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ASSESSING DISPARITIES IN WASH INDICATORS: A PROVINCIAL COMPARISON USING MULTIPLE INDICATOR CLUSTER SURVEYS (MICS6) REGIONAL/AREA DATA

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ABSTRACT

Pakistan has though made strides towards Sustainable Development Goal 6 (SDG 6), access to safe Water, Sanitation, and Hygiene (WASH) services continues to be a significant public health and development issue. This study aims to compare and analyse the WASH indicators in the context of equity for WASH indicators in Pakistan with special focus on Azad Jammu and Kashmir (AJ&K) based on the regional/areas' Multiple Indicator Cluster Surveys (MICS6) data in line with the WHO & UNICEF Joint Monitoring Program (JMP) framework using a quantitative, descriptive and comparative approach to examine the disparities in access to improved water sources, sanitation facilities, hand-washing facilities and safely managed services in Punjab, Sindh, Khyber Pakhtunkhwa (KP), Balochistan, AJ&K and Gilgit-Baltistan (GB). The results show significant disparities between regions and between rural and urban areas in all WASH dimensions. Punjab demonstrates good performance in terms of water access and hygiene facilities, while KP shows relatively balanced results. Persistent poverty, poor infrastructure and governance issues are associated with Sindh and Balochistan. One important observation is the "dual paradox" in AJ&K, where access to improved water sources is low, while access to sanitation is very high and to safely managed services is also very high, indicating the need for localized governance and community-based systems. The study finds that WASH inequality in Pakistan is multidimensional and is influenced by geography, socioeconomic status, governance capacity and rurality. To reach SDG 6, the focus needs to move beyond infrastructure expansion to more equity-driven, governance-sensitive, and region-specific WASH interventions, especially in rural and hard-to-reach places.

Keywords:

1. INTRODUCTION

The availability and sustainable management of water and sanitation for all, as part of Water, Sanitation and Hygiene (WASH), is widely acknowledged as a key determinant of population health, educational attainment, human dignity, and poverty reduction. It is integral to the Sustainable Development Goals (SDGs) of SDG 6: ensuring availability and sustainable management of water and sanitation for all (Kazmi, 1992; Kazmi, 1995; Kazmi, 2010; United Nations, 2015; Idris, 2018; WHO & UNICEF, 2021; WHO &

UNICEF, 2023; Kazmi et al., 2024; Kazmi et al., 2025a). While there has been significant growth in WASH access since 2000, as reflected in global monitoring reports, the progress has been uneven both across and within countries. Persistent inequalities in access to WASH linked to income, geography, gender, disability, and fragile contexts continue to be the "last mile" of WASH access (United Nations, 2015; WHO & UNICEF, 2021; WHO & UNICEF, 2023). Poor WASH services are disproportionately affecting rural communities, geographically isolated communities, and households facing multiple vulnerabilities in many Low and Middle-Income Countries (LMICs), which increases the risks of enteric diseases, childhood stunting, malnutrition, and productivity loss (Sorenson et al., 2011; Javed, 2018; Prüss-Ustün et al., 2019; WHO & UNICEF, 2023). Investments in WASH have significant economic and social returns, such as lower health care expenses, better educational outcomes, and time savings, but these benefits are not always distributed equitably, unless there are explicit policies and interventions that are designed to be equitable (Hutton & Varughese, 2016; Prüss-Ustün et al., 2019; Kazmi, 1992; 10095; Kazmi et al., 2023a&b, 2024, 2025a and 2026a).

Pakistan is a case study of many such challenges. There are significant differences between the basic and safely managed WASH services at the national and provincial level, between wealth quintiles, and between urban and rural areas, as evidenced in the country (Kazmi, 1992; Sorenson et al., 2011; United Nations, 2015; Hutton & Varughese, 2016; Javed 2018; Geere et al., 2018; NIPS Pakistan & ICF, 2019; Prüss-Ustün et al., 2019). The Multiple Indicator Cluster Surveys (MICS6) conducted in the provinces and administrative regions of Pakistan show significant disparities in access to safely managed drinking water, sanitation and hygiene facilities, between richer and poorer households and between urban and rural areas (Government of Punjab & UNICEF, 2017-18; Javee et al., 2018; Government of Sindh & UNICEF, 2018-19; Javed et al., 2018; Ali et al., 2019; Shoukat et al., 2019; Government of AJ&K & UNICEF, 2020-21; Government of Khyber Pakhtunkhwa & UNICEF, 2022; Government of Balochistan & UNICEF, 2022; Government of Gilgit-Baltistan & UNICEF, 2024-25). The Pakistan Demographic and Health Survey also correlates poor sanitation and hygiene with child morbidity, diarrheal disease and poor nutritional outcomes (Kazmi, 1995; Kazmi, 2005; Kazmi, 2009; Kazmi, 2010; NIPS Pakistan & ICF, 2019). WASH inequalities also have strong gender dimensions, in addition to infrastructure coverage. Women and girls are disproportionately burdened with water collection, spending many hours collecting water under physically challenging and potentially unsafe conditions, which has implications for health, education, personal safety and economic participation (Kazmi, 1995 &2009; Sorenson et al., 2011; Caruso et al., 2015; Geere et al., 2018; WHO & UNICEF JMP, 2023; Kazmi et al., 2024). These burdens are even more pronounced in geographically challenging and water-scarce areas.

Azad Jammu and Kashmir (AJ&K) and Gilgit-Baltistan (GB) have a unique place in the overall WASH situation in Pakistan. The mountainous topography, scattered rural settlements, climate variability, natural disasters like earthquakes, landslides, and floods, alongwith conflict-related disruptions along the Line of Control (LOC) pose significant challenges to WASH service delivery, maintenance, and monitoring (Hussain et al., 2012; Javed et al., 2018; Ali et al., 2019; Shoukat et al., 2019; Government of AJ&K & UNICEF, 2020-21; Kazmi et al., 2024; Kazmi et al., 2025a; Government of GB & UNICEF, 2024-25; Kazmi et al., 2026a). The same difficulties are also present in some areas of KP and Balochistan, where the rugged topography, volatile border situation and the influx of refugees further exacerbate the challenges of infrastructure provision. While there are datasets for the province, AJ&K is still under-represented in analytical studies that systematically analyse WASH inequalities using an equity and gender lens. Existing studies tend to analyze AJ&K as part of national averages or only descriptive statistics, and do not use standardized inequality measures or intersectional approaches that consider gender, wealth, and rural–urban differences at the same time (WHO & UNICEF,

2021; WHO & UNICEF, 2023; UNICEF, 2023; Kazmi et al., 2024). Furthermore, national assessments show that there is ongoing microbial contamination and inadequate water safety management systems in Pakistan, especially in remote and challenging areas, with limited region-specific comparative data for AJ&K (PCRWR, 2015; Aziz et al., 2018; Kazmi et al., 2025a).

This study aims to fill these gaps by conducting a comparative and equity-based analysis of WASH indicators in AJ&K compared to other provinces and regions of Pakistan based on the latest micro data from MICS6 and harmonized indicators with the framework of the WHO & UNICEF Joint Monitoring Programe (JMP) (WHO & UNICEF, 2021; Government of AJ&K & UNICEF, 2020-21; UNICEF, 2023; WHO & UNICEF, 2023). The study focuses on inequalities in access to improved water sources, sanitation facilities, hand-washing facilities, and safely managed services, and also takes into account gender-sensitive aspects like the responsibility of water collection and related time burdens. The analysis takes an intersectional approach that accounts for inequalities based on gender, wealth status and urban–rural residence (Sorenson et al., 2011; Caruso et al., 2015; Idris, 2018; Geere et al., 2018; Naeem, K. et al., 2019; Naeem, S. et al., 2019; WHO & UNICEF, 2023; Kazmi et al., 2023a&b, 2024, 2025a and 2026a). The study compares AJ&K with other provinces and regions/areas to highlight common and context-specific challenges to equitable progress towards SDG 6.

This study has four significant contributions to the literature. First, it is one of the few WASH analyses available for AJ&K that are province-comparative and equity-disaggregated, based on recent micro data from the MICS6 and JMP-aligned indicators (WHO & UNICEF, 2023; Government of AJ&K & UNICEF, 2020-21; Government of Gilgit-Baltistan & UNICEF, 2024–25). Second, it incorporates areas (urban-rural) and gender-specific indicators, specifically water collection responsibilities and associated burdens, in a broader inequality framework, which goes beyond traditional infrastructure-based assessments to a more lived understanding of WASH deprivation (Sorenson et al., 2011; Caruso et al., 2015; Geere et al., 2018; WHO & UNICEF, 2023). Third, the study uses standardised inequality measures, such as absolute and relative gaps, concentration indices, slope and relative indices of inequality, allowing for transparent comparisons across regions and population subgroups, consistent with global monitoring (Hutton & Varughese, 2016; WHO & UNICEF, 2017; WHO & UNICEF, 2018; WHO & UNICEF, 2023). Lastly, the study provides policy-relevant recommendations based on the empirical evidence, identifying specific sectors and population groups that need more investment and context-sensitive interventions, such as climate-resilient infrastructure, water safety planning, area and gender-responsive WASH design, and community-managed service models (Hutton & Varughese, 2016; WHO & UNICEF, 2018; Naeem K. et al., 2019; Naeem S. et al., 2019; WHO & UNICEF, 2023).

2. Literature Review

Safe Water, Sanitation, and Hygiene (WASH) services is one of the most important public health problems worldwide. Recent estimates indicate that over 2 billion people are still without safely managed drinking water services and about 4.2 billion people are without safely managed sanitation facilities (UNUCEF, 2024; WHO & UNICEF, 2023). While progress has been made globally since the adoption of the Millennium Development Goals (MDGs) and subsequently the Sustainable Development Goals (SDGs) but this has not been uniform across and within countries (United Nations, 2015; WHO & UNICEF JMP, 2021). There remains a disproportionate level of deprivation in terms of access to WASH and quality of WASH services in rural areas, among low-income households and in marginalised communities and geographically isolated regions (WHO & UNICEF, 2023). There is growing evidence that “last-mile” inequalities are closely linked to poverty, weak governance, environmental vulnerability, and climate risks, thus highlighting the developmental and public health nature of WASH inequities (Javed., 2018; Prüss-Ustün et al., 2019).

The relationship between WASH access and health outcomes is well established in the

literature. Poor water supply, sanitation and hygiene practices are a major driver of diarrheal diseases, enteric infections, childhood stunting, under-nutrition and preventable mortality, especially in Low and Middle Income Countries (LMICs) (Kazmi, 1995; Javed., 2018; Prüss-Ustün et al., 2019). In addition to health effects, poor WASH services create significant economic and social costs including higher health care costs, lower productivity, school absences and time spent collecting water (Hutton & Varughese, 2016). Research also shows that WASH investments generate significant social and economic benefits, but these benefits are however, not always equitably distributed, as access to WASH infrastructure tends to be prioritized for populations that are easier to reach and politically visible (WHO & UNICEF JMP, 2023). International policy frameworks are increasingly focusing on equity-based monitoring approaches that take into account socioeconomic, geographic and gender-based inequalities in WASH assessments (WHO & UNICEF JMP, 2021).-

Rapid urbanization, population growth, climate variability and entrenched poverty in South Asia exacerbate WASH inequalities. Rural–urban disparities and inequalities based on wealth have been identified as a challenge to overall national progress in all regional studies (WHO & UNICEF JMP, 2017; WHO & UNICEF JMP, 2023). Climate-related hazards, such as floods, droughts and landslides, also negatively impact infrastructure reliability and service sustainability, especially for already vulnerable communities. The findings of the research in South Asia also reveal that women, children and marginalised groups, including those in rural areas, are disproportionately affected by the lack of access to safe drinking water and sanitation (Hutton & Varughese, 2016).

These are some of the regional WASH issues that are present in Pakistan. Current evidence shows that there is significant variation in access to drinking water, sanitation and hygiene services between provinces and administrative regions, which is attributed to differences in socioeconomic development, governance capacity, infrastructure investment and geographic conditions (UNICEF, 2020; Kazmi et al., 2023b). Punjab and Sindh have relatively better access to improved water sources and sanitation facilities while Khyber Pakhtunkhwa (KP), Balochistan, Azad Jammu and Kashmir (AJ&K), and Gilgit-Baltistan (GB) have significant gaps, especially in rural and mountainous areas (Hussain, et al., 2012; Government of Punjab & UNICEF, 2017-18; Aziz, et a., 2018; Javed., 2018; Government of Sindh & UNICEF, 2018-19; Ali et al., 2019; Shoukat et al., 2019; Government of AJ&K & UNICEF, 2020-21; Government of GB & UNICEF, 2024-25). There are considerable disparities in WASH indicators between provinces, wealth quintiles, and urban and rural areas in Pakistan, as captured by National household surveys, such as the Multiple Indicator Cluster Surveys MICS6 (UNICE, 2020) and the Pakistan Demographic and Health Survey (PDHS) (NIPS Pakistan & ICF, 2019). The studies have consistently found that lower-income households and rural communities have less access to improved services and more exposure to environmental health hazards.

Poor institutional coordination, poor infrastructure, lack of funding and monitoring systems are cited in several studies as the reasons for WASH inequalities in Pakistan (Aziz et al., 2018; Javed et al., 2018; Naeem K. et al., 2019: Naeem S. et al., 2019). Water quality is a major issue of concern. The Pakistan Council of Research in Water Resources (PCRWR) has conducted national assessments which show that even sources classified as “improved” are contaminated with microbes and water safety management is not consistent (PCRWR, 2018). The results highlight the need to consider dimensions of accessibility, availability, quality, and safety in WASH measurement frameworks, as well as to recognize the limitations of using infrastructure-based indicators, which is what the WHO & UNICEF Joint Monitoring Programme (JMP) service ladders do (WHO & UNICEF JMP, 2017; WHO & UNICEF JMP, 2023). It is therefore becoming more and more evident in the literature that access alone is not enough to understand WASH inequalities without also

looking at service reliability and management quality.

Another significant theme in the WASH literature is the gender aspects. Women and girls in many LMICs are responsible for collecting water and managing household water (Sorenson et al., 2011; Geere et al., 2018). Women and girls often have to travel long distances to fetch water, climb steep hills and mountains, and endure unreliable supply systems to obtain water, which takes up a significant amount of their time. These responsibilities have significant consequences for education, economic involvement, psychosocial health, and personal safety (Caruso et al., 2015). Poor sanitation conditions also make sanitation insecure, impacting on privacy, dignity and social participation, particularly for adolescent girls and women. These implications have been taken into account and more recently, the WHO & UNICEF JMP frameworks call for the integration of gender-sensitive indicators such as responsibility for water collection and time spent collecting water in WASH monitoring systems (WHO & UNICEF, 2023). Empirical studies include such indicators that are however limited in Pakistan and South Asia, especially at subnational level.

In Pakistan, AJ&K and GB are specific contexts that are under-researched in the field of WASH. The areas have specific geographical and administrative features that make service provision and infrastructure development difficult. Logistical and operational challenges are significant in mountainous areas, with dispersed settlements, landslides, floods, earthquakes and climate variability posing major challenges to WASH provision and maintenance (Hussain et al., 2012; Javed et al., 2018; PCRWR, 2018; Ali et al., 2019; Shoukat et al., 2019; Government of AJ&K & UNICEF, 2020-21; Government of GB & UNICEF, 2024-21). The same issues are also seen in parts of KP and Balochistan where remoteness and insecurity due to the border regions further restricts service delivery. Although there are MICS6 datasets available for these areas, most studies conducted are descriptive and do not use standard inequality measures or frameworks to systematically examine WASH inequalities.

Research work on AJ&K is still very limited in terms of its scope and analysis. Previous research tends to include AJ&K in national data or offers only basic coverage figures without breaking down results by gender, rural–urban location, or wealth. This means that there is little evidence on the intersectional aspects of WASH inequality in the region. Moreover, few studies look at the link between geography, governance structures and service quality in determining water instead of WASH outcomes in mountainous settings (Aziz, et, 2018; Javed., 2018; Ali et al., 2019; Shoukat et al., 2019). Although there is evidence that mountainous areas increase the physical burden, time poverty and safety risks of water collection for women and girls, gendered dimensions of water collection and the impact of challenging terrain are still under-researched.

The literature reviewed thus indicates that there are several gaps that need to be addressed. First, there is a lack of comparative analysis across provinces and regions of Pakistan, based on standardised measures and an equity lens, to assess WASH inequalities. Second, AJ&K is still under-represented in analytical research due to its special geographical and administrative setting. Third, gender dimensions of WASH access, such as water collection burdens, are not fully included in subnational analyses. Last, but not least, the existing literature tends to concentrate on the access to infrastructure and does not pay much attention to the effectiveness of governance and the quality of services, or to the management of services in a safe way.

To address these gaps, the present study uses indicators aligned with the WHO &UNICEF JMP gender-sensitive indicators, and standardized inequality measures to draw a comparative and gender perspective on WASH conditions at the provincial and regional level, and specifically in AJ&K and to inform evidence-based, gender-responsive and context-specific policy discussions for advancing equitable progress toward SDG 6.

3. Methodology and Data Sources

The study is of quantitative, descriptive and comparative type which aims to investigate the differences between Water, Sanitation and

Hygiene (WASH) indicators at provincial and regional/areas level of Pakistan with special focus on Azad Jammu and Kashmir (AJ&K). The analysis is based on an equity and gender sensitive approach that is consistent with SDG 6, which focuses on universal and equitable access to safe water, sanitation and hygiene services (United Nations, 2015; WHO & UNICEF JMP, 2017; WHO & UNICEF JMP, 2023). Through the use of harmonized WASH indicators and comparative analysis, the study evaluates regional inequalities and service gaps across Pakistan.

The study is based mainly on secondary data from the Multiple Indicator Cluster Survey (MICS6) carried out by UNICEF in partnership with provincial and regional/areas' governments. MICS offers nationally and provincially representative household-level information on health, education and WASH conditions (UNICEF, 2020). The latest available MICS6 data for Punjab, Sindh, Khyber Pakhtunkhwa (KP), Balochistan, Azad Jammu and Kashmir (AJ&K), and Gilgit-Baltistan (GB) has been analyzed. These datasets can be disaggregated by rural–urban residence and socioeconomic conditions, and are appropriate for equity-based assessment.

Four key WASH indicators are analysed, following the definitions of the WHO & UNICEF Joint Monitoring Programme (JMP): access to improved water sources, access to improved sanitation facilities, hand-washing facilities with soap and water, and safely managed water and sanitation services (WHO & UNICEF JMP, 2021 & 2023). Improved water sources are piped water, boreholes, tube wells and protected wells, and improved sanitation facilities are flush toilets with sewerage or septic tank. Safely managed services include aspects of service quality, reliability and safety in addition to access. Descriptive and comparative statistical methods were employed to determine differences between provinces and between urban and rural residents. SPSS, STATA and Microsoft Excel were used to calculate frequencies, percentages and comparative distributions. The results were presented in tables and graphical illustrations to emphasize the inequality pattern in the regions.

There are some limitations in the study. Causal interpretation is limited due to the cross-sectional design of MICS6 and comparability may be limited by the differences in survey years by province/area. Some indicators, especially safely managed services for GB, were not available, in addition. Nevertheless, the use of standardized MICS and JMP methodologies improves the reliability and comparability of the findings in Pakistan.

4. Data Analysis and Results

This section compares Water, Sanitation and Hygiene (WASH) indicators between provinces/regions and areas in Pakistan based on MICS6 data (UNICEF, 2023; WHO & UNICEF JMP, 2023). The analysis is presented in Tables 4.1 to 4.4 and their graphical representations and includes access to improved water sources, sanitation facilities, hand-washing facilities and safely managed services. The findings reveal not only disparities in coverage but also more fundamental disparities that are driven by geographic, governance capacity, and rural-urban differences (United Nations, 2015; WHO & UNICEF JMP, 2021). A detailed account of Province/Region/Area-wise WASH Indicators in Pakistan is in the next subsections.

4.1 Composite WASH Profile Across Provinces/Areas in Pakistan

Table 4.1 supported by Figure 4.1 provides a composite and an integrated overview of all four WASH indicators, enabling cross-sectoral comparison across provinces/areas.

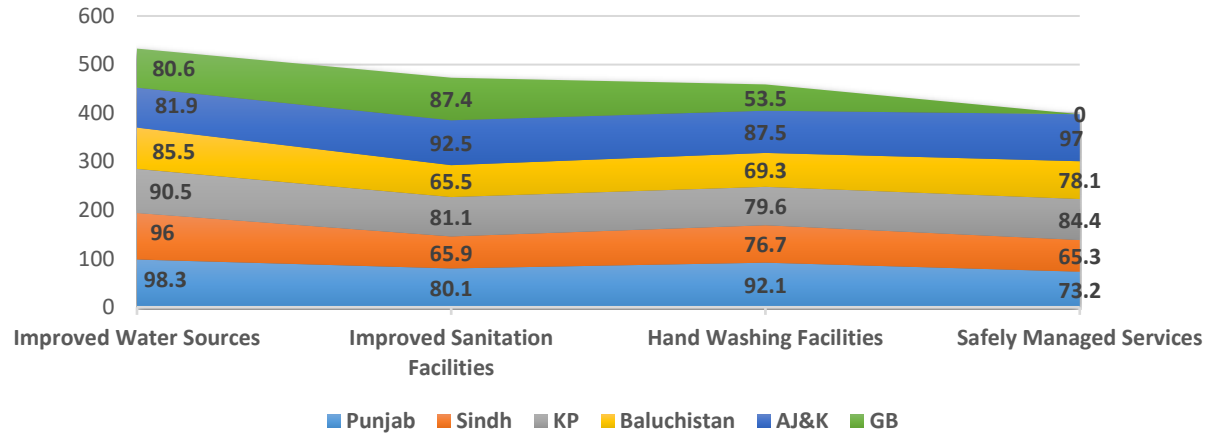
Table 4.1: Province/Region/Area-wise WASH Indicators in Pakistan (%)

Region/Area	Improved Water Sources	Improved Sanitation Facilities	Hand Washing Facilities	Safely Managed Services
Punjab	98.3	80.1	92.1	73.2
Sindh	96.0	65.9	76.7	65.3
KP	90.5	81.1	79.6	84.4

Baluchistan	85.5	65.5	69.3	78.1
AJ&K	81.9	92.5	87.5	97.0
GB	80.6	87.4	53.5	Nil
Sources: Provincial/ Areas MICS6 held during 2016 -2025				

A clear divergence pattern emerges, indicating that no single province performs consistently well across all WASH dimensions, and that WASH progress in Pakistan is highly uneven and dimension-specific. Moreover, the Table 4.1 and Figure 4.1 clearly reflects Provencal/area wise discrepancies in these WASH dimensions.

Figure 4.1: Comparative Bar Chart of WASH Indicators Across Provinces %



Therefore, in Pakistan, regional inequalities in sanitation access reveal trends of uneven investment in public health development, community-level WASH involvements and wider behavioural change campaigns (Hutton & Varughese, 2016; UNICEF, 2023, WHO/UNICEF JMP, 2023). These findings stress on an urgent need for integrated WASH related policies, combining infrastructure development, targeted support for seclude segment of the population and behavioural interventions.

Punjab has the highest overall performance on access to improved water sources (98.3%) and hand-washing facilities (92.1%), which indicates relatively advanced infrastructure development and wide coverage of services (Government of Punjab & UNICEF, 2018-19; UNICEF, 2023). Although it has performed well in basic access indicators, its safely managed services (73.2%) are comparatively low as compared to Khyber Pakhtunkhwa and Azad Jammu and Kashmir, which shows a clear gap in quality and management, in terms of service reliability, safety assurance and monitoring systems (Hutton & Varughese, 2016; WHO, 2023; WHO/UNICEF JMP, 2023). However, Sindh has a marked structural imbalance in its WASH profile. Access to improved water sources is relatively high (96.0%) while sanitation (65.9%) and hygiene facilities (76.7%) are significantly weaker (Government of Sindh & UNICEF, 2018-19). This is a result of the unequal development of WASH, probably due to heavy investments in urban areas, and continued deprivation among rural and low-income groups (WHO, 2023; WHO & UNICEF JMP, 2023; Kazmi et al., 2024). The resulting pattern indicates the high level of urban-rural disconnection, with progress in water supply not paralleled by water and sanitation/hygiene systems (WHO & UNICEF JMP, 2021). Khyber Pakhtunkhwa has a relatively well-balanced WASH profile, with relatively strong performance on indicators, especially sanitation (81.1%) and safely managed services (84.4%). This indicates a

more holistic WASH development path, where the expansion of infrastructure and improvements in service quality have developed in a more coordinated way than in other provinces. On the other hand, Balochistan is consistently doing worse than other provinces on every measure, and long-standing service delivery problems, especially in remote and sparsely populated areas where access, maintenance and institutional reach is structurally limited, are the causes of this poor performance (PCRWR, 2015). A unique trend is seen in Azad Jammu and Kashmir, where there is a paradoxical WASH profile. Although it has 2nd lowest access to improved water sources (81.9%) yet has the highest sanitation coverage (92.5%) and safely managed services (97.0%) in the country. This indicates that although geography and topography limit water supply, sanitation systems and service management are relatively effective, which is probably due to localized governance and community-level service mechanisms (Sorenson et al.2011: Hutton & Varughese, 2016; UNICEF, 2023; WHO, 2023; WHO & UNICEF JMP, 2023; Kazmi, et al. 2024 -2025a & 2026a). The overall picture from Table 4.1 and Figure 4.1 shows that there is a distinct separation between access and service quality. This is particularly seen in AJ&K, and KP where the infrastructure deployment is comparatively low but service management is not. However, the effectiveness of governance and local service systems seem to be more important than the extension of infrastructure for WASH performance (WHO & UNICEF JMP, 2023; UNICEF, 2023).

4.2 Access to Improved Water Sources (AWWS)

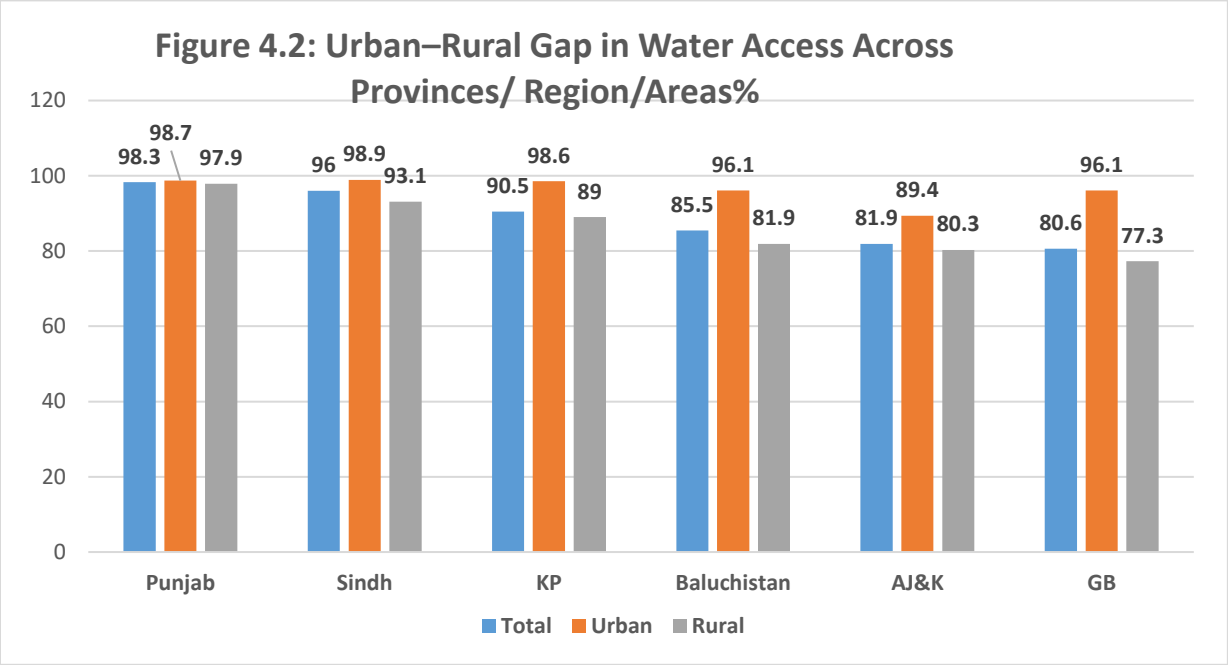
The findings presented in Table 4.2 and Figure 4.2 suggest that there is a consistent urban advantage in access to improved water sources in all provinces and regions of Pakistan, but the size and the extent of the urban disadvantage, and the underlying structural drivers of the inequality, are quite variable across contexts (PCRWR, 2015; WHO, 2023; WHO & UNICEF JMP, 2023; Kazmi et al., 2024).

Table 4.2: Urban–Rural Disparities in Accessing Improved Water Sources in Pakistan's Provinces/Areas (%)

Region/Areas	Total	Urban	Rural
Punjab	98.3	98.9	97.9
Sindh	96.0	98.6	93.1
KP	90.5	98.6	89.00
Baluchistan	85.5	96.1	81.9
AJ&K	81.9	89.4	80.3
GB	80.6	96.1	77.3

Sources: Provincial/ Areas' MICS6 held during 2016 -2025

Overall, urban populations enjoy higher levels of access compared to rural populations as demonstrated in Figure 4.2, but the extent of this gap differs depending on geography, infrastructure development, and socioeconomic conditions (United Nations, 2015; WHO & UNICEF JMP, 2021).



In Balochistan, Azad Jammu and Kashmir and GB, the rural access 81.9%, 80.3% and 77.3% respectively is significantly lower than the urban access in turn 96.1%, 89.4% and GB 96.1% (Government of Balochistan & UNICEF, 2022; Government of AJ&K & UNICEF, 2020-21; Government of GB & UNICEF, 2024-25). This suggests that although there are variations in overall development contexts, there are high spatial barriers to accessing water in these three regions/areas, particularly at rural level. While overall access is relatively high, inequality is more manifested in terms of broader WASH deficits rather than access to water in Sindh (PCRWR, 2015; WHO, 2023; WHO & UNICEF JMP, 2023; Kazmi et al., 2024; Government of Sindh & UNICEF, 2018-19). By contrast, even in the most successful province, Punjab, there is little difference between the rural and urban access rates 97.9% versus 98.9%, suggesting that spatial inequality is still present, albeit at a low level (Government of Punjab and UNICEF, 2017-18).

AJ&K is a case study of particular significance from a critical perspective. Although urban access is relatively high (89.4%), rural access is lower (80.3%), indicting a greater spatial disparity, which is not only due to income-based inequality, but also due to geographic isolation, mountainous terrain, man-made and natural disasters, and dispersed settlement patterns (Sorenson et al., 2011; Ali, et al., 2012; Geere et al., 2018; Aziz, 2018; Kazmi et al., 2024; Kazmi et al., 2025a; Kazmi et al., 2026a). Likewise, Balochistan is an example of the combined effect of remoteness and infrastructural underdevelopment, which further highlights the structural nature of water access inequality (PCRWR, 2015). Overall, the results indicate that water access inequality in Pakistan is not uniform but context-specific. It is mainly economic in Sindh, spatial and geographic in AJ&K, Balochistan and GB and relatively mixed in KP, where both terrain and socioeconomic differences have an impact on access outcomes together (Regional/Areas MICS6 from 2016 to 2025).

4.3 Improved Sanitation Facilities

In Pakistan, regional disparities in hygiene access reflect uneven investment in public health promotion, behavioural change campaigns, and community-level WASH interventions (WHO/UNICEF JMP, 2023). These findings underscore the need for integrated WASH policies that combine infrastructure development with sustained hygiene education, behavioural interventions, and targeted support for

disadvantaged populations (Kazmi et al., 2024 a&b). The sanitation patterns shown in Table 4.3 and Figure 4.3 are quite different from the water access patterns, indicating that sanitation improvement in Pakistan has a different developmental and behavioral pathway. Adoption, affordability and behavioural change processes at the household level are more important drivers of sanitation outcomes than geography and infrastructure, as in the case of water supply (WHO & UNICEF JMP, 2021; WHO & UNICEF JMP, 2023; UNICEF, 2023).

Table 4.3: Urban–Rural Sanitation Coverage Across Provinces/ Areas in Pakistan %

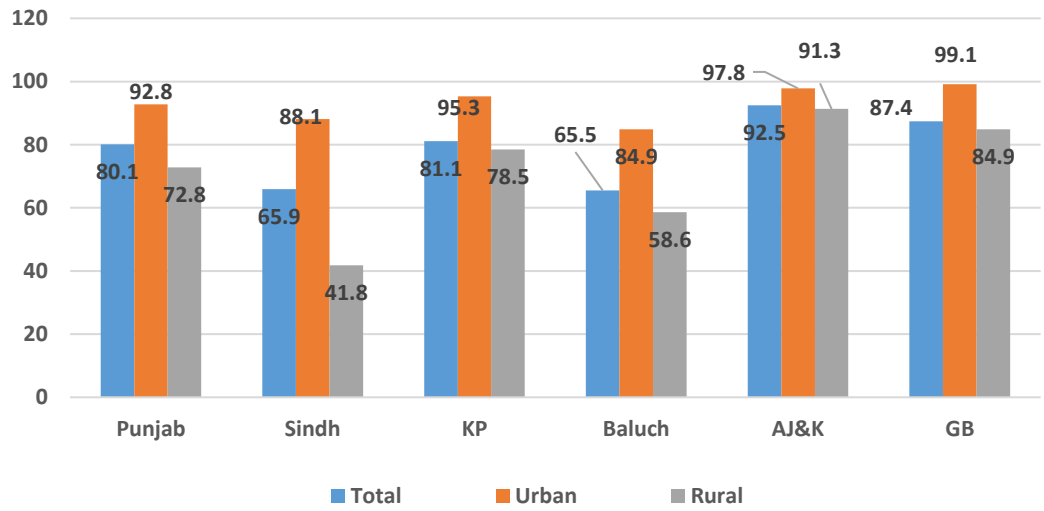
Region/Areas	Total	Urban	Rural
Punjab	80.1	92.8	72.8
Sindh	65.9	88.1	41.8
KP	81.1	95.3	78.5
Baluchistan	65.5	84.9	58.6
AJ&K	92.5	97.8	91.3
GB	87.4	99.1	84.9

Sources: Provincial/ Areas MICS6 held during 2016 -2025

Azad Jammu and Kashmir is the top performing region with an overall sanitation coverage of 92.5% and good performance in both rural (91.3%) and urban (97.8%) areas. This means that even in geographically limited areas, widespread adoption of sanitation is possible if the acceptance of sanitation at the household level and the mechanisms to implement it are effective (United Nation, 2015; Government of AJ&K & UNICEF, 2021). Likewise, the sanitation in Gilgit-Baltistan and outcomes of Khyber Pakhtunkhwa (81.1%)

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Figure 4.3: Comparative Sanitation Coverage and Urban–Rural Gaps (%)



are relatively good, indicating that the diffusion of sanitation practices in mountainous areas may have been more effective than its diffusion in areas with similar infrastructural constraints (Prüss-Ustün et al., 2019; Government of Pakhtunkhwa , 2022; WHO, 2023). Severe deficits are seen in Sindh and Balochistan, on the contrary. Sindh has one of the highest rural sanitation gaps (41.8%),

indicating significant rural deprivation and intra-provincial inequality. Balochistan is also relatively weak with a score of 58.6% due to structural underdevelopment, limited service outreach and continued governance constraints in remote areas (United Nation, 2015; Government of Sindh & UNICEF, 2018-19; Government of Balochistan & UNICEF, 2022, WHO 2023; WHO and UNICEF - JMP, 2023).

One of the key analytical interpretations is that the outcomes of sanitation are less influenced by centralized infrastructure and more by community-led adoption of latrines, household decision-making, and affordability (Caruso et al., 2015; WHO & UNICEF JMP, 2023). In this aspect, AJ&K's performance is good and the urban–rural gap is not very wide (97.8% urban versus 91.3% rural), which suggests relatively balanced distribution of sanitation services between urban and rural areas (Government of AJ&K & UNICEF, 2020-21; Kazmi et al., 2023s and 2024). In general, the results indicate that poverty and institutional capacity are more strongly related to the sanitation inequality in Pakistan than just geography (Regional/Area's MICS6 from 2016 to 2025). Socioeconomic deprivation is shown in Sindh (NIPS & ICF, 2019; Government of Sindh & UNICEF, 2018-19), governance and structural weaknesses in Balochistan (PCRWR, 2015; Government of Balochistan & UNICEF, 2018-19) as potential hindrance while effective local-level adoption and community-driven systems can achieve high sanitation coverage in difficult terrains like in AJ&K (Sorenson et al., 2011; Geere et al., 2018; Government of AJ&K & UNICEF, 2020-20).

4.4 Hand-wash facilities in Regions/Areas of Pakistan

The Table 4.4 and Figure 4.4 display that the distribution of hygiene access is the most uneven across Pakistan suggesting that this aspect of WASH is comparatively under-prioritized in policy, and is highly dependent on the behaviour, awareness and socioeconomic conditions of households shown in both (UNICEF, 2023; WHO & UNICEF JMP, 2023). Unlike water and sanitation services in regions, the outcomes of hygiene are not primarily determined by large-scale infrastructure systems but are instead shaped by daily practices, affordability of hygiene materials, and the effectiveness of sustained public health messaging. The studies further reveal that access to hand-washing amenities using water and soap is closely linked with maternal education, household income, and rural–urban residence, emphasizing on broader designs of social inequality (WHO & UNICEF, 2023l Kazmi, et al., 2024).

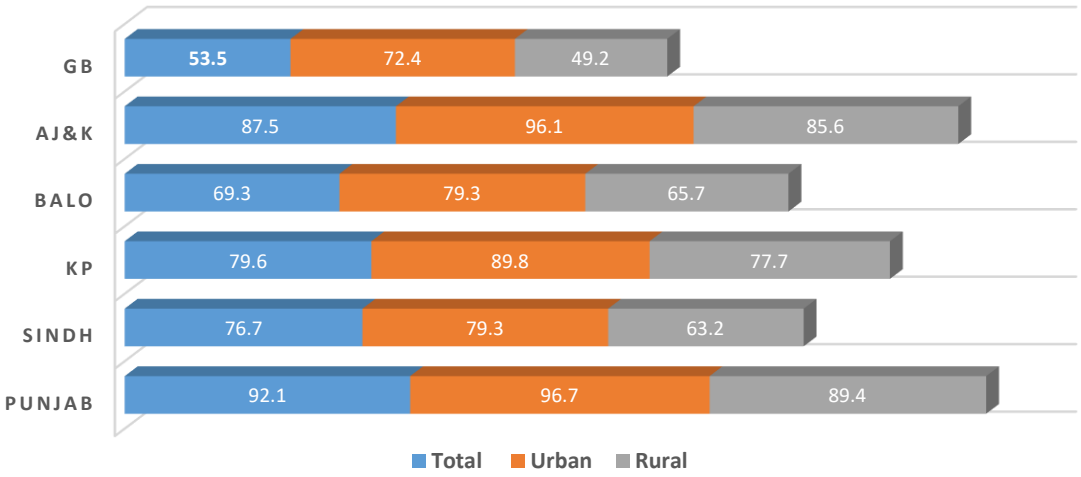
Table 4.4: Hand-wash Facilities by Region and Urban–Rural Residence (%)

Region/Areas	Total	Urban	Rural
Punjab	92.1	96.7	89.4
Sindh	76.7	79.3	63.2
KP	79.6	89.8	77.7
Baluchistan	69.3	79.3	65.7
AJ&K	87.5	96.1	85.6
GB	53.5	72.4	49.2

Sources: Provincial/ Areas MICS6 held during 2016 -2025

Consequently, disparities in hygiene accessibility are not only shaped by infrastructure availability but also by wider socioeconomic and educational conditions (Hutton & Varughese, 2016; Prüss-Ustün et al., 2019; Hutton & Varughese, 2016; WHO & UNICEF, 2023; WHO, 2023; UNICEF, 2023; Provincial/area's MICS6 2016-25).

Figure 4.4: Provincial and Urban–rural Inequality in Hand-washing Facilities (%)



Provincially, the level of household preparedness is relatively strong in Punjab (92.1%) and Azad Jammu and Kashmir (87.5%) indicating higher levels of preparedness and hygiene awareness (Government of Punjab & UNICEF, 2017-18; Government of AJ&K & UNICEF, 2020-21). In contrast, the situation in the region of Gilgit-Baltistan is quite alarming as it is a deprivation hotspot with an access to hygiene of only 53.5%, showing high level of lack of infrastructure availability and hygiene practices.

The urban–rural split further confirms the structural nature of the inequality. Urban areas generally perform better than rural areas in all provinces/areas, but the rural gaps are highest in Gilgit-Baltistan (49.2%), Sindh (63.2%) and Balochistan (65.7%). AJ&K (96.1% and 85.6%) is the 2nd best rural and urban vicinities behind Punjab (96.7% and 89.4%) respectively. This pattern indicates that compounded disadvantages may occur when rural populations lack access to basic infrastructure, are poor, and receive little exposure to hygiene education and behaviour change interventions, which may lead to poorer health outcomes in rural areas (United Nation, 2015; WHO & UNICEF JMP, 2017; WHO & UNICEF JMP, 2021; UNICEF, 2015; WHO & UNICEF JMP, 2023;).

A critical analysis of these results reveals that there are infrastructural deficits, but these are not the only factors that account for the difference in hygiene. Rather, it is the result of a combination of factors, including cost considerations, levels of education, poverty severity, and the success of public health outreach programs (Caruso et al., 2015; Sorenson et al., 2011). The relatively good performance of AJ&K despite having lower water access indicates that the campaigns on hygiene awareness and adoption of the behavior may be partly offsetting infrastructure constraints. Hygiene inequality is the most sensitive indicator of socioeconomic deprivation in Pakistan, with multiple vulnerabilities in Gilgit-Baltistan and rural Sindh resulting in deep gaps in basic health-protective practices (Shoukat, et al., 2019; WHO, 2014; WHO& UNICEF - JMP. 2018 &2019;

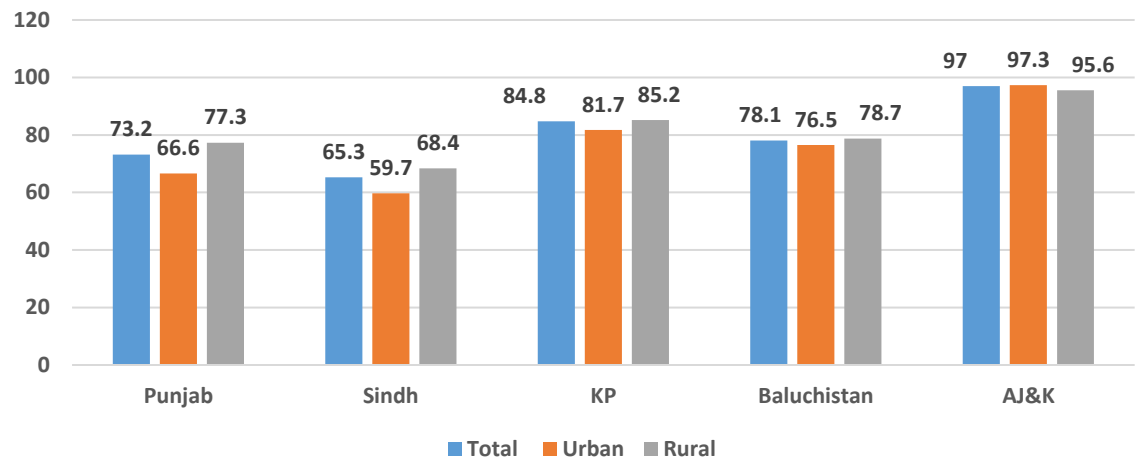
4.5 Safely Managed Services

Safely managed services are the most policy-relevant and analytically stringent dimension of WASH, going beyond access to include the quality, safety, continuity and effectiveness of services (WHO & UNICEF JMP, 2021; WHO & UNICEF JMP, 2023).

Table 4.5: Safely Managed Water & Sanitation Services Across Provinces/ Areas (%)			
Region/Areas	Total	Urban	Rural
Punjab	73.2	66.6	77.3
Sindh	65.3	59.7	68.4
KP	84.8	81.7	85.2
Baluchistan	78.1	76.5	78.7
AJ&K	97.0	97.3	95.6
GB	nil	-	-
Sources: Provincial/ Areas MICS6 held during 2016 -2025			

The data in Table 4.5 and Figure 4.5 show a significant variation between provinces, showing that high levels of basic WASH infrastructure do not guarantee results of safely managed outcomes. The performance in Azad Jammu and Kashmir is highest in the country (97.0%), which shows very good level of service reliability and effective local level management systems (Government of AJ&K & UNICEF, 2020-21). This indicates that the region has been able to keep the quality of service high, despite the geographical and infrastructural limitations, possibly due to the presence of local governance structures and community-based management systems that provide continuity and monitoring (Kazmi et al., 2023a&b; Kazmi, et al., 2924; Kazmi et al., 2025a; Kazmi et al., 2926a&b).

Figure 4.5: Comparison of Safely Managed Service Coverage Across Provinces/ Areas (%)



Khyber Pakhtunkhwa (84.8%) and Balochistan (78.1%) show moderate performance, meaning there is partial effectiveness of the system, but some areas of concern regarding safety and reliability of services, especially in remote and resource constrained areas (Government of Khyber Pakhtunkhwa & UNICEF, 2022; Government of Balochistan & UNICEF, 2022; Kazmi et al 2024; Kazmi et al., 2025a&b). Meanwhile, in Punjab and Sindh, basic WASH coverage is not much low (73.2%) and (65.3%) respectively, indicating the coverage is far behind the other regions, underlining the gap between providing services and ensuring quality (Government of Punjab & UNICEF, 2017-18; Government of Sindh & UNICEF, 2018-19).

One of the main analytical interpretations is that there is a WASH development paradox. In some provinces like Punjab and Sindh, infrastructure is saturated and services are available but are poorly

managed, inadequately maintained, and not monitored for water quality (Hutton & Varughese, 2016; Naeem K. et al., 2019). Whereas AJ&K offers the reverse setup with lower level of infrastructure coverage and very high levels of service safety and reliability. This indicates that smaller-scale, community managed or locally governed systems in mountainous areas may be better able to deliver quality services than large-scale, centralized, but stretched urban systems (Sorenson et al., 2011; Ali, et al., 2018; Aziz , 2018; Geere et al., 2018; Naeem S. et al., 2019). Overall, the results indicate that access to safely managed services is not limited to the availability of infrastructure but it is a performance dimension that is mainly determined by the governance effectiveness, institutional capacity and strength of the system management (WHO & UNICEF JMP, 2023; UNICEF, 2023).

5. Key Findings and Discussion

The overall findings show that WASH inequality in Pakistan is not linear, but rather a multidimensional phenomenon that arises from the interplay between geography, governance capacity, and socioeconomic structure, and is not driven by a single factor (United Nations, 2015; WHO & UNICEF JMP, 2023). The data in the Tables 4.1–4.5 reveal that there are different inequality logics at play in water, sanitation, hygiene and service quality, resulting in very uneven outcomes at the provincial level and not a uniform national trend (WHO & UNICEF JMP, 2021; UNICEF, 2023). The most salient and puzzling feature in the region of Azad Jammu and Kashmir is a "dual paradox." The area has relatively low access to improved water sources and very high sanitation coverage and highest safely managed services as indicated in the results above referred tables. This gap suggests that although water supply is limited by topography and low population density, the sanitation and service quality outcomes are well supported by good local governance, behavioral uptake, and community-level service management systems (Sorenson et al., 2011; Javed et al., 2018; Ali et al., 2019; Shoukat et al., 2019; Shukaat, et al 2018; Government of AJ&K & UNICEF, 2020-21). The presence of infrastructural constraint and high service efficiency reflects the non-linear development of WASH in the mountains.

Overall, the results validate the notion of dimension-specific WASH inequality. Geographic constraints are the main culprit for water inequality, most notably in AJ&K and Gilgit-Baltistan where topography and dispersion are major factors reducing access to services (Hussain et al., 2012; Javed et al., 2018). Sanitation inequality, on the other hand, is more closely linked to poverty and household adoption patterns especially in Sindh and Balochistan (Government of Sindh & UNICEF, 2018-19; Government of Balochistan & UNICEF, 2022). Hygiene inequality is the combined effect of socioeconomic deprivation and behavioural constraints, and service quality inequality is more strongly associated with governance effectiveness - particularly in Punjab and Sindh, where high infrastructure coverage does not always lead to safely managed outcomes (Government of Punjab & UNICEF, 2017-18).

The urban–rural inequality is the most persistent structural inequality in all dimensions of WASH. The indicators of water, sanitation and hygiene consistently show that rurality is more strongly associated with deprivation than province boundaries (WHO & UNICEF JMP, 2021). This shows that inequality in space is entrenched in Pakistan's WASH system and is only partially tackled by the development progress at the provincial level. Another major lesson learned is that there was a continued gap between "improved access" and "safely managed services." The high basic coverage does not imply safety, reliability or quality assurance of the service, though several provinces report high basic coverage. This is especially true in Punjab and Sindh, where infrastructure saturation is linked with governance and operational inadequacies (Hutton & Varughese, 2016). In contrast, AJ&K shows greater efficiency in making a limited infrastructure produce high quality results, suggesting that smaller scale or community-managed systems might be more effective in geographically-limited contexts (BoSAJ&K, 2016

& 2024; Javed et al., 2018; Ali et al., 2019; Shoukat et al., 2019).

The policy implications of the findings are very clear: Pakistan's WASH policy needs to shift the focus from infrastructure scaling up to improving the quality of service and strengthening the governance framework and equity-based targeting. To address rural deprivation, improve institutional accountability, and incorporate gender and geography-informed planning approaches, is crucial to the effort to reduce multidimensional inequalities and meet SDG 6 (United Nations, 2015; WHO & UNICEF JMP, 2023; UNICEF, 2023).

6. Conclusion and Recommendations

This study compares the Water, Sanitation and Hygiene (WASH) services in Pakistan on a comparative and equity basis, concentrating on the situation in Azad Jammu and Kashmir, based on the data of MICS6 (UNICEF, 2023; WHO & UNICEF JMP, 2023). The results show that WASH development is highly uneven across Pakistan and is not justifiable to be explained using national averages. Rather, the findings show a complex pattern of inequalities - geographic, governance-related, socioeconomic, and persistent – which are evident between rural and urban areas (United Nations, 2015; Naeem K., et al., 2019; Naeem S., et al., 2019; WHO & UNICEF JMP, 2021).

One of the major findings is the multi-dimensionality of WASH inequality. Geography and infrastructure constraints, especially in the mountainous areas like AJ&K and Gilgit-Baltistan, are the primary constraints on water access (Hussain, 2012; Javed et al., 2018; Ali et al., 2019; Shoukat et al., 2019; Government of AJ&K & UNICEF, 2020-21; Government of GB & UNICEF, 2020-21). The disparities in sanitation are more strongly associated with poverty and individual household adoption, while disparities in hygiene are more strongly associated with broader behavioral and socioeconomic disparities (Caruso et al., 2015; Sorenson et al., 2011). Importantly, the quality of services (safely managed services) is more about governance effectiveness than infrastructure availability (Hutton & Varughese, 2016). The AJ&K case is particularly interesting because it shows low water access and very high sanitation and service quality and illustrates the importance of local governance systems.

The study findings indicate that the SDG 6 in Pakistan necessitates a change of paradigm from infrastructure-based planning to integrated approach with focus on service quality, equity and sustainability (WHO & UNICEF JMP, 2023). The ongoing rural–urban divide and disconnect in access and provision of safely managed services suggest that current strategies are not sufficient to ensure inclusive WASH development (UNICEF, 2023).

The implications of this policy are therefore evident. First, investment needs to be targeted at the rural and less accessible areas, most importantly in Sindh, Balochistan and Gilgit-Baltistan, where the deprivation is the highest (Kazmi et al., 2024). Second, WASH planning should focus on service quality, such as better water safety monitoring, water safety systems, and institutional accountability (WHO & UNICEF JMP, 2021). Third, gender-responsive interventions need to address the disproportionate burden of water collection on women and girls, by improving service proximity and reliability (Caruso et al., 2015). Finally, the best practices in community managed and decentralized systems seen in AJ&K should be replicated in other regions (Sorenson et al., 2011; Javed et al., 2018; Shoukat el al., 2019; Kazmi, et al 2024; Kazmi, et al 2025a&; Kazmi, et al 2026a&b). Lastly, better coordination between the federal and provincial institutions is needed for the allocation of resources and for regular monitoring of WASH indicators in an equitable manner. To conclude, an equitable approach to WASH access in Pakistan should be context specific, take into consideration governance issues, and be equity oriented, both in terms of infrastructure and structural inequalities, across regions (United Nations, 2015; WHO & UNICEF JMP, 2023).

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