

Assessing Households' Difficulties in Water Fetching and Latrine Use: A Case Study of Karnali Province, Nepal

Laxmi Chandra Mahat¹

¹PhD Scholar, Population Studies

Faculty of Humanities and Social Sciences, Tribhuvan University, Kirtipur, Nepal

Corresponding Author

Laxmi Chandra Mahat

Email: lcmahat@gmail.com

To Cite this article: Mahat, L. C. (2026). Assessing households' difficulties in water fetching and latrine use: A case study of Karnali province, Nepal. *International Research Journal of MMC*, 7(3), 14–27. <https://doi.org/10.3126/irjmmc.v7i3.97067>

Submitted: 24 May 2026

Accepted: 14 May 2026

Published: 15 July 2026

Abstract

Over the past three decades Nepal has substantially extended its water and sanitation infrastructure and, in 2019, declared itself free of open defecation. Yet how access varies from one community to the next remains poorly understood, especially in lower-income provinces like Karnali. This study documents, at the household level, who struggles to fetch water and use a latrine, and how those struggles differ across social groups. Using a cross-sectional design, the author surveyed 800 households in Karnali, split evenly between Bhagabatimai Rural Municipality, Dailekh, and Birendranagar Municipality, Surkhet. Data were collected in 2024 using structured questionnaires administered on tablets using mWater platform. Chi-square tests related two yes-or-no difficulty measures to four characteristics: place of residence, self-assessed poverty, caste and ethnicity, and sex of the household head. In total, 8.1 percent of households reported difficulty fetching water and 8.5 percent difficulty with latrine use. The rural water-difficulty rate ran about seven times the urban rate, and the rural latrine rate roughly doubled the urban one. Dalit households were worst affected for water, while Dalit and Other households shared the highest latrine difficulty. Among those reporting trouble, physical impairment was the leading obstacle, ahead of vision and hearing problems. Together, the results expose rooted inequities tied to terrain, income, caste, and disability, pointing toward rural-focused, caste-aware, and disability-friendly investment to advance Sustainable Development Goal 6. Importantly, the study offers some of the first household-level, disaggregated evidence of WASH difficulty in Karnali, helping planners reach households that coverage data tend to hide.

Keywords: WASH, water fetching, latrine use, Karnali province, disability

1. Introduction

Whether a household can reliably obtain clean water, use a safe toilet, and maintain basic hygiene shapes both its members' health and their sense of dignity. The sixth Sustainable

Development Goal commits governments to closing the gap in drinking water and sanitation by 2030, reaching everyone regardless of wealth or location. Behind that commitment, however, lies a question that aggregate targets rarely answer: within a given country or community, who is left carrying the daily cost of inadequate provision? The scale of the shortfall is considerable. Roughly 419 million people were still relieving themselves in the open as of 2022, around 3.5 billion had no safely managed sanitation, and the pace of expansion in water services was running far below what the 2030 timeline demands (UN-Water, 2024; UNSD, 2024). Such shortfalls are rarely spread evenly. They cluster according to where a household sits geographically, how much it earns, which social group it belongs to, and how local authorities set their spending priorities. In Nepal's rural areas, the daily walk to collect water can consume several hours and falls largely on women and girls, a burden that headline coverage figures tend to remove. Yet despite WASH being widely recognized as both a health and a gender issue, very little work has asked precisely who runs into functional WASH difficulties at the household level in regions such as Karnali, among the most remote and least prosperous parts of the country.

Nepal has made considerable progress over the past three decades, with household access to improved water sources rising from 46 percent in 1990 to approximately 95 percent by the early 2020s, and an official declaration of Open Defecation Free (ODF) status in 2019 (UNICEF Nepal, 2022; Enpho, 2024). But do these aggregate milestones reflect the lived reality of the most marginalized households? Can a coverage figure capture whether a Dalit woman in a remote mountain village actually has a functional, accessible latrine? Evidence suggests not. The ODF declaration has been questioned by field practitioners, with documented cases of communities reverting to open defecation after monitoring stopped (Kouassi et al., 2023).

1.1 Statement of the Problem

Karnali Province presents this gap in its simplest form. The Nepal Demographic and Health Survey 2022 identified the province as having the lowest proportion of households with on-premises water access at 13.9 percent; it is precisely the kind of context where infrastructure figures cover deep functional disparities (Adhikari & Khanal, 2024). Yet much research in Nepal relies on nationally representative data and fails to characterize intra-provincial variation or to address the specific daily experiences of WASH difficulty at the household level.

1.2 Research Gap

Three forces persist in the literature as the main structural sources of WASH inequality in Nepal and across South Asia: caste, poverty, and geography. For Dalit households the problem runs deeper than low income, extending to a socially enforced distance from shared facilities that rests on long-standing notions of ritual status (WaterAid, 2022; Spears & Thorat, 2019). Wealth, too, reliably tracks WASH adequacy (Baral et al., 2024), and yet it cannot account for everything, neither why certain very poor communities report comparatively few difficulties, nor why disability can produce WASH barriers that have little to do with a household's finances. Gender is a further dimension that is structurally rooted but rarely measured well: the time cost of fetching water falls mainly on women and girls, though whether ordinary household surveys ever register that burden is an open question. Disability is arguably the most neglected axis of all. People with disabilities make up an estimated one in seven of the global population and consistently find water and sanitation harder to reach, but in Nepal the topic is largely missing from both the questionnaires used to measure WASH and the programs designed to deliver it (Hembling et al., 2019; Kc & Adhikari, 2021). It is these blind spots that the present study sets out to address.

1.3 Research Objective

This study assesses and compares household-level WASH difficulties, specifically difficulty in fetching water and difficulty in using a latrine across place of residence, perceived poverty status, caste and ethnicity, and gender of the household head, in two contrasting municipalities of Karnali Province: Bhagabatimai Rural Municipality (rural) and Birendranagar Municipality (urban). By disaggregating along these dimensions, the study moves beyond aggregate coverage figures to identify who bears the functional burden of inadequate WASH and what this implies for equitable progress toward Sustainable Development Goal 6.

1.4 Delimitations and Implications

This study is delimited to two municipalities of Karnali Province and to household-level, self-reported measures of functional difficulty in water fetching and latrine use captured at a single point in time. It does not measure water quality, water quantity, or individual-level time-use, nor is it designed to be statistically representative of the entire province. Within these boundaries, the study carries clear implications for practice: by revealing which social groups are left behind once headline coverage has been achieved, it offers WASH planners in Karnali an evidence base for rural-focused, caste-aware, and disability-inclusive targeting, and it signals where future, larger-scale and individual-level research is most needed.

2. Literature Review

2.1 Conceptualizing Water Fetching, Latrine Use, and Functional Access

Water fetching refers to the process by which household members, typically women and girls in rural South Asian contexts, travel to, collect, and transport water from a source for domestic use. Difficulty in water fetching thus involves not only the physical distance to a water point but also the terrain traversed, the time cost borne, the physical capacity of the household member, and the reliability or seasonal availability of the source. It is distinguished from simple access to an improved water source: a household may nominally possess access to a standpipe yet face severe difficulty if that standpipe is more than an hour's walk away across mountainous terrain, if the member responsible has a mobility limitation, or if the source runs dry seasonally (Hembling et al., 2019; WHO & UNICEF, 2023).

Next, latrine-use difficulty refers to barriers encountered in physically accessing and using a latrine or, where no latrine exists, in reaching a site for open defecation. These barriers include distance to the facility, the design of the facility such as steps, the absence of grab-bars, and an unsuitable squatting posture for persons with disabilities, as well as social or cultural constraints on use by particular household members. Where open defecation remains common, reaching a suitable site requires mobility, privacy, and safety, conditions that are not guaranteed for elderly, disabled, or female household members (Ibid.).

These conceptual distinctions matter because coverage-based WASH indicators, which record the presence of improved facilities, can mask functional difficulties. A central critique of the SDG 6 monitoring framework is precisely its reliance on infrastructure presence rather than functional access, service quality, or equity of use (Bain et al., 2022). Aggregate national statistics cover profound intra-country disparities across urban-rural divides, wealth quintiles, caste lines, and disability status. This gap between reported coverage and lived experience is particularly pronounced in settings such as Karnali Province, where infrastructure may nominally exist but is functionally inadequate for significant segments of the population (Adhikari & Khanal, 2024).

2.2 WASH and Public Health: The Burden of Inadequate Access

Few risk factors weigh as heavily on global health as poor water and sanitation. When these are lacking, the result is a familiar set of infections spread through contaminated water, including diarrhea, cholera, and typhoid, and it is young children who pay the heaviest price. The situation is especially serious in Nepal's outlying provinces, where diarrheal illness continues to sicken large numbers of under-fives and the absence of dependable WASH carries real consequences (WHO & UNICEF, 2023). The damage is not limited to acute illness. Repeated exposure to fecal pathogens can quietly disrupt the gut and stunt a child's growth even when that child is eating enough, a process researcher describes as environmental enteric dysfunction. Where open defecation continues after a community has been certified free of it, the old routes of transmission stay open and erode earlier progress in child and maternal health. Indeed, the well-documented tendency of certified communities in Nepal to slip back into open defecation is a reminder that building toilets only pays off in health terms if behavior change is sustained over time (Kouassi et al., 2023).

2.3 Gender, Caste, and Disability as Structural Determinants

The gender burden of WASH is well established: women and girls disproportionately bear the labor of water collection in rural Nepal and across South Asia, spending several hours daily walking to and from distant sources, time excluded from education, income generation, and rest (WHO & UNICEF, 2023). This time cost is structurally rooted in rural household economies and tends to be invisible in household-level survey instruments that assign WASH responsibility to a generic household head. Women without access to private sanitation also face risks of harassment and violence at shared or outdoor defecation sites, and the absence of menstrual hygiene management facilities compounds the dignity burden.

Within Nepal, caste and ethnicity act as drivers of WASH inequality in their own right, not merely as stand-ins for poverty. Households from Dalit communities, long positioned at the bottom of the social order, struggle with several disadvantages at once: weaker claims to land, less leverage in dealings with water user committees, and the quiet but persistent practice of being kept away from shared water points on grounds of ritual status (WaterAid, 2022; Spears & Thorat, 2019). A further obstacle is the deep-seated unwillingness, tied to caste norms around who may handle waste, to clean or empty latrine pits, an obstacle that sanitation initiatives built on the Community-Led Total Sanitation model have struggled to overcome (Kvamme & Torabi, 2019). Economic hardship layers onto these social barriers. Of all the factors examined in the Nepali context, household wealth predicts adequate WASH most strongly, and the gap between richest and poorest is wide, with the top wealth group several times more likely than the bottom to enjoy adequate provision (Baral et al., 2024). This pattern is not confined to WASH: wealth-based inequality runs through essential service use in Nepal more broadly, as documented for maternal health care, where utilization gaps between rich and poor households have persisted over a decade (Shrestha, 2022). Even so, money is not the whole story, since the Dalit disadvantage does not disappear once income is held constant.

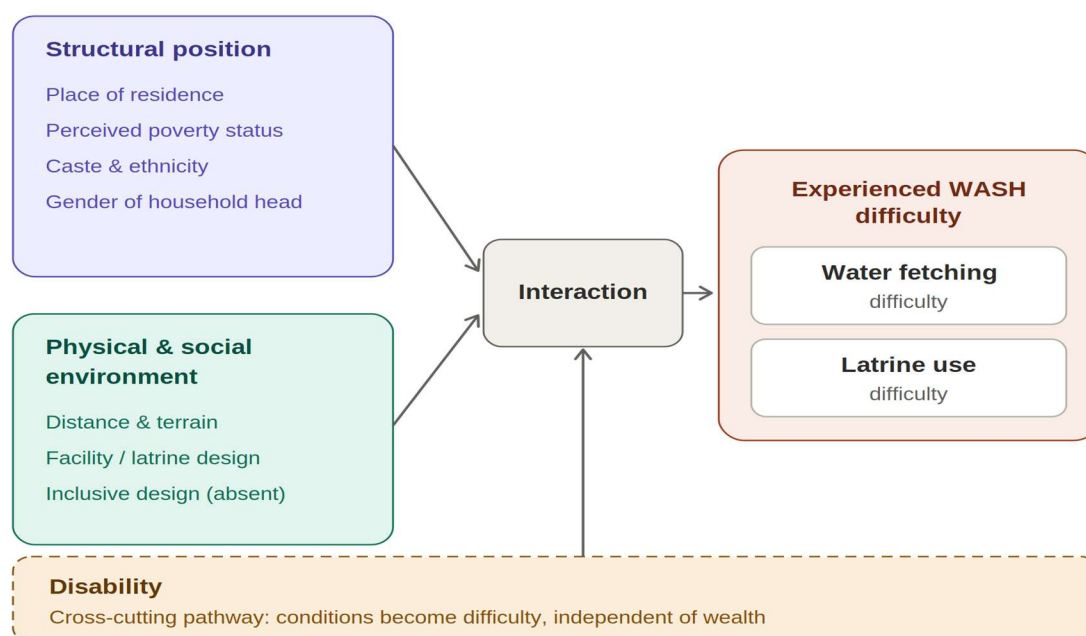
Disability represents a third underexamined axis. Where facilities are distant, terrain is mountainous, and latrine design is not inclusive, physical and sensory limitations translate directly into WASH difficulty regardless of household wealth (Hembling et al., 2019; Kc & Adhikari, 2021). Nepal's WASH policies contain minimal provisions for disability inclusion, and these commitments have not been systematically translated into programming at the local government level in provinces such as Karnali. Against this conceptual and empirical background, the present

study fills a specific gap: the absence of primary, municipality-level data on experienced functional WASH difficulty, disaggregated by residence, poverty, caste, gender, and disability, from within Karnali Province.

2.4 Conceptual Framework

Building on the distinction between coverage and functional access set out above, this study adopts a simple conceptual framework in which experienced WASH difficulty is treated as the outcome of an interaction between a household's structural position and the physical and social environment in which WASH services are accessed. Four socio-demographic determinants, place of residence (rural or urban), perceived poverty status, caste and ethnicity, and gender of the household head, are positioned as the structural axes along which the burden of difficulty is expected to concentrate. Disability is positioned as a cross-cutting functional pathway that converts distance, terrain, and inaccessible facility design into difficulty largely independent of household wealth. Within this framework, the two observable outcomes are difficulty in water fetching and difficulty in latrine use, and the central expectation is that difficulty will be greatest where structural disadvantage — rural location, poverty, and lower-caste status, coincides with unfavorable physical conditions and an absence of inclusive design. This framework, summarized schematically in Figure 1, guides both the selection of the four explanatory variables and the disaggregated, comparative analysis that follows.

Figure 1: *Conceptual framework linking household structural position, the physical and social access environment, and disability to experienced WASH difficulty.*



3. Materials and Methods

This study drew on a cross-sectional household survey conducted from June to August 2024 across Bhagabatimai Rural Municipality and Birendranagar Municipality in Karnali Province, Nepal. The survey was conducted by the author as part of a doctoral research project under the Faculty of Humanities and Social Sciences, Tribhuvan University. A total of 800 households were surveyed, with 400 per municipality, generating equal representation between the rural and urban study settings. Birendranagar, the provincial capital, served as the urban case, offering a context of relatively better infrastructure and service connectivity, while Bhagabatimai represented the rural case, characterized by dispersed settlements, greater distance from services, and fewer paved road connections. All data were collected during the 2024 survey period.

In each municipality, household lists maintained within existing Water Users and Sanitation Committees (WUSCs) under the respective wards served as the sampling frame. Households were selected at regular intervals from each WUSC user list, and in cases of household absence, the nearest occupied household was substituted. Data collection was conducted by trained enumerators proficient in Nepali with field-level WASH experience. Structured questionnaires were administered using tablets through the mWater system, a free, open-source data platform for collecting and managing data specifically for the water, sanitation, and hygiene sector.

The system was used to capture data on whether any household member experienced difficulty fetching water, whether any member experienced difficulty using a latrine or reaching a place for open defecation, and the specific types of difficulties experienced, using a multiple-response format. The variable difficulty was measured using a dichotomous response category, where respondents indicated either Yes or No based on their experience or perception regarding the specified condition. A response of Yes represented the presence of difficulty, whereas No indicated its absence. The binary response format was intended to simplify data collection, ensure clarity for respondents, and facilitate quantitative analysis through simple coding and interpretation.

Respondent households were further characterized by place of residence (rural or urban), perceived poverty status (poor or non-poor), caste and ethnicity (Brahmin/Chhetri, Dalit, Janajati, and Others), and gender of the household head or reporting member. Data quality checks were implemented through daily supervisor review and real-time monitoring via the mWater tracking system, including field-level back-checks on a random sub-sample of completed questionnaires. To address questions of data validity, the binary difficulty measure was cross-validated by reviewing responses on the types-of-difficulty item: households that reported No difficulty but listed a difficulty type were identified and reviewed.

Triangulation of quantitative findings was sought, where possible, through the author's field observations during data collection, informal discussions with local WUSC members, and consistency checks against administrative WASH data maintained by the respective municipalities. The study was conducted in accordance with ethical research principles, including voluntary participation, written informed consent, and data confidentiality.

3.1 Data Analysis

Survey data were exported from the mWater platform and analyzed using SPSS version 23.0. Household characteristics and the two binary difficulty outcomes were first summarized using frequencies and percentages. Chi-square (χ^2) tests of independence were then used to assess the statistical association between each socio-demographic variable, place of residence, perceived poverty status, caste and ethnicity, and gender of the household head, and each of the two primary

outcome variables. All tests were two-tailed, with statistical significance set at $p < 0.05$. The types-of-difficulty item, which permitted multiple responses, was analyzed using response-level frequencies and row percentages within each socio-demographic group; because these draw on a small subset of respondents, the resulting distributions are reported as indicative patterns rather than precise prevalence estimates.

4. Results and Discussion

4.1 Water Fetching Difficulty

Before examining the patterns in detail, it is worth considering what the 8.1 percent overall rate means and why it appears low. Water fetching difficulty was operationally defined as a household-reported Yes to the question of whether any member experienced difficulty fetching water, with difficulty left to respondents' own perception. This binary self-report approach captures difficulty as experienced and acknowledged by the household, but it is likely to undercount the true burden for at least two reasons. First, households that have normalized daily multi-hour water walks, a common reality in rural Karnali, may not characterize this as difficulty since it is simply the expected routine. Second, households that have developed coping strategies, such as using a nearer but potentially unimproved source, purchasing water, or restricting water use, may report no difficulty even when functional access is inadequate. The apparent low rate is therefore better read as a floor estimate of households experiencing acute, recognized difficulty, not as an indicator that WASH access is broadly satisfactory. With this interpretive caution in mind, the 8.1 percent rate, and especially the 14.3 percent rural rate, nevertheless identifies a significant subset of households whose recognized difficulty points to urgent structural shortfalls. As shown in Table 1, the rural-urban gradient was the strongest single differentiator. Rural households reported a water fetching difficulty rate of 14.3 percent, against 2.0 percent in urban areas, a sevenfold difference that was highly significant. A comparison between households reporting difficulty and those reporting none reveals structurally distinct profiles: households with difficulty are overwhelmingly concentrated in rural areas, while households without difficulty are more likely to be urban, non-poor, and Brahmin/Chhetri, benefiting from either piped water connections or proximity to improved community sources.

Perceived poverty was also a significant differentiator. Poor households reported a water fetching difficulty rate of 15.1 percent, compared with 6.8 percent among non-poor households. This finding is consistent with wider evidence linking household wealth to WASH access in Nepal (Kafle et al., 2022) and reflects the reality that wealthier households are better positioned to invest in private connections, storage vessels, or water-purification solutions that reduce dependence on distant sources. It also mirrors a broader pattern in Nepal in which poorer households remain disadvantaged in accessing essential services, including maternal health care, where utilization gaps between rich and poor have persisted over time (Shrestha, 2022).

Caste and ethnicity emerged as a third significant axis. Dalit households reported a difficulty rate of 15.6 percent, noticeably higher than Brahmin/Chhetri (7.9 percent), Others (3.2 percent), and Janajati (0.9 percent). This pattern echoes a well-documented dynamic across Nepal and India, in which Dalit communities tend to be served last when public infrastructure is rolled out and are quietly kept from shared water points on the basis of ritual standing (WaterAid, 2022; Spears & Thorat, 2019). Gender, by contrast, produced no statistically significant association with water fetching difficulty, with male and female household members reporting nearly identical rates of 8.5 percent and 7.5 percent respectively. This finding does not negate the well-established reality that women and girls disproportionately bear the time burden of water collection; rather, it

suggests that at the level of experienced difficulty, as opposed to time spent, the differential burden may not be evident as a distinctly female phenomenon when aggregated at the household level and examined at a single point in time.

Table 1: Households Facing Difficulty in Fetching Water by Socio-demographic Characteristics

Background characteristics	Yes (%)	No (%)	Statistical Test
Place of Residence			$\chi^2(1) = 40.205; p < .001$
Rural	14.3	85.8	
Urban	2.0	98.0	
Perceived Poverty Status			$\chi^2(1) = 9.689; p = .002$
Poor	15.1	84.9	
Non-poor	6.8	93.2	
Caste & Ethnicity			$\chi^2(3) = 21.494; p < .001$
Brahmin/Chhetri	7.9	92.1	
Dalit	15.6	84.4	
Janajati	0.9	99.1	
Others*	3.2	96.8	
Gender			$\chi^2(1) = 0.257; p = .612$
Male	8.5	91.5	
Female	7.5	92.5	
Total (N = 800)	8.1	91.9	

Note: χ^2 = chi-square statistic. *Others includes Thakuri, Dasnami/Sanyasi, and Muslim households. N = 800.

4.2 Latrine-Use Difficulty

Difficulty with latrine use or accessing an open defecation site was reported by 68 households, or 8.5 percent, marginally higher than the water difficulty rate. As with water fetching, the operational definition deserves attention. Latrine-use difficulty was defined as a household-reported Yes to the question of whether any member experienced difficulty using a latrine or reaching a site for open defecation. This combined indicator captures two distinct conditions: households that have a latrine but face difficulty using it due to physical design barriers, disability, or household member characteristics, and households that rely on open defecation and face difficulty reaching a suitable site due to distance, terrain, safety, or physical limitations. These conditions are meaningfully different from one another; the former implicates facility design and inclusive sanitation, while the latter implicates the persistence of open defecation in rural areas.

As shown in Table 2, the rural-urban disparity is significant, with 12.3 percent of rural households reporting difficulty compared with 4.8 percent of urban households. This rural-urban gap is narrower than for water difficulty, which may reflect both higher rates of latrine ownership in urban areas and the fact that open defecation, where it persists, involves inherent physical demands that are less differentiated by urban-rural infrastructure quality. Importantly, perceived poverty status was not significantly associated with latrine-use difficulty. This distinction from the

water fetching pattern is analytically meaningful: it suggests that barriers to latrine and open defecation site access are less readily overcome by household economic resources than water access barriers, as physical mobility, facility design, and distance remain constraints even when a household has some financial capacity.

Caste and ethnicity again registered as a highly significant differentiator. Dalit households reported a 12.5 percent latrine-use difficulty rate, compared with 7.6 percent for Brahmin/Chhetri, 12.7 percent for Others, and 3.8 percent for Janajati. The higher rate among the Others category, which includes smaller ethnic and religious minorities, points to the WASH vulnerability of groups that sit outside the primary caste framework and may be even less visible to WASH programming. As documented in studies of open defecation behavior in rural Nepal, the constraints facing lower-caste households include not just poverty but culturally enforced reluctance to use or maintain latrines linked to pit-emptying norms and caste hierarchy, a dynamic that latrine construction campaigns have often failed to address (Kvamme & Torabi, 2019; Spears & Thorat, 2019). Gender showed no significant association with latrine-use difficulty, with male and female household members reporting nearly equal rates of 8.1 percent and 9.1 percent respectively, reinforcing the argument that aggregated household-level data may obscure the gendered dimensions of WASH experience that require individual-level or qualitative measurement to surface.

Table 2: Households Facing Difficulty in Using a Latrine or Open Defecation Site by Socio-demographic Characteristics

Background characteristics	Yes (%)	No (%)	Statistical Test
Place of Residence			$\chi^2(1) = 14.464; p < .001$
Rural	12.3	87.8	
Urban	4.8	95.3	
Perceived Poverty Status			$\chi^2(1) = 0.889; p = .345$
Poor	12.3	87.7	
Non-poor	8.0	92.0	
Caste & Ethnicity			$\chi^2(3) = 21.494; p < .001$
Brahmin/Chhetri	7.6	92.4	
Dalit	12.5	87.5	
Janajati	3.8	96.2	
Others*	12.7	87.3	
Gender			$\chi^2(1) = 0.238; p = .625$
Male	8.1	91.9	
Female	9.1	90.9	
Total (N = 800)	8.5	91.5	

Note: χ^2 = chi-square statistic. *Others includes Thakuri, Dasnami/Sanyasi, and Muslim households. N = 800.

4.3 Types of Difficulty Experienced

Among the 72 difficulty-related instances reported, given the multiple-response format, physical problems dominated, with 52.3 percent of responses citing physical impairment as the underlying barrier to water or sanitation access. This was followed by eyesight problems (26.2 percent), hearing difficulties (18.5 percent), mental impairment (12.3 percent), and communication problems (1.5 percent). As shown in Table 3, these distributions vary considerably by socio-demographic group. Among Dalit respondents, physical problems were cited by 55.6 percent and hearing problems by 25.9 percent, underscoring that disability in this community is compounded by the structural WASH disadvantages already identified. Urban respondents showed a higher proportion of eyesight-related difficulties (45.5 percent versus 19.7 percent rural), which may reflect the older age profile or different occupational exposures of urban dwellers who report WASH difficulties, while rural respondents were dominated by physical impairments (49.2 percent), consistent with the physical demands of crossing mountainous terrain to reach water sources or open defecation sites.

The prevalence of physical impairment as a barrier aligns with findings from Nepal's Tanahun district, where physical impairment and disability severity were the disability characteristics most strongly associated with water difficulty scores, even after controlling for socioeconomic status (Hembling et al., 2019). It also resonates with global evidence that structural barriers, such as the distance between a household and its water source, the absence of grab-bars in latrines, and the presence of steps or uneven terrain, are the proximate mechanisms through which disability translates into WASH difficulty (Hembling et al., 2019; Kc & Adhikari, 2021). These barriers are highly addressable through inclusive design and site-selection principles, yet they remain largely absent from WASH programming in Karnali Province.

The quantitative findings in this section are supported by the author's direct field observations during data collection, which revealed cases of households whose latrines were technically functional but inaccessible in practice. In one Bhagabatimai household, the only latrine required navigating a steep earthen bank, obstructing access for an elderly member with limited mobility. In a neighbouring household, the latrine slab design required deep bending and was unusable for a member with joint damage. These illustrative observations, while not systematic, are consistent with the patterns in Table 3 and underline the gap between infrastructure presence and functional access.

Table 3: *Types of Difficulty Faced by Household Members Across Socio-demographic Groups*

Background Characteristics	Eyesight (%)	Hearing (%)	Communicating (%)	Physical (%)	Mental (%)
Place of Residence					
Rural	19.7	18.0	0.0	49.2	13.1
Urban	45.5	9.1	9.1	36.4	0.0
Perceived Poverty Status					
Poor	35.0	5.0	0.0	50.0	10.0
Non-poor	19.2	21.2	1.9	46.2	11.5
Caste & Ethnicity					

Background Characteristics	Eyesight (%)	Hearing (%)	Communicating (%)	Physical (%)	Mental (%)
Brahmin/Chhetri	28.6	11.9	2.4	40.5	16.7
Dalit	14.8	25.9	0.0	55.6	3.7
Janajati	100.0	0.0	0.0	0.0	0.0
Others*	0.0	0.0	0.0	100.0	0.0
Gender					
Male	22.9	12.5	2.1	47.9	14.6
Female	25.0	25.0	0.0	45.8	4.2
Total (N' = 72)	26.2	18.5	1.5	52.3	12.3

Note: N' = 72 total multiple-response instances. Percentages for types of difficulty are row percentages within each socio-demographic group. *Others includes Thakuri, Dasnami/Sanyasi, and Muslim households.

4.4 Discussion

The findings contribute to a growing body of evidence that WASH difficulties in Nepal are not randomly distributed; they follow predictable social fault lines fixed into Karnali Province's landscape by decades of geographic marginalization, caste-based inequality, and poverty. Three patterns deserve particular attention. First, the rural-urban gradient in both water fetching and latrine-use difficulty is substantial and consistent. The sevenfold difference in water difficulty between Bhagabatimai and Birendranagar reflects the compound disadvantage of rural geography, including longer distances to water sources, underdeveloped piped water systems, and fewer alternative coping mechanisms. Research using NDHS 2022 data confirms that Karnali ranks last among Nepal's seven provinces in on-premises water access, with only 13.9 percent of homes having direct water access on site, nearly four times lower than Bagmati and Gandaki provinces (Adhikari & Khanal, 2024). Infrastructure expansion alone will be insufficient; service quality, reliability, and physical proximity must improve simultaneously (Bain et al., 2022).

Second, the consistent statistical significance of caste, particularly the higher difficulty rates among Dalit households, confirms what qualitative and community-level research has long suggested: caste functions as an independent and compounding determinant of WASH difficulty, not simply a proxy for poverty (Aryal et al., 2021; UNICEF Nepal, 2018; WaterAid, 2017). Even controlling for perceived poverty status, which is itself significant for water but not sanitation difficulty, Dalit households bear disproportionate burdens. As extensively documented, Dalit communities in Nepal face structural barriers to toilet construction, including land tenure insecurity, inability to afford construction, and informal exclusion from shared infrastructure by higher-caste neighbours (WaterAid, 2022). The near-absence of water fetching difficulty among Janajati households, at 0.9 percent, contrasted with 15.6 percent among Dalit households, illustrates that ethnicity is not a uniform disadvantage; local geography, indigenous water governance, and settlement patterns can create conditions of relative WASH adequacy even within a province with poor overall infrastructure (Kafle et al., 2022).

Third, the non-significance of gender merits continued engagement rather than removal. The finding does not contradict the extensive literature on women's disproportionate time burden in water collection, a pattern well documented in Karnali and across Nepal's rural belt (WHO &

UNICEF, 2023). Rather, it suggests that the type of difficulty captured in this survey, namely reported experienced difficulty at the household level, does not map neatly onto the gendered burdens captured by time-use surveys or qualitative research on dignity, safety, or mobility constraints. Women and girls who spend three to four hours daily fetching water may not report difficulty in the sense captured by a dichotomous household survey question, yet their WASH-related burden is profound. This methodological insight has implications for how WASH surveys are designed and what they can and cannot reveal about gender equity.

The disability dimension connects to an emerging global literature on inclusive WASH. Physical impairment as the dominant functional barrier is predictable in Karnali, where water sources are often distant, terrain is mountainous, and sanitation facilities, where they exist, are rarely designed for users with mobility limitations. Nepal's post-2015 guidelines on universal toilet design and the SDG 6.2 mandate to address the needs of people in vulnerable situations have created a policy architecture for inclusive WASH, but implementation in remote mountain municipalities remains minimal (Kc & Adhikari, 2021). The finding that urban respondents more commonly report eyesight-related difficulties, while rural respondents more commonly cite physical problems, suggests that disability-WASH interactions may take different forms in urban and rural settings, and that intervention design should be spatially differentiated (Hembling et al., 2019).

The study has several limitations. First, the poverty classification is self-reported and perceived rather than measured through an objective wealth index, a standard limitation in community surveys that may introduce misclassification. Second, the household-level unit of analysis complicates individual-level disparity analysis, particularly for gender and disability dimensions where intra-household variation is likely significant. Third, the multiple-response disability question uses raw frequencies from a subset of respondents, meaning the percentage distributions in Table 3 should be read as indicative patterns rather than precise prevalence estimates. Fourth, the cross-sectional design prevents causal inference. Nevertheless, the study's strength lies in its equal-sized rural-urban comparison within the same province, its systematic socio-demographic disaggregation, and its direct relevance to WASH programming in one of Nepal's most under-researched provinces.

5. Conclusion and Recommendation

This study set out to identify who experiences difficulty fetching water and accessing sanitation in Karnali Province, and the evidence points consistently to rural households, Dalit communities, and economically poor households as those carrying the heaviest burden, with physical impairment shaping the functional dimension of that burden for those who report it most acutely, while gender, at the aggregated household level, did not emerge as a significant predictor — a result that reflects the limits of household-level measurement rather than the absence of gendered inequalities; although the direction of these patterns of rural marginalization, caste-based exclusion, and poverty as WASH determinants is well theorized, the study's contribution is disaggregated, municipality-level empirical evidence from a province where such evidence is scarce, and its juxtaposition of the ODF declaration and SDG 6 ambitions exposes a persistent gap between coverage-based metrics and functional access that aggregate statistics tend to obscure; the policy implications follow directly, in that investment in WASH infrastructure in Karnali must be paired with targeted attention to Dalit settlements, where construction, access, and behavior-change barriers are compounded by caste discrimination and land insecurity, poverty-sensitive subsidies for household water connections and latrine upgrades remain essential in rural areas

where the poverty–difficulty association is significant, a minimum standard of inclusive design — grab-bars, step-free approaches, and careful siting to reduce walking distance for persons with reduced mobility — should apply to all publicly funded water points and sanitation facilities, and gender-disaggregated data collected through time-use and individual-level approaches, rather than household-level binary questions, should be built into the monitoring frameworks of WASH programs in Karnali Province so that women’s and girls’ differential burdens become visible to planners and funders.

6. Acknowledgements

The author gratefully acknowledges the households of Bhagabatimai Rural Municipality and Birendranagar Municipality for their participation, the local Water Users and Sanitation Committees for facilitating access to the sampling frame, and the field enumerators for their dedicated data collection. The author thanks Prof. Govinda Subedi and Dr. Bidhya Shrestha for their initial review and comments on the manuscript.

References

1. Adhikari, B., & Khanal, D. R. (2024). Provincial disparities in household drinking water access time in Nepal: Evidence from NDHS 2022. *Humanities and Social Sciences Journal*, 16(1–2), 113–124. <https://nepjol.info/index.php/hssj/article/download/87408/66273/250815>
2. Aryal, S., Regmi, P. R., & Paudel, P. (2021). Caste exclusion and health discrimination in South Asia: A systematic review. *Journal of Health, Population and Nutrition*, 40(1), 56–68. <https://doi.org/10.1186/s41043-021-00275-2>
3. Bain, R., Luyendijk, R., & Bartram, J. (2022). Water, sanitation, and hygiene of Nepal: Status, challenges, and opportunities. *ACS ES&T Water*, 2(11), 1981–1992. <https://doi.org/10.1021/acsestwater.2c00303>
4. Baral, S., Sharma, P., & Bhandari, P. (2024). Multi-level factors associated with utilization of water, sanitation and hygiene services by mothers in Nepal. *PLOS ONE*, 19(3), Article e0301162. <https://doi.org/10.1371/journal.pone.0301162>
5. Enpho. (2024). *Nepal progress towards achieving 2030 sanitation goal*. Environment and Public Health Organization. <https://enpho.org/featured-post/nepal-progress-towards-achieving-2030-sanitation-goal/>
6. Hembling, J., El-Sayed, H., & Brault, M. (2019). Are current approaches for measuring access to clean water and sanitation inclusive of people with disabilities? Comparison of individual- and household-level access between people with and without disabilities in the Tanahun district of Nepal. *PLOS ONE*, 14(10), Article e0223557. <https://doi.org/10.1371/journal.pone.0223557>
7. Kafle, S., Bhattarai, S., & Thapa, P. (2022). Prevalence and correlates of water, sanitation, and hygiene (WASH) and spatial distribution of unimproved WASH in Nepal. *International Journal of Environmental Research and Public Health*, 19(6), Article 3361. <https://doi.org/10.3390/ijerph19063361>
8. Kc, S., & Adhikari, R. (2021). Are Nepal’s water, sanitation and hygiene and menstrual hygiene policies and supporting documents inclusive of disability? A policy analysis. *International Journal for Equity in Health*, 20, Article 155. <https://doi.org/10.1186/s12939-021-01477-0>

9. Kouassi, H. A. A., Andrianisa, H. A., Traoré, M. B., Sossou, S. K., Nguematio, R. M., Ymélé, S. S. S., & Ahossouhe, M. S. (2023). Review of the slippage factors from open defecation-free (ODF) status towards open defecation (OD) after the Community-Led Total Sanitation (CLTS) approach implementation. *International Journal of Hygiene and Environmental Health*, 250, Article 114160. <https://doi.org/10.1016/j.ijheh.2023.114160>
10. Kvamme, E., & Torabi, F. (2019). What motivates open defecation? A qualitative study from a rural setting in Nepal. *BMC Public Health*, 19, Article 779. <https://doi.org/10.1186/s12889-019-7069-4>
11. Shrestha, B. (2022). A decade of inequality between the rich and the poor in utilizing antenatal care services in Nepal (2006–2016). *International Research Journal of MMC (IRJMMC)*, 3(1). <https://doi.org/10.3126/irjmmc.v3i1.44183>
12. Spears, D., & Thorat, A. (2019). The puzzle of open defecation in rural India: Evidence from a novel measure of caste attitudes in a nationally representative survey. *American Journal of Agricultural Economics*, 101(3), 712–731. <https://doi.org/10.1093/ajae/aay068>
13. UNICEF Nepal. (2018). *Understanding social norms for sanitation and hygiene in Nepal*. UNICEF Nepal.
14. UNICEF Nepal. (2022). *Water and sanitation (WASH): Country overview*. <https://www.unicef.org/nepal/water-and-sanitation-wash>
15. UNSD. (2024). *The Sustainable Development Goals report 2024 — Goal 6: Clean water and sanitation*. United Nations Statistics Division. <https://unstats.un.org/sdgs/report/2024/Goal-06/>
16. UN-Water. (2024). *SDG 6 progress reports: Summary brief on mid-term status of SDG 6 global indicators and acceleration needs*. UN-Water. <https://www.unwater.org/publications/sdg-6-progress-reports>
17. WaterAid. (2017). *Out of order: The state of the world's toilets*. WaterAid.
18. WaterAid. (2022). *Reaching the unreached: Ensuring Dalit communities in Nepal have decent toilets*. WASH Matters. <https://washmatters.wateraid.org/blog/reaching-the-unreached-ensuring-dalit-communities-in-nepal-have-decent-toilets>
19. World Health Organization, & UNICEF. (2023). *Progress on household drinking water, sanitation and hygiene 2000–2022: Special focus on gender*. WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.