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Rural Living in Nepal: Housing, Water & Waste in Paanchkhal

Labanya Devi Ghimire*
Associate Professor
Department of Humanities, Baneshwor Multiple Campus, Kathmandu, Nepal.
labanyaghimire@gmail.com
https://orcid.org/0009-0002-7584-784X

Shamila Lamichhane
Junior Actuarial Analyst
Badri Management Consultancy, New Delhi, India.
lamichhaneshamila@gmail.com
https://orcid.org/0009-0002-1647-8351

Samir Lamichhane
1st Year Student, B.E (Electronics).
TU Institute of Engineering, Pulchowk Campus, Nepal.
sammirlamichhane@gmail.com
https://orcid.org/0009-0000-4798-1190

Corresponding Author*
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Abstract

Background: Poor housing conditions, waste disposal, sanitation and water supply system of community is directly associated with the adverse health conditions of inhabitants. Their improvement is fundamental to improving health and raising living standards of the people. Studies from developing countries like Nepal have suggested for the need of improving healthy housing conditions to enable the people to lead a healthy and productive life. Similarly, studies have also suggested that proper disposal of household waste and the provision of safe drinking water to the communities remains as the major challenge to the national and local governments of developing countries like Nepal.

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Objective: The objective of this study was to assess the housing conditions and provisions for household waste disposal, drinking water source, storage and treatment in the selected rural communities of Paanchkhal Municipality, Kavrepalanchowk district, Nepal.
Methods: A descriptive cross-sectional study was conducted using a self-administered semi-structured questionnaire collecting primary data from 124 household heads of the study community. Descriptive statistics like frequency, percentage, mean and standard deviation were used in data analysis.
Results: The mean household size was (4.84 SD ±1.99). Slightly more than half (53.23%) of houses were of *Pakka* type with little more than one-third (37.90%) having separate kitchen inside or outside house and little over half (55.64%) of households reported of using firewood as the main source of fuel for cooking. All except two study households (98.38%) had latrine in house or premise and the large majority of which were improved ones (86.88%). Composting (37.09) and burning (27.42%) were the two most commonly used methods of household waste disposal. River was the common source of water for a little more than one-third (37.09%) of households with large majority using plastic container for storage. Three-fourth of households (75%) reported of practicing drinking water purification with filtering being the most commonly reported method used (37.09%). Nearly three-fourth (71.77%) of household stored water in plastic container and all but three study households (98.57%) reported of covering of water stored in house.
Conclusion: Nearly half of study households were of *Kachcha* type with about one-third having separate kitchen inside house. Majority households resorted to firewood for cooking. Large majority of households had improved latrines. Composting was the most commonly used waste disposal method. Over one-third of households relied on river as the main water source and three-fourth practiced drinking water purification.

Keywords: Rural households, Housing type, Latrine availability, Waste disposal practice, Household water source, Water purification.

Introduction

Poor housing conditions, waste disposal, water supply, and sanitation of community is directly associated with the adverse health conditions of its inhabitants (Acharya et al., 2018; Dobe et al., 2011; Ghimire et al., 2013; Zuber et al., 2023). Housing denotes the physical structures that provide shelter, social services with a hygienic neighborhood for fulfilling the essential needs of the people. Housing conditions such as type of housing, ventilation, overcrowding of occupants, use of biofuel and indoor tobacco smoking as well as the type of surroundings greatly affect one's health and well-being (Acharya et al., 2018; Zuber et al., 2023). Poor housing conditions are particularly reported to be associated with health problems such as acute respiratory infections, asthma, tuberculosis, cardiovascular diseases and lung cancer. Studies from developing countries like India and Nepal have highlighted the need for

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improving healthy housing conditions to enable the people to lead a healthy and productive life (Acharya et al., 2018; Zuber et al., 2023).

Likewise, waste is the by-product of natural resources people use. Inappropriate disposal of solid waste threatens human health and environment (Ghimire et al., 2013; Rani et al., 2022). Improper solid waste management is the source of environmental pollution in developing countries including Nepal. It is also a matter of big public health concern as waste materials provide food and shelters to disease-carrying vectors and rodents such as flies, mosquitoes and rats (Dobe et al., 2011; Ghimire et al., 2013; Rani et al., 2022; Eshete et al., 2023). So, proper disposal of waste generated from households is important for reducing the risk of environmental and public health problems (Rani et al., 2022; Eshete et al., 2023; Aryal et al., 2024). Studies have shown low levels of waste segregation and management among households in developing countries including Nepal, and solid waste remains as a major challenge for local governments and other stakeholders in these settings (Aryal et al., 2024; GoN., 2022).

Similarly, water is essential for survival of all life forms. Safe and readily available water is important for public health, whether it is used for drinking, domestic use, food production or recreational purposes (Pradhan et al., 2018). Although people may have access to piped water at home or community, water may still be contaminated by defects in distribution system or due to improper storage and handling (Pradhan et al., 2018). In addition, many people in developing countries including Nepal make use of other common sources such as wells, bore holes, ponds and streams but they are not well protected from parasites, micro-organisms and harmful chemical substances (Ghimire et al., 2013; Pradhan et al., 2018). Hence, promoting household water treatment and safe storage pay an important role in preventing waterborne diseases (GoN., 2022; Pradhan et al., 2018; Adam et al., 2021). Moreover, the provision of safe water supply and improved sanitation to the rural community has been a major challenge to the national and local governments more particularly in developing countries like Nepal (Gautam et al., 2020). Thus, there is a need for improving the handling and storage practices of drinking water at household level, and practices of water treatment for reducing public health risks related to water borne diseases (Adam et al., 2021; Gautam et al., 2020).

Thus, an integrated approach involving multiple agencies becomes necessary in minimizing the prevalent problems of housing conditions, waste management, water supply and environmental cleanliness. Their improvement is fundamental to improving health and socio-economic development as well as raising living standards of people (Pradhan et al., 2018; Gautam et al., 2020; Mock et al., 2017). Under such premise, a study was necessitated to be carried out on conditions related to housing conditions, waste disposal, water supply and sanitation in the study area. This study was carried out as a part of the field works for bachelor level Rural Development students of Baneshwor Multiple Campus (BMC)-Kathmandu and was led by the researcher who is a faculty member teaching rural development study at BMC.

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Research Objective

The objective of this study was to assess the housing conditions and provisions for household waste disposal, drinking water source, storage and treatment in the selected rural communities of Ward 9 and 11 of Paanchkhal Municipality, Kavrepalanchowk District, Nepal.

Literature Review

Review of relevant literatures from different researchers and authors regarding conditions related to housing, household waste management, water supply and sanitation in rural communities have been presented below in the order of global, regional and national context. The search engine 'Google Scholar' has been used for this. The review is limited to the literatures published in English language.

A 2023 review article on housing conditions and health outcomes in India and abroad between 1999 and 2020 highlighted that there is a need to improve housing conditions in India to enable the people to lead a healthy and productive life (Zuber M et al., 2023)

A cross sectional study conducted in 2016 in eastern Nepal among 525 participants with the objective of assessing the housing conditions, sanitation coverage and hygiene practices among rural community showed the is need of awareness programs to be focused on improvement in housing and sanitation conditions in the community (Acharya A et al., 2018).

A community-based cross-sectional study conducted in 2023 among 390 households' to assess the knowledge, attitudes and practices on household solid waste management and associated factors in Ethiopia revealed that most households had correct knowledge and positive attitudes towards solid waste management but poor practice was observed in the study area. The study indicated that lack of experience in sorting solid waste, ways of removal, knowledge about reduce, reuse and recycle, absence of adequate solid waste landfills, and lack of door-to door waste collections services were identified as the major contributing factors for the poor practice (Eshete H et al., 2023).

A study conducted in India in 2022 among 60 respondents using exploratory research design examining respondents' knowledge on household solid waste management and existing waste disposal practices over past one year showed that majority of the respondents complained about the ill effects of improper disposal of solid waste, >80% collectively said that it causes infectious diseases, unpleasant odour and unclean surroundings. Study findings also revealed that that even though respondents have knowledge on waste management but their practice towards disposal of dry waste is poor (Rani VU et al., 2022).

A cross-sectional study conducted in 2022 in Nepal using cluster sampling technique covering 230 households with the aim to investigate waste management techniques, infrastructure,

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resources, policies, and challenges specific to a municipal area indicated that 42.14% of solid waste was collected through door-to door collection services, 5.87% was mismanaged in open public places, 11.21% was used as compost manure, and the rest was discarded on riverbanks, dug up, and burned. Solid waste generation was found to be at 197.604 g/capita/day (GoN., 2022).

A community-based cross-sectional study conducted in 2018 in Mogadisu Somalia with the objective of assessing the household water treatment and storage practices among 386 households showed that majority of residents had good practice of water storage and most common method of water treatment was chlorination (91%) followed by boiling (15.8%), filtration (11.7%) and solar disinfection (5.7%) (Adam FH et Al., 2021).

A cross-sectional study conducted in Oct-Nov 2017 in India that surveyed a total of 250 households using WHO toolkit for monitoring and evaluating household water treatment and safe storage program. This study revealed that majority of households had piped connection (32%) followed by public standpipe (31.2%), hand pump (27.6%) as source of water. 60% had knowledge about boiling followed by chlorination 27%, membrane filters 22.4%. Majority (63%) of the participants had thought boiling as the best method for disinfection of drinking water (Pradhan SK et al., 2018).

A review study conducted in 2019 in Nepal with the objective to describe the situation of water supply, sanitation and hygiene (WASH) in Nepal by analyzing secondary data and information obtained from published and unpublished literature revealed that about 97% of the total population had access to basic sanitation facilities and 87% had access to basic water supply facility. However, one-fourth of the existing toilet facility across the country were poorly constructed requiring upgrade and only 25 percent of water supply systems were well functioning and 68 percent can supply water to water taps throughout year (Budhathoki CB., 2019).

Research Methods

A descriptive cross-sectional study was carried out among 124 household heads of selected rural community of Ward 9 and 11 of Paanchkhal Municipality, Kavrepalanchowk district, Nepal. Response was taken from a member of the same household aged 18 years or above in the case absence or inability of household head to participate in the study. The study site was selected based on researcher's convenience. Convenient sampling method was employed to collect data from 124 households upon receiving the respondents' consent. Face to face interview along with observation method was employed to collect primary data using a semi-structured questionnaire developed in Nepali language. The questionnaire was adapted from locally used study tools and published literatures and finalized upon taking inputs from expert faculty members. The questionnaire contained items regarding the general conditions related

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to housing, waste disposal, water supply, treatment and storage, and sanitation of the study households. Students were oriented about the research methodology and questionnaire prior to the field work.

Approval for the study was obtained from both the Research Management Committee (RMC) of Baneshwor Multiple Campus (BMC) as well as from the concerned municipal authority of study area. Informed consent was obtained from all respondents participated in the study. Confidentiality and anonymity of the respondents was maintained. Data from completed questionnaires were entered into KoboToolbox (https://kf.kobotoolbox.org/) and then transferred to Microsoft Word. Descriptive statistics like frequency, percentage, mean and standard deviation were used in data analysis.

Results

Out of 127 households surveyed, data from 124 completed surveys were included in the analysis. Descriptive statistics were generated to show the household size and sex of the respondents as well as conditions related to housing, sanitation, waste disposal, drinking water source, storage and treatment of the surveyed households.

Household size and sex of the respondents:

The mean household size was 4.84 persons per household (SD ± 1.99) with household size ranging from 2 to 9 persons per household. Out of 124 respondents, 71 were males (57.2%) and 53 (42.8%) were females, (Table 1).

Table 1: Household size and sex of the respondents of rural communities of Paanchkhal Municipality, Kavrepalanchowk, Nepal, 2025 (n=124)

Variables	N	%
Household Size		
Mean 4.84 SD ±1.99		
Sex		
M	71	57.2
F	53	42.8

Housing conditions of rural communities of Paanchkhal Municipality:

Out of 124 surveyed households, 66 (53.23%) were *Pakka* and 58 (46.77%) were *Kachha* type. Households with separate kitchen inside and outside house were 47 (37.90%) each respectively, 69 (55.64%) households generally used firewood to cook food, 83 (66.93%) households had outlet for smoke in kitchen. Likewise, 122 out of 124 households had latrine facility in house or its premise, and 106 out of 122 households reported of having improved ones, (Table 2).

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Table 2: Housing conditions of rural communities of Paanchkhal Municipality, Kavrepalanchowk, Nepal, 2025 (n=124)

Variables	N	%
Type of House		
Pakka	66	53.23
Kachha	58	46.77
Place to usually cook food		
Separate kitchen inside home	47	37.90
Separate kitchen outside home	47	37.90
Cooking inside home with no separate kitchen	28	22.58
Cooking outside home	2	1.66
Type of fuel generally used for cooking		
Firewood	69	55.64
LP Gas (Gas Cylinder)	49	39.52
Others (Coal /Electricity)	6	4.84
Outlet for smoke in Kitchen		
Present	83	66.93
Absent	41	33.06
Household availability of latrine		
Yes	122	98.39
No	2	1.61
Types of latrine (n=122)		
Improved	106	85.49
Unimproved	18	14.51

Mostly used solid waste disposal method in rural households of Paanchkhal Municipality: Out of 124 surveyed households, composting was reported as the mostly used method of solid waste disposal by 46 households (37.09%) followed by burning by 34 households (27.42%), burying in garbage pit by 29 households (23.39%), throwing in river by 10 households (8.06%) and throwing anywhere in public area by 5 households (4.03%), (Table 3).

Table 3: Mostly used methods of solid waste disposal in rural households of Paanchkhal Municipality, Kavrepalanchowk, Nepal, 2025 (n=124)

Variables	N	%
Composting	46	37.09
Burning	34	27.42
Burying in garbage pit	29	23.39
Throwing in river	10	8.06
Throwing anywhere in public area	5	4.03

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Household drinking water source, storage and treatment methods in rural communities of Paanchkhal Municipality:

Out of 124 surveyed households, river was the main source of drinking water for 46 households (37.09%), municipal water supply for 37 (29.84%) households, Spring for 19 (15.32%) households, tube well for 15 (12.10%) households, tanker supply for 4 (3.22%) households and others for 3 (2.42%) households. 89 (71.77%) of households used plastic bucket or jar to store drinking water in house and 121 (97.58%) of households reported to cover the water stored in house. Likewise, water purification was done by 93 (75.00%) households, and among the households practicing water purification before drinking, the most common method followed was filtering by 46 households (37.09%), (Table 4).

Table 4: Household drinking water source, storage and purification methods in rural communities of Paanchkhal Municipality, Kavrepalanchowk, Nepal, 2025 (n=124)

Variables	N	%
Household sources of water		
River	46	37.09
Municipal water supply	37	29.84
Spring	19	15.32
Tube well	15	12.10
Supplied by water tanker	4	3.22
Others	3	2.42
Container for storing water in house		
Plastic bucket/jar	89	71.77
Steel utensil	26	20.97
Earthen pot	6	4.84
Others	3	2.42
Covering of stored water in house		
Yes	121	97.58
No	3	2.42
Households water treatment (purification)		
Yes	93	75.00
No	31	25.00
Household water purification methods (N=93)		
Filtering	42	45.16
Boiling	25	26.88
Cloth filtration	9	9.68
Solar disinfection	8	8.60
Sedimentation	7	7.53
Others	2	2.15

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Discussion

The mean household size was 4.84 persons per household which was higher than the national average of 4.37 persons per household (NSO., 2023). Regarding the type of housing, a little above half of the houses (53.23%) were of *Pakka* type. This finding was similar to that shown by a study done in western Nepal (54.9%) and much higher than that shown by another study done in eastern Nepal (33.9%) but lower than that shown by a studies done in India (59.9%) (Acharya et al., 2018; Ghimire et al., 2013; Nagaraj et al., 2020). These differences may have been due to differences in socio-economic and geographic conditions of the study populations.

This study showed that 75.8% of households had separate kitchen inside home or outside home combined. This finding was higher (69.52%) than that shown by another study done in Nepal but much lower (95.2%) than that shown by a study done in India (Acharya et al., 2018; Nagaraj et al., 2020). Regarding the type of fuel generally used for cooking, 55.64% of households in this study reported of using firewood which is higher than the national average as shown by the 2021 National Census (51.01%) and also much higher than that shown by a study done in Ghana (33.3%) (NSO., 2023; Abokyi et al., 2024). Likewise, liquefied petroleum gas (LPG) was the generally used fuel for 39.52% of households in this study which was lower than the national average as shown by the 2021 National Census (44.28%) but higher than that shown by a study done in Ghana (24.5%) (NSO., 2023; Abokyi et al., 2024). Outlet for smoke in kitchen was present in 66.93% of households in this study which was higher than that shown by two studies done in Nepal (65.8% and 48.38% respectively) and a study done in India (47.6%) (Acharya et al., 2018; Ghimire et al., 2013; Nagaraj et al., 2020). These differences may have been due to differences in study settings and socio-economic conditions of study populations.

Regarding the availability of sanitation (latrine) facility in house or its premise, very high proportion of households (98.39%) in this study reported of possessing such facility. This finding was much higher than that shown by studies done in Nepal (92%) and India (87.5%) respectively (Acharya et al., 2018; Kant et al., 2020). Similarly, 85.49% of households reported of having improved latrine facility which was again much higher than that shown by another study done in Nepal (60.54%) and closer to a study done in India (84.8%) (Acharya et al., 2018; Kant et al., 2020). These variations may have occurred due to differences in socio-economic conditions and behavioral differences among study populations.

On the mostly used method of solid waste disposal, 37.09% of households in this study reported of using composting method. This finding was much higher than that shown by other studies done in Nepal (11.21%) as well as that done in Ethiopia (11.0%) (Aryal et al., 2024; Eshete et al., 2023). 27.42% of households in this study reported of burning household waste materials, which was lower than that shown by studies done in Nepal (35.12%) and Ethiopia (42%) respectively (Aryal et al., 2024; Eshete et al., 2023). Likewise, 23.39% of households in this

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study reported of burying solid waste in garbage pit. This finding was lower than that shown by a study done in Nepal (35.12%) but much higher than that shown by a study done in Ethiopia (12.6%) (Aryal et al., 2024; Eshete et al., 2023). 8.06% of households in this study reported of throwing waste in river, which was lower than that shown by another study done in Nepal (12.85%) (Aryal et al., 2024). Similarly, 4.03% of households in this study reported of throwing waste anywhere in pubic area. This finding was close to that shown by another study done in Nepal (5.8%) while it was much lower than that shown by a study done in Ethiopia (21.5%) (Aryal et al., 2024; Eshete et al., 2023). Socio-economic conditions and cultural practices among study populations may have resulted to these differences.

Regarding the commonly accessed sources of drinking water, majority of households (37.09%) in this study relied on river water. This finding was hugely higher than the national average of 0.3% and also than that shown by another study done in Nepal (4.4%) (NSO., 2024; Ghimire et al., 2013). Likewise, 29.84% of households in this study relied on municipal water supply which was much lower than that shown another study done in Nepal (77.6%), slightly lower than that shown by a study done in India (32%) but higher than that shown by a study done in Ethiopia (24.82%) (Ghimire et al., 2013; Pradhan et al., 2018; Asefa et al., 2023). 15.32% of households in this study relied on spring which was slightly higher than that shown by a study in Ethiopia (14.23%) (Asefa et al., 2023). Likewise, 12.10% of households in this study relied on tube well which was much lower than that shown by studies done in India (27.6%) and Ethiopia (37.96%) (Pradhan et al., 2018; Asefa et al., 2023). These variations may have occurred due to geographical and socio-economic variations among study population.

Regarding the commonly used container for storing water in house, large majority of households (71.77%) used plastic bucket or jar, which was slightly lower than that shown by another study done in Nepal (80.76%) and much lower than that shown by a study done in India (18.4%) but slightly higher than that shown by a study done in Somalia (75.4%) (Acharya et al., 2018; Pradhan et al 2018; Adam et al., 2021). 20.97% of households in this study used steel utensils for storing water, which was lower than that shown by a study done in India (36.4%) (Pradhan et al 2018). Likewise, 4.84% of households in this study used earthen pot to store water, which was found to be similar as shown by studies done in Nepal (4.57%) and India (5.2%) respectively but much lower than that shown by a study done in Somalia (12.4%) (Acharya et al., 2018; Pradhan et al 2018; Adam et al., 2021). 97.58% of households in this study reported of covering drinking water stored in house, which was much higher than that shown by studies done in Nepal (72.38%) and Somalia (59.6%) respectively (Acharya et al., 2018; Adam et al., 2021).

Regarding the methods of household drinking water purification, 75% of households in this study reported of purifying water before drinking. This finding was much higher than that shown by a study done in Ethiopia (43.9%) (Admasie et al., 2022). On commonly adopted

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method of water purification, 45.16% of households reported of using filtering methods, which was much higher than that shown by studies done in India (9.6%) and Ethiopia respectively (5.1%) (Pradhan et al., 2018; Admasie et al., 2022). 26.88% of households in this study reported of boiling for water purification, which was much lower than that shown by a study done in India (60.8%) but closer to that shown by a study done in Ethiopia (24.9%) (Pradhan et al., 2018; Asefa et al., 2023). 9.68% of households in this study used cloth filtration, which was much higher than that shown by a study done in India (4%) but much lower than that shown by a study done in Ethiopia (19.1%) (Pradhan et al., 2018; Asefa et al., 2023). Similarly, 7.53% of households in this study reported of resorting to sedimentation as method of water purification. This findings was closer to the findings shown by studies done in India (7.2%) and Ethiopia (6.12%) respectively (Pradhan et al., 2018; Asefa et al., 2023). Such differences may have occurred due to socio-economic and behavioral variations among study populations.

Limitations

Several limitations must be considered for taking inferences from the findings of this study as it is a cross-sectional study that used a small convenient sample. Moreover, the descriptive cross-sectional design of this study limits to draw inferences for causal relationship among variables of this study.

Conclusion and Recommendation

This study showed that only a little more than half of households were of *Pakka* type, two-fifth of households had separate kitchen inside home, more than half of the households used fire wood as common source of cooking, and two-third of households had outlet for smoke in kitchen. Only a small portion of households didn't had latrine with a large majority having improved type, and little more than one third households reported of composting of household solid waste.

Likewise, more than one third of households used river as the main source for drinking water and nearly three-fourth used plastic container to store water in house. A large majority of households covered the stored water, and filtering was the commonly used method of water purification.

Study findings were suggestive of the need for improving housing conditions and waste disposal practices as well as increasing household access to improved water supply and improving water storage and purification practices for enhanced health and development prospects of the study community.

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Author Contribution

Principal author Labanya Devi Ghimire (LG): concept, literature review, methodology, study tool, data collection, processing, analysis, and writing manuscript.
Co-author Shamila Lamichhane (ShL): literature review, methodology, data entry, processing, analysis, and manuscript review.
Co-author Samir Lamichhane (SL): literature review, data entry, processing, analysis, and manuscript development.

Conflict of interests: None.

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