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Examining How Digital Divides Shape Social Media Platform Preference and Usage in Climate-Vulnerable Coastal Bangladesh

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Abstract: This study investigates the influence of demographic disparities on social media usage patterns among climate-vulnerable, resource-constrained coastal communities, based on Digital Divide Theory. The study specifically examines whether age, sex, education level, and household income correlate with social media usage patterns. Social media usage was defined by platform preference, usage duration, and visit frequency. A quantitative research design was used with a stratified, randomly selected sample of 384 from Khulna and Satkhira. Data were analyzed using descriptive statistics, one-way ANOVA, Kruskal–Wallis H, and chi-square tests. The results show significant demographic disparities in digital engagement. Age was significantly associated with platform preference, usage duration, and visiting frequency, with younger respondents being the most engaged. Significant gender differences were also observed regarding usage duration and visiting frequency, while education level was significantly correlated with platform preference and usage duration. Household income was significantly associated with only secondary platform preference, although higher-income groups tended to demonstrate higher social media engagement. The findings suggest that alongside digital access, patterns and intensity of digital engagement are influenced by demographic inequalities. The study extends the Digital Divide Theory by demonstrating that digital inequalities persist even within increasingly connected communities. It highlights the importance of demographic-sensitive communication strategies in disaster management and development communication in climate-vulnerable coastal contexts. However, the cross-sectional quantitative design and the exclusion of behavioral and contextual variables such as digital literacy, smartphone ownership, and cultural norms, which may influence the social media engagement pattern, are important limitations of the study.

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INTRODUCTION

Digital technologies have transformed global communication, enabling new forms of interaction and information exchange. Facebook, YouTube, WhatsApp, TikTok, and Instagram

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are all social media sites that are now a part of everyday life. Globally, mobile broadband infrastructure has improved while the cost of data has decreased. People can now get online more easily, especially in developing countries (International Telecommunication Union [ITU], 2023). But just because more people are online doesn't mean everyone uses the internet in the same way. Differences in access, skills, and usage patterns still determine who benefits from digital technologies and how they do so (van Dijk, 2012; Tilly, 1999; Robinson et al., 2020).

Many studies have shown that demographic factors are good ways to tell how people use social media. Younger individuals use a wider range of platforms and demonstrate higher levels of engagement (Hruska & Maresova, 2020; Zia & Malik, 2019; Auxier & Anderson, 2021). They tend to switch to platforms that are more interactive and fun faster than older users do. Older users tend to stick with platforms that are more focused on content consumption and use them less often (Budree et al., 2019; Sultan, 2021). There is also a lot of evidence that men and women use digital media in different ways. Research has shown that men and women don't always have very different platform preferences. However, they do often spend different amounts of time online, are more or less engaged, and have different levels of digital confidence (Jayabharathi et al., 2022; Yaqoob et al., 2020). People with more education tend to use the internet for more things, both general and specific. On the other hand, people with less education tend to use the internet more for fun and less for work (Blank & Groselj, 2014). Moreover, social media was used more by people with higher household income (Hruska & Maresova, 2020) than by people with less household income.

In Bangladesh, climate-induced disasters, poverty, weak digital infrastructure, and limited public infrastructure created multiple socio-economic and environmental vulnerabilities for the coastal regions. Different climatic events, such as cyclones, salinity intrusion, flooding, and livelihood insecurity, affect communities in coastal districts like Khulna and Satkhira, shaping people’s access to communication technologies and digital participation. In addition, patterns of social media access and engagement in these resource-constrained settings may be further influenced by gender norms, educational disparities, and economic inequalities. However, limited empirical research has examined how these demographic and contextual inequalities shape social media usage patterns in coastal Bangladesh, despite the increasing importance of social media for information sharing, communication, and disaster-related awareness. These research gaps limit government and non-government organizations’ capacity to develop an informed strategy for reaching the climate-vulnerable coastal community in any initiative, including agricultural extension services, disaster management, and social protection, among others.

To address this gap, this study was conducted to examine the relationship between demographic factors such as age, gender, education, and income and social media usage patterns among people in Khulna and Satkhira, two coastal districts in Bangladesh. It specifically investigates differences in platform preference, usage duration, and visiting frequency among different demographic groups.

Theoretical Framework

This study was conducted based on the digital divide theory coined by van Dijk. The digital divide refers to inequalities in access to digital technologies among different social groups. These divides result from socio-economic and cultural inequalities, which contribute to social media divides. These inequalities are mainly described using simple demographics of individuals (van Dijk, 2012) and correspond mainly to categorical differences, e.g., race, sex, and religion (Tilly, 1999). van Dijk (2012) further explained the categorial distinction as employers and (un)employed, management and employees, high- and low-level education, male and female, old and young, parents and children, whites and blacks, citizens and migrants. According to the digital divide theory, usage of digital media is constrained by three different factors, e.g., motivation, physical and material access, and digital skill. The motivation is influenced by time, money, skill, age, culture, psychology, and desire. The physical and material access is influenced by income, education, age, sex, and ethnicity. Two types of skills are required for digital media use, e.g., content-related and medium-related. These skills are also associated with socio-economic and cultural inequalities. Feng et al. (2019) explained social media divides on this ground. They argued that social media divides are an extension of digital divides. They found individual demographics like sex, education, income, and locality (e.g., urban or rural residency) to constitute the intended use of social media.

Despite digital divide theory helping to understand how inequalities shape digital access and usage, it has been criticized for its primary focus on structural and demographic inequalities. This theory gives less attention to contextual and behavioral dimensions of digital engagement, while recent studies have identified that local socio-cultural realities, individual motivations, and patterns of digital participation beyond simple access to technology shape social media usage patterns. Nevertheless, Digital Divide Theory remains highly relevant for examining how demographic inequalities influence social media engagement in resource-constrained and climate-vulnerable settings such as coastal Bangladesh.

Conceptual Framework

The study developed a conceptual framework based on Digital Divide Theory by linking demographic inequalities with patterns of social media usage. Drawing from Digital Divide Theory, which provides the foundation that socio-economic and demographic characteristics shape digital access, digital skills, and online participation, and based on previous empirical studies, age, sex, education level. income was selected as an independent demographic variable. On the other hand, social media usage patterns were operationalized by three variables: platform preference, usage duration, and visiting frequency.

Previous research has examined how people use social media in different ways, not just how they access it or begin using it. Researchers often examine how people use social media by looking at factors such as which platform they prefer, how long they use it, and how often they visit social networking sites (Hruska & Maresova, 2020; Sultan, 2021; Budree et al.,

2019). Not only do these dimensions examine how people use social media, but they also examine how often and how carefully they do so.

Users' platform preferences show that they are more likely to use certain apps, like Facebook, YouTube, Instagram, or TikTok. However, these preferences vary by demographic group (Budree et al., 2019; Sultan, 2021). Usage duration, which is usually measured in hours per day, shows how engaged someone is and has been widely used to compare differences between age and gender groups (Zia & Malik, 2019; Yaqoob et al., 2020). Visiting frequency, or how many times a day people use social media (for example, more than three times a day), indicates how often they do the same thing (Hruska & Maresova, 2020). These three indicators work together in quantitative research to give a picture of how people use social media as a whole.

This study uses the well-known parts of Digital Divide Theory (van Dijk, 2012), which looks at how social and demographic factors affect access to and use of technology, to define the dependent variable. This study looks at how people use social media by measuring:

- Platform Preference
- Usage Duration
- Visiting Frequency

The conceptual framework suggests that demographic factors like age, sex, level of education, and income have a direct effect on these three aspects of social media use. The model suggests that differences in demographic traits cause measurable differences in platform choice, frequency of use, and frequency of interaction in the coastal areas of Bangladesh.

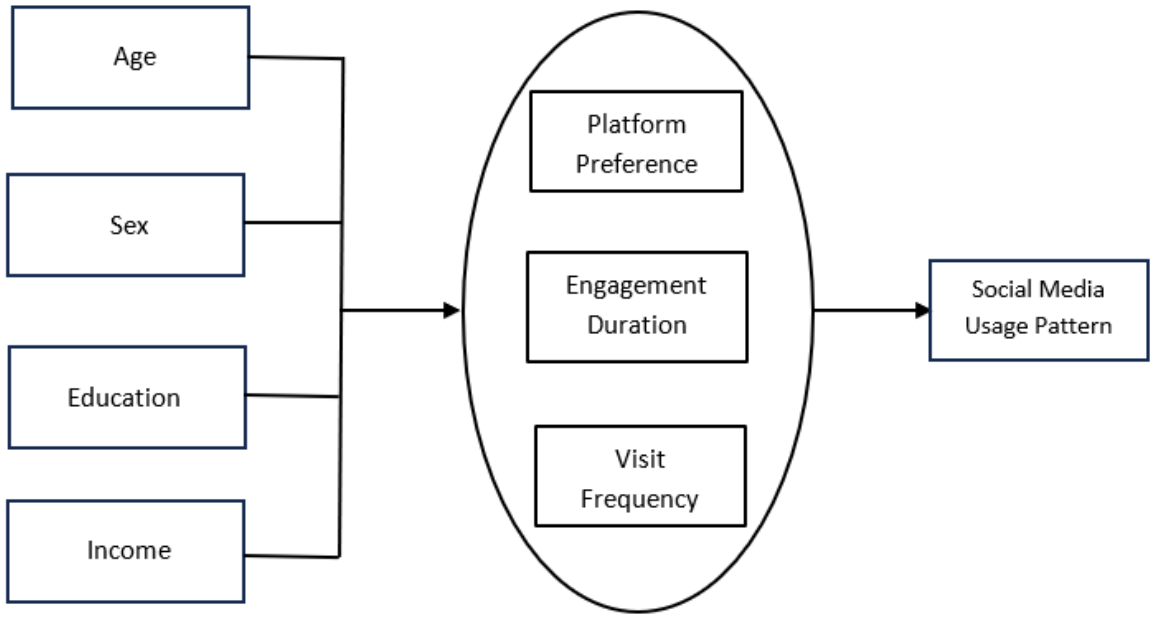

***Figure 1**: Conceptual Framework developed by authors*

Hypothesis Construction

Penni (2015) found "a strong relationship between age and gender, and social media technologies". The study identified age and gender as the strong predictors of social media use. Hruska & Maresova (2020) found age and education as demographic predictive variables for social media usage patterns. They found that people who have higher education are more likely to use social media, while age has a strong negative correlation with social media usage. Similarly, Zia & Malik (2019) also found a negative association between age and social media use. Koles & Nagy (2012) found an association between age, sex, and social media usage. Findings of many other studies are consistent with the above discussion that demographic variables, e.g., age, sex, and education, are predictive factors for social media usage (Shabir et al., 2014; Budree et al., 2019; Hunter & Taylor, 2020; Baglari et al., 2020; Gambo & Özad, 2020).

Multiple studies found that social media engagement and access to digital technologies are influenced by income (Bucy, 2000; Iqbal et al., 2025; Junco et al., 2010; Micheli, 2016). However, the studies had mixed findings; some found a positive relationship between income and usage of social media, that is, having better access to smartphones, internet connectivity, and more usage (Hruska & Maresova, 2020; Junco et al., 2010; Močnik & Širec, 2010), while some found a negative relationship (Redmiles, 2018; Tsetsi & Rains, 2017). Digital Divide Theory further suggests that sociocultural inequalities may shape digital participation and engagement patterns (van Dijk, 2012). In rural coastal Bangladesh, cultural norms related to gender roles, mobility, and access to technology may indirectly influence social media behavior across demographic groups.

Most studies indicate moderate to strong correlations, suggesting demographic factors are important but not deterministic in social media adoption and usage. On this ground, the following hypotheses were developed to test:

H1. There is a relation between age and social media usage patterns

H2. There is a relation between sex and social media usage patterns

H3. There is a relation between education level and social media usage patterns

H4. There is a relation between household income and social media usage patterns

The study will answer the following research questions.

There are four specific research questions to achieve the study objective stated above:

1. Is there a relationship between age and social media usage patterns?
2. Is there a relationship between sex and social media usage patterns?
3. Is there a relationship between education level and social media usage patterns?
4. Is there a relationship between household income level and social media usage patterns?

RESEARCH METHOD

A quantitative research approach was utilized in this study. A stratified random sampling method was used. Using Cochran's sampling formula, considering a 95% confidence level, 5% Margin of error, and a 50% p-value, the sample size was estimated as 384. The sample was distributed across two coastal districts of Bangladesh: Khulna and Satkhira. For sample selection, systematic random sampling on the walk was used. The sampling frame was people who use social media of any sex, age, or educational background. Data were collected from 01 May 2024 to 30 May 2024 in the field using KoboCollect. The data were cleaned and managed using MS Excel and analyzed using SPSS version 26. For this study, descriptive and inferential statistics were used. Mainly, the chi-square test, Kruskal–Wallis H, and the one-way ANOVA were used for group comparison.

FINDINGS

The findings of the study have been discussed based on different aspects of social media usage patterns, including platform preference, duration of use, and frequency of visits. This research investigates the relationships among socio-demographic factors, such as age, sex, education, and income, and aspects of social media use. Statistical tests have been conducted to test the significance of the differences and relationships.

The Relation Between Age and Social Media Usage Patterns

Table 1 clearly demonstrates age-related patterns across platform preference, usage duration, and visiting frequency. For Rank 1, Facebook was the top choice across all age groups, but was highest among younger respondents (86% of 18–34 years). On the other hand, YouTube was preferred more by older respondents (21% in both 35–51 and >52 groups) than younger ones (8%). For rank 2, YouTube became the dominant second choice across all ages, especially among respondents above 52 years (74%). Choosing TikTok as a second choice was higher among younger respondents and was not selected at all by the older group. Age had a significant effect on usage duration. Younger respondents, aged 18–34 years, showed the highest use of social media (Table 20). More than half (52%) of them spend over three hours a day on Facebook and YouTube. Age also influenced visiting frequency. Younger respondents (18–34 years) used to visit social media most frequently, with 72% visiting Facebook/YouTube more than three times a day. This frequency gradually decreased as age increased.

To assess whether the differences were statistically significant, one-way ANOVA tests were conducted. The results found a significant age difference in platform preference (Rank 1: $F = 5.700$, $p = 0.001$; Rank 2: $F = 3.578$, $p = 0.007$), usage duration ($F = 23.585$, $p < 0.001$), and visiting frequency ($F = 6.903$, $p < 0.001$). This finding suggests that users' age significantly influenced social media usage patterns. The result supports the hypothesis that there is a strong correlation between age and social media usage. Greater digital familiarity, higher

social networking needs, and greater adaptability to interactive platforms are possible causes of higher social media engagement among younger users.

Table 1. *Age Differences in Social Media Platform Preference, Usage Duration, and Visiting Frequency*

Variable	Category	18-34 (%)	35-51 (%)	>52 (%)	F	P
Platform Preference (Rank 1)	Facebook	86%	72%	77%	5.700	0.001
	YouTube	8%	21%	21%		
	WhatsApp	1%	4%	0%		
	Tiktok	4%	3%	2%		
	Imo	1%	0%	0%		
	Instagram	0.4%	0.0%	0.0%		
	Telegram					
Platform Preference (Rank 2)	Facebook	13%	24%	23%	3.578	0.007
	YouTube	64%	58%	74%		
	WhatsApp	7%	5%	2%		
	Tiktok	12%	9%	0%		
	Imo	2%	4%	0%		
	Instagram	1%	0%	0%		
	Telegram	0.4%	0.0%	0.0%		
Usage Duration	1. 30 mins a day	0%	5%	16%	23.585	<0.001
	2. 30 mins to 1 hour a day	3%	11%	19%		
	3. 1-2 hours a day	20%	16%	33%		
	4. 2-3 hours a day	24%	34%	14%		
	5. More than 3 hours a day	52%	34%	19%		
Frequency of visiting	1. More than 3 Times a Day	72%	65%	56%	6.903	<0.001
	2. 2-3 Times a Day	24%	30%	30%		
	3. Once a Day	1%	2%	14%		
	4. 2-3 Times a Week	3%	2%	0%		

Note: Percentages calculated within age groups. F and p values derived from one-way ANOVA tests

The Relation Between Sex and Social Media Usage Patterns

Table 2 demonstrates sex-related patterns across platform preference, usage duration, and visiting frequency. Data showed a slight difference between the percentage of men and women in ranking social media platforms as their first and second choice. Also, a clear difference between men and women was found in terms of usage. Men use social media much more than women. Nearly half of the men (47.4%) said they use social media for more than three hours a day, while only 23.6% of women reported this level of usage. Similarly, a clear difference was found between men and women regarding visiting frequency. Men reported much more frequent visits—73% of men visit Facebook/YouTube more than three

times a day, compared to only 40% of women. Women were more represented in the lower-frequency categories, especially the "2–3 times a week" group.

The chi-square test found no significant difference between the sexes in relation to ranking (Rank 1, $\chi^2 = 6.171$, $p = 0.290$; Rank 2, $\chi^2 = 5.633$, $p = 0.466$), suggesting that men and women generally prioritize similar platforms. However, the chi-square test results show a statistically significant association between sex and usage duration ($\chi^2 = 19.007$, $p = 0.001$) and between sex and visiting frequency ($\chi^2 = 49.497$, $p < 0.001$). Therefore, the hypothesis "there is a relation between sex and social media usage patterns" is partially supported. This may indicate that gendered inequalities existed in access to digital devices, smartphone ownership, available time, and online participation.

Table 2. *Association Between Sex and Social Media Usage Patterns (Social Media Platform Preference, Usage Duration, and Visiting Frequency)*

Variable	Category	1. Men	2. Women	χ^2 (df)	P
Platform Preference (Rank 1)	Facebook	82%	84%	6.171	0.290
	YouTube	13%	9%		
	WhatsApp	1%	5%		
	Tiktok	4%	2%		
	Imo	1%	0%		
	Instagram	0%	0%		
	Telegram				
Platform Preference (Rank 2)	Facebook	17%	13%	5.633	0.466
	YouTube	62%	76%		
	WhatsApp	6%	5%		
	Tiktok	11%	4%		
	Imo	2%	2%		
	Instagram	1%	0%		
	Telegram	0.3%	0%		
Usage Duration	1. 30 mins a day	4%	2%	19.007	0.001
	2. 30 mins to 1 hour a day	6%	9%		
	3. 1-2 hours a day	17%	40%		
	4. 2-3 hours a day	25%	25%		
	5. More than 3 hours a day	47%	24%		
Frequency of visiting	1. More than 3 Times a Day	73%	40%	49.497	0.001
	2. 2-3 Times a Day	24%	40%		
	3. Once a Day	2%	5%		
	4. 2-3 Times a Week	1%	15%		

Note: Percentages calculated within the sex. F and p values derived from one-way ANOVA tests and χ^2 and p values derived from chi square test

The Relation Between Education and Social Media Usage Patterns

Table 3 presents education-related patterns across platform preference, usage duration, and visiting frequency. The data showed that education level strongly influences platform preferences. For Rank 1, across all educational groups, Facebook was the dominant choice, ranging from 75% among respondents with primary education to 100% among those with no literacy. Slightly more diverse preferences were shown by respondents with higher education, with 7% selecting YouTube and 6% selecting WhatsApp as their first choice. YouTube was selected more as a first choice by those with primary and secondary education (17% and 15%). For Rank 2, YouTube became the most common second choice across all education levels (51–70%), especially among respondents with secondary education (70%). People with lower education levels (for example, those with no literacy or only primary education) were more often found in the higher usage categories such as 2–3 hours and more than 3 hours per day. Those with higher levels of education were spread more evenly across different time categories. Education showed a slight difference in relation to visiting frequency. Respondents with no literacy had slightly higher proportions in the "more than three times a day" group (80%), while higher-educated respondents showed a similar pattern but with slightly more variation across categories.

To assess whether the differences were statistically significant, one-way ANOVA tests were conducted. The results found a significant difference in education level in platform preference (Rank 1: $F = 3.747$, $p < 0.05$; Rank 2: $F = 6.29$, $p < 0.001$) and usage duration ($F = 2.587$, $p < 0.05$). However, no significant difference in education level was found across different visiting frequencies ($F = 2.078$, $p > 0.05$). Therefore, the finding partially supports the hypothesis that there is a relation between education level and social media usage patterns. These patterns may also reflect differences in digital literacy, affordability of internet access, occupational demands, and access to digital devices.

Table 3. *Education-Level Differences in Social Media Platform Preference, Usage Duration, and Visiting Frequency*

Variable	Category	Higher Education	Higher Secondary	No Literacy	Primary	Secondary	F	P
Platform Preference (Rank 1)	Facebook	85%	83%	100%	75%	81%	3.747	0.011
	YouTube	7%	10%	0%	17%	15%		
	WhatsApp	6%	0%	0%	2%	1%		
	Tiktok	0%	7%	0%	6%	2%		
	Imo	1%	0%	0%	0%	1%		
	Instagram	1.2%	0.0%	0.0%	0.0%	0.0%		
	Telegram							
Platform Preference (Rank 2)	Facebook	15%	12%	20%	21%	18%	6.229	<0.001
	YouTube	62%	51%	60%	67%	70%		
	WhatsApp	15%	9%	0%	0%	2%		
	Tiktok	5%	20%	0%	10%	8%		
	Imo	0%	7%	20%	2%	1%		

Variable	Category	Higher Education	Higher Secondary	No Literacy	Primary	Secondary	F	P
	Instagram	3%	0%	0%	0%	0%		
	Telegram	0.0%	1.2%	0.0%	0.0%	0.0%		
Usage Duration	1. 30 mins a day	5%	1%	0%	2%	4%	2.587	0.037
	2. 30 mins to 1 hour a day	7%	5%	0%	8%	7%		
	3. 1-2 hours a day	19%	11%	20%	33%	22%		
	4. 2-3 hours a day	22%	22%	40%	25%	28%		
	5. More than 3 hours a day	48%	61%	40%	31%	38%		
Frequency of visiting	1. More than 3 Times a Day	73%	76%	80%	67%	63%	2.078	0.103
	2. 2-3 Times a Day	26%	23%	20%	29%	27%		
	3. Once a Day	1%	0%	0%	4%	5%		
	4. 2-3 Times a Week	0%	1%	0%	0%	5%		

The Relation Between Household Income and Social Media Usage Patterns

Table 4 demonstrates that household income varied across different dimensions of social media usage patterns. Household income showed slight differences in platform preferences. For Rank 1, the higher-income group preferred TikTok (mean household income BDT 21,769.23, mean ranks 239.00), followed by Facebook (mean household income BDT 20,295.89, mean ranks 196.26), and Imo (mean household income BDT 20,000, mean ranks 239.00). In case of Rank 2, the respondents who prioritized Telegram had the highest mean household income, BDT 30,000 (mean ranks 346.50), followed by WhatsApp (mean household income 26,583.33, mean ranks 245.15).

People with higher income levels were more often found in the higher usage categories; for example, people who reported using social media more than three hours a day had a mean income of BDT 21,317.65 (mean ranks 205.96). In contrast, those who reported 30 minutes to one hour a day had a mean household income of BDT 17,576.92 (mean ranks 157.67), though the lowest-usage group (less than 30 minutes a day) reported a slightly higher mean income than the latter group (mean income BDT 19,653.85, mean ranks 178.00). Income showed no noticeable difference in relation to visiting frequency. However, the less frequently visiting groups (2-3 Times a Week) reported the lowest mean household income,

BDT 18,700.00 (mean ranks 201.80). In comparison, the most frequently visiting group (More than 3 Times a Day) reported the highest mean household income, BDT 19962.26 (mean rank 190.98).

To assess whether the differences were statistically significant, a non-parametric Kruskal–Wallis H test was conducted instead of one-way ANOVA because household income was not normally distributed and exhibited substantial positive skewness (2.127).

The Kruskal–Wallis H test found no statistically significant difference in household income across Rank 1 platform preferences (H = 6.932, p = 0.226); in contrast, the difference for Rank 2 was statistically significant (H = 13.762, p = 0.032). For other variables, such as usage duration and visiting frequency, the difference in household income was also not statistically significant. The Kruskal–Wallis H test showed H = 5.644, p = 0.227 for usage duration and H = 1.194, p = 0.755 for visiting frequency.

Overall, household income was significantly associated only with secondary platform preference, which suggests that respondents with higher incomes diversify platform use. However, there was no significant relationship between household income and usage duration or visiting frequency. Therefore, the hypothesis “there is a relation between household income and social media usage patterns” is partially supported.

Table 4. *Household Income Differences in Social Media Platform Preference, Usage Duration, and Visiting Frequency*

Variable	Category	Mean Household Income (BDT)	Std. Deviation	Mean rank	Kruskal-Wallis H	P
Platform Preference (Rank 1)	Facebook	20295.89	9570.057	196.26	6.932	0.226
	YouTube	17404.26	5310.611	169.48		
	WhatsApp	14071.43	10109.519	134.21		
	Tiktok	21769.23	6431.094	239.00		
	Imo	20000.00	.000	239.00		
	Instagram	18000.00	.	183.00		
	Telegram					
Platform Preference (Rank 2)	Facebook	18101.56	6452.008	184.72	13.762	0.032
	YouTube	19432.93	8601.173	188.10		
	WhatsApp	26583.33	15296.822	245.15		
	Tiktok	19589.74	8744.075	185.23		
	Imo	25000.00	11726.039	244.28		
	Instagram	25000.00	.000	314.50		
	Telegram	30000.00	.	346.50		
Usage Duration	1. 30 mins a day	19653.85	10892.246	178.00	5.644	0.227
	2. 30 mins to 1 hour a day	17576.92	9453.774	157.67		
	3. 1-2 hours a day	19215.19	7803.140	190.69		

Variable	Category	Mean Household Income (BDT)	Std. Deviation	Mean rank	Kruskal-Wallis H	P
	4. 2-3 hours a day	18535.71	5823.101	185.71		
	5. More than 3 hours a day	21317.65	10738.100	205.96		
Frequency of visiting	1. More than 3 Times a Day	19962.26	9575.482	190.98	1.194	0.755
	2. 2-3 Times a Day	19810.00	8128.631	201.79		
	3. Once a Day	19363.64	10337.047	171.23		
	4. 2-3 Times a Week	18700.00	2359.378	201.80		

DISCUSSION

Social media usage was widespread within the coastal community; however, usage patterns varied significantly. Facebook and YouTube were popular with all groups, but the way people used them differed significantly based on gender, age, and level of education.

Age was consistently associated with platform preference, usage duration, and visiting frequency. Young people (ages 18 to 34) were the most active users, checking platforms often and using interactive apps like Facebook and TikTok. Older people liked YouTube better and logged in less often. This pattern suggests that social media usage intensity declines with increasing age. This finding is consistent with the finding of Zia & Malik (2019), who reported that age is negatively associated with social media usage. The finding also supported Yaqoob et al.'s (2020) finding that age is associated with social media platform preference and usage duration, and the finding of Budree et al (2019) that different age groups show preferences for different platforms based on frequency of use. It was also consistent with the finding of Sultan, A. J. (2021), who stated that age is associated with different social media platform usage behaviors. This result may be explained by the idea that younger users may be more digitally adept with interactive platforms. In contrast, older users may prefer content-based platforms that require less continuous engagement. However, demographic factors appear influential rather than deterministic.

Sex was significantly associated with usage duration and visiting frequency; however, there was no statistically significant difference between the sexes regarding platform preference. While platform choice may be similar between women and men, women reported lower usage duration and frequency compared to men. This finding is partially consistent with Jayabharathi et al (2022), who found that sex is associated with differences in social media usage duration, visiting frequency, and platform preference. Similarly, Yaqoob et al (2020) found that being male is associated with higher social media addiction and longer usage duration. However, unlike previous studies, the present findings did not identify sex-based differences in platform preference.

A possible explanation of this difference may relate to broader social and structural factors that shape digital access and participation. In the country's rural context, women have lower smartphone ownership, limited access to shared smartphones, limited time availability due to heavy household responsibilities, and concerns about online safety. Although the present study did not directly measure these factors, they may contribute to sex-based differences in social media usage patterns.

Education also affected how people used social media. People with more education were more comfortable using multiple platforms, like WhatsApp and Instagram, and they used more features. People who couldn't read or write well mostly used Facebook and YouTube, and they tended to consume content passively. Çelik et al (2023) also found that higher education students prefer Instagram, WhatsApp, YouTube, Twitter, Snapchat, Telegram, Pinterest, Facebook/FB Messenger, and TikTok for educational purposes. Although no significant difference was observed between social media visiting frequency and educational level, education was associated with social media usage duration. People with lower education spend more time on social media compared to higher educated people; this finding is consistent with Wang et al (2025) and Tsetsi & Rains (2017). Higher-educated people's likelihood of being engaged in structured activities that limit time for extended social media use, and their possible goal-oriented, efficient digital engagement, may explain the difference in usage duration between higher- and lower-educated groups. Moreover, as Blank & Groselj (2014) found, lower education was linked to narrower and more entertainment-focused use, which may explain the extended use of social media among the lower educated group.

Moreover, household income was significantly associated with respondents' rank 2 platform preference, such as respondents with higher household income using Telegram and WhatsApp as their secondary social media platform. This suggests that respondents with higher household income tend to diversify their social media use across multiple platforms, potentially reflecting greater digital exposure, device availability, or communication needs. Although no statistically significant difference was found in relation to household income and usage duration and visiting frequency, the pattern showed that higher-income groups tend to use social media more and more frequently. However, these differences were insufficient to establish a statistically significant association. This finding can be explained by access to digital resources, although the factor was not directly measured in the present study.

This study has broader implications for understanding digital inequality in climate-vulnerable and resource-constrained settings. The difference in social media usage patterns resulting from demographic inequality suggests that the inequality not only influences access but also the intensity and nature of digital participation. These disparities may shape different groups' access to disaster communication, public services, educational content, and development communication disseminated through social media platforms. In disaster-prone coastal Bangladesh, limited infrastructure, unequal patterns of digital engagement, and the risk of climatic events may reinforce existing social and informational inequalities. By demonstrating that demographic inequalities influence social media engagement patterns

even in an increasingly widespread digital technologies context, the findings extend the Digital Divide Theory. The findings imply the need to consider socio-economic disparities, gendered access, digital literacy, and contextual vulnerabilities beyond infrastructure expansion in digital inclusion strategies for development interventions.

CONCLUSION

This study reinforces the theory of the digital divide by showing that people's demographics, e.g., age, sex, education, and income, which are used to describe inequalities, shape patterns of social media engagement. The findings supported the view that deeply rooted inequalities influence social media usage patterns in systems of society and culture. While demographic characteristics are not deterministic factors of social media engagement, they significantly contribute to social media platform preference, usage duration, and visiting frequency.

This study has important practical implications for government and non-government organizations. The results suggest that, to reach different demographic groups, tailored social media strategies are required that consider platform preference, digital literacy, content complexity, language accessibility, and engagement frequency across social groups. Therefore, organizations should adopt targeted social media strategies based on demographic characteristics. The study further suggests that digital inclusion interventions should prioritize marginalized populations with limited digital access and lower engagement capacity.

Although the study identified significant demographic differences in social media usage patterns, other unmeasured factors such as digital literacy, smartphone ownership, internet affordability, occupational engagement, household responsibilities, and local socio-cultural norms may also influence patterns of social media engagement. This study was conducted only in two coastal districts of Bangladesh with only three pieces of demographic information, which limits the generalizability of the findings. To provide a more comprehensive understanding, future research should include a wider geographical area and more demographic characteristics, such as occupation and migration status.

To gain a more detailed understanding of digital inequalities, future studies should consider additional variables linked with this, like digital literacy, smartphone ownership, occupation, migration status, internet affordability, and cultural norms. A mixed-method research approach and longitudinal studies across wider geographic regions can provide more in-depth insights for a better understanding of how climate vulnerability, socio-economic conditions, and technological change interact to shape social media engagement patterns over time.

Overall, the findings of this study are particularly relevant in rural and resource-constrained settings, in countries like Bangladesh, where social media strategies and policies need to consider demographic disparities in digital engagement alongside infrastructure gaps.

Author Contributions

Imran Khan designed the study, wrote the protocol, analyzed quantitative data, did the statistical test, and prepared the first draft. Nilima Khatun assisted in data analysis and in preparing the first draft. She also managed the literature searches. A.B.M. Saiful Islam guided and mentored the study design, assisted in analysis and management, and guided and assisted in developing the methodology and questionnaire. All authors read and approved the final manuscript.

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Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available because they contain information that could compromise the privacy of research participants. The data are available from the corresponding author on reasonable request.

Conflict of Interest

The authors declare that they have no conflict of interest.

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