



Impact of Water, Sanitation and Hygiene (WASH) Facilities on Patient Satisfaction in Government Hospitals: Evidence from India

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Abstract

Access to Water, Sanitation and Hygiene (WASH) services are essential for quality health services, patient safety and infection prevention. But there is scanty empirical evidence of the impact of WASH facilities on patient satisfaction in Indian Government Hospitals. The study analysed the effect of WASH facilities on the satisfaction of the patients in government hospitals in Andhra Pradesh, India. A cross-sectional survey was carried out of 300 in-patients with primary data gathered using a structured questionnaire of five dimensions of WASH FIT, namely: water, sanitation, healthcare waste management, hand hygiene, environmental cleaning. Descriptive statistical analysis, reliability analysis, pearson correlation and multiple linear regression were used to analyze the data in SPSS version 22. The reliability coefficients obtained were between 0.75 and 0.87 which means the internal consistency of the measurement scale was satisfactory. The results showed that water, sanitation, and healthcare waste management had significant and positive effects on patient satisfaction, while no statistically significant effects were found for hand hygiene and environmental cleaning. The study adds to the paucity of empirical research on WASH and patient satisfaction in government hospitals in India, and is the first to isolate the WASH aspects most important to the patient's experience of the quality of health care. The results will be useful for hospital management and policy makers, who should focus on investing in water supply, sanitation, waste disposal in the health care system, as well as the comprehensive quality improvement initiatives to strengthen the patient-centred health care delivery and nurturing sustainable health care systems.

Keywords: Water, Sanitation and Hygiene (WASH); Patient Satisfaction; Government Hospitals; Healthcare Quality.

Introduction

Safe, effective and patient-centred healthcare (WHO, 2020) is dependent on water, sanitation and hygiene (WASH) services. Good WASH facilities also play a big role in the quality of health services, creating a clean, safe and dignifying environment where healthcare workers, patients and visitors could attend services without the threat of healthcare-associated infections (WHO & UNICEF, 2015; WHO, 2020, 2023). WASH in Health Care facilities is part of Universal Health Coverage (UHC) and Sustainable Development Goal (SDG) 6 and is essential for the provision of equitable, high quality health care services (UN, 2015; WHO, 2017, 2020). Although ongoing efforts have been made, there are still gaps in WASH infrastructure in many healthcare facilities in low and middle-income countries, which create serious challenges to patient safety and quality of health services (WHO & UNICEF, 2015; WHO, 2023; Gnanasekaran et al., 2024).

The quality of healthcare services is not only clinical competence, but also the physical environment in which the healthcare is provided (Lamb et al., 2010; Mohammed et al., 2016). From Donabedian's (1988) Structure – Process – Outcome (SPO) framework, healthcare infrastructure is one of the structural factors that directly affects service delivery process and the outcomes of the care provided to patients (Moore, 2015; Ameh et al., 2017). In this context, WASH facilities are vital structural resources that enable infection prevention and control, environmental safety, efficiency and patient comfort (WHO, 2023). Reliable water supply allows for the continuation of clinical and domestic activities, good sanitation limits disease transmission, good hygiene practices with hand cleaning limit the spread of infections, proper management of healthcare waste reduces the contamination of the environment, and regular environmental cleaning establishes a safe and hygienic healthcare environment (WHO, 2019). Together, these factors contribute to patients' impressions of the quality of care received and their satisfaction with the quality of care received.

Patient satisfaction is one of the most accepted measures of healthcare quality as it measures patients' perceptions of their healthcare experiences and is believed to be a measure of health system performance (Cleary, 1988; Sitzia, 1997; Batbaatar et al., 2017). Patients who are satisfied with the treatment are more likely to take the treatment, have trust in healthcare providers, use healthcare services appropriately, recommending healthcare institutions to others (Batbaatar et al., 2017; Liu, 2021). The majority of the previous studies have focused on the patient satisfaction with the service quality aspects, that is, responsiveness, reliability, assurance, empathy, and tangibles (Parasuraman et al., 1988; Naidu, 2009; Fatima, 2019). Compared to other influences on patient satisfaction, however, limited attention has been paid to the contribution of WASH infrastructure as a determinant of patient satisfaction, which has direct influence on patient's day to day experiences in healthcare facilities (WHO, 2023). Evidence shows that poor WASH conditions in health care facilities are still a public health issue globally (Bouزيد et al., 2018). Limited water supply, inadequate sanitation facilities, hand hygiene facilities, environmental cleaning and healthcare waste management have been linked to the risk of healthcare-associated infections, poor quality of

care, and low levels of patient confidence in healthcare institutions (Bouزيد, 2018; Hutton, 2024). Although there have been significant studies on the clinical impact of poor WASH, there have been fewer studies that looked at WASH from the patient perspective and its effect on patient satisfaction with the healthcare service (Omarova, 2023; Purwandari, 2024). This disparity is especially noticeable in less developed countries where resource limitations are likely to impact on the delivery of health care services and the infrastructure.

The Government of India has undertaken multiple initiatives for sanitation and sanitation improvements, such as Swachh Bharat Mission, Jal Jeevan Mission and Kayakalp Programme, which have further catalysed the efforts towards improving sanitation and environmental cleanliness, and quality of public health facilities in India (Ghosh, 2016; Mehta & Chavda, 2018; MoHFW, 2021; MoJS, 2023; Ilangovan, 2026). However, there are still differences in WASH services provision in government hospitals, especially in resource-limited settings (WHO & UNICEF, 2015; Ogunsola & Mehtar, 2020). Empirical evidences pertaining to the perceptions of the patients about WASH facilities and the impact on patients' satisfaction is limited in AP and the state has invested significantly in extending public healthcare services. It is important to understand these relationships to be able to evaluate gaps in infrastructure and design efforts to improve quality in government healthcare institutions.

While many studies have looked at either the WASH status aspects or patient satisfaction, fewer studies have related these to a comprehensive healthcare quality framework. While much of the WASH literature has concentrated on the preparedness of WASH facilities, infection prevention and environmental health outcomes, patient satisfaction research has concentrated largely on interpersonal aspects of healthcare delivery (Batbaatar et al., 2017; WHO, 2023). It is therefore necessary to have a gap in theory and practice to understand how WASH facilities as structural determinants of healthcare quality influence patients' assessment of healthcare services. This gap can be filled through research in environmental health and research in healthcare quality literature as part of the understanding of WASH infrastructure as a part of patient-centered care.

In this background, the present study aims at examining the effect of WASH facilities on patient satisfaction in government hospitals in Andhra Pradesh, India. The study specifically focuses on 5 areas of WASH facilities: water supply, sanitation, healthcare waste management, hand hygiene and environmental cleaning, and assesses the impact on overall patient satisfaction with healthcare services. This study has brought together two components, environmental health infrastructure and patient satisfaction and thus provided an integrated view of health care quality, with policy, hospital management, and public health practitioners recommendations to improve WASH services and patient-centered care in government hospitals.

Materials and Methods

a. Study design and sample

The study was of quantitative type, cross sectional design that focused on the effect of Water, Sanitation and Hygiene (WASH) facilities on patient satisfaction in selected government hospital in Andhra Pradesh, India. The sample of the respondents for the study was 300. Multi-stage sampling technique was used. Based on this, the study area was divided into three zones namely Coastal Andhra, North Andhra, Rayalaseema. Secondly, a government hospital with maximum number of beds in each region was chosen. Finally, purposive sampling was employed to identify the respondents and to get the random sampling of each selected hospital and 100 in-patients and/or their attendants/bystanders were selected. Those who resided in the hospital for 24 hours or longer are the "respondents" in this study.

b. Instrument

A structured questionnaire divided into three parts (demographic information, WASH facilities, and patients' satisfaction level) was used to gather primary data. The patient's perception of WASH facilities was measured using items adapted from the WHO-UNICEF (2022) Water and Sanitation for Health Facility Improvement Tool (WASH FIT) and associated monitoring indicators. Five dimensions of WASH were assessed: water (5 items), sanitation (6 items), healthcare waste management (6 items), hand hygiene (5 items), and environmental cleaning (9 items). Single item was used to measure patient satisfaction which reflects the overall satisfaction of the respondents with regards to healthcare services received in the hospital. The answers to all these items were on a 5-point Likert scale of 1 = strongly disagree to 5 = strongly agree.

c. Research hypotheses

The following hypotheses were formulated for the study.

H1: Water supply has a positive impact on patient satisfaction.

H2: Sanitation has a positive impact on patient satisfaction.

H3: Healthcare waste management has a positive impact on patient satisfaction.

H4: Hand hygiene has a positive impact on patient satisfaction.

H5: Environmental cleaning has a positive impact on patient satisfaction.

d. Data analysis

The collected data were analyzed using SPSS version 22. Reliability was assessed using Cronbach's alpha. Correlation and multiple regression analysis were conducted to look into the effect of WASH facilities on patient satisfaction. The p value of less than 0.05 was taken as statistical significance.

Results

Table 1: Descriptive Statistics and Internal Consistency Reliability of Study Variables

Construct	Items	Mean	SD	α
Water (W)	5	3.03	.75	.75

Sanitation (S)	6	2.96	.76	.81
Healthcare Waste Management (HWM)	6	2.98	.72	.78
Hand Hygiene (HH)	5	2.97	.75	.78
Environmental Cleaning (EC)	9	2.94	.75	.87
Patient Satisfaction (PS)	1	3.01	.99	NA

Note: $N = 300$. Cronbach's α is reported for multi-item constructs. Patient satisfaction was measured using a single item; therefore internal consistency is not applicable.

Table 1 presents the descriptive statistics and internal consistency reliability of the study variables. Mean scores ranged from 2.94 to 3.03, indicating moderate perceptions of WASH services in government hospitals. Cronbach's alpha coefficients ranged from 0.75 to 0.87, exceeding the recommended threshold of 0.70 and indicating satisfactory internal consistency across all multi-item constructs.

Table 2: Pearson Correlation Matrix

Variable	W	S	HWM	HH	EC	PS
Water (W)	1					
Sanitation (S)	-.004	1				
Healthcare Waste Management (HWM)	-.017	.090	1			
Hand Hygiene (HH)	.033	-.060	.107	1		
Environmental Cleaning (EC)	-.065	-.006	.070	.064	1	
Patient Satisfaction (PS)	.172**	.122**	.183**	.077	.098	1

Note: Pearson correlation coefficients are reported. $N = 300$. $p < 0.05^*$, $p < 0.01^{**}$.

Table 2 presents the Pearson correlation coefficients among the study variables. Patient satisfaction was positively correlated with water ($r = 0.172$, $p = 0.003$), sanitation ($r = 0.122$, $p = 0.035$), and healthcare waste management ($r = 0.183$, $p = 0.001$). Correlations involving hand hygiene and environmental cleaning were not statistically significant. Inter correlations among the predictor variables were low, suggesting no evidence of problematic multicollinearity.

Prior to conducting the regression analysis, assumptions of linearity, independence of errors, homoscedasticity, normality of residuals, and multicollinearity were assessed. No substantial violations of these assumptions were detected.

Table 3: Multiple Linear Regression Predicting Patient Satisfaction

Predictor	<i>B</i>	<i>SE</i>	β	95% CI for <i>B</i>	<i>t</i>	<i>p</i>	<i>VIF</i>
Constant	.538	.485	-	-.415 to 1.492	1.111	.267	-
Water	.244	.074	.184	.098 to .390	3.293	.001	1.005
Sanitation	.148	.073	.113	.003 to .292	2.009	.045	1.013
Healthcare Waste Management	.224	.078	.162	.070 to .377	2.872	.004	1.025
Hand Hygiene	.087	.074	.066	-.058 to .233	1.182	.238	1.021
Environmental Cleaning	.125	.074	.095	-.020 to .270	1.696	.091	1.012

Model fit: $R = 0.299$; $R^2 = 0.089$; Adjusted $R^2 = 0.074$; $F(5, 294) = 5.769$; $p < 0.001$.

Note. Dependent variable: Patient Satisfaction. *B* = unstandardized regression coefficient; *SE* = standard error; β = standardized regression coefficient; CI = confidence interval; VIF = variance inflation factor.

Multiple linear regression analysis was performed to examine the association between WASH dimensions and patient satisfaction (Table 3). The overall regression model was statistically significant, $F(5, 294) = 5.769$, $p < 0.001$, explaining 8.9% of the variance in patient satisfaction ($R^2 = 0.089$; adjusted $R^2 = 0.074$). Water ($\beta = 0.184$, $p = 0.001$; 95% CI: 0.098–0.390), healthcare waste management ($\beta = 0.162$, $p = 0.004$; 95% CI: 0.070–0.377), and sanitation ($\beta = 0.113$, $p = 0.045$; 95% CI: 0.003–0.292) were significant positive predictors of patient satisfaction. In contrast, hand hygiene and environmental cleaning were not significantly associated with patient satisfaction. Multicollinearity diagnostics indicated no evidence of multicollinearity, with VIF values ranging from 1.005 to 1.025. Accordingly H1, H2, and H3 were supported, whereas H4 and H5 were not supported.

Discussion

The present study explored the impact of WASH facility on Patients satisfaction in government hospitals, Andhra Pradesh, India. Water, sanitation and healthcare waste management were found to have significant impact on patient satisfaction while hand hygiene and environmental cleaning were not found to have statistically significant impact. While the regression model accounted for only a small percentage of the variance in patient satisfaction ($R^2 = 0.089$), the results indicate that essential WASH services are an important component of patients' perceptions of the quality of their healthcare, and that many other organizational and interpersonal factors impact on patient satisfaction that are not related to environmental infrastructure changes.

The results indicated that water was the greatest contributor to patient satisfaction, highlighting the need for continuous supply of good and sufficient water in healthcare facilities. This result is aligned with international evidence indicating that improved water supply increases trust in the health care system, boosts infection prevention, and contributes to overall better health care services (WHO, 2023; Gnanasekaran et al., 2024). The systematic evidence in recent years has shown that water infrastructure is one of the most effective WASH interventions in healthcare facilities, especially in low and middle-income countries where service disruptions are prevalent (Gnanasekaran et al., 2024). Moreover, the WHO and the United Nations Children's Fund (2023) have

remained a strong advocate for the need for uninterrupted access to safe water for quality healthcare and patient safety. Against this, access to water remains a pressing issue of public health especially in low resource communities (Yamani et al., 2026).

Patient satisfaction was also strongly positively affected by sanitation. Well designed, accessible and sanitary hygienic facilities allow patients to enjoy a better experience, both in terms of comfort and privacy and their perception of the quality of services they receive. The result aligns with the previous empirical studies in healthcare facilities in low-income and middle-income countries that found that poor sanitation is correlated with increased patient dissatisfaction and decreased healthcare service utilization (Cronk et al., 2015; WHO, 2023). The findings from recent study further confirm that sanitation infrastructure continues to play a key role in improving healthcare quality and is a significant factor in patient-centred care (Gnanasekaran et al., 2024).

Another important factor affecting patient satisfaction was healthcare waste management. Effective segregation, storage, treatment and disposal of health care waste lead to safer health care environments and increase the confidence of patients in the management of the hospital. This finding aligns with recent studies which highlighted that good healthcare waste management decreases environmental pollution, infection control and enhances the perception of healthcare quality (Windfeld & Brooks, 2015; Purwandari et al., 2024). A recent study also revealed that healthcare waste management is one of the environmental health services that needs continuous investment, especially in health systems with limited resources (Purwandari et al., 2024).

Hand hygiene, however, had no significant impact on patient satisfaction. While hand hygiene is known to be among the most effective interventions to prevent healthcare-associated infections, there can be limited opportunities for patients to observe hand hygiene facilities in hospitals. Thus, hand hygiene could have a stronger impact on patients' safety than patient perceptions of service quality. This is in line with previous studies that showed that WASH-related infrastructure is more visible and thus more likely to impact on patient perception, while behavioural-based infection prevention practices are less visible and therefore less likely to impact on patient perception (Howard, 2020; WHO, 2023).

Likewise, there was no statistically significant difference in patients' satisfaction with environmental cleaning. A possible reason is that, a clean hospital environment is considered as being expected, not considered as an unusual feature of the quality of hospital care. Moreover, a study (Alotaibi et al., 2026) evident that the largest share of healthcare waste in non-hazardous, but unsafe handling may create disproportionate risks for patients, workers, communities, and for the environment too. Therefore, environmental cleaning may only have an impact on satisfaction when standards are not met, which can be seen. However, despite its limited impact on patient-reported satisfaction, recent studies still argue that environmental cleaning is essential to reduce healthcare-associated infections and to improve general health care quality (WHO, 2023; Gnanasekaran et al., 2024).

This is also in line with global data showing that the overall satisfaction of patients is not solely dependent on the provision of WASH facilities. Many studies argued that patient satisfaction was achieved when quality of service is provided. A study (Lavado and Lagos, 2026) revealed that management and accessibility of water and sanitation impact service quality. Another study of healthcare facilities in low and middle-income countries revealed that the poor provision of WASH services negatively impacts satisfaction; however, provider behaviour, communication, waiting time and perceived clinical care quality have been shown to have a greater impact on patient satisfaction (Bouzd, 2018; Gnanasekaran et al., 2024). This observation gives a good reason why the regression model in the present study has relatively small explanatory power.

From a policy perspective, the study concludes that government hospitals need to focus on improving the reliability of water supply systems, sanitation facilities and healthcare waste management, and also need to enhance quality of care policies in general, such as by strengthening the responsiveness and communication of their staff and improving the efficiency of services. These comprehensive approaches can improve patient satisfaction and help to build more secure and resilient healthcare systems. The recommendations are aligned with recent evidence from around the world that supports a full package approach to WASH improvements as an integral part of health system strengthening, rather than investments in infrastructure alone.

Conclusion

The relationship of Water, Sanitation, and Hygiene (WASH) services to patient satisfaction in Government Hospitals, Andhra Pradesh, India has been investigated. The results showed that water availability, sanitation and health care waste management were important positive factors affecting patient satisfaction, indicating the importance of these WASH dimensions in the perception of health care quality. No such relationship was found with patient satisfaction for hand hygiene and environmental cleaning, however, after controlling for the other WASH dimensions. These practices are basic infection control or patient care principles, but may not be apparent to the patient during a hospital stay, and therefore less impactful on satisfaction scores.

The study adds to the scarce empirical findings linking the WASH services to the satisfaction level of patients in public healthcare facilities in India. The results indicate that the investment in reliable water supply, proper sanitation facilities, and better waste management at healthcare facilities can improve the patients' experiences and improve the quality and safety of healthcare. These enhancements also align with wider public health objectives such as infection prevention and control, environmental sustainability and efforts towards Sustainable Development Goal (SDG) 3 (Good Health and Well-being) and SDG 6 (Clean Water and Sanitation).

While the regression model accounted for only a small amount of the variance in satisfaction with the healthcare ($R^2 = 0.089$), the results suggest that the level of WASH infrastructure is one of the elements of health care quality. Patient satisfaction is a complex phenomenon, and other factors, including communication with the health care provider, responsiveness of health personnel, waiting time, access to medicines, and clinical quality of care, also

play a role. This means that in order to maximize patient satisfaction and service quality, improvements to WASH need to be part of a larger health system strengthening project.

This study has a number of limitations. In the first place, the study has been carried out in government hospitals in Andhra Pradesh which would constrain the findings to be generalizable to other health care settings. Second, a single item was used as an indicator of patient satisfaction, which might not adequately reflect the multidimensionality of this construct. Lastly, as the regression model had rather limited explanatory power, other factors affecting patient satisfaction were not accounted for in the present analysis. To better understand how WASH services affect patient satisfaction, future studies should use validated, multi-item patient satisfaction tools, include other dimensions of healthcare quality, include comparisons to both public and private healthcare facilities, and use longitudinal or mixed-methods approaches.

The results highlight the importance of WASH infrastructure not just as infection prevention and environmental health measures, but also as part of enhancing patient experiences in public health care facilities. Reliable water supply, sanitation and healthcare waste management utilities, combined with other healthcare quality improvement efforts can help improve patient-centred care and strengthen more resilient and sustainable health systems.

Conflicts of Interest

The authors declare that they have no competing interests.

Acknowledgement

Venkatesh Bathala is the awardee Doctoral Fellowship from ICSSR (File no.: ICSSR/RFD/2023-24/312). This paper is largely an outcome of the Doctoral Fellowship sponsored by the Indian Council of Social Science Research (ICSSR), New Delhi, India. However, the responsibility for the facts stated, opinions expressed, and the conclusions drawn is entirely of the authors.

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