

HOUSEHOLD ACCESS TO CLEAN DRINKING WATER, SANITATION AND HYGIENE AMONG THE RESIDENTS OF TALUKA CHACHRO: A CROSS-SECTIONAL STUDY

Dr Mumtaz Ali Rahimoon¹, Dr Gulzar Usman², Dr Hafiza Amina Hassan³

¹MSPH Postgraduate Student, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan

²Associate Professor, Department of Community Medicine, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan

³Consultant Gynaecologist and Obstetrician, Al -Habib Medical Centre, Umerkot, Pakistan

Abstract

Background: Access to safe drinking water, adequate sanitation, and proper hygiene (WASH) services are essential for preventing disease and improving quality of life. However, rural and water-scarce regions of Pakistan continue to experience significant WASH-related challenges due to limited infrastructure, environmental constraints, and socioeconomic vulnerabilities

Objectives: This study aimed to assess household access to clean drinking water, sanitation facilities, and hygiene practices among residents of Taluka Chachro. It specifically evaluated drinking water sources and availability, sanitation conditions, hygiene behaviors, and household waste disposal practices.

Methods: A descriptive cross-sectional study was conducted among 139 households in Taluka Chachro over six months from October 2025 to April 2026. Households were selected through simple random sampling. Data were collected using a structured, pre-tested questionnaire covering demographic characteristics, water access and quality, sanitation facilities, hygiene practices, and waste management. Data were analyzed using SPSS version 29. Frequencies, percentages, descriptive statistics, and Chi-square tests were applied, with statistical significance considered at $p < 0.05$.

Results: The majority of households (63%) relied on dug wells or hand pumps as their primary drinking water source, while only 11% had piped water access. Intermittent water availability was reported by 44% of households, and 61% perceived their water as slightly turbid or murky. Forty percent of households did not use any water treatment method. Sanitation conditions were poor, with 36% practicing open defecation, while only 26% had flush toilets with septic tanks. Regarding hygiene practices, 56% used soap and water for handwashing, whereas only 53% consistently washed hands before meals and after defecation. Waste disposal practices were inadequate, with 41% of households disposing of waste outside their homes.

Conclusion: WASH conditions in Taluka Chachro remain inadequate, with major gaps in safe water access, sanitation infrastructure, and hygiene behaviors. Integrated community-based interventions, improved WASH infrastructure, and hygiene promotion programs are required to reduce health risks and improve living conditions.

Keywords: WASH; Drinking Water; Sanitation; Hygiene Practices; Water Scarcity; Taluka Chachro; Pakistan.

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Introduction

Access to safe drinking water, adequate sanitation, and appropriate hygiene (WASH) services represents a fundamental determinant of public health and human development. Safe water is essential not only for survival but also for disease prevention, personal dignity, food security, and socioeconomic progress. The World Health Organization (WHO) recognizes safe water availability and effective management as key components in reducing preventable diseases and improving population health outcomes.¹ Despite

global efforts toward universal WASH coverage, millions of people continue to experience inadequate access due to poverty, environmental challenges, weak infrastructure, and unequal resource distribution.²

Water scarcity and unsafe water supplies remain major public health concerns, particularly in low- and middle-income countries. Communities dependent on unreliable or contaminated water sources face increased risks of diarrheal diseases, malnutrition, and other infectious conditions.² Pakistan is among the

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countries experiencing severe water-related challenges, where increasing population pressure, climate variability, groundwater depletion, and inadequate water management systems have intensified the problem.³ Contaminated water sources contribute substantially to the national disease burden, with unsafe water and poor sanitation associated with a considerable proportion of preventable illnesses and deaths.⁴

The burden of inadequate WASH services is particularly severe in rural and arid regions where communities often rely on traditional and vulnerable water sources. Tharparkar district of Sindh, including Taluka Chachro, represents one such geographically challenging area characterized by desert conditions, recurrent droughts, limited rainfall, and dependence on groundwater resources. A baseline survey conducted in the Thar Desert reported that groundwater was the primary drinking water source for approximately 91% of households, while only a small proportion depended on piped water supplies. Limited water availability and long distances for water collection disproportionately affect women and children, reducing educational opportunities and increasing household burdens.⁵

Sanitation deficiencies further increase public health risks by facilitating environmental contamination and disease transmission. Lack of improved sanitation facilities, open defecation practices, and inadequate waste disposal contribute to contamination of soil and water sources, increasing exposure to pathogens responsible for diarrheal diseases and other infections. Improved sanitation infrastructure, combined with community awareness and behavioral interventions, is therefore essential for reducing preventable health risks and improving living conditions.⁶

Hygiene practices are closely interconnected with water availability and sanitation conditions. Activities such as handwashing with soap, safe food handling, and personal hygiene require consistent access to sufficient quantities of clean water. However, in water-scarce communities, households often prioritize drinking and cooking needs over hygiene-related activities, resulting in reduced handwashing frequency and compromised health protection.⁶ Strengthening hygiene awareness alongside improvements in water and sanitation infrastructure is necessary for sustainable disease prevention.

Although several initiatives have been implemented to improve WASH conditions in Pakistan, significant inequalities remain, particularly in remote rural communities. Local evidence regarding household-level water access, sanitation facilities, and hygiene behaviors is essential for identifying specific gaps and developing targeted interventions. Taluka Chachro represents an underserved area where environmental constraints and socioeconomic vulnerabilities may

significantly influence household WASH practices.

Therefore, this cross-sectional study was conducted to assess the current status of household access to clean drinking water, sanitation facilities, and hygiene practices among residents of Taluka Chachro. The findings aim to provide evidence regarding existing WASH challenges and support policymakers, healthcare professionals, and stakeholders in designing context-specific strategies to improve community health and well-being.

The objective of this study was to assess the current status of household access to clean drinking water, sanitation facilities, and hygiene practices among the residents of Taluka Chachro. Specifically, the study aimed to evaluate the availability and accessibility of drinking water sources used by households, examine the types of sanitation facilities and related practices adopted by the community, and assess household-level hygiene behaviors, including handwashing practices, availability and use of hygiene materials, and waste disposal methods. The study further intended to identify existing gaps and challenges in WASH conditions to provide evidence for developing targeted public health interventions for improving the health and well-being of the local population.

Materials and Methods

A descriptive cross-sectional study was conducted among households residing in Taluka Chachro, Sindh, Pakistan, over a period of six months from 6th October 2025 to 5th April 2026. A total of 139 households were selected using a simple random sampling technique. Households residing in Taluka Chachro for at least six months, with an adult participant willing to provide informed consent, were included in the study. Data were collected through a structured, pre-tested questionnaire covering demographic characteristics, household drinking water sources, water availability and quality, sanitation facilities, hygiene practices, and waste disposal methods.

Collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 29. Descriptive statistics, including frequencies and percentages for categorical variables and mean with standard deviation for continuous variables, were calculated. The Chi-square test was applied to determine associations between categorical variables, with statistical significance considered at a p-value <0.05. Ethical approval was obtained from the Research Ethics Committee of Liaquat University of Medical and Health Sciences, and informed consent was obtained from all participants before data collection.

Results

A total of 139 households were included in the study. The majority of respondents belonged to the economically active age groups, with low educational

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attainment and predominantly agriculture-based occupations. WASH-related findings explained considerable challenges in water availability, sanitation infrastructure, and household hygiene practices.

Table 1. Demographic Characteristics of Respondents (n = 139)

Variables	Frequency (n)	Percentage (%)
Age group (years)		
18–25	22	16
26–35	38	27
36–45	34	24
46–55	25	18
≥56	20	15
Gender		
Male	79	57
Female	60	43
Education level		
No formal education	49	35
Primary (1–5 years)	32	23
Middle (6–8 years)	25	18
Secondary (9–10 years)	18	13
Intermediate and above	15	11
Occupation		
Farmer/Agriculture	61	44
Daily wage laborer	33	24
Government/Private job	12	9
Business/Shopkeeping	10	7
Housewife	18	13
Unemployed/Other	5	3
Monthly household income (PKR)		
<20,000	46	33
20,000–30,000	38	27
31,000–40,000	26	19

41,000–50,000	17	12
>50,000	12	9

The demographic profile showed that most respondents were aged 26–35 years (27%), followed by 36–45 years (24%). More than one-third of participants had no formal education (35%), and agriculture was the predominant occupation (44%), reflecting the rural socioeconomic characteristics of Taluka Chachro.

Table 2. Household Drinking Water and Sanitation Characteristics (n = 139)

Study Variable	Frequency (n)	Percentage (%)
Primary drinking water source		
Dug well/Hand pump	88	63
Piped water	15	11
Other sources	36	26
Frequency of water availability		
Continuous (daily)	38	27
Intermittent (every 2–3 days)	61	44
Occasional (weekly or less)	40	29
Perceived water quality		
Clear and odorless	34	24
Slightly turbid	47	34
Murky/colored	38	27
Foul odor/unpleasant taste	20	15
Household water treatment		
Boiling	41	29
Filtering	33	24
Chlorination/Tablets	9	6

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No treatment	56	40
Sanitation facility		
Flush toilet with septic tank	36	26
Pit latrine	44	32
Open defecation	50	36
Shared/Public facility	9	6

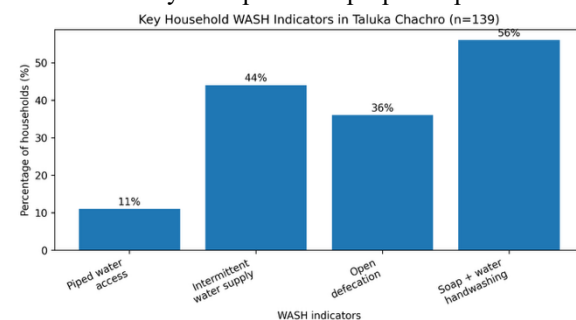
Water access remained a major challenge, with 63% of households depending on dug wells or hand pumps, while only 11% had piped water access. Nearly half of households (44%) reported intermittent water availability. Poor perceived water quality was common, as 61% reported slightly turbid or murky water. Furthermore, 40% of households did not use any water treatment method. Sanitation conditions were inadequate, with 36% practicing open defecation and only 26% having flush toilets with septic tanks.

Table 3. Household Hygiene Practices and Waste Management (n = 139)

Study Variable	Frequency (n)	Percentage (%)
Handwashing materials used		
Soap and water	78	56
Water only	44	32
Ash/Mud	9	6
Hand sanitizer	8	6
Handwashing before meals and after defecation		
Always	73	53
Sometimes/Irregularly	45	32
Rarely/Never	21	15
Bathing frequency		
Daily	47	34
Every alternate day	36	26
Twice weekly	31	22
Once weekly or less	25	18
Solid waste disposal		

practice		
Proper disposal in pit/dustbin	42	30
Thrown outside house	57	41
Burned within compound	31	22
Municipal collection	9	7

More than half of respondents (56%) used soap and water for handwashing, while 53% reported consistent handwashing before meals and after defecation. However, water scarcity affected personal hygiene, with 40% of households bathing only once or twice weekly. Waste disposal practices were inadequate, as 41% of households disposed of waste outside their homes and only 30% practiced proper disposal.



The graph highlights major WASH gaps identified in the study, including limited piped water access, unreliable water supply, continued open defecation practices, and the proportion of households using soap and water for handwashing. These findings show the interconnected challenges of water accessibility, sanitation infrastructure, and hygiene behavior in Taluka Chachro

Discussion

This cross-sectional study evaluated household-level water, sanitation, and hygiene (WASH) conditions among residents of Taluka Chachro, Sindh, Pakistan. The findings demonstrate substantial gaps in access to safe drinking water, sanitation facilities, hygiene practices, and household waste management. These challenges reflect the broader WASH inequalities experienced by rural and climate-vulnerable communities in Pakistan, where environmental limitations, water scarcity, poverty, and inadequate infrastructure continue to influence public health outcomes.¹⁻³

The present study found that most households (63%) relied on dug wells or hand pumps as their primary drinking water source, whereas only 11% had access to piped water. Furthermore, nearly half of households (44%) reported intermittent water availability. Similar patterns have been documented in water-stressed

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regions of Pakistan, where dependence on groundwater remains common due to insufficient centralized water supply systems.^{4,5} The Thar region, including areas of Sindh such as Chachro, is particularly vulnerable because of its desert environment, limited rainfall, recurrent droughts, and dependence on groundwater resources. Previous studies from the Thar region have highlighted that communities frequently face difficulties related to water accessibility, long collection distances, and unreliable water sources.⁶

Water quality concerns were also prominent in this study. A majority of respondents reported slightly turbid or murky water, and 40% of households did not apply any water treatment method before consumption. Previous research has shown that groundwater quality in Pakistan is affected by multiple factors, including climate variability, agricultural activities, geological conditions, and inadequate monitoring systems.^{3,5,7} Unsafe water quality is associated with increased risks of gastrointestinal infections and other waterborne diseases, particularly among vulnerable populations such as children and individuals with limited healthcare access.^{8,9} Therefore, improving household water treatment practices and strengthening water quality surveillance systems should be prioritized in underserved communities.

The findings regarding sanitation facilities indicate persistent sanitation challenges in Taluka Chachro. More than one-third of households practiced open defecation, while only a minority had access to improved sanitation facilities. Similar sanitation inequalities have been reported in low- and middle-income countries, where rural communities often experience limited access to safe sanitation due to economic barriers, inadequate infrastructure, and geographical isolation.^{10,11} Poor sanitation contributes to environmental contamination and facilitates fecal-oral transmission pathways, increasing the burden of preventable infectious diseases.^{12,13} Evidence from sanitation intervention studies suggests that community-based approaches, combined with infrastructure development and behavioral change strategies, are effective in improving sanitation outcomes.¹⁴

Hygiene practices in this study showed moderate awareness but inconsistent implementation. Although more than half of households reported using soap and water for handwashing, only 53% consistently practiced handwashing before meals and after defecation. Similar findings have been reported in other rural settings where hygiene behaviors are influenced by water availability, socioeconomic conditions, education level, and cultural practices.^{15,16} Handwashing with soap remains one of the most

effective and affordable interventions for reducing diarrheal diseases; however, its effectiveness depends on continuous availability of water and hygiene materials.¹⁷

The study also identified poor household waste management practices, with 41% of households disposing of waste outside their homes. Improper waste disposal contributes to environmental pollution, creates breeding sites for disease vectors, and increases exposure to pathogens.¹⁸ Similar concerns have been reported in communities where formal waste collection systems are limited or unavailable. Sustainable waste management strategies, including community awareness programs and locally appropriate disposal mechanisms, are essential components of comprehensive WASH improvement programs.¹⁹

An important finding of this study was the significant relationship between education level, hygiene practices, and sanitation facility type. Households with higher educational attainment demonstrated better hygiene behaviors and greater utilization of improved sanitation facilities. This finding aligns with previous research demonstrating that education plays an important role in influencing health-related behaviors, decision-making, and adoption of preventive practices.^{20,21} Improving educational opportunities and integrating hygiene promotion into community programs may therefore contribute to sustainable improvements in WASH outcomes.

The implications of these findings are important for public health planning. Improving WASH conditions in Taluka Chachro requires a multisectoral approach involving local government authorities, healthcare providers, community organizations, and development partners. Interventions should focus on expanding reliable water supply systems, promoting household water purification methods, constructing affordable sanitation facilities, improving waste disposal mechanisms, and strengthening hygiene education. Community participation is particularly important because evidence indicates that locally engaged WASH programs have greater sustainability and long-term effectiveness.^{22,23}

Climate change represents an additional challenge for water-insecure communities such as Taluka Chachro. Increasing temperature, changing rainfall patterns, and prolonged drought conditions may further affect groundwater availability and water quality.^{24,25} Climate-resilient WASH strategies, including improved groundwater management, rainwater harvesting, and sustainable water governance, should therefore be incorporated into future interventions.²⁵

This study has several limitations. First, the cross-sectional design prevents establishing causal relationships between WASH conditions and health

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outcomes. Second, information was collected through self-reported responses, which may introduce recall bias or social desirability bias. Third, water quality assessment was based on household perceptions rather than laboratory testing; therefore, microbiological and chemical contamination could not be confirmed. Finally, because the study was conducted in a single taluka, findings may not be directly generalizable to all rural communities of Pakistan.

Despite these limitations, this study provides important evidence regarding household WASH conditions in an underserved desert population. The findings emphasize the urgent need for integrated, context-specific interventions to improve safe water access, sanitation coverage, hygiene practices, and environmental health in Taluka Chachro.

Conclusion

This study expresses that households in Taluka Chachro face substantial WASH challenges, including limited access to safe drinking water, inadequate sanitation facilities, and inconsistent hygiene practices. Thus, the findings highlight the need for integrated interventions focusing on sustainable water supply, improved sanitation infrastructure, waste management, and hygiene education. Strengthening community participation and targeted public health strategies is essential to improve health outcomes.

References

1. Qamar K, Nchasi G, Mirha HT, Siddiqui JA, Jahangir K, Shaeen SK, Islam Z, Essar MY. Water sanitation problem in Pakistan: A review on disease prevalence, strategies for treatment and prevention. *Ann Med Surg (Lond)*. 2022;82:104709. doi:10.1016/j.amsu.2022.104709.
2. Zhang D, Sial MS, Ahmad N, Filipe AJ, Thu PA, Zia-Ud-Din M, et al. Water scarcity and sustainability in an emerging economy: a management perspective for future. *Sustainability*. 2021;13.
3. Zeb H, Yaqub A, Ajab H, Zeb I, Khan I. Effect of climate change and human activities on surface and groundwater quality in major cities of Pakistan. *Water*. 2023;15(15):2693. doi:10.3390/w15152693.
4. Howard G. The future of water and sanitation: global challenges and the need for greater ambition. *J Water Supply Res Technol*. 2021;70(4):438-448. doi:10.2166/aqua.2021.127.
5. Jhaman Das Hirani, Ali M. Water scarcity in desert belts in Pakistan: a case of Thar region. *Ann Human Soc Sci*. 2023;4(1):443-452.
6. Ahmad S, Jia H, Ashraf A, Yin D, Chen Z, Xu C, et al. Water resources and their management in Pakistan: a critical analysis on challenges and implications. *Water-Energy Nexus*. 2023;6:137-150.
7. Murtaza F, Muzaffar M, Mustafa T, Anwer J. Water and sanitation risk exposure in children under-five in Pakistan. *J Fam Community Med*. 2021;28:103.
8. Nadeem M, Anwar M, Adil S, Syed W, Al-Rawi MB, Iqbal A. The association between water, sanitation, hygiene, and child underweight in Punjab, Pakistan: an application of population attributable fraction. *J Multidiscip Healthc*. 2024;2475-2487.
9. Ahmed T, Zounemat-Kermani M, Scholz M. Climate change, water quality and water-related challenges: a review with focus on Pakistan. *Int J Environ Res Public Health*. 2020;17(22):8518. doi:10.3390/ijerph17228518.
10. UNICEF and WHO. *Progress on household drinking water, sanitation and hygiene 2000-2022: special focus on gender*. 2023.
11. Ishaque W, Sultan K, Zia ur Rehman. Water management and sustainable development in Pakistan: environmental and health impacts of water quality on achieving the UNSDGs by 2030. *Front Water*. 2024;6.
12. Van Minh H, Nguyen-Viet H. Economic aspects of sanitation in developing countries. *Environ Health Insights*. 2011;5:63-70. doi:10.4137/EHI.S8199.
13. Zhou X, Li Z, Zheng T, Yan Y, Li P, Odey EA, et al. Review of global sanitation development. *Environ Int*. 2018;120:246-261. doi:10.1016/j.envint.2018.07.047.
14. Bauza V, Ye W, Liao J, Majorin F, Clasen T. Interventions to improve sanitation for preventing diarrhoea. *Cochrane Database Syst Rev*. 2023;1(1):CD013328. doi:10.1002/14651858.CD013328.pub2.
15. Kayser GL, Rao N, Jose R, Raj A. Water, sanitation and hygiene: measuring gender equality and empowerment. *Bull World Health Organ*. 2019;97(6):438-440. doi:10.2471/BLT.18.223305.
16. Dickson-Gomez J, Nyabigambo A, Rudd A, Ssentongo J, Kiconco A, Mayega RW. Water, sanitation, and hygiene challenges in informal settlements in Kampala, Uganda: a qualitative study. *Int J Environ Res Public Health*. 2023;20(12):6181.
17. Siddiqua A, Hahladakis JN, Al-Attiya WAKA. An overview of the environmental pollution and health effects associated with waste landfilling and open dumping. *Environ Sci Pollut Res Int*. 2022;29(39):58514-58536.

18. Krystosik A, Njoroge G, Odhiambo L, Forsyth JE, Mutuku F, LaBeaud AD. Solid wastes provide breeding sites, burrows, and food for biological disease vectors and urban zoonotic reservoirs: a call to action for solutions-based research. *Front Public Health*. 2020;7:405.
19. Malolo R, Kumwenda S, Chidziwisano K, Kambala C, Morse T. Social outcomes of a community-based water, sanitation and hygiene intervention. *J Water Sanit Hyg Dev*. 2021;11(3):483-493.
20. Nelson S, Drabarek D, Jenkins A, Negin J, Abimbola S. How community participation in water and sanitation interventions impacts human health, WASH infrastructure and service longevity in low-income and middle-income countries: a realist review. *BMJ Open*. 2021;11(12):e053320.
21. Li P, Karunanidhi D, Subramani T, Srinivasamoorthy K. Sources and consequences of groundwater contamination. *Arch Environ Contam Toxicol*. 2021;80(1):1-10.
22. Arshad N, Imran S. Assessment of arsenic, fluoride, bacteria, and other contaminants in drinking water sources for rural communities of Kasur and other districts in Punjab, Pakistan. *Environ Sci Pollut Res Int*. 2017;24(3):2449-2463.
23. Ejemot-Nwadiaro RI, Ehiri JE, Arikpo D, Meremikwu MM, Critchley JA. Hand-washing promotion for preventing diarrhoea. *Cochrane Database Syst Rev*. 2021;12(1):CD004265.
24. Prüss-Ustün A, Wolf J, Bartram J, Clasen T, Cumming O, Freeman MC, et al. Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: an updated analysis with a focus on low- and middle-income countries. *Int J Hyg Environ Health*. 2019;222(5):765-777.
25. Shemer H, Wald S, Semiat R. Challenges and solutions for global water scarcity. *Membranes (Basel)*. 2023;13(6):612.