frequency of households assigning a particular rank to each barrier in each cell.

The validation of these rankings was undertaken through the application of the chi-square test method. To test whether the categorical variables are associated or not, Campbell (2007) suggest the chi-square test of independence as a statistical tool expressed in equation as:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(Oij - Eij)^2}{Eij}$$

Where, Oij is the observed frequency and Eij is the expected or theoretical frequency obtained based on the hypothesis that variables are independent to each other. Eij are estimated by using relation as in equation below:

$$Eij = \frac{RT * CT}{N}$$

Here, RT is the row total for each row, CT is the Column total for each column and N is the total number of responses. The degree of freedom for this test is {(c-1) (r-1)} as 'r' is number of rows and 'c' is number of columns.

4. MAIN FINDINGS

General household characteristics

In this study, a total of 300 households were sampled to investigate various aspects related to cooking practices, energy usage and technological barrier for adoption of induction cooker. About 51 percent of the total population was male and 49 percent of the total population were female. The average male and female in a household were 2.48 and 2.38 respectively. The total household size was 4.86.

Table 1: Maximum Education level of Family

S.N.	Education level	Population	Percentage %
1	School	66	22
2	Graduate	152	50.7
3	Post Graduate and above	82	27.3
5	Total	300	100

Source: Field survey 2021

Among the surveyed population, 22 percent of families reported school education as their highest level, while a significant portion of 50.7 percent had achieved graduate-level education. Furthermore, 27.3 percent of families attained postgraduate education as their highest level.

Table 2: Education level of cooking member

S.N.	Education Level	Number	Percentage %
1	Below SLC	51	17
2	School level	169	56.3
3	Graduate	64	21.3
4	Post Graduate	16	5.4
5	Total	300	100

Source: Field survey, 2021

The educational attainment levels of individuals responsible for cooking within families demonstrates a diverse range of educational backgrounds. Notably, 17 percent of individuals had educational levels below the School Leaving Certificate (SLC), while a majority of 56.3 percent had completed school education. A significant portion of 21.3 percent holds graduate-level education, highlighting a substantial segment of the cooking population with higher educational qualifications. Moreover, a smaller proportion of 5.4 percent had achieved postgraduate education as their highest level.

Knowledge and adoption patterns of induction stoves within households

Table 3 provides an overview of the knowledge and adoption patterns of induction stoves within households. Among the surveyed households, 27 percent (81 households) possess an induction stove. In contrast, 47 percent (142 households) were without an induction stove but were aware of the technology. This group represents households that had the knowledge but had not yet adopted the technology. The remaining 26 percent (77 households) neither had an induction stove nor were aware of its existence.

Table 3: Familiarity with induction stoves within households

	Having Induction stove	**Don't have an induction stove**		**Total**
		Know about the Induction stove	**Don't know about the Induction stove**	
No. of household	81	142	77	300
Percentage %	27	47	26	100

Source: Field survey, 2021

Share of fuel types in household cooking

In terms of the first choice of cooking fuel, LPG was the predominant choice in 272 households, while 26 households opt for electricity. As for the second choice of cooking fuel, electricity was favored by 206 households, LPG was chosen by 68 households, and 26 households selected alternative fuels such as kerosene, firewood, and biomass.

Furthermore, LPG serves as the main source of cooking in those households, with an average consumption rate of one 14.2 Kg LPG cylinder every 41.6 days. The average year of acquiring an LPG stove was reported to be 14 years.

Table 4: Choice of cooking fuel

First choice of cooking fuel			
	Fuel type	**No. of HH**	**Percentage**
1	LPG	272	90.66
2	Electricity	26	8.66
3	Others	2	0.66
Second choice for cooking fuel			
	Fuel type	**No. of HH**	**Percentage**

1	Electricity	206	68.66
2	LPG	68	22.66
3	Others	26	8.66

Source: Field survey, 2021

Use of electricity for cooking

An electric appliance used for cooking and their operation duration is shown in the table 5:

Table 5: Electric appliance for cooking purposes

S.N.	Electric device	Percentage of household using electric device / appliances	Average operating hour of electric device/ appliances
1	Rice cooker	45	1.37 hours per day
2	Induction stove	27	1.99 hours per day
3	Microwave	17	2.67 hours per week
4	Traditional heater	8	4.2 hours per week
5	Water heater	33	1.06 hours per day
6	Infrared cooker	1.7	1.4 hours per day

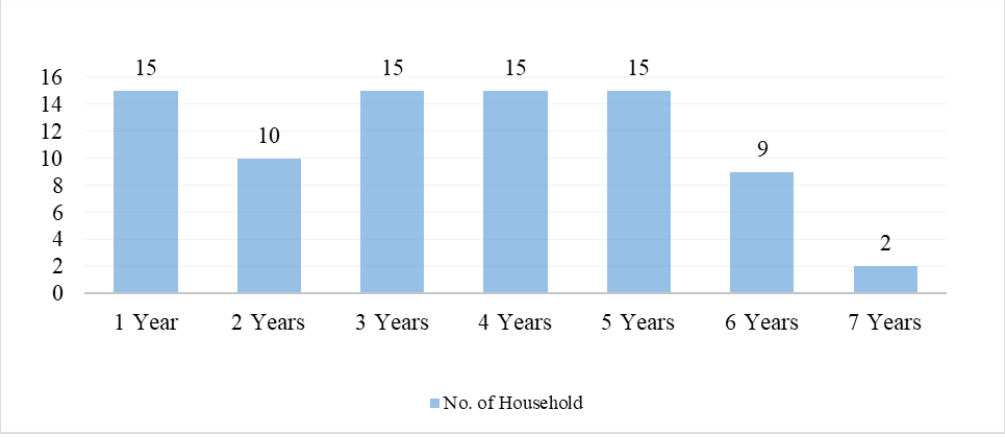
Source: Field survey, 2021

This study investigated the usage patterns of various electric devices with a specific focus on understanding both the prevalence of appliance adoption and the corresponding average operating hours. The most widely used electric device among surveyed households was the Rice Cooker, with 45 percent of households incorporating this appliance into their daily routines, averaging 1.37 hours of usage per day. Following closely is the Induction Stove, utilized by 27 percent of households for an average of 1.99 hours per day. Microwave usage was observed in 17 percent of households, with an average operating time of 2.67 hours per week. Traditional Heaters exhibited lower adoption rates, with 8 percent of households utilizing them. Water Heaters were used for an average of 1.06 hours per day. The Infrared Cooker had the lowest adoption rate, with 1.7 percent of households incorporating it into their daily routines, averaging 1.4 hours of operation per day.

Year of acquiring of induction stove

The induction stove is the newer technology. It has been used for the past 7 years only. There was no significant growth in households using induction stoves. The year of acquiring of induction stove by household is shown in the figure 1:

Figure 1: Year of acquiring of induction stove

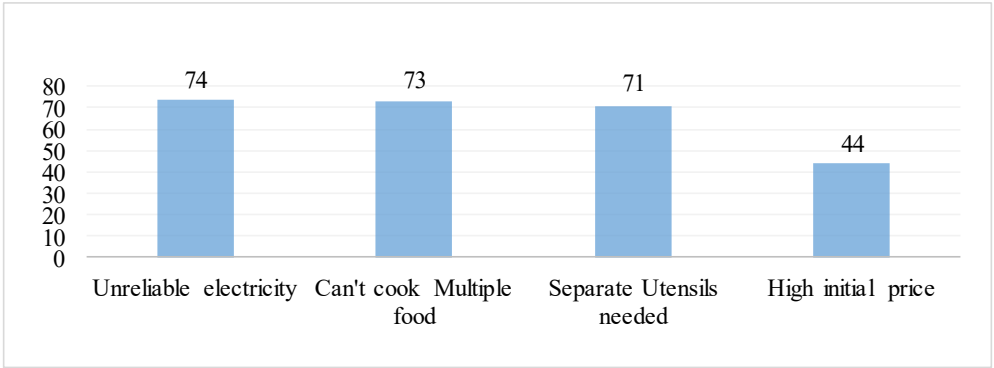


Focusing on the duration of time preceding the acquisition of these cooking appliances, the presented table illustrates the distribution of households based on the number of years elapsed before their purchase of an induction stove. Notably, the data reveals that induction stoves represent a relatively newer technology in the market, and their adoption has steadily increased over recent years.

Barrier to the adoption of induction stove

The surveyed households identified several factors influencing their decision not to adopt induction stoves. The percentage of household and barrier of induction stove adoption is shown in the figure 2:

Figure 2: Barrier to the adoption of induction cooking experienced by households without an induction stove but knowledgeable about it

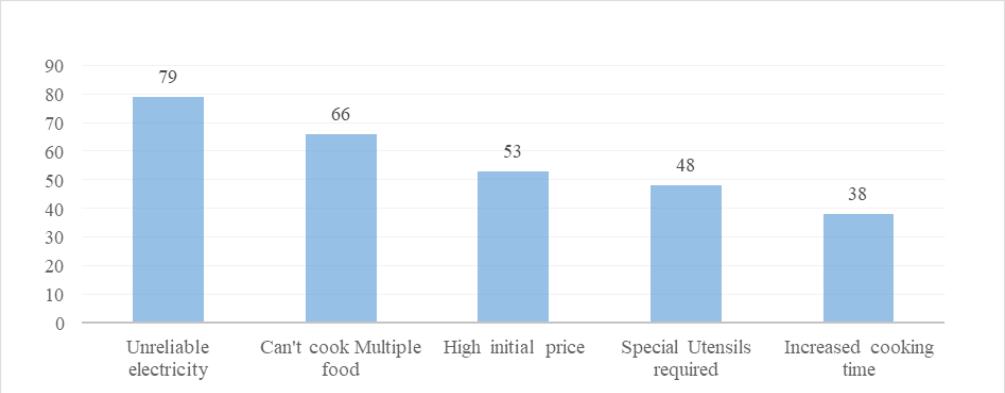


The figure 2 illustrates the perceived barriers hindering the adoption of induction stoves among households that currently do not possess this technology. A substantial 74 percent of households cited unreliable electricity as a major barrier, highlighting the importance of a stable power supply for the successful implementation of induction cooking. Additionally, 73 percent of respondents expressed concerns about the inability to cook multiple foods simultaneously on induction stoves, revealing a perceived limitation that might impact their cooking preferences.

Another prominent barrier, indicated by 71 percent of households, is the requirement for separate utensils when using induction stoves. This underscores the need for compatibility between existing cookware and induction technology, which might pose a practical challenge for potential adopters. Lastly, the high initial cost emerged as a barrier for 44 percent of households, indicating that financial considerations play a significant role in the decision-making process regarding the adoption of induction stoves.

In examining the barriers reported by households already using induction stoves, it becomes evident that concerns about unreliable electricity, multitasking limitations, utensil compatibility, high initial costs, and perceived increases in cooking time are significant considerations. The percentage of households and barriers to the adoption of induction stoves is shown in the figure 3 which outlines the perceived barriers among households that had already adopted induction stoves, shedding light on factors that may impact the ongoing usage and satisfaction with this technology.

Figure 3: Barrier to the adoption of induction stove experienced by households acquiring induction stoves.



The data reflects the percentage of households that identified specific challenges associated with their induction stove experience. Notably, 79 percent of respondents noted unreliable electricity as a primary barrier, emphasizing the critical importance of a consistent power supply for optimal operation. Additionally, 66 percent of households expressed concerns about the inability to cook multiple foods simultaneously, indicating a perceived limitation in the multitasking capabilities of induction stoves.

Another noteworthy barrier, identified by 48 percent of households, is the necessity for separate utensils when using induction stoves. This underscores the practical considerations associated with the compatibility of existing cookware with induction technology, a factor that may impact user convenience and adoption rates. Furthermore, 53 percent of households cited high initial costs as a challenge, highlighting the financial aspect as a significant factor influencing the decision to adopt induction stoves. Surprisingly, 38 percent of households identified increased cooking time as a perceived barrier.

Ranking the barrier to the adoption of induction cooking by households not using induction cooking

Respondent were asked to rank the barriers to adoption of induction stoves. The major barrier experienced by respondents is ranked one, the second most significant barrier as two and so on. Table 6 presents the ranking of barriers to the adoption of induction cooking as reported by households without induction stoves. Each barrier is categorized into four ranks (A1, A2, A3, A4) based on the perceived significance by the respondents. The number in the table indicate the number of households that assigned each ranking.

Table 6: Ranking the barrier of induction stove by the household without induction stove

The barrier to the adoption of induction cooking		Rank by household			
		First(A1)	Second(A2)	Third(A3)	Fourth(A4)
Uncertain of electricity	**B1**	48	22	12	7
Requirement of special utensils	**B2**	35	37	26	5
High Initial cost	**B3**	26	16	17	11
Cooking time increase	**B4**	9	15	17	10
Can't operate at different heat and spilling	**B5**	12	28	25	21
Taste of food change	**B6**	2	10	11	13

Source: Field survey, 2021

Uncertainty regarding electricity availability (B1) emerges as the most prominent barrier, with 48 households ranking it as the first (A1) barrier. The requirement for special utensils (B2) follows closely, with 35 households ranking it as the first barrier. High initial cost (B3) and the potential increase in cooking time (B4) are also noted as significant barriers, with varying rankings among respondents. Notably, concerns related to the inability to operate at different heat levels and the possibility of spilling (B5) are ranked particularly high, with 28 households considering it as the second (A2) barrier. Taste alteration of food (B6) is perceived as a comparatively lesser barrier, with only 2 households ranking it as the first (A1) barrier. These rankings offer valuable insights into the varied concerns of households without induction stoves, providing a nuanced understanding of the factors influencing their decision-making processes regarding the adoption of induction cooking technology.

Ranking the Barrier to the adoption of induction cooking by households using induction cooking

Similar rankings of barriers to the adoption of induction cooking were also done by households that were using induction stoves. Uncertainty of electricity availability was the first major barrier and the requirement of special utensils was the second major barrier to the adoption of induction stove. The ranking of barriers to the adoption of induction cooking reported by households that have already embraced this technology is shown in table 7.

Table 7: Ranking the barrier of induction stove by the household using induction stove

The barrier to the adoption of Induction Cooking		Rank by household			
		First(A1)	Second(A2)	Third(A3)	Fourth(A4)
Uncertain of electricity	**B1**	45	10	6	3
Requirement of special utensils	**B2**	10	28	11	7
High initial cost	**B3**	12	5	13	6
Cooking time increase	**B4**	6	11	7	5
Can't operate at different heat and spilling	**B5**	1	11	12	17
Taste of food change	**B6**	4	11	8	6

Source: Field survey, 2021

For households using induction stoves, uncertainty regarding electricity availability (B1) emerges as a primary concern, with 45 households ranking it as the first (A1) barrier. The requirement for special utensils (B2) is also notable, with 28 households ranking it as the second (A2) barrier. High initial cost (B3) and the potential increase in cooking time (B4) are identified as concerns, with varying rankings among respondents.

Interestingly, households using induction stoves rank the inability to operate at different heat levels and the possibility of spilling (B5) as a minimal concern, with only 1 household considering it the first (A1) barrier. Taste alteration of food (B6) is ranked moderately, with 4 households identifying it as the first (A1) barrier.

These rankings provide valuable insights into the specific concerns of households already using induction stoves, offering a nuanced understanding of the factors influencing their ongoing experience with induction cooking technology.

Application of Chi-square independence tests and test results

Table 8 outlines the results of the chi-square hypothesis testing conducted for households not using induction cooking, focusing on the relationship between the ranking of barriers and the adoption of induction cooking. The null hypothesis (H0) posited that there is no significant relation between the ranking and the barriers to the adoption of induction cooking, while the alternative hypothesis (H1) suggested a significant relationship.

Table 8: The chi-square hypothesis established in the study and the significance value

Hypothesis	χ^2	df	p- value	Result
For Household not using induction cooking:				
H_0: There is no significant relation between ranking and the barrier of the adoption of induction cooking	72.03	15	0.00	Reject H_0
H_1: There is a significant relation between ranking and the barrier of the adoption of induction cooking				Accept H_1
For Household using induction cooking:				
H_2: There is no significant relation between ranking and the Barrier of the adoption of induction cooking	96.79	15	0.00	Reject H_2
H_3: There is a significant relation between ranking and the barrier of the adoption of induction cooking				Accept H_3

The chi-square value calculated was 72.03 with 15 degrees of freedom, resulting in an extremely low p-value of 0.00. As a result, the null hypothesis (H0) was rejected, indicating a significant relationship between the ranking of barriers and the adoption of induction cooking for households not currently using this technology. The alternative hypothesis (H1) was accepted based on this statistical evidence. Same result was obtained for household using the induction stove.

These findings highlight the importance of considering the ranking of barriers as a factor influencing the adoption of induction cooking. According to the Chi-square test results (significant p-value < 0.05), the test signifies that two categories of variables are dependent i.e. there is a significant relation between Ranking and the Barrier of the adoption of Induction Cooking for households using induction cooking and households not using induction cooking.

5. DISCUSSIONS

Results obtained from the primary survey indicate that households have increasingly embraced newer and more efficient cooking methods in recent years. In 2014, research conducted by Bajracharya (2015) revealed that the consumption of 14.2 Kg LPG cylinder by households over a period of 47.39 days. However, this study indicates a decline to 41.9 days, suggesting a shift in energy consumption patterns towards higher levels on the energy ladder. Notably, the predominant phenomenon observed is energy stacking, wherein households do not entirely transition to more efficient fuels but instead experience an increase in the proportion of cleaner and modern fuels used. The energy ladder theory explains that as families gain socioeconomic status

they abandon technologies that are inefficient, less costly, and more polluting and move from traditional to middle-category fuels such as charcoal, coal, or kerosene. In the last phase, the households switch fuels such as LPG and electricity.

The findings of this study reveal several key insights into the technological barriers affecting the adoption of induction cooking in households. The literature review underscores consistent barriers such as high initial costs, specific utensil requirements, and consumer perceptions. Lynch (2019) and Ugye et al. (2019) both emphasize the cost factor, highlighting its substantial influence on adoption rates. Additionally, concerns about the compatibility of induction cookers with certain cookware and limited access to electricity in certain regions contribute to the overall reluctance in adopting this technology.

Table 6 and Table 7 present the ranking of barriers for households without and with induction stoves, respectively. For households without induction stoves, uncertainty about electricity and the need for special utensils emerged as prominent concerns. However, households already using induction stoves demonstrated varying priorities, with electricity uncertainty remaining a significant barrier. Interestingly, the inability to operate at different heat levels and spilling ranked lower for households already using induction stoves, suggesting a potential shift in perceived barriers once the technology is adopted.

The chi-square hypothesis testing results in Table 8 further authenticate the significance of the relationship between the ranking of barriers and the adoption of induction cooking. The rejection of the null hypothesis for both sets of hypotheses (H0 and H2) indicates a clear association between the ranking of barriers and the adoption of induction cooking among households not using this technology.

The disadvantage of induction stoves identified was the requirement of specific cookers and high cost. Ugye et al., (2019). Similar results are obtained in this study. Households need to buy induction stoves at higher prices than that of LPG cookers. They also need to buy separate utensils that operate on it. Cast iron, enameled cast iron, and many types of stainless steel cookware are induction-compatible. Aluminum, all-copper, or glass cookware do not work unless they have a layer on the bottom with magnetic properties. Older, non-magnetic pans simply do not work. Therefore, the requirement for special cookware is one of the major barriers. Many manufacturers have started adding a magnetic layer to the bottom of these cooktops, so this barrier might have less significance in the future if such a practice will be done by all other manufacturers.

In recent days, induction stove with multiple cooking options are also available, But its price is higher. Also, the current drawn by multiple cooking at a time increases. Many households may not have electrical systems that can handle that amount of current. It is very much costlier to reinstall all wiring systems for such induction stoves.

If a large community was to shift from LPG stoves to induction stoves, then there could be an unexpected peak demand for electricity during the peak cooking hours because of the use of induction stoves (Dahal, 2020). The cost of upgrading from 5-Ampere to 15-Ampere meter capacity plus the associated increase in per unit cost of electricity add a cost burden to the consumers, which altogether could discourage many from switching to electric cooking. (Vaidya, 2020). Thus electricity tariffs must be restructured and the overall distribution network must be redesigned for a reliable supply of electricity.

6. CONCLUSION

Urban households predominantly occupy the higher rank of the energy ladder, relying primarily on LPG as their main energy source for cooking, followed by electricity. However, only 27 percent of these households have adopted induction stoves, while a notable 26 percent remain unaware of this cooking technology. A substantial portion, comprising 47 percent of households, possesses awareness of induction stoves yet opts not to incorporate this technology into their homes highlighting a considerable gap between awareness and adoption in the context of induction cooking.

This study provides a comprehensive examination of the technological barriers influencing the adoption of induction cooking. The literature review identifies consistent barriers, including cost, specific utensil requirements, and consumer perceptions. The ranking analysis for households with and without induction stoves emphasizes the nuanced nature of these barriers, with variations in priorities depending on the adoption status. The identified technological barriers include the need for special utensils, increased cooking time, limitations in operating at different heat levels, and concerns about a potential change in the taste of food. Similarly uncertainties about electricity, and high initial costs are also hindering the adoption of induction stove. For each barrier, the ranks represent the priority assigned by households, shedding light on the key challenges perceived in adopting induction cooking technology. The chi-square hypothesis testing further establishes a statistically significant relationship between the ranking of barriers and the adoption of induction cooking.

These findings offer valuable insights for policymakers, manufacturers, and researchers aiming to promote the widespread adoption of induction cooking technology. Strategies addressing specific barriers identified in this study, such as enhancing

consumer awareness, providing subsidies, and developing marketing campaigns emphasizing the benefits of induction cooking, can contribute to overcoming these obstacles. As the world continues to seek sustainable and energy-efficient alternatives, understanding and addressing the barriers to induction cooking adoption is crucial for the successful integration of this technology into households worldwide.

In conclusion, an awareness program should be launched to penetrate the use of induction stoves in Nepalese society. There is a need for government policy to encourage the use of induction cooking by reducing its initial cost which can be achieved by removing tax or even providing subsidy on it. Special skilled manpower is required and electronic components are always prone to malfunction after certain times and conditions. Also, there is a need to restructure electricity tariffs and revamp the entire distribution network to ensure a reliable and consistent supply of electricity.

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