Who gets online? Examining the socioeconomic factors of internet adoption in Nepal.

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Abstract

This study examines socioeconomic factors influencing household internet adoption in Nepal, leveraging microdata from the Nepal Living Standards Survey (NLSS) 2022/23. Analyzing 9,600 households through logistic regression, the research identifies key determinants of internet connectivity amid a national penetration rate of 49.6% in early 2024. The purpose is to inform policies tackling the digital divide, with Nepal targeting 95% broadband coverage by 2030.

Findings reveal stark disparities: only one-third of households have broadband access. Education significantly impacts connectivity—90% for master's degree holders versus 23% for those with SLC/SEE or below. Caste influences access too, with 37% connectivity for "Other" castes compared to 21% for Dalits. Infrastructure matters: cement-bonded homes (46%) and electricity access (18.9% boost) correlate with higher adoption. Geographically, Bagmati (60%) and Gandaki (51%) outperform Karnali (13%) and Sudurpashchim (18%). Economic factors like remittances and urban residency (47% vs. 16% rural) further enhance access.

Recommendations include bolstering digital literacy programs, expanding rural infrastructure, offering targeted subsidies for marginalized communities, and developing region-specific strategies. These steps aim to bridge connectivity gaps, fostering an inclusive digital economy and supporting socioeconomic development in Nepal.

1. Introduction

Digital infrastructure encompasses the foundational systems, both physical and digital, that enable internet connectivity. Internet penetration, driven by various socioeconomic factors such as caste and education level, reflects the adoption of this connectivity. Internet access has become essential in today's world, with telecommunication networks, broadband infrastructure, internet exchange points, data centers, and power grids serving as core elements. The internet links these components globally, and its availability and quality depend on the robustness of this core infrastructure. Gaps in infrastructure can limit internet penetration from rural to national and global levels. The internet contributes significantly to the global GDP, with a direct contribution of approximately 2% to Nepal's national GDP, and indirect impacts on sectors like e-commerce, remittance, agriculture, and tourism.

The International Telecommunication Union (ITU), the governing body for ICT matters, released its 2024 report on digital connectivity. According to this report, 5.5 billion people, or 68% of the world's population, were online in 2024. Internet usage varies significantly by income level, with 93% penetration in high-income countries compared to 27% in low-income countries.

In Nepal, internet penetration has seen substantial growth, with approximately 15.40 million users as of early 2024, representing 49.6% of the total population. However, significant disparities persist based on caste, education level, location, and gender. Urban areas have much higher internet access rates (65%) compared to rural regions (22%), highlighting a stark digital divide. The National Broadband Policy aims to address this by providing 95% broadband coverage by 2030, with a focus on rural connectivity. The Rural Telecommunication Development Fund report of 2023 notes the installation of 1,500 towers since 2017 to extend telecom services to remote areas.

The Government of Nepal is committed to enhancing internet adoption through initiatives like the Digital Nepal Framework. However, challenges related to infrastructure, digital literacy, and economic disparities must be overcome to create a more inclusive digital economy.

This study aims to identify key socioeconomic factors influencing household internet adoption in Nepal using microdata from the NLSS 2022/23. The investigation involves exploring the status of household internet connectivity, employing a logistic regression model to analyze the impact of socioeconomic factors, and discussing the findings. The results are expected to inform policy interventions aimed at achieving the government's goal of 60% fixed broadband internet connectivity by the end of F/Y 2028/29 and supporting initiatives like the Nagarik App for e-governance.

However, it is important to acknowledge the limitations of this study. The analysis is constrained by the exclusion of certain variables, such as income and expenditure, which may also influence household internet adoption. Additionally, the focus on household-level connectivity, while providing a broad overview, does not account for variations in individual usage patterns within households. Furthermore, the study relies on microdata from the NLSS 2022/23, meaning its findings are contingent on the quality and scope of this survey. Despite these limitations, the study offers valuable insights into the socioeconomic factors shaping household internet adoption in Nepal, providing a foundation for policy interventions and future research.

2. Literature Review

The relationship between household internet connectivity and socioeconomic factors in Nepal is a critical area of study, particularly in the context of the digital divide and its broad implications. Several studies have examined how socioeconomic factors influence access to digital resources, including internet connectivity, revealing disparities in device ownership and technology use based on economic status. In Nepal, where internet access is vital for socioeconomic inclusion, understanding these factors is essential for addressing inequalities and promoting digital literacy.

Ethnicity plays a significant role in shaping various aspects of life in Nepal, including family formation. While existing research has focused on the timing of family formation, it is crucial to consider how ethnic factors may also influence access to digital resources like the internet. Socioeconomic and demographic determinants, such as women's status and household structure, impact the utilization of maternal health services and may similarly affect internet access within households. Disparities in education levels and media access have been linked to practices like open defecation in agricultural households, highlighting the broader implications of digital exclusion.

The COVID-19 pandemic underscored the importance of internet connectivity for education and healthcare, especially in resource-poor settings. Students' motivation towards online classes was significantly influenced by internet connectivity and accessibility, emphasizing the need to address digital disparities to ensure equitable access to education. Access to technology and information has also been identified as a key factor in promoting maternal and child health, further highlighting the role of digital resources in healthcare outcomes.

Studies have also examined the relationship between disability status and access to sexual and reproductive health services in Nepal, underscoring the need to address barriers to digital resources for marginalized populations. Unequal access to high-speed internet and devices has been linked to socioeconomic status, contributing to educational inequalities [8]. Understanding the digital divide in education is crucial for promoting digital literacy among students from diverse socioeconomic backgrounds.

In conclusion, the relationship between household internet connectivity and socioeconomic factors in Nepal is complex and multifaceted. Ethnicity, education levels, and household structure are key determinants shaping disparities in internet connectivity. Addressing these inequalities is essential for promoting digital inclusion and ensuring equitable access to online resources. Further research is needed to identify specific barriers to internet connectivity in Nepal and develop targeted interventions to bridge the digital divide and enhance digital literacy among marginalized populations.

3. Methodology & data

This study aims to identify the key socioeconomic factors influencing household internet adoption in Nepal, utilizing microdata from the 4th round Nepal Living Standard Survey (NLSS) 2022/23. A three-step investigation procedure is adopted: first, extracting key socioeconomic indicators from the NLSS microdata and exploring household internet connectivity status across these indicators; second, employing a logistic regression model to analyze how the probability of household internet connection varies with changes in these socioeconomic indicators; and third, discussing the possible reasons and logic behind the regression findings.

We employ data from 9,600 households, taking household internet connectivity as a binary dependent variable (1 if the household has internet connection, 0 if not). The study considers multiple independent socioeconomic indicators including households' average age, caste, education level, dwelling foundation, electricity connection, household size, gender of the household's head, households' gender composition, household geographical location, and remittance receipt.

4. Findings

4.1 Facts and figures

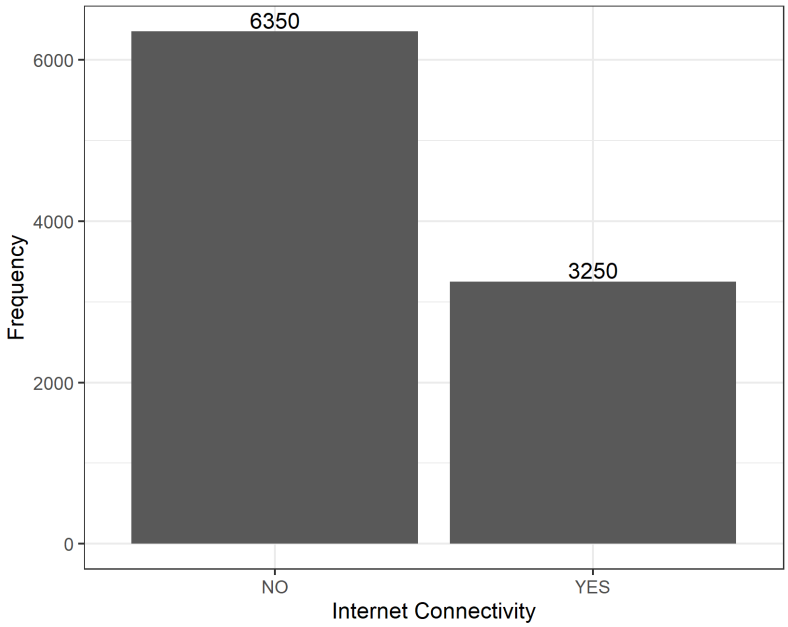

Figure 1: Households with internet connectivity

Figure 1 presents the distribution of households with broadband internet connectivity, based on the NLSS 2022/23 microdata. Among the 9,600 households sampled, approximately one-third (3,250) reported having broadband internet access. This finding highlights a significant digital divide, as two-thirds of the households—representing the majority—are still offline and lack internet connectivity.

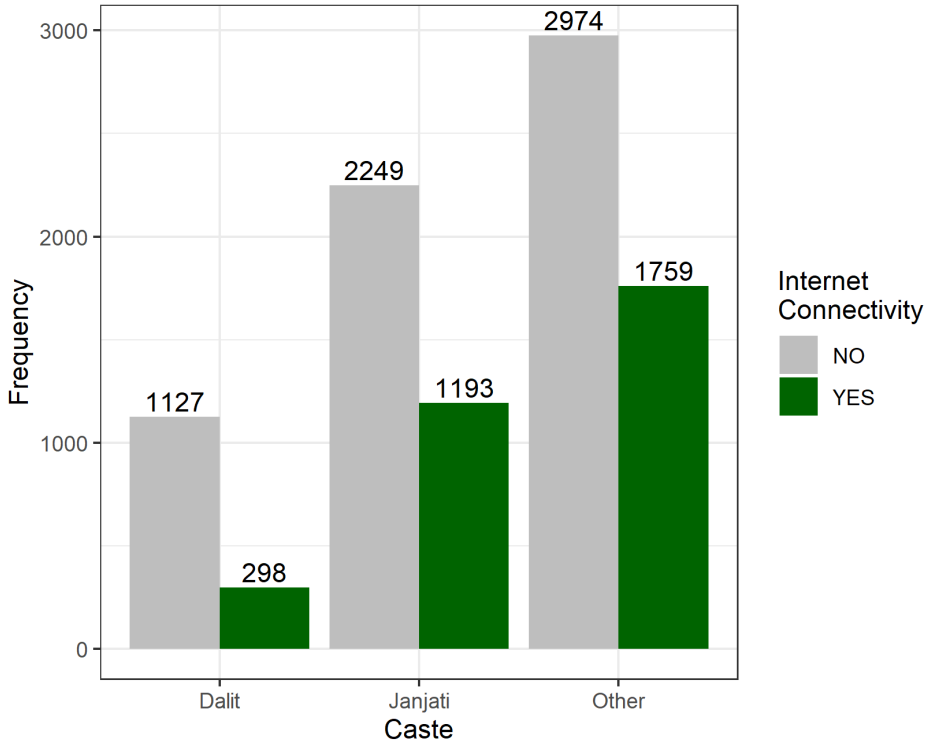

Figure 2: Households having internet connectivity by Caste groups

Figure 2 shows how many households from different castes have internet connectivity. There are three castes shown: Dalit, Janjati, and Other. Each caste has two bars: one gray bar for households without internet and one green bar for households with internet. For the Dalit caste, 1127 households don't have internet, while 298 households have internet. For the Janjati caste, 2249 households don't have internet, while 1193 people do. For the Other caste, 2974 people don't have internet, while 1759 people do. From the graph, it is clear to see that more

people in the "Other" caste have internet access compared to the Dalit and Janjati castes. It highlights the differences in internet connectivity among these groups.

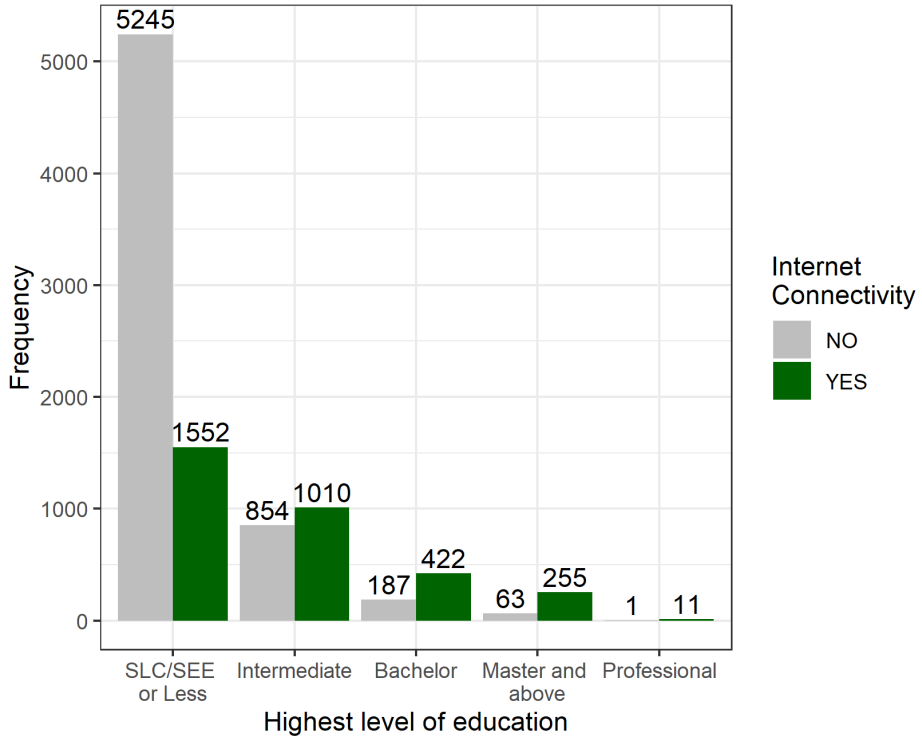

Figure 3: Households having internet connectivity by highest education level in the households

Figure 3 illustrates a clear relationship between education level and internet connectivity, revealing that higher educational attainment is associated with increased access to the internet. Individuals with an education level of SLC/SEE or less predominantly lack internet connectivity, with 5245 out of 6797 in this category not having access. As educational levels rise to Intermediate and Bachelor, there is a noticeable increase in internet connectivity, with 1010 out of 1864 and 422 out of 609 individuals, respectively, having internet access. This pattern continues with those holding a master's degree or higher, where 255 out of 318 are connected. The professional education level shows the highest connectivity, with nearly all individuals (11 out of 12) having internet access. This data underscores the significant disparity in internet access based on education, especially for those with lower educational qualifications.

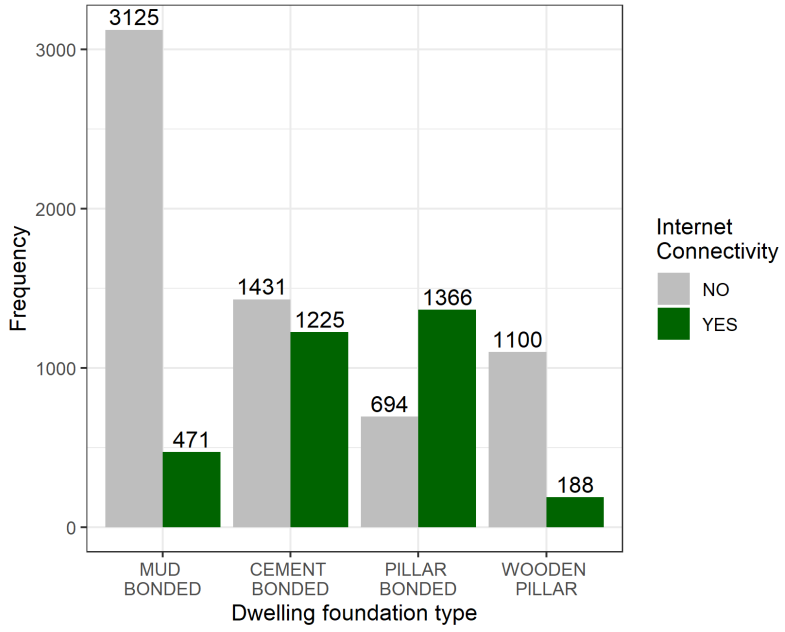

Figure 4: Households having internet connectivity by dwelling foundation type

Figure 4 depicts the relationship between the type of dwelling foundation and internet connectivity, revealing significant disparities in access based on housing structure. Mud-bonded dwellings exhibit the lowest internet connectivity, with only 471 out of 3596 individuals having access, indicating a substantial digital divide for residents in these types of homes. In contrast, pillar-bonded dwellings show a higher level of connectivity, with 1366 out of 2060 individuals connected to the internet, suggesting that more robust housing structures are associated with better internet access. Cement-bonded dwellings display a more balanced distribution, with 1225 out of 2656 individuals having internet connectivity. Wooden pillar dwellings, similar to mud-bonded ones, also show low connectivity, with only 188 out of 1288 individuals connected.

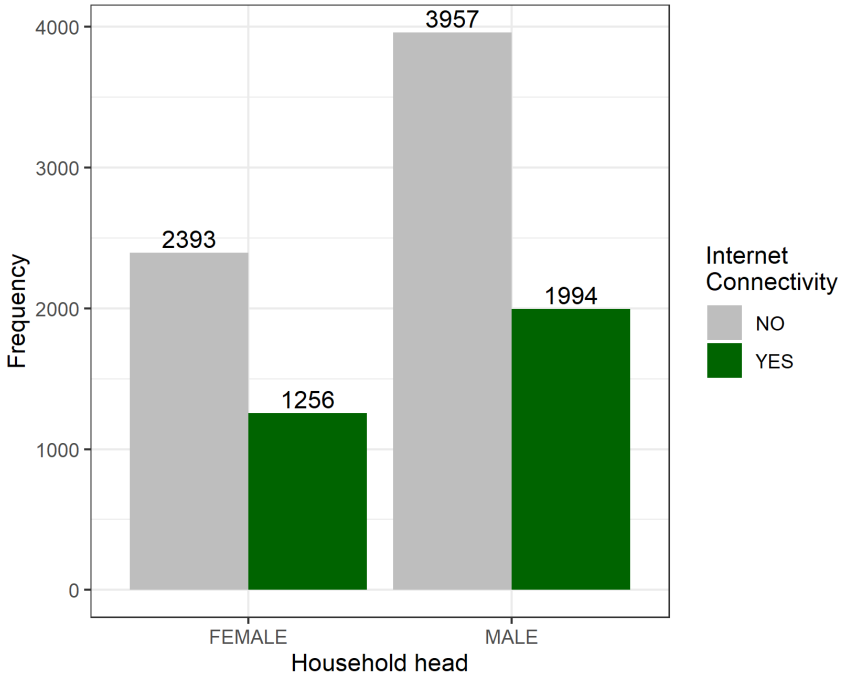

Figure 5: Households having internet connectivity by household head gender

Figure 5 displays the relationship between the gender of the household head and internet connectivity, revealing notable differences in access between female-headed and male-headed households. For female-headed households, a significant portion lacks internet connectivity, with 2393 out of 3649 individuals not having access, compared to 1256 who do. In contrast, male-headed households exhibit a higher level of internet connectivity, with 1994 out of 5951 individuals connected, although a larger absolute number, 3957, still lack access.

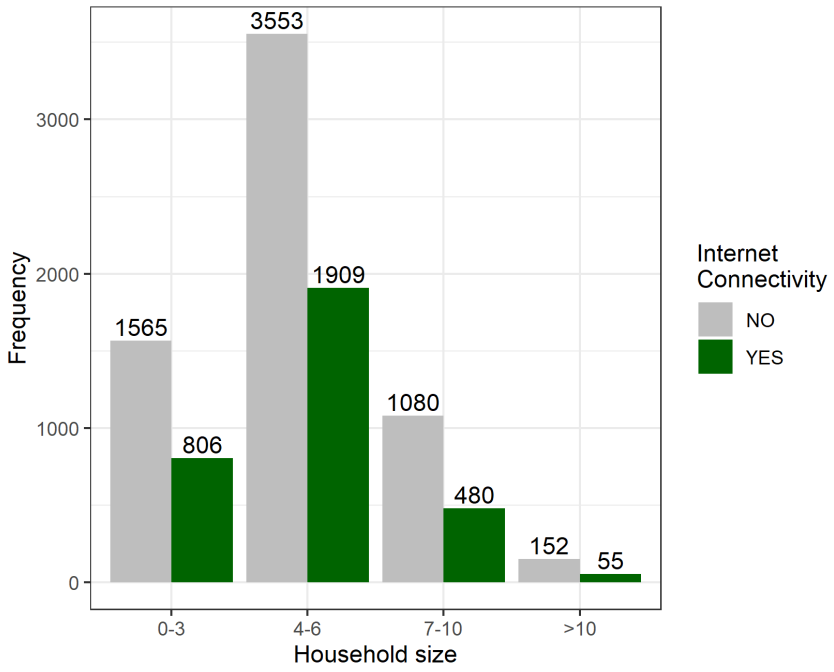

Figure 6: Households having internet connectivity by household size

The bar chart of Figure 6 exhibits the frequency of households with and without internet connectivity across different household sizes. The chart reveals that households in the 4-6 member range have the highest frequency, with 3553 without internet connectivity and 1909 with internet connectivity. In contrast, households with more than 10 members have the lowest frequency, showing only 152 without internet connectivity and 55 with internet connectivity. This pattern highlights significant disparities in internet access, with smaller household sizes having relatively higher internet connectivity compared to larger households. The 0-3 member households and 7-10 member households also show notable gaps in connectivity, indicating potential areas where access could be improved.

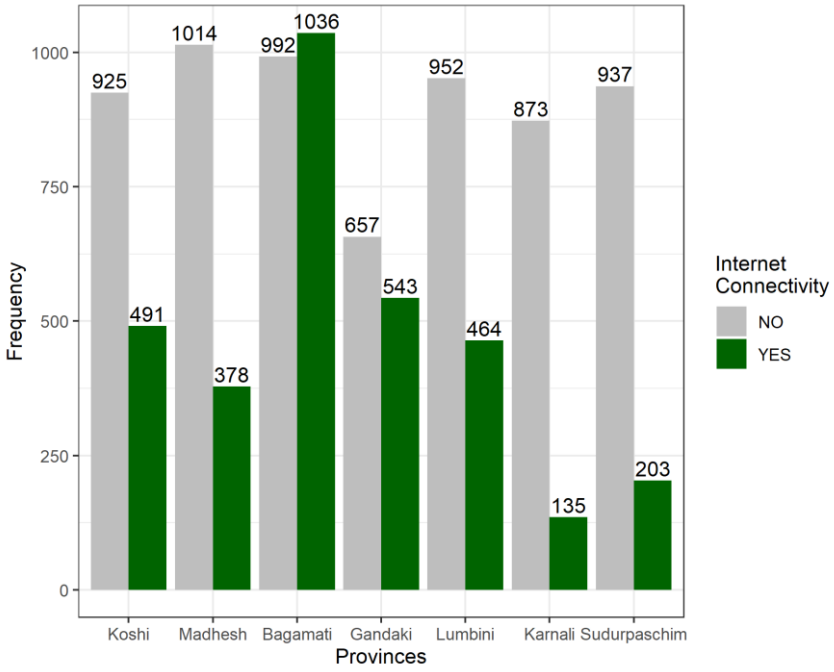

Figure 7: Households having internet connectivity by provinces

Figure 7 presents the status of households' internet connectivity by provinces, highlighting significant regional disparities in access. Bagmati province stands out with the highest internet connectivity, where 1036 out of 1728 individuals are connected, contrasting

sharply with Karnali, which has the lowest connectivity, with only 135 out of 1070 individuals having access. Provinces like Koshi and Madhesh show moderate levels of connectivity, with 491 out of 1416 and 378 out of 1372 individuals connected, respectively. Gandaki and Lumbini provinces exhibit a more balanced distribution, with 543 out of 1200 and 464 out of 1336 individuals having internet access, respectively. Sudurpashchim province, similar to Karnali, also shows low connectivity, with only 203 out of 1140 individuals connected.

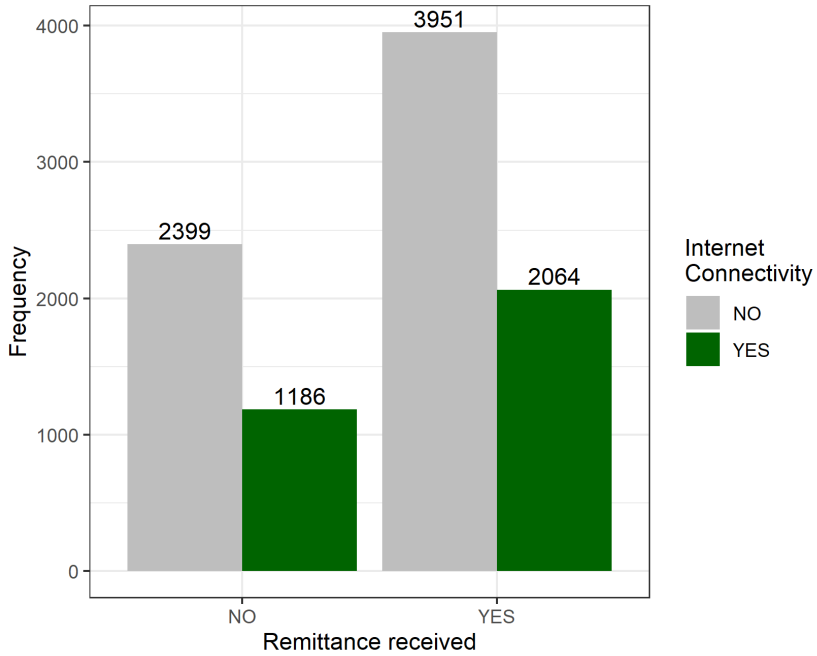

Figure 8: Households having internet connectivity by households receiving/not-receiving remittances

Figure 8 depicts the relationship between internet connectivity and the receipt of remittances. It categorizes the data into four groups based on whether individuals have internet access (YES or NO) and whether they receive remittances (YES or NO). The chart shows that among those who do not receive remittances, a majority (2,399 individuals) lack internet connectivity, while a smaller portion (1,186 individuals) have internet access. Conversely, among those who do receive remittances, a larger number (2,064 individuals) have internet connectivity compared to those without (3,951 individuals).

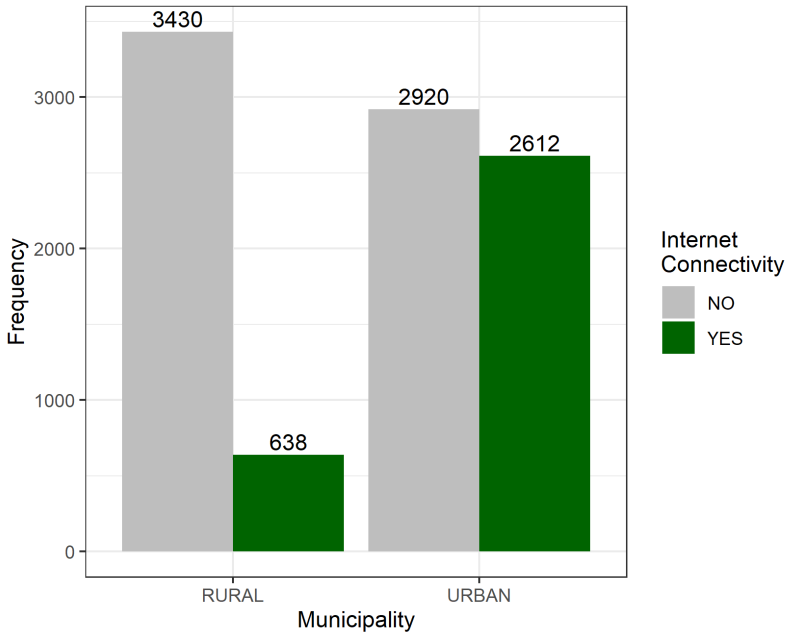

Figure 9: Households having internet connectivity by rural and urban municipalities

Figure 9 depicts the relationship between internet connectivity and municipality type, categorized into rural and urban areas. For rural areas, a significant majority (3,430 individuals) do not have internet access, while a smaller portion (638 individuals) do. In contrast, urban areas show a more balanced distribution, with 2,920 individuals lacking internet connectivity and 2,612 individuals having access. This suggests that internet access is more prevalent in urban areas compared to rural ones, highlighting a potential digital divide between these regions. The data indicates that urban environments may offer better infrastructure or opportunities for internet connectivity compared to rural settings.

4.2 Inferential Analysis

Table 1: Average marginal effect estimates of various socioeconomic factors on households' internet connectivity using logistic regression model.

Base Group	Factor	Average Marginal Effect	SE	p
	Household average age (greater than overall mean)	-0.009	0.008	0.265
	Caste			
Dalit	Janajati	0.038***	0.013	0.003
	Other	0.060***	0.012	0.000
	Education			
Up to SLC	Bachelor	0.258***	0.019	0.000
	Intermediate	0.171***	0.011	0.000
	Master and above	0.353***	0.028	0.000
	Professional	0.472***	0.148	0.001
	Dwelling foundation			
Mud Bonded	Cement Bonded	0.186***	0.011	0.000
	Pillar Bonded	0.300***	0.014	0.000
	Wooden Pillar	0.044***	0.015	0.004
	Have Electricity	0.189***	0.016	0.000
	Household head male	-0.031***	0.009	0.000
	Household size	0.007***	0.002	0.000
	Household male share	0.001***	0.000	0.006

	Province			
Karnali	Koshi	0.099***	0.019	0.000
	Madhesh	0.010	0.019	0.606
	Bagmati	0.120***	0.019	0.000
	Gandaki	0.178***	0.020	0.000
	Lumbini	0.060***	0.019	0.001
	Sudurpaschim	-0.046**	0.019	0.018
	Remittance received	0.016*	0.008	0.051
	Municipality	0.155***	0.009	0.000

Note: ***, **, and * denote the 1%, 5%, and 10% level of significance.

Table 1 presents the results of a logistic regression analysis that examines the association of various socioeconomic factors on households' internet connectivity. The table provides average marginal effect estimates, which indicate how changes in each factor relate to the likelihood of a household having internet access.

The first factor considered is the household's average age, specifically whether it is greater than the overall mean. The analysis shows a negative marginal effect of -0.009, suggesting that households with an average age above the mean are slightly less likely to have internet connectivity. However, this effect is not statistically significant ($p = 0.265$), indicating that age may not be a strong predictor of internet access in this context.

The table also examines the impact of caste on internet connectivity. Compared to the base group (Dalit), households belonging to the Janajati and Other castes have significantly higher probabilities of having internet access, with marginal effects of 0.038 and 0.060, respectively. These effects are statistically significant at the 1% level, indicating a strong association between caste and internet connectivity.

Education level is another crucial factor analyzed in the table. The results show that higher education levels are positively associated with internet connectivity. Compared to the base group (up to SLC), households with a Bachelor's degree, Intermediate education, Master's degree, and Professional qualifications have significantly higher probabilities of having internet access. The marginal effects range from 0.171 for Intermediate education to 0.472 for Professional qualifications, all of which are statistically significant at the 1% level. This suggests that education plays a vital role in determining internet access.

The dwelling foundation type is also considered in the analysis. Compared to mud-bonded foundations, cement-bonded, pillar-bonded, and wooden pillar foundations have positive and significant marginal effects on internet connectivity. This indicates that households with more robust dwelling foundations are more likely to have internet access. Additionally, having electricity is positively associated with internet connectivity, with a significant marginal effect of 0.189.

The table also examines the impact of household characteristics on internet connectivity. Households with a male head are less likely to have internet access, with a significant marginal effect of -0.031. However, larger household size and a higher share of males in the household are positively associated with internet connectivity, with significant marginal effects of 0.007 and 0.001, respectively.

Geographical location, as represented by provinces, also plays a role in internet connectivity. Compared to Karnali, households in Koshi, Bagmati, Gandaki, and Lumbini provinces have significantly higher probabilities of having internet access, with marginal effects ranging from 0.060 to 0.178. However, households in Sudurpaschim province have a significantly lower probability of having internet access, with a marginal effect of -0.046.

Finally, the table considers the impact of remittances and municipality status on internet connectivity. Receiving remittances has a positive but marginally significant effect on internet access, with a marginal effect of 0.016. Living in a municipality has a significant positive effect on internet connectivity, with a marginal effect of 0.155.

Overall, the table highlights the importance of various socioeconomic factors in determining households' internet connectivity. Education, dwelling foundation type, electricity availability, household characteristics, geographical location, remittances, and municipality status all play significant roles in influencing internet access.

5. Discussion

This study identifies the various factors contributing to internet usage in Nepal. While there are several challenges to internet connectivity in the country, the 2022/23 Nepal Living Standards Survey reveals that about 40% of households have internet access. This is primarily due to a lack of infrastructure and the living conditions of the people.

In this research, an analysis of internet usage was conducted with respect to factors such as caste, education, housing construction materials, provinces of the country, electricity use, remittances received, and municipality, and how they relate to the economic conditions of the residents. The results of this analysis are presented in Table 1. The data shows that residents categorized as Janjati and others (such as Barman and Kshatriya) are 4% and 6% more likely to use the internet than Dalits, respectively.

Education has a significant impact on internet usage. Compared to residents with a School Leaving Certificate (SLC), the percentage of internet users among those with an Intermediate level, Bachelor's degree, and Master's degree or higher are 17.1%, 25.8%, and 35.3%, respectively. Furthermore, 47.2% of professionals use the internet, compared to those with an SLC. This demonstrates the higher impact of education level on internet usage, which can be related to the economic condition of the people.

Additionally, Table 1 indicates that residents living in houses made with cement-based materials are more likely to use the internet compared to those residing in mud mortar dwellings. Compared to the residents living in mud mortar houses, internet users in houses made with cement mortar walls, reinforced concrete pillars, and wooden pillars are 18.6%, 30%, and 4.4% more likely to use the internet, respectively. Similarly, 18.9% more residents with electricity are likely to use the internet compared to those without electricity. This shows a good correlation between economic factors and internet usage.

Moreover, a province-wise study on internet usage has been conducted. Gandaki Province residents have the highest internet usage compared to other provinces. About 17.8%, 12%, 9.9%, 6%, and 1% of residents in Gandaki, Bagmati, Koshi, Lumbini, and Madhesh Provinces are more likely to use the internet than those in Karnali Province. The provincial annual GDP growth rate for 2022/23 shows that Gandaki Province has a higher annual GDP growth rate than the other provinces (Table 2). This shows that the higher GDP growth, the residents are more likely to use of the internet. Similarly, Lumbini and Koshi have similar growth rates, while Bagmati has a lower growth rate than Koshi and Lumbini, but the number of internet users in Bagmati is still higher. This may be due to the internet infrastructure developed around the capital, Kathmandu, even though the economic condition in and around the capital remains relatively poor.

Table 2: Provincial Annual GDP Growth Rate 2022/2023

Year/Province	Koshi	Madhes	Bagamati	Gandaki	Lumbini	Karnali	Sudurpaschim	Nepal
2022/23	2.00	1.69	1.44	3.26	2.06	1.91	1.78	1.86

Residents receiving remittances are more likely to use the internet than others. Furthermore, residents living in municipalities are more likely to use the internet than those in rural municipalities. This indicates that higher economic conditions are associated with higher internet usage.

6. Conclusion and recommendations

The findings of this study highlight the complex interplay between socioeconomic factors and household internet connectivity in Nepal. Education and caste emerge as significant

influencers, with higher education levels strongly linked to greater internet access—households with a master's degree or above boast a 90% connectivity rate, compared to just 23% for those with SLC/SEE or below. This disparity emphasizes the need for policies that boost educational attainment, particularly among marginalized groups, to close the digital gap. Infrastructure, such as sturdy housing and reliable electricity, also plays a crucial role in expanding internet penetration. In rural areas, where connectivity is only 16% compared to 47% in urban municipalities, investing in digital infrastructure is essential. Geographical differences further reveal uneven access, with provinces like Gandaki achieving 51% connectivity while Karnali (13%) and Sudurpashchim (18%) trail behind, calling for focused efforts in underserved regions. Economic factors, such as remittances and municipality status, along with gender and household composition, additionally shape connectivity trends, suggesting that economic empowerment and gender-inclusive policies could enhance access.

To meet the Government of Nepal's target of 60% fixed broadband connectivity by the end of F/Y 2028/29, a multifaceted strategy is vital. Prioritizing digital literacy and education programs stands out as a cornerstone, given education's pivotal role in driving internet use. Integrating digital skills into school curricula and setting up community training centers in rural areas can empower underserved populations. Expanding infrastructure investment in rural and less-developed provinces is equally critical to bridge the urban-rural divide, with public-private partnerships and affordable solutions like community Wi-Fi networks offering practical ways to extend broadband reach. Targeting marginalized communities, such as Dalit households with just 21% connectivity, through subsidies and awareness campaigns can tackle affordability and cultural barriers. Additionally, strengthening provincial-level digital equity strategies ensures that region-specific challenges are addressed, promoting balanced progress across Nepal. By implementing these interventions—enhancing digital literacy, providing targeted subsidies, developing regional infrastructure, and establishing robust monitoring frameworks—Nepal can build an inclusive digital economy, enabling all citizens to seize the opportunities of the digital era and supporting broader socioeconomic growth.

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