Water, Sanitation and Infection Control Practices in Rural health facilities of Jodhpur District: An Intervention through Supportive Supervision

Thesis

Submitted to

All India Institute of Medical Sciences, Jodhpur

In partial fulfilment of the requirement for the degree of

DOCTOR OF MEDICINE (MD)

(COMMUNITY MEDICINE)

July 2020 **DR. SRIDEVI G**

AIIMS, JODHPUR

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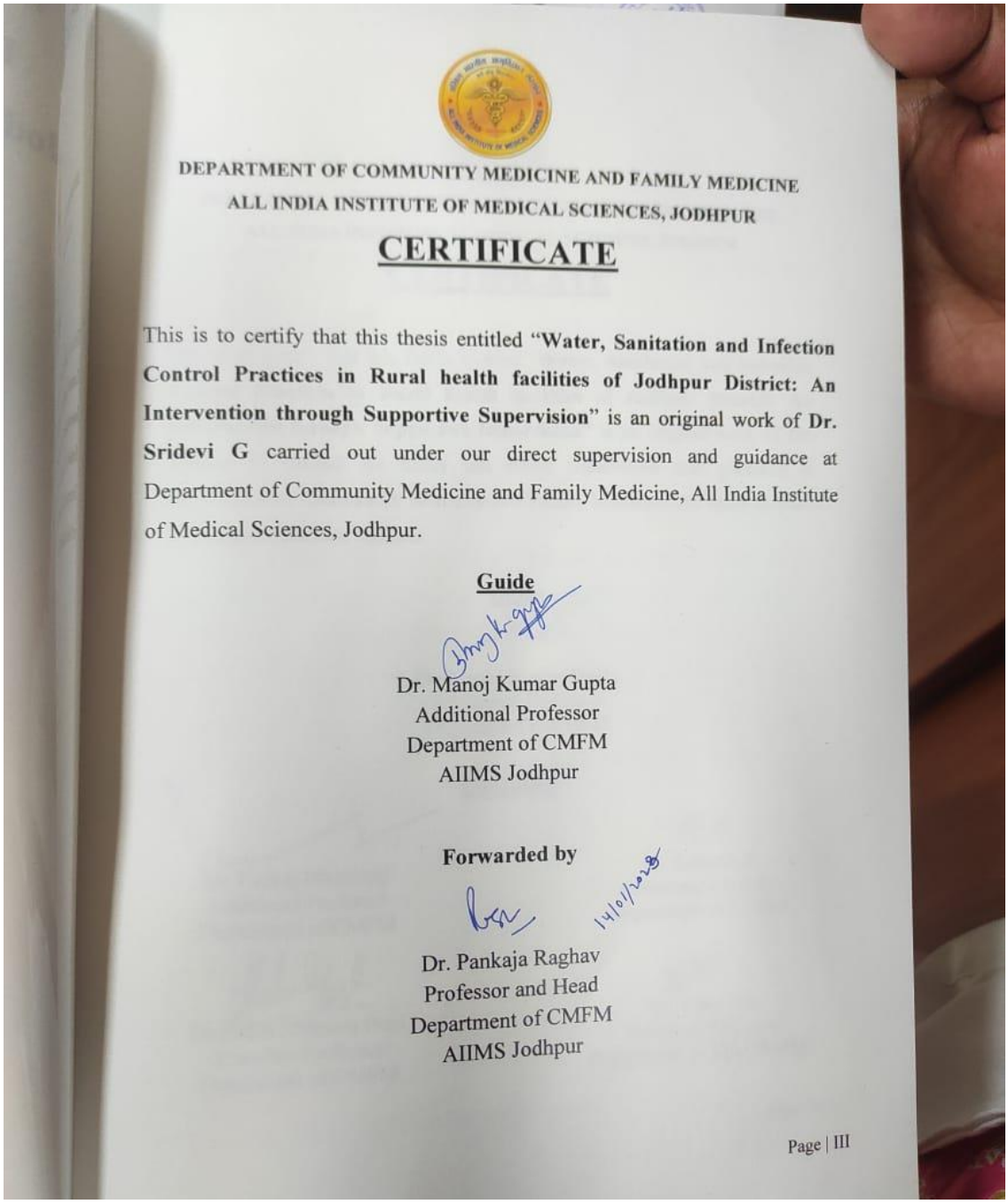

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DECLARATION

I, hereby declare that the work reported in the thesis entitled **"Water, Sanitation and Infection Control Practices in Rural health facilities of Jodhpur District: An Intervention through Supportive Supervision"** embodies the result of original research work carried out by undersigned in the Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur.

I further state that no part of the thesis has been submitted either in part or in full for any other degree of All India Institute of Medical Sciences or any other institution/ University.

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Sri. G

Dr. Sridevi G

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List of abbreviations

ANM	Auxiliary Nurse Midwife
AMR	Antimicrobial Resistance
ASB	Aerobic Spore Bearers,
BIS	Bureau of Indian Standards
BMW	Biomedical Waste
BMWM	Biomedical Waste Management
BOR	Bed Occupancy Rate
CAT	Comprehensive Assessment Tool
CDB	Community Development Block
CHC	Community Health Center
FACET	Facility Evaluation TOOL for WASH in Institutions
FM	Fully Met
GNB	Gram-Negative Bacilli
HCAI	Health Care Associated Infections
HCF	Health Care Facility
HCW	Health Care Workers
HH	Hand Hygiene
HHCAR	Hand Hygiene Complete Adherence Rate
HHPAR	Hand Hygiene Partial Adherence Rate
ICC	Infection Control Committee
IEC	Information Education Communication
IPC	Infection Prevention and Control
IPHS	Indian Public Health Standards
JMP	Joint Monitoring Programme
LMIC	Lower Middle-Income Countries
LT	Lab Technician
MOHFW	Ministry of Health and Family Welfare

MOIC	Medical Officer In-charge
MPN	Most Probable Number
NM	Not Met
OPD	Outpatient Department
PHC	Primary Health Center
PM	Partially Met
RAT	Rapid Assessment Tool
SARA	Service Availability and Readiness Assessment
SDG	Sustainable Development Goal
SDI	Service Delivery Indicators
SIS	Sanitation Inspection Risk Score
SPA	Service Provision Assessment
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WASH Con	WASH in HCF Conditions Assessment tool
WASH FIT	Water, Sanitation and Hygiene- Facility Improvement Tool
WHO	World Health Organization

SUMMARY OF THESIS

Background

Safe water, sanitation and hygiene are key public health interventions to improve the health care facility and to prevent nosocomial infections

Aim

To improve the water, sanitation, and infection control practices in Rural health facilities of Jodhpur District through supportive supervision.

Objectives

1. To assess the water, sanitation, and infection control practices in rural health facilities of the Jodhpur district
2. To provide supportive supervision for the improvement of water, sanitation, and infection control practices in rural health facilities of the Jodhpur district
3. To assess the changes in water, sanitation, and infection control practices in rural health facilities of Jodhpur district post-intervention

Methodology

This study presents the findings of an intervention study conducted in luni Block of the Jodhpur district. All the health care facilities (PHCs and CHCs) in that block were included. Based on WASH FIT and WHO guidelines, a semi-structured interview was scheduled for quantitative and qualitative assessments. A total of 11 health care facilities (5 CHCs, 6 PHCs) were included in this study. Baseline assessment was done in all of them. Following this, the intervention workshop using posters, demonstration and PowerPoint presentation was conducted covering various domains of WASH FIT. Supportive supervision strategy was adopted to provide continuous monitoring and feedback. After a gap of 3 months, a follow-up assessment was done in all the HCFs, and intervention was provided in case of any deficiencies observed. Endline assessment was done after 3 months of the follow up assessment using the same tool. Water and swab

samples from labour room were collected from the facilities for microbiological surveillance during the baseline and endline assessments.

Results:

Out of 11 facilities included in this study, five were CHCs, and six were PHCs. The average population covered in all the CHCs combined was 45,732 and for PHCs, it was 21,765. During the baseline, none of the facilities included in this study had a bed occupancy rate of more than 60%. Average OPD attendance in CHCs was 57 and in PHCs it was 22. None of the facilities had adequate manpower as per IPHS 2012. There were specific gaps in practices related to water, sanitation, hygiene, and infection control in health care facilities. The major issues in water-related practices were quality, accessibility, safe storage, periodic testing of chlorine residue, and sanitation inspection risk score. Unable to meet menstrual hygiene-related needs, improper records of cleaning, lack of responsibility for management of sanitation and health care waste, and inadequate usage of PPE for waste disposal were significant gaps in sanitation-related practices. The unavailability of functional hand hygiene stations, non-adherence to hand hygiene compliance activities, and inadequate knowledge regarding the correct concentration of cleaning solution were identified as potential lacunae related to hygiene. All the facilities had shown statistically significant improvement in WASH FIT scores across all four domains (water, sanitation, hygiene, and management) post intervention.

Conclusion:

Practices related to water, sanitation, hygiene, and infection control in health care facilities of rural Jodhpur were not satisfactory. There were specific gaps in all these domains. The intervention in the form of capacity building of healthcare workers, formation of Infection Control Committee, and continuous supportive supervision was found effective in significantly improving the practices related to water, sanitation, and hygiene in health care facilities.

Chapter 1: INTRODUCTION

Provision of safe drinking water, sanitation facilities, and hygiene are essential public health strategies to improve Quality of Care (QoC) (1). Water of suitable quality and quantity, facilities for securely handling excreta and healthcare waste, and the implementation of hygienic practises such as hand hygiene and environmental cleaning are also necessary for any healthcare facility (HCF) (2,3). The cause - effect relationship between birth attendant hand hygiene practises and maternal infection has long been proven. (1,4). More recently, the causal linkage between neonatal sepsis, maternal mortality, and increasing antimicrobial resistance to poor access to water and sanitation and an unclean birth environment has been established (3,5). Water Sanitation and Hygiene (WASH) services and practices are necessary for delivering most infection prevention and control practices and are crucial for improving disease related outcomes (6).

Improving WASH in healthcare facilities is essential to meet Sustainable Development Goals (SDG) in 2030, which includes targets 6.1 and 6.2 related to WASH (7). This consists of a global call to action on WASH in HCFs launched in 2018 (6–9), envisioning universal and sustainable access to safe WASH in HCFs, particularly in Lower- and middle-income countries, where services are frequently lacking. WHO and UNICEF are co-leading the execution of a worldwide roadmap to improve WASH services in HCFs. WASH in healthcare facilities is also crucial to achieving target 3.8, which aims to provide all people with access to quality essential healthcare services (1). Even community members are more likely to visit the health care facilities with safe and proper WASH facilities and services.

WASH coverage in HCFs is inadequate. According to the SDGs baseline statistics released in 2019, one in every four HCFs lacks basic water services, and one in every five lacks sanitation facilities, affecting over two billion and 1.5 billion people, respectively. Most of these people are in Lower- and middle-income countries (LMIC) (10). Similar deficiencies exist for appropriate segregation and disposal of medical waste as well as for basic hand hygiene facilities. It is predicted that between 10% and 70% of Healthcare-Associated Infections (HCAIs) in high-income nations are avoidable, depending on the context, baseline infection rates, and the type of illness (11).

According to the JMP report launched in 2022, showcasing the progress on WASH in Health Care Facilities highlighted basic water service was available in four out of five HCFs, no sanitation service was observed in 1 out of 10 HCFs, and basic hygiene services were available in half of the HCFs (6).

These infections have been decreased by multi-modal strategies, such as increasing the availability of hand hygiene items and enhancing healthcare professionals' hand hygiene practises (11). In facilities with substandard services there is high prevalence of HCAIs (12). Most pathogenic microorganisms isolated in HCFs in LMICs are directly linked to environmental contamination, such as poor water quality, poor hand hygiene, or contaminated equipment and surfaces (1). Inadequate environmental hygiene in these settings has been identified as a potentially important determinant of the high burden of HCAIs, and other adverse outcomes such as maternal and new-born mortality (2,3).

Evidence suggests that poor WASH in healthcare facilities also results in increased prophylactic use of antibiotics during childbirth, which may be a significant contributor to Antimicrobial Resistance (AMR). Inadequate WASH contributes to the transmission of preventable infection in health care and, by extension, the spread of AMR. Nearly 670,000 infant deaths worldwide each year due to sepsis may be partially caused by pathogens that have developed resistance (13). Also, improper wastewater disposal from healthcare facilities might spread AMR in the environment. Implementation of WASH is a necessary pillar in providing quality health care services (14). In low-resource health care facilities, providing WASH related services should be considered as a non-negotiable essential service. Ensuring proper WASH management is not just the responsibility of healthcare workers but also of the non-clinical staff as well as to the people visiting any healthcare facility. Focussed leadership and supportive supervision are important to ensure not just the availability but also its maintenance.

To provide high-quality care and lower infection rates, healthcare facilities must have the necessary infrastructure and human resources to deliver safe, efficient, equitable, and people-centered services. WASH services assist healthcare systems to be more resilient to respond more effectively to emergencies (including natural disasters and outbreaks) and keep them under control when they occur. Robust and reliable monitoring systems are essential to manage and improve WASH services, track progress, and focus resources

where they are most needed. Monitoring is necessary at both the facility level and on a global/national scale.

A comprehensive evaluation, with the assessment of WASH in HCFs, followed by tailored intervention in a customized manner, is essential. In India, many health care facilities, specifically labour rooms, and newborn intensive care units, experience a high burden of nosocomial infection due to inadequate WASH facilities and improper waste management. This results in a higher incidence of maternal and neonatal sepsis and nosocomial infections, leading to a higher maternal and neonatal mortality rate.

In India, only 19.2% of labour rooms and 3.2% of post-natal care wards across the three tiers of healthcare facilities have usable toilets (15). Every year, hundreds of millions of people are affected by healthcare-associated illnesses, with 15% of patients reportedly developing one or more infections while hospitalized (11).

These threats can be effectively addressed by improving WASH in healthcare settings, including strengthening infection prevention and control, operation and maintenance of infrastructure, hand hygiene, and biomedical waste management.

Water and Sanitation for Health Facility Improvement Tool (WASH FIT) is a multi-step, progressive method for improving WASH services, quality, and patient experience. WHO and UNICEF developed this tool in a digital dashboard consisting of a risk-based management approach to improve the quality of care in HCFs (16). With this tool, internal teams perform self- assessment under various WASH parameters in their facilities. Facility assessments following the implementation of this tool showed that facilities improved without much external financial or material support. It was also observed that when it is coupled with supportive supervision and proper training, health care facilities improved their WASH services and practices.

In collaboration with the Government of India (GoI), WHO and UNICEF have adopted an evidence-based approach to strengthen WASH in HCFs. Incongruent, the Kayakalp initiative was launched in 2015 by the Ministry of Health and Family Welfare (MoHFW) to reward the health care facilities which promote cleanliness (17). Kayakalp uses a specific standard protocol to award the best two District hospitals (DH) in each state, the Best two Community Health Centres (CHC) / Sub District Hospitals (SDH), and one Primary Health Center (PHC) in every district(18). The various parameters used to score

the performance of Health care facilities are hospital/ facility upkeep, sanitation, and hygiene, waste management, infection control, hygiene promotion, and support.

Supervision is an excellent option to provide further training, improve performance, and address other systemic issues (19). Rather than looking for problems, supportive supervision assists in making things function. Supportive supervision promotes open, two-way communication and the development of team approaches to issue-solving (20).

With this background, it was hypothesized that supportive supervision would improve healthcare facilities' water, sanitation, and infection control practices. Therefore, this study was planned with the following aim and objectives.

Chapter 2: AIM AND OBJECTIVES

Aim

To improve the water, sanitation, and infection control practices in Rural health facilities of Jodhpur District through supportive supervision.

Objectives

1. To assess the water, sanitation, and infection control practices in rural health facilities of the Jodhpur district
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Chapter 3: REVIEW OF LITERATURE

3.1. WASH

Safe water, sanitation, and hygiene are essential for the health and well-being of an individual. The improved standard of WASH is essential for better physical health, environmental protection, better educational outcomes, more convenient time management, the assurance of lives with dignity, and equitable treatment for men and women. According to evidence, increasing service levels for safely managed drinking water or sanitation (indicators for SDG 6.1 and 6.2), such as regulated piped water or connections to sewers with wastewater treatment, can significantly improve health by lowering the number of deaths from diarrheal disease. The WHO vision for WASH is: '*To Substantially improve Health through the Safe Management of Water, Sanitation and Hygiene Services in all Settings.*' (21)

3.2. WASH in healthcare facilities

World Health Organization (WHO) considers the term 'Health Care Facilities as "*all formally recognized facilities that provide health care, including primary (health posts and clinics), secondary, and tertiary (district or national hospitals), public and private (including faith-run), and temporary structures designed for emergency contexts*," (22).

'WASH in health care facilities is defined as "the provision of water, sanitation, health care waste, hygiene, and environmental cleaning infrastructure, and services across all parts of a facility." (21) The critical role of WASH in health care facilities is essential in ensuring quality improvement in infection prevention and control, improving quality of care, reducing maternal and neonatal care and antimicrobial resistance. The organic role of WASH extends beyond forming an infection control committee, boosting the staff morale and health care workers' performance to improve the overall hygiene in patient care.

WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) indicate that WASH services in healthcare facilities are sub-standard in every region. An estimated 896 million people use healthcare facilities with no water service, and 1.5 billion use facilities with no sanitation service. Many people are likely served by

healthcare facilities lacking hand hygiene facilities and safe waste management. WASH services are more likely to be available in hospitals than in other healthcare facilities and urban areas than in rural areas. With the support of 35 partners, WHO and UNICEF combinedly monitor WASH services in healthcare facilities. (23)

3.3.Tools for Assessment of WASH in health care facilities

Revamping WASH in HCFs requires continuous monitoring and feedback, which can be done by upgrading tools for assessments of WASH services. A handful of tools are available for evaluating WASH in HCFs, and the components included in each tool are summarized. Following are descriptions of some of these tools

3.3.1. Service Provision Assessment (SPA) tool

This is the first tool developed in 1991 by ICF International under the USAID-funded MEASURE DHS project. This assessment tool in the health care facility collects information on service availability and Quality of Care (QoC) measures. There are two dimensions of quality of care: structural quality (Physical and human resources) and process quality (experience of care and provision of care). Key topics assessed in the tool include child health, antenatal health, delivery, and newborn care, family planning, malaria, Water Sanitation and Hygiene services, Health system assessment, and emergency preparedness. Indicators assessed in the WASH component include the availability of water sources, basic sanitation services, infection control practices, and biomedical waste disposal. The advantage of this tool is it provides a comprehensive snapshot of HCF in many countries. The disadvantage is it doesn't provide data on "WHY"; for example, the non-availability of cleaning solution was captured, but the reason for the lack of procurement was not mentioned. This tool will be further revised in 2022 to make the SPA indicator driven and reemphasize QoC. (24)

3.3.2. Service Availability and Readiness Assessment (SARA) tool

This was the second tool developed in health facility assessment to monitor the service availability and readiness of the health sector. This tool was developed through a collaboration between World Health Organization and the United States Agency for International Development in 2011 to fill the gaps in tracking the progress of the health system. It is developed based on SPA Tool, but it has the added advantage of capturing

data for the question “WHY” in service availability and functioning of resources. A further revision of the SARA tool was done in 2015. This tool includes various components related to the infrastructure, service availability, and diagnostics. It was not a specifically developed assessment tool for WASH indicators. (25)

3.3.3. Service Delivery Indicators (SDI) tool

The World Bank developed and monitored the SDI tool to generate service delivery and education-related statistics in healthcare facilities and schools. The survey was conducted in 2012 and scaled up in 2014 in six African countries. SDI surveys were planned to be repeated every two years. It included fewer indicators overall than SARA and SPA, but it was the most comprehensive for WASH (access, quality, and reliability). An infrastructure score was created by combining water, sanitation, and electricity. However, one limitation of this tool was that it only addressed infrastructure-related WASH. Data on hand hygiene, infection control measures, health care waste storage, and disposal were not collected (26).

3.3.4. Rapid Assessment Tool (RAT)/Comprehensive Assessment Tool (CAT)

This tool was developed by the World Health Organization in the guidelines document of WASH in HCF in emergencies, 2012. This tool was designed to assist the safety level of healthcare facilities during emergencies. A quick assessment of healthcare waste-related public health hazards can be done using Rapid Assessment Tool. When there is an ample amount of time, the Comprehensive Assessment Tool can be used for conducting a depth assessment of hazards, including point of origin, conveyance, storage, treatment, and final disposal. The advantage of these tools was that they had given scores exclusively for WASH. Disadvantages include its usage in emergency settings only. (27)

3.3.5. Emory tool

This tool was developed to assess the WASH infrastructure and resources in HCFs by the Center for Global Safe Water (CGSW) at Emory University. It utilizes survey data, observations, and water quality indicators and includes modules on water, sanitation, hygiene, infection control, medical waste, wastewater, and accessibility of WASH resources. This tool was developed based on the WHO publication Essential Environmental Health Standards in Health Care (2008), other existing tools in literature,

proposed SDG, and previous research conducted by Emory CGSW on WASH in HCFs. It was implemented in referral hospitals and health care facilities for assessment of WASH status. (28)

3.3.6. Mahatma Gandhi Swachhta Mission

A Guideline for making health institutions more effective, clean, neat, accountable, and quality oriented was launched by the government of Gujarat in 2014 called Mahatma Gandhi Swachhta Mission. It includes three components-standards, a checklist for responsible persons of different departments, and a checklist for liaison persons. The merits of this tool are that it includes all departments individually and it is comprehensive. Demerits include it was not robust and difficult to apply in small settings and limited to the state of Gujarat state. (29)

3.3.7. UNICEF IAPSM TOOL

From September to December 2014, this tool was adopted in the functional delivery points (FDPs) of eight high-priority districts (HPDs) in Gujarat. Its primary purpose was to evaluate the degree of WASH service provision, practices, and obstacles in health centres, particularly in labour rooms, postnatal wards, and antenatal care (ANC) outpatient departments (OPDs) of FDPs of all eight HPDs in Gujarat. It also encompassed making strategic recommendations to enhance WASH compliance. The key elements were the postnatal ward, labour room, restrooms, BMW management, water facility, and ANC OPD. (30)

3.3.8. WASH Tool Kit

This tool was created by the SHARE-funded multi-country study conducted by the Indian Institute of Public Health Gandhinagar (IIPHG) and BRAC and was known as the Soapbox WASH tool kit. During the study's formative stage, a set of tools was created and used in seven maternity units in Bangladesh and India during 2013-2014. These seven survey instruments were divided into four categories: photo prompt interview guides (for managers, health care professionals (HCPs), cleaners, and mothers); facility needs assessment; document availability; walkthrough checklist with the microbiological component. The fact that this tool had microbiological, photo prompt, and all other

WASH components was a strength. The fact that this tool kit was primarily intended for use in labor and delivery rooms was its major shortcoming. (31)

3.3.9. Swachhta Guideline for public health care facility/KAYAKALP

This guideline was launched in May 2015 as part of the Swachhta Mission (2014-2019) for state guidance. The Gujarat government adopted and modified the Mahatma Gandhi Swachhta Mission guideline initiative (GOG). It was launched to promote cleanliness and enhance the quality of public health facilities. It includes the same components and checklist and components. In the year 2015-2016, based on the hospital/facility upkeep, sanitation and hygiene, waste management, infection control, support services, and hygiene promotion, rewards were given to the district Hospitals with the Highest score on the set criteria with a cash prize of 50 lakhs for 1st place and 20 lakhs for 2nd place and three lakhs for district hospitals achieving 70% of the specified criteria. The demerit of this guideline is that it doesn't include specific criteria for sub-centers. (18)

Table 1 Tools and indicators for assessment of WASH in HCF

Indicators	Tools							
	SPA	**SARA**	**SDI**	**RAT/ CAT**	**Toolbox**	**MGSM**	**KAYAKALP**	**UNICEF-IAPSMG**
Year of implementation	1991	2011	2012	2012	2014	2015	2015	2015
Water component	R	O	R	R&O	O	O	O	R&O
Sanitation component	O	R	R	O	O	O	O	O
Hygiene component	O	O	R	R&O	O	O	O	O
Microbiological surveillance	X	X	X	X	✓	X	✓	X
Individual and system determinants	X	X	X	✓	✓	X	X	X
Patient satisfaction with WASH	✓	X	X	X	✓	X	X	X
Staff satisfaction with the WASH facility	X	X	X	X	✓	X	X	X
Documentation	X	X	✓	X	✓	X	✓	✓
Training on IPC	X	X	X	✓	✓	✓	✓	X
Photo documentation	X	X	X	X	✓	X	✓	X
Procurement process documentation	✓	X	X	✓	✓	X	X	X

R – Reported, O-Observed, ✓ - Available, X – Not available

3.3.10. Digital tools

WASH is an essential component in HCFs, and there is an imminent need for new and innovative tools powered with new-age technology to assess WASH practices in HCFs. Mobile-based applications make this task of monitoring and assessment more accessible, affordable, effortless, and less time-consuming for monitoring thousands of HCFs across the world. Some of these WASH-based apps are described below:

a) WASH FIT Digital (Water and Sanitation for Health Facility Improvement Tool):

In 2015, WHO and UNICEF developed an open-access and free application published later in the year 2018. It originated from the WASH FIT guide (by WHO and UNICEF). It was established on the mWater digital monitoring platform as a foundation for risk-based and ongoing improvement. The WASH FIT framework directs a cycle of continuous improvement through evaluations, risk prioritization, and the definition of specific, focused interventions. This online version of WASH FIT gathers the information via the WASH FIT app and uses the WASH FIT website to display statistics for the facilities. It focuses mainly on four broad areas (water, sanitation, hygiene, and management) with indicators and goals for achieving minimum standards in each area. Depending on the needs, one can customize the assessment form to include all or only some of the indicators. This app involves five steps: Creating a WASH FIT team, assessing the situation, setting priorities, implementing the plan, and evaluating it. By using the program, hospitals and health facilities could take control of their WASH status, comprehend their current WASH condition, and implement gradual improvements. The second edition of WASH FIT was released in 2022. It includes a set of fact sheets, checklists, updated assessments and examples of national adoption, a comprehensive training manual, and slides. (32)

b) FACET (The Facility Evaluation TOOL for WASH in Institutions):

This tool was developed jointly by Terre des Hommes, Eawag, and CartONG in 2016 with the support of the UNICEF/ WHO Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP's) and later published in 2018. It is an open-source analysis tool that is intuitive and customizable and provides online/offline mobile data collection. Once the data is collected on a mobile device, it is directly analyzed with the FACET analyzer, an offline tool. Meanwhile, one can also analyze collected information on the online platform using Power BI FACET Analyzer. Health authorities were encouraged to be included in the planning process and survey teams. FACET's operation, local context adaptation, survey preparation, and enumerator training are all covered in a manual. The tool's core features and working principles are introduced in a separate

practitioner's guide, which also provides instructions on how to modify it to fit the local situation. (33)

c) WASH Con (WASH in HCF Conditions Assessment tool):

Emory University, Atlanta, developed a simple yet effective tool named WASHCon in 2014, which was later published in 2016. This tool offered a thorough outline of the infrastructure, WASH conditions, and resources available in HCFs. This app helps to measure all five core domains of WASH (including water supply, environmental cleanliness, hand hygiene facilities, sanitation facilities, and waste management) in the HCFs. The data gathered can be used to educate and focus on programmatic operations designed to improve WASH in HCF and assist advocacy efforts. Like FACET, this tool also aligned with the JMP indicators. This tool was mobile-based, convenient to use, and has automated online consoles and reports so that it can be implemented at any level of HCF. The automated consoles/dashboard enabled users to view the WASH scores of different HCFs, which could then be compared between multiple HCFs. This made it possible for each HCF to pinpoint the WASH areas that need development and provided information to guide and organize local and regional programmatic efforts to enhance WASH in HCF (30).

The advantage of WASH FIT over other tools where it covers all four domains essential to improve WASH practices in the HCFs. It provides a framework for monitoring and continuously implementing resources based on identified needs. It enables shared responsibility by encouraging team-based approach.

3.4. WASH global scenario

One of the most pressing issues in the country is equitable access to safe drinking water and sanitation, which the government addresses on a priority basis. Globally 2 billion people do not have access to safely managed drinking water. Among those people, only 1.2 billion people have basic drinking water services. Safely managed sanitation services are available to 3.6 billion people, accounting for nearly half of the world's population. Only 1.9 billion people have basic sanitation services, and 494 million practice open defecation. Handwashing with soap and water at home, included under basic hygiene services, is not available for 2.3 billion people, and 670 million people across the globe do not have handwashing facilities at all. (34)

Findings from the JMP Global Baseline Report show that in 2016, 74 percent of healthcare facilities globally had basic water services, 21 percent had no sanitation service, and 16 percent had no hygiene service. (35)

Globally there is an official mandate provided by the WHO/UNICEF Joint Monitoring Programme (JMP) to monitor progress on SDG6 and SDG 3. In line with JMP, countries have various initiatives to improve WASH in HCF. For example, India has launched the "Kayakalp" initiative at the national level to incentivize public health facilities to demonstrate commitment to safe water, sanitation, and infection control practices.

Following was some of the studies depicting WASH service in HCFs in various countries:

3.4.1. Observational studies

Kayiwa et al., (2020) conducted a cross-sectional study in Uganda to assess the water, sanitation, and hygiene service availability in the health center of level III, level IV, and Private Not for Profit (PNFP) HCFs since these facilities provide maternal and child health services. A total of 60 healthcare facilities were included, and data collection was done using the WASH Conditions tool consisting of surveys, checklists, and water quality testing. As per JMP definition of WASH in HCF, 12.1% HCFs have basic WASH service. There were 48.3%HCFs having limited water service, 84.5% HCFs having limited sanitation service, 50% HCFs having limited environmental cleaning, 56.9%

HCFs having limited hand hygiene service, and 51.7% HCFs having limited waste management services. It was found that 93.1% of HCFs had a primary water source available within the facility premises, and 70.7% HCFs depended on piped water supply. There was water discontinuity in 75.9% HCFs. On-site sanitation systems were used by approximately 25.9% of the HCFs. Facilities that were providing menstrual hygiene needs were 68.3%. Only 20.0% (12/58) of the HCFs had improved toilets accommodating people with limited mobility. There were 59.4 % HCFs with functional hand hygiene facilities, and 43.3 % HCFs had functional hand hygiene stations with soap and water within five meters of the toilet. In environmental cleanliness services, there were visibly clean wards in 86.7% HCFs and clean floors in 88.3% HCFs. Almost 79.3% HCFs reported cleaning beds and mattresses constantly. Waste management services with protected areas for healthcare waste storage are available in 63.2% HCFs. Pre-treatment before disposal of infectious waste is not done in 58.6% HCFs, and improper treatment of sharp waste was observed in 58.6% HCFs. Waste segregation was done in 85 %HCFs. As per WHO microbial drinking water quality assessment guidelines, 87.9% HCFs had zero coliform colony forming unit per 100 ml of water. This study highlighted the structural and performance limitation in the provision of WASH in HCF (36).

A Cross-Sectional study by **Ohwo et al., (2019)** was conducted in Yenagoa (Nigeria) 2019 to gauge the status of WASH services in private HCFs in the study area. The assessment was carried out on 30 private HCFs using a structured questionnaire and direct field observation. The study findings per the JMP definition of basic WASH services in HCFs portrayed that only 93.33, 60 and 66.67% of HCFs have basic water, sanitation, and hand hygiene, respectively. This study showed that 70% HCFs had their water source within the facility premises, and the source of water in 70% HCFs was a borehole; 26.6% HCFs were piped water supply. 70% HCFs had a water closet toilet facility, and 43.3% had four or more toilets for outpatients and one per 20 inpatient users. Separate toilets were available for staff and patients in 83.3% of facilities, and sex-separate toilets were available in 63.3% HCFs. For individuals with reduced mobility, 66.6% of facilities had toilets available. Functional hand hygiene stations were available at all points of care in 80% HCFs, and handwashing stations within 5 meters of the latrine were available in 73% HCFs. Materials and solutions for cleaning are available in 90% HCFs. Personal protective equipment like gloves, aprons, and boots are available in

83.3% HCFs. Using the JMP service ladder for global monitoring of WASH in HCFs, 93.3% HCFs had basic water services, and 6.67% HCFs had limited water services. There were 66.67% HCFs with drinking water available to staff, patients, and caregivers. Beds for patients are separated by 2.5m from the center of one bed to the next in 83.3% HCFs. The study concluded that the WASH services available in Yenegoa were undesirable and that there was a massive disparity in the provision of WASH services in these private HCFs. The author has emphasized the need to bridge this gap, thereby ensuring a lower incidence of healthcare-associated infections in HCFs in Yenegoa. (17)

A Cross-Sectional study by **Guo et al., (2017)** was conducted in 1,318 randomly selected rural health-care facilities (HCFs) of sub-Saharan Africa (Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia) to understand the status of WaSH in them. This was done using the HCF WaSH questionnaire (designed using WHO/UNICEF international standards for WaSH indicators, USAID Surveys, and drinking water analysis) for being administered to head doctors and nurses; and employing drinking water analysis for Escherichia coli. The study found that less than 50% of rural HCFs had access to improved water sources on-premises, functional and enhanced sanitation, and constant access to soap and water for washing hands, with the lowest being 7% (Ethiopia). Less than 25% of HCFs reported having a continuous supply of water, soap, and hand-drying materials. In more than 74% of facilities, the improved water source was boreholes (most common), rainwater, or piped water. 62% (Ethiopia) to 84% (Zambia) facilities had a 24-hr/day water supply. Microbiologically, water quality was tested in Uganda and Mozambique, and intermediate/ high-risk water quality was found in 15.3% and 29.6% of facilities, respectively. 66% (Ethiopia) to 96% (Zambia) facilities had improved sanitation facilities- with pit latrines with slabs being the most common, followed by ventilated improved pit latrines. More than 87% of these facilities were reported to be in use. 35% (Mozambique) to 96% (Rwanda) of HCFs reported having at least one designated handwashing station for hand hygiene. Still, a smaller proportion (25% in Zambia to 63% in Rwanda) had a continuous supply of the necessities like water and soap/ ash. The study concluded that low access to soap for handwashing in rural HCFs surveyed limited the ability of healthcare professionals to conduct routine handwashing, as observed in up to 75% of the surveyed HCFs. The author opined that handwashing with soap is one of the most basic yet crucial infection control interventions for

preventing disease transmission in HCF. The estimates of "basic" services were likely to be overestimated. Robust qualitative research is needed on the reasons for low rates of continuous access to basic supplies, i.e., soap, water, and drying materials, obstacles enroute to the maintenance of sanitation facilities in HCFs, and challenges associated with safe water retrieval from water storage containers. (37)

In a study conducted by **Hirai et al., (2021)** using Water and sanitation for health facility improvement tool (WASH FIT) in Zimbabwe in 50 covid 19 isolation facilities, it was revealed that one in four HCFs did not have adequate services across all the domains. The water domain had four essential indicators of water availability, accessibility, cleanliness, and storage, and the average score for improved water service availability across the HCFs was 1.44. Availability of water services in sufficient quantity for all users was having lowest score at 0.94. The sanitation domain had six essential indicators on the availability of usable toilets, the separation of improved latrines by personnel type and sex, the presence of menstrual hygiene management-friendly and disability-friendly sanitation facilities, and the presence of handwashing stations within five meters of latrines. Average scores were lowest for two indicators: menstrual hygiene management-friendly (0.56) and disability-friendly sanitation facilities (0.34). The Healthcare waste domain included six essential indicators. The average score was highest for the availability of a trained person responsible for managing healthcare waste (1.36), and the lowest score of 0.88 for sufficient energy for incineration. The hand hygiene domain included two essential indicators: the average score of functional hand hygiene station availability was 1.26, and the hand hygiene promotion material display was 1.22. The facility environment, cleanliness, and disinfection domain had seven indicators, and the indicator exterior of the facility, clean and well-fenced, had the highest score of 1.50. The management domain consists of four essential indicators. The indicator availability of adequate cleaners and WASH maintenance staff had the highest average score of 1.14, and the availability of planned annual budget had the lowest score of 0.72. The study concluded that it remains difficult for many HCFs designated as COVID-19 isolation facilities to obtain essential WASH services. To reduce COVID-19 transmission and other infectious agents within HCFs, immediate WASH interventions are required. (38)

Secondary data analysis was conducted by **Kmentt et al., (2021)** using the publicly available dataset 'Data verse of the Water Institute at the University of North Carolina' consisting of rural HCFs data in 14 Lower Middle-Income Countries (LMIC). The HCF survey has assessed data in five domains: water, sanitation, hygiene, waste management, and administration and training. The study showed that almost 85% HCFs had improved water sources, 90% HCFs reported having access to their sanitation, 7% of facilities had basic level waste management,57% HCFs had functional HH stations for at least one point of an acre, and 53% of the surveyed countries had IPC protocol (IPCP) and designated WASH/IPC focal person (FP). The study found that the presence of infection prevention and control protocols (IPCPs), having an IPC/WASH focal person at the facility, and conducting WASH training for staff were associated with higher levels of WASH services. The study concluded that there are potential interventions, such as implementing IPCPs, identifying WASH leaders in HCF, and conducting training that can lead to service improvements in LMICs. (19)

3.4.2. Interventional studies

A cluster randomized controlled trial was conducted by **Aghdassi et al., (2020)** in Germany in peripheral wards of a tertiary care university center. Twenty peripheral wards were included; ten were assigned randomly to the intervention group and ten to the control group. The intervention wards were provided with teaching materials on aseptic procedures, alcoholic hand dispensers, and quarterly Hand Hygiene (HH) compliance feedback. The study conducted that compliance before the aseptic procedure improved significantly in the intervention group from 44% (168actions /380 HH opportunities) to 53% (764 actions/ 1452 HH opportunities), while no significant increase was noted in the control group, and there is no significant overall improvement in HH compliance in both the groups. The study concluded that the simultaneous comprehensive implementation of HH interventions in multiple wards was complex. (39)

Derkesen et al., (2020) conducted an intervention study in two obstetric university hospitals to improve adherence to hand hygiene recommendations during the COVID-19 pandemic. Displaying posters, providing disinfectant dispensers, and reminders to adhere to standard operating procedures were the intervention provided, and adherence to hand hygiene recommendations increased from 47% to 95%. The study concluded that

obstetric healthcare workers adapted hand hygiene behavior to prevent infections during the pandemic. (40)

A study was conducted by **Khan et al., (2017)** at the Maternal and child hospital in Karachi to assess hand-washing compliance before surgery using video surveillance. In this study, a remote video auditing system and motion sensor equipment were installed in the scrub area to monitor compliance. A sign indicating "camera monitoring" was displayed on the wall, hand hygiene was measured for four weeks without feedback, and weekly feedback was during the next 12 weeks. During the pre-feedback period (4 weeks), the overall compliance was 22(14.6%), and there was a comprehensive 310(80.7%) increase in hand hygiene compliance during the 12-week post-feedback period. The study concluded that video monitoring combined with real-time feedback could improve hand hygiene compliance among healthcare workers. (41)

Stevenson et al., (2014) conducted a cluster-randomized feasibility trial of implementing multidimensional infection control interventions in rural hospitals in Idaho and Utah. Four-month baseline assessment of hand hygiene compliance was observed in ten small rural community hospitals. Five facilities were randomly assigned to the intervention group and five facilities to the control group. In the intervention group, a hospital-wide campaign was conducted to improve HH compliance which included education sessions, providing alcoholic hand rub and personal protective equipment at patient care areas, posters, written materials, and recognition and reward programs were done. Additional interventions like education on isolation precautions, a campaign to promote the isolation of patients, and results of active microbiological surveillance were provided in the intervention group. This study showed that the estimated average absolute change in complete HH compliance in intervention hospitals ranged from 7.8% to 35.5% (20.1%) and from control hospitals -6.3% to 5.9% (-3.1%). The estimated average absolute change in "any compliance" ranged from 17.8% to 38.2% (28.4%) in intervention hospitals and −16.7 to 20.7% (0.7%) in control hospitals. This study has proved that replicable interventions can significantly improve hand hygiene compliance. (42)

A comparative study was conducted by **Wiedenmayer et al., (2020)** in Maji kwa Afya ya Jamii(MKAJI) and non-MKAJI healthcare facilities in Dodoma, Tanzania, to evaluate the impact of training in hand hygiene. The 'WHO HH Self-Assessment Framework Tool

2010’ with five indicators having cumulative scores of 500 points, was used. The cumulative scores stratified each health facility’s unit into inadequate (0–125), basic (126–250), intermediate (251–375), or advanced (376–500) HH-level (scores). This study showed that MKAJI health facilities had significantly higher median HH scores of (IQR) 190(120-262.5) compared with non-MKAJI facilities 165(95-230). There was a significantly higher hand hygiene score in healthcare facilities associated with the MKAJI interventional project. (43)

Hosny et al., (2018) conducted an interventional study to improve medical waste handling and management in 11 government hospitals in Alexandria Governorate, Egypt, with a sample size of 349 medical waste handlers. The status of healthcare waste management was assessed using an observational checklist and a self-structured questionnaire developed for pre-training and post-training assessment. The training package was designed after reviewing relevant literature and delivered through lectures and discussion. The scoring system was adopted, and score percentages were calculated, which revealed that in the pre-intervention phases, 9.6% had a high knowledge level. In contrast, in post-intervention, 97.3% had a high knowledge level score, which was statistically significant except in four items related to the need to segregate biomedical waste, a color-coding system for segregation, and disposal of general waste in black and disposal of infectious waste in red bags. Regarding the practice of waste handlers in the pretraining phase, 1.1% were in the good practice category, and 80% were in the poor practice category, which increased in the post-training phase to 92.1% in the good practice category and 0.8% in the poor practice category. The study concluded that skill-raising training aids in enhancing the knowledge and practice skills of medical waste handlers. (44)

3.5. WASH: Indian scenario

According to 2011 Census data, 85.5 percent of the population had access to safe drinking water, while only 30.8 percent of rural households had toilet facilities.

According to the WHO and UNICEF Joint Monitoring Report (JMP) for 2020, 89% of India's rural population has access to a basic drinking water supply, while only 56% of the population uses a safely managed water supply. Regarding sanitation, the JMP

reported that access to at least basic sanitation services is available for 67% of the rural population, while properly managed sanitary facilities are used by only 51% of the population. (45)

Swachh Bharat Mission, the Jal Jeevan Mission, the National Mission for Clean Ganga (Namami Gange), and other national initiatives have given necessary thrust to India's commitment to providing universal access to clean water and sanitation.

Progress on WASH in health facilities 2000-2021 report was released by JMP in 2022 estimated the water, sanitation, hand hygiene, health care waste management, and environmental cleaning (WASH) services in health care facilities with sufficient data from 40 countries revealed that 94% hospitals in India have access to basic water services,78% hospitals have access to basic hygiene services,76% hospitals have access to basic waste management services and 73% hospitals have access to basic environmental cleaning services. There were no estimates available for the sanitation domain in India (46).

3.5.1. Observational studies

Diwan et al., (2016) conducted a cross-sectional study to describe self-reported HH practices and to assess knowledge and attitudes regarding hand hygiene among healthcare workers in a rural Indian teaching hospital in Ujjain. Out of 489 healthcare workers, 259 participated in the study. Two questionnaires were constructed: one for respondents with no direct patient contact (NDPC) and the other for respondents working with direct patient contact (DPC). The NDPC and DPC questionnaires both focused on knowledge and attitudes toward HH, with the DPC questionnaire also included questions about self-reported practices. Among DPC respondents, the majority of them (>50%) "always" performed HH in all circumstances other than "before any direct patient contact" and "between interaction with various patients." The median score of the self-reported HH practice score among them was 12.5. In NDPC respondents, the overall percentage of always practicing HH varied from 77-98% among various variables, and the median knowledge score was 15. Lack of time (73%) was the significant perceived barrier to non-compliance with hand hygiene reported in the study. (47)

Golandaj et al., (2019) conducted an observational study in Karnataka to assess public healthcare staff's awareness, attitude, and practices of biomedical waste management. The study was conducted among 273 participants, including 29 doctors,177 nurses,23 pharmacists, and 44 supporting staff in primary and secondary-level healthcare facilities. There were nine variables in knowledge and attitude regarding BMW each, and a higher number of HCWs (98.6%) in the knowledge domain correctly answered that disease was spread by improper BMWM. In the attitude domain, 100% of HCWs had a favorable attitude toward the importance of knowledge generation, hazards, and legislation. This study indicated that the awareness of the categorization of BMW and proper color coding was poor among all categories of public health staff. Comprehensive training programs about BMW management, including in-house segregation transportation, storage of waste in color bins, and final disposal for treatment, etc., for all hospital staff, are strongly recommended. Vaccination against Tetanus and Hepatitis B should be given to all healthcare personnel especially waste handlers and sanitary workers. (48)

An institution-based cross-sectional study was conducted by **Dey et al., (2020)** to assess the Knowledge, Attitude, and practices about BMW management as per 2016 rules among resident doctors and nursing staff in a tertiary care specialty hospital, Ranchi. The study group includes 50 randomly selected residents and nursing staff. The mean and standard deviation of knowledge score among resident doctors were (8.060±0.6518), and nurses were (8.320±0.957). The attitude score among resident doctors (was 17.84±2.852) and among nurses were (20.78±2.043), and the Practice score among resident doctor were (8.86±1.714) and nurses were (11.84±1.167). The study showed that both groups had adequate and comparable knowledge of most items. In the case of attitude and practice, there was a significant difference in perspective and approach between groups with p =0.0001. Nurses had a more favorable attitude and practice than resident doctors in various aspects like segregation, transportation, disposal of BMW and maintaining records and reporting to an authority. The study also highlighted the need for a regular training program regarding BMW management. (49)

Vijayalakshmi et al., (2020) conducted an observational study to assess the microbiological quality and contamination levels of hospital water samples collected from the storage points in the hospital in Visakhapatnam. The samples collected in the

study were processed within 2 hours, and the Most Probable Number (MPN) method was used to identify pathogenic bacteria. In the study, ten water samples were collected, and all the samples crossed the permissible MPN count >10 coliform count/100ml, indicating the water is not potable for drinking. Further disinfection procedures are needed. (50)

3.5.2. Intervention studies

A pre-post experimental study was conducted by **Sudharshini Subramaniam et al., (2018)** in the district healthcare facilities of Tamil Nadu to evaluate the role of supportive supervision in improving WASH in healthcare facilities. A checklist for assessing public health facilities during the supervisory visit was done using the WASH supervisory checklist consisting of three components- Labour ward, New-born Care Corner/ Special New-born Care Unit/ New-born Stabilization Unit, and post-natal wards. There were toilet facilities, waste segregation, handwashing facilities, and cleanliness in each component. It was based on these four domains; each facility was classified as fully functional (34-42), partially functional (19-33), and non-functional (0-18). There was a regular supportive supervision visit every three months in the facilities, and the onsite training was given if there was any deviation. For follow-up activities, the supervision findings were communicated to stakeholders of health service delivery authorities in Tamil Nadu. This study showed that the proportion of non-functional facilities dropped from 41.6% to 7.3%, and there was a statistically significant increase in partially functional (52.6% to 71.5%) and fully functional facilities (5.8% to 21.2%). Supportive supervision has a direct effect on improving WASH practices in healthcare facilities (20).

An interventional study was conducted by **Gopalakrishnan et al., (2021)** to improve hand hygiene compliance in NICU. The intervention was provided in the study in five phases, namely 1) baseline, 2) self-directed learning through posters/ placards/ screen savers on hand hygiene/PowerPoint slides, 3) participatory learning through Didactic lectures, videos and live demonstration, 4) closed circuit TV- active monitoring of hand hygiene opportunities for hand hygiene adherence and 5) CCTV plus monitoring with individualized feedback to healthcare providers for acceptable or unacceptable behaviors. This study showed that hand hygiene compliance improved from 69.8% in the baseline to 77 % in the endline. Compared to before-WHO moments (5.2%), the increase in hand-hygiene compliance was higher for after-WHO moments (12.7%; up to 2.5-folds for

moment 5). Educational intervention feedback and monitoring WHO moments can significantly improve hand hygiene compliance among healthcare providers. (51)

Sastry et al., (2017) conducted a prospective study to assess the impact of hand hygiene audits on hand hygiene compliance in tertiary care hospitals in Puducherry. Hand hygiene audits were designed based on the WHO HH audit tool kit and the audits recorded -HH opportunities, complete HH action performed, and partial HH action performed by healthcare workers. A total of 19,936 opportunities were assessed, Hand Hygiene complete adherence rate (HHCAR) was 45.5%, and HH partial adherence rate was 21.17%. During the study period, monthly HHCAR increased from 37.5% to 51.7%, which was statistically significant. World Health Organization Moments 3 and 4 had statistically significant compliance (78.5% and 71.8%, respectively; $P < .001$) compared with Moments 1, 2, and 5. This study concluded that HH audit significantly influences HH compliance, and more emphasis is needed on WHO 5 moments of hand hygiene. (52)

Laskar et al., (2018) conducted an interventional study in the intensive care unit of tertiary care hospital in Puducherry to assess the effect of multimodal interventions on the improvement of HH compliance. The study encompassed three phases, namely the preintervention, intervention, and post-intervention phases. The audit form in the study was developed based WHO HH audit tool kit consisting of three elements: HH opportunities available, complete HH actions performed by HCW, and partial HH actions. Interventions provided in the study were education and extensive training on HH practices, WHO Five Moments for Hand Hygiene. Charts of WHO-recommended Moments and steps of HH were displayed in all ICUs, wards, and near all wash sinks. In this study, 53 HCWs were audited, and 6350 HH opportunities were recorded. HHCAR in the pre-intervention and post-intervention phases were 3% and 70.1%, respectively, reflecting a significant improvement in compliance, and there was a decrease in hand hygiene partial adherence rate (HHPAR) was observed from 47.2% in the pre-intervention phase to 21.4% in the post-intervention phase. It also showed that only 55%-82% of HCWs were aware of the WHO's Five Moments for Hand Hygiene. This study concluded that systematic multidimensional intervention is needed to improve hand hygiene compliance significantly. (53)

An interventional study was conducted by **Gaikwad et al., (2018),** assessing the pre-existing knowledge and evaluating the effectiveness of one-day educational activities to improve the knowledge regarding infection control practices in tertiary care rural medical college and hospital Raipur. Educational activity comprising didactic lectures and hands-on training on infection control practices was provided to 34 nursing staff, and cognitive gain was assessed. The study showed that the average percentage of test scores for the pre-test was 19.71% which increased significantly to 76.69% in the post-test. The class average normalized gain post-intervention was 70.97%. The study concluded that educational intervention has a significant impact on improvement in knowledge, and periodic intervention is required. (54)

Chappola et al., (2014) in New Delhi conducted a quasi-experimental study to evaluate the impact of an educational intervention on hand hygiene compliance in the Neonatal intensive care unit (NICU). The educational intervention was given with continued monitoring of HH compliance through Education and training, audits, feedback, and a reminder to the healthcare workers. Hand hygiene compliance was 46% before the intervention, and it improved significantly to 69% post-intervention. The study concluded that effective hand hygiene practices could reduce nosocomial infection in the facility. (55)

Chakravarthy et al., (2014) conducted an interventional study in Bangalore to evaluate the impact of a multidimensional hand hygiene approach in intensive care hospitals, which are members of the International Infection Control Consortium (INCC). The multidimensional hand hygiene approach consists of six components: administrative support, supplies availability, education and training, reminders, process surveillance, and performance feedback. This study observed 3612 HH opportunities, and overall adherence to HH increased from 36.9% to 82%, which was statistically significant. This study showed that HH compliance among physicians is higher than among nurses and that a multidimensional hand hygiene approach is needed in all healthcare facilities. (56)

An interventional study conducted by **Agarwal et al., (2021)** on awareness about biomedical waste management (BMW) among health care personnel in the J.A.H group of hospitals, Gwalior. The study aimed to find out the level of knowledge, attitude, and practices towards BMW management among participants and to inculcate safe and

healthy practices of BMW management through education intervention. A structured questionnaire was prepared to assess the knowledge of participants, and educational intervention was given by teaching and audio-visual presentation. The knowledge scores were graded arbitrarily into poor, good, and excellent. The excellent level of knowledge was captured among 70% senior doctors (13/18 questions correct), 65% postgraduates, 35% nursing staff, and 4% sanitary staff. In the post-intervention phase, there was an increase in knowledge among the doctors, 20.47%, postgraduates 10.75 % and 8% nursing staff, and 9.72% sanitary staff. The practice of color-coding during BMW management among Senior doctors is 75%, PGs is 60%, the nursing staff is 62.5%, and sanitary staff is 56.7%. The study showed the knowledge of safe needle practice among doctors was 90%, postgraduates were 80%, the nursing staff was 85%, and the sanitary staff 60%. The study concluded that the participants' overall knowledge, attitude, and practices regarding BMW management were fair and far better among the doctors. (57)

Kaore et al., (2018) conducted an interventional study to assess the change in knowledge, attitude, and practices toward BMWM after educational intervention among healthcare personnel in Raipur. The training was provided to 80 healthcare personnel through didactic lectures covering the Existence of Biomedical Waste rules, Categories of Waste, Different color codes used and Waste segregation methods, demonstrations, and fun games. The participants were explained about the Biomedical waste management application, which has training and game mode for Biomedical waste management (BMWM). This study shows a Percentage Rise in Learning Outcomes in Post-Test over Pre-Test among House Keeping Staff 22.45 %, Nurses 37.4 %, Junior residents 32.59 % and Technicians 36.72 %. The author concluded that the knowledge and attitudes between the groups of healthcare personnel varied and were found to be satisfactory after the educational intervention. (58)

A quasi-experimental study was conducted by **Sharma et al., (2017)** to evaluate the impact of educational intervention on knowledge and attitude of BMWM among health care personnel in tertiary care hospitals of Bengaluru. A total of 95 HCWs were enrolled in this study, and the trained Community Medicine staff conducted educational training programs in the form of PowerPoint presentations on various aspects of BMW management (according to the latest guidelines and rules), including a demonstration of

color-coded bags and containers. The mean knowledge score in the study was 34.5±18.8 on the pre-test and 84.5±6.1 on the post-test. The mean score of favorable attitudes in the Pre-test was 62.4±25.7 and in Post-test was 88.7±4.8; both were statistically significant. The author concluded that all healthcare workers should receive regular BMW management training. This should be accompanied by effective rule implementation and regular oversight monitoring by the authorities concerned. (59)

Chapter 4: METHODOLOGY

This facility-based pre- and post-interventional study was conducted in rural health care facilities (PHCs and CHCs) of Jodhpur district from March 2021 to December 2022. The healthcare facilities were enrolled in the study after obtaining permission from the Chief Medical Health Officer (CMHO) of Jodhpur district (**Annexure B**). Consent was obtained from the Medical Officer and healthcare workers in the respective healthcare facilities during data collection (**Annexure E, F**). The facility and healthcare workers were not bound to compulsion and were free to withdraw during the study.

4.1. Study setting

The study was conducted in primary and secondary level healthcare facilities in rural areas of Jodhpur.

4.2. Study design

This study was facility-based Pre and Post Interventional study design conducted in PHCs and CHCs of Luni block

4.3. Study participants

All the health care workers in the selected PHCs and CHCs of rural Jodhpur were included in this study. It includes medical officers, nurses, pharmacists, lab technician, paramedical staffs, housekeeping staffs, and other staffs in the HCFs.

4.4. Sampling technique

In the state of Rajasthan, the study was planned in rural health care facilities of Jodhpur district. The Jodhpur district has ten rural and four urban Community Development Blocks (CDB). Out of ten rural CDBs, one CDB was selected by simple random sampling.

All the CHCs and PHCs of the selected block were visited, and all the available healthcare workers in those facilities were enrolled in the study.

Figure 1 depicts the geographical distribution of the HCFs selected for the study.

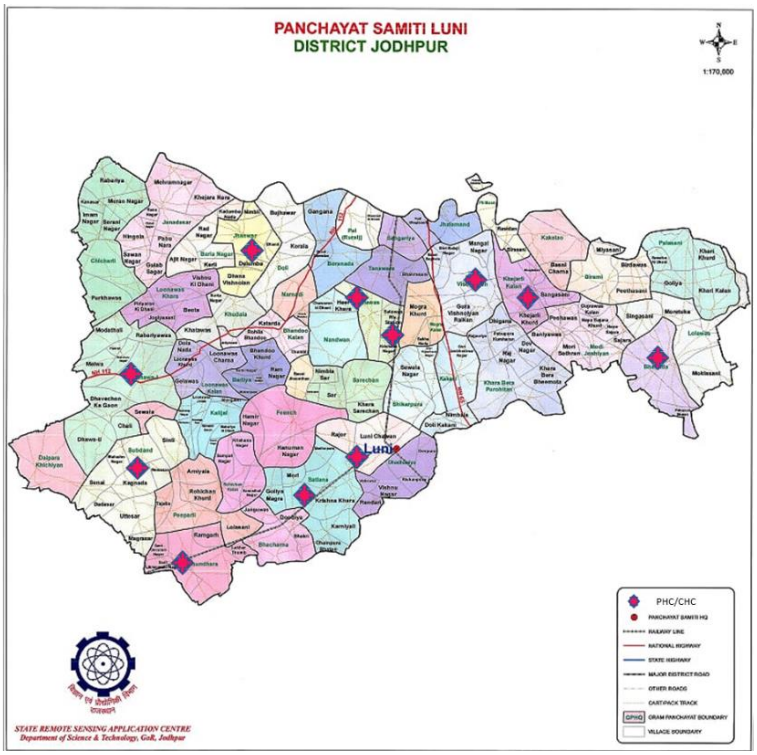

Figure 1: Map showing selected health care facilities (PHC/CHC) in Luni Block

4.5.Study duration

This study was conducted from March 2021 to December 2022. After getting clearance from the Institutional Ethical Committee, the Luni block was selected by simple random sampling, and baseline data collection commenced in April 2021. The intervention was delivered through training of HCWs and supportive supervision of the health facilities following the baseline assessment. After maintaining a gap of 3 months, a follow-up assessment was done from October 2021 to December 2021. During this period, supportive supervision was provided to the healthcare facilities. After maintaining a gap of 3 months, the endline data collection was started on April 2022 till July 2022. Data entry was done parallel to data collection. Data analysis and write-up were done from July 2022 onwards till December 2022.

4.6.Study tools

Physical status and service availability in the health care facilities were assessed as per Indian Public Health Standards (IPHS) 2012 PHC and CHC.

For assessing WASH in healthcare facilities, the questionnaire had three sections: Essential indicators, Advanced indicators, and Additional indicators. Essential and Advanced indicators were adopted from the WASH FIT tool (the Water and Sanitation for Health Facility Improvement Tool) (**Annexure G**) covering water, sanitation, health waste disposal, hygiene, and management. Additional indicators were taken from the Kayakalp implementation tool (**Annexure H**).

4.6.1. WASH-FIT tool

WASH FIT is an open-access tool developed in collaboration with WHO and UNICEF to assess small primary healthcare facilities.

The tool consists of four components- Water, sanitation, hygiene, and management

The indicators in all four domains are classified into essential and advanced. Each indicator is further classified as follows: fully meets the target with a score of 3+, partially meets with a score of 2+, and not satisfied with a score of 1+ based on the observation.

a. WATER

This domain has 15 indicators and is classified into essential and advanced indicators. Four essential indicators assess the availability of improved water supply in the facility, sufficient quantity, reliable drinking water station, and safe drinking water storage. The advanced indicator has eleven variables related to the sanitary inspection risk score, water treatment, and appropriate chlorine residue. Each indicator will be labelled as fully meeting the target with a score of 3+, partially meeting with a score of 2+, and not meeting with a score of 1+. Based on the score for each indicator, the cumulative score and percentage of indicators fully meeting, partially meeting, and not meeting the target is calculated for each domain

b. SANITATION AND HEALTHCARE WASTE

This domain has two parts- part A covers sanitation, and part B covers healthcare waste disposal. Part A consists of six essential indicators covering the number of toilets available, separate toilets with accessibility to patients, functional hand hygiene station within five meters of latrines, and four advanced indicators covering record maintenance related cleaning, wastewater management, and greywater drainage system. Part B consists of six essential indicators covering the availability of trained persons responsible for the handling of waste, functional waste collection containers, and correct segregation of waste at the generation point. The advanced indicator also has six variables related to the availability of the standard operating procedure and usage of personal protective equipment by the waste handlers. Based on the score for each indicator, the cumulative score and percentage of indicators fully meeting, partially meeting, and not meeting the target are calculated for each domain.

c. HYGIENE

This domain has two parts- part A covers hand hygiene, and part B covers facility environment, cleanliness, and disinfection. Part A consists of two essential indicators covering the availability of functional hand hygiene stations and hand hygiene promotion materials and three advanced indicators covering hand hygiene compliance activities regularly. Part B consists of 6 essential indicators covering availability of trained person responsible for handling of waste, functional waste collection containers, correct segregation of waste at generation point. Advanced indicator also has 6 variables related to availability of standard operating procedure, usage of personal protective equipment by the waste handlers. Based on the score for each indicator, cumulative score and percentage of indicators fully meeting, partially meeting, and not meeting target is calculated for each domain.

d. MANAGEMENT

This domain consists of four essential and seven advanced indicators, including a quality improvement/management plan, planned budget for the facility, availability of cleaning & maintenance staff, and training of health care workers on infection prevention and control.

4.6.2. Kayakalp

This initiative was launched by the Ministry of Health & Family Welfare to complement the efforts of ‘’Swachh Bharat Abhiyan”. Some indicators from “The Kayakalp facility assessment tool” were utilized to make additional indicators of WASH in HCFs. It has six thematic areas for assessment of HCFs which includes Sanitation and hygiene, waste management, Hospital Upkeep, Infection control, Hygiene promotion and Hospital support services (60).

4.7. Operational definitions of different terms used in WASH FIT

a. Improved water source

It includes piped water, boreholes/tube wells, protected wells, protected springs, rainwater, and packaged or delivered water. This refers to the water supply for general purposes, including drinking, washing, and cleaning.

b. Sufficient water supply

Water needs will vary depending on the type of facility and the number of patients. To calculate the facility’s water requirements, add up the following requirements or applicable national standards: Outpatients (5 L/consultation) +inpatients (40–60 L/patient/day) + operating theatre or maternity unit (100 L/intervention) + dry or supplementary feeding centre (0.5–5 L/consultation depending on waiting time) + cholera treatment centre (60 L/patient/day).

c. Facility water storage requirement

To calculate the facility’s water storage requirements, add up the following requirements needed for 24 hours or applicable national standards and multiply by two to get the total for 48 hours:

Outpatients (5 L/consultation) + inpatients (40–60 L/patient/day) + operating theatre or maternity unit (100 L/intervention) + dry or supplementary feeding centre (0.5–5 L/consultation depending on waiting time) + cholera treatment centre (60 L/patient/day). Source: Essential environmental standards in health care (WHO, 2008).

Acceptable storage methods include clean, covered, and well-maintained containers which prevent contamination from entering and are free from any

cracks, leaks, etc. Such containers should also allow water to be extracted without hands or other potentially contaminated surfaces from touching the water (i.e., through a tap).

d. Toilet requirement

At least four toilets per outpatient setting (one for staff; one for female patients; one for male patients; one for disabled users). More latrines may be needed depending on the size of the facility.

Improved sanitation facilities include flush toilets into the managed sewer or septic tanks and soakage pit, VIP latrines, pit latrines with slab, and composting toilets.

To be considered usable, a toilet/latrine should have a door that is unlocked when not in use (or for which a key is available at any time) and can be locked from the inside during use. There should be no significant holes in the structure, the hole or pit should not be blocked, water should be available for flush/pour flush toilets, and there should be no cracks or leaks in the toilet structure. It should be within the grounds of the facility, and it should be clean, as noted by the absence of waste, visible dirt, excreta, and insects.

e. Toilet for reduced mobility people

A toilet can be considered to meet the needs of people with reduced mobility if it meets the following conditions: can be accessed without stairs or steps, handrails for support are attached either to the door or sidewalls, the door is at least 80 cm wide, the toilet has a raised seat (between 40–48 cm from the floor), a backrest and the cubicle has space for circulation/manoeuvring (150 x 150 cm). The sink, tap, and water outside should also be accessible, and the top of the sink should be 75 cm from the floor (with knee clearance). Switches for lights, where relevant, should also be at an accessible height (max. 120 cm).

f. Functional hand hygiene station

A functional hand hygiene station may consist of soap and water with a basin/pan for washing hands. Water should not be chlorinated. Alcohol-based hand rub is not suitable for use at latrines.

g. Point of care

Three elements come together: the patient, the health care workers, and care or treatment involving contact with the patient or their surroundings. This may include consultation rooms, operating rooms, delivery rooms, and laboratories. Hand hygiene stations should have a sink or bucket with a tap and water with soap or alcohol-based hand rub. There should be at least two hand hygiene stations in a ward with more than 20 beds.

h. Clean as noted by the absence of waste, visible dirt and excreta, and insects. Environmental surfaces or objects contaminated with blood, other body fluids, secretions, or excretions are cleaned and disinfected as soon as possible using standard hospital detergents/disinfectants.

i. The **budget** refers to that used for capital and operational costs. It could be from the community management group and/or the government, according to the policies and practices in the country.

4.8.Study Framework

The details related to the flow of the study have been shown in the flow diagram

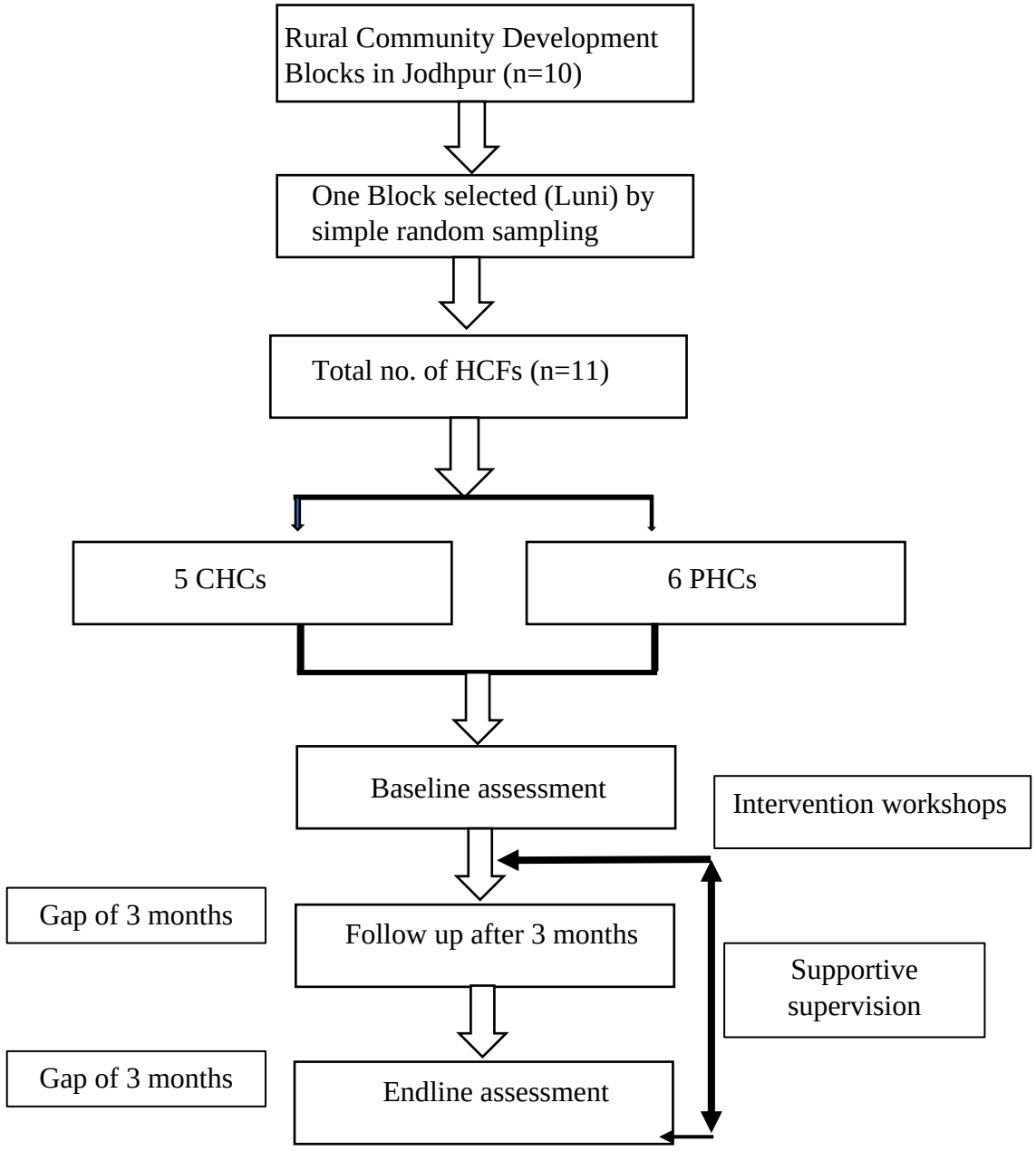

Figure 2: Flow diagram of the study

4.9. Study procedure

i. Selection of healthcare facilities
ii. Baseline assessment of the facilities
iii. Intervention training
iv. Supportive supervision, including formulation of an infection control committee
v. Follow up after 3 months assessment of training
vi. Continued supportive supervision
vii. Endline assessment of facilities

4.9.1. Selection of healthcare facilities

Luni block was selected out of ten rural community development blocks of the Jodhpur district by simple random sampling. All the PHCs and CHCs in the Luni block were included in this study. There are 5 CHCs and 6 PHCs in the block. Consent was obtained from the Chief Medical Health Officer of Jodhpur district, the Medical Officer In charge, and healthcare workers of respective healthcare facilities. Personal visits were made to the healthcare facilities after inclusion in the study. Every healthcare worker has explained the purpose of the study before obtaining informed consent.

4.9.2. Baseline assessment of the facilities

All the PHCs and CHCs in the selected block were visited, and baseline assessment was done using predefined tools. Interviews were conducted with the healthcare workers. One water sample was collected from the main drinking water source in each of the facility and transported via vaccine carrier to the Department of CMFM, AIIMS Jodhpur. The Physical, Chemical, and Microbiological aspect of drinking water were assessed using WHO water quality standards (61). Physical and chemical parameters were tested using the HI3817 water quality test kit in the Environmental laboratory of the Department of CMFM, AIIMS Jodhpur. Microbiological parameters were tested using the Multiple tube method in the Hospital infection control laboratory of the Department of Microbiology, AIIMS Jodhpur. Six Swab samples were taken from the facilities with a functional labour room in each of the facilities. Swabs were taken from six sites from the labour room, namely spotlight, gauze drum, delivery tray, fetoscope, rubber sheet and episiotomy scissors using the surface swabbing technique. The surface swabbing is done using a nutrient agar plate and incubated at 37℃ for 24 hours in the Hospital infection control laboratory of the Department of Microbiology, AIIMS Jodhpur. The entire process of selection and baseline assessment was completed in a period of four months, from March 2021 to June 2021.

Figure 3: Assessment of HCFs during baseline

4.9.3. Intervention Training

An intervention training module was developed covering all the following domain (**Annexure J**)

Table 2 Contents of the intervention training workshops

Intervention component	Content
Water	● Availability- Quality and quantity (including strategies to reduce water use) ● Storage – frequency of cleaning of overhead/ underground tank ● Frequency of drinking water testing using chloroscope ● Water conservation & its importance
Sanitation	● Inclusive toilet facilities (gender-separated and with disability access) ● Quantity and quality of toilet facilities ● Safe collection, storage, and treatment of fecal waste
Healthcare waste management	● Hazards and risk of improper handling of Bio-Medical Waste ● Management of waste as per BMW rules ● Segregation of waste in the correct liner for suitable treatment ● Safe storage, treatment, and disposal of waste ● Waste reduction and recycling ● Usage of personal protective equipment by waste handlers ● Management of sharps waste and pre-treatment before disposal
Hand hygiene	● Availability of handwashing stations with soap and alcohol-based hand rub

	● WHO five moments of Hand Hygiene ● Six steps of handwashing ● Handwashing adherence checklist ● Handwashing observation checklist ● Compliance and auditing ● Needle stick injury management
Environmental cleaning	● Cleaning Protocols ● Frequency of cleaning ● Availability of supplies (mops, brooms, cleaning detergents, storage facility, personal protective equipment – PPE), staff availability, competency, and budgeting ● Types of cleaning solution and appropriate usage (concentration, site) ● Spill management
Management and personnel	● Staffing, coordination, and monitoring ● Reporting, performance review, and accountability mechanisms, ● Training and behaviour change, budgeting, resource mobilization ● Staff with assigned responsibility on each domain

Training of HCWs

Considering various domains assessed using WASH FIT and Kayakalp tool, the intervention module was developed to incorporate all of them through different channels of communication such as an information booklet, Power Point (PPT) presentations, demonstrations, posters, and checklist.

All the available healthcare workers, including medical officers, nursing officers, lab technicians, paramedical staff, and housekeeping staff, were given training related to all the domains of WASH in Health care facilities. The capacity-building workshop was conducted offline through PowerPoint presentations, posters, and live demonstrations for 2 hours. The initial 10 mins were utilized for introduction and orientation to the importance of WASH in HCF, 45 mins were used for the following domains viz Water, Sanitation, Infection control practice including hand hygiene and Biomedical waste Management, next 45 mins were utilized for demonstration and enaction, and last 20 mins were used for distributing posters, checklists and clearing queries of HCWs.

Figure 4: Intervention workshops in the HCFs

4.9.4. Supportive supervision, including formulation of an infection control committee

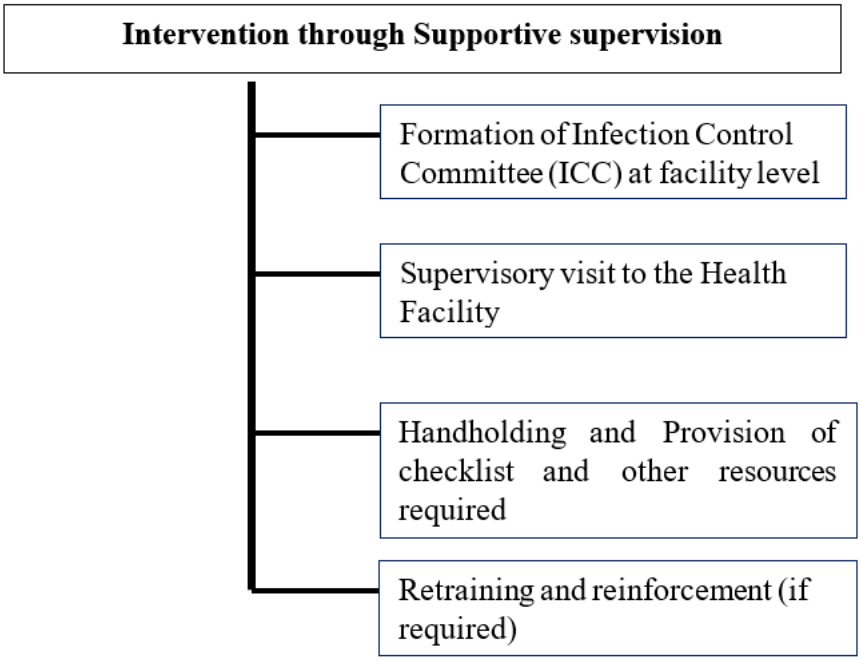

Figure 5: Components of intervention through supportive supervision

Supportive supervision is a strategy that enables individuals to enhance their own work performance consistently. It is carried out respectfully and without authoritarianism, with an emphasis on making supervisory visits as an opportunity to advance the knowledge and expertise of the concerned staff in the work assigned.

- Setting up a supportive supervision system
- Formulation of the infection control committee
- Planning regular supportive supervision visits
- Conducting a supervisory visit
- Follow up activities

A supportive supervision system was set up by creating an assessment using a questionnaire and a checklist for supervision and ensuring adequate resource availability for conducting visits.

The “Infection Control Committee” was formulated with an official order signed by the head of the facility to monitor and support the improvement of WASH in HCFs. HCWs

were asked to involve themselves actively in the ICC that was formed in the facility to improve WASH practices. The committee consists of the following members:

- Medical Officer In Charge (MOIC) as chairperson
- Nursing Officer (NO)
- Lab Technician (LT)
- Community Health Officer (CHO)
- Pharmacist
- Housekeeping In Charge

This committee was intended to improve infection control practices in the facility. The committee was supposed to meet at least once every month to review the activities done in the HCFs and submit the checklists filled.

During the supervisory visit, information was collected by the investigator using a checklist, and if any deficiencies were observed, onsite training was also given. The checklist and intervention material were displayed to facilitate continuous reinforcement of WASH-related practices in HCFs.

The overall findings of the facility were communicated with the Medical Officer In Charge and the Chief Medical Health Officer, Jodhpur district.

4.9.5. Follow-up assessment after three months

After three months of intervention workshops, the same pretested questionnaire used in baseline was filled to assess the health care facilities. If any deviation occurred after the follow up assessment, the Infection Control Committee was immediately notified. The supportive supervision was continued in the HCFs by the investigator after 3 months follow up assessment too.

4.9.6. Endline assessment of facilities

After three months, endline assessment was done in all the health care facilities using the same tools used during baseline. Water and swab samples were taken from the HCFs and sent for quality assessment. Following the endline review, follow-up activities were ensured by reporting the findings to the Infection Control Committee in the healthcare facilities. All the stakeholders were informed about the importance of supervision.

Figure 6: Assessment of HCFs during endline

4.10. Statistical analysis

Data were entered in Microsoft excel, and all entries were checked for errors. The data were analyzed using Microsoft Excel 2016 and Statistical Package for Social Sciences ver. 23.0. (IBM SPSS, Inc., Chicago, IL). Descriptive analysis, including frequency distribution, proportion, and mean, was performed to summarize the characteristics of the healthcare facilities. Cumulative scores were calculated for each component, and the total score was calculated by adding those cumulative scores. Cumulative scores of individual facilities were analyzed using the Friedmann test after checking normality using the Shapiro-Wilk test. Changes in the mean scores were analyzed using repeated measures ANOVA

4.11. Ethical approval and consent to participate

Ethical approval was obtained from AIIMS Jodhpur, Institutional ethics committee vide reference No. AIIMS/IEC/2021/3348, dated – 12/03/2021(**Annexure A**). All the healthcare workers were informed about the objective of the study and the benefits of participating in the study. After inclusion in the study, written consent was taken from the Chief Medical Health Officer, Jodhpur district, the Medical Officer in Charge, and the staff of the facilities included in this study. A participant information sheet was given to all the participants, and their role in the study was correctly explained before administering the tool. Data confidentiality was assured to the participants, and they were given the option of withdrawing from the study at any point if they desired to do so. Privacy was maintained during the interview. There were no adverse events reported during the study. IEC material for the intervention was shared with all the participants.

Chapter 5: RESULTS

The results are described under the following headings

1. Physical status of health facilities based on the availability of resources
2. Service delivery status in health facilities
3. Assessment of water in HCFs
4. Physical, chemical, and bacteriological parameters in drinking water
5. Assessment of sanitation and health care waste disposal in HCFs
6. Assessment of hygiene and facility environment, cleanliness, and disinfection in HCFs
7. Microbiological surveillance of labor room
8. Assessment of management in HCFs

5.1.Service provision in the health facilities

Table 3 Physical status of health facilities based on the availability of resources

Variables	CHC					PHC					
	Dhundhara	**Jhanwar**	**Luni**	**Salawas**	**Dhawa**	**Bhatinda**	**Guda Bishnoiyan**	**Kherjalikalan**	**Kudi Bhagatasni**	**Satlana**	**Subdand**
Population covered	48000	58830	38000	56000	27832	24500	30840	25800	18000	13450	18000
OPD services	+	+	+	+	+	+	+	+	+	+	+
Emergency services(24x7)	+	+	+	+	+	-	-	-	-	-	-
Number of beds available	20	30	30	42	11	6	10	3	2	2	6
Bed Occupancy Rate in the past four months (%)	30	40	40	50	20	14	15	10	-	-	-
Average daily OPD Attendance	65	60	55	55	48	30	12	12	15	45	15

+ Present, - Absent

Table 4 Service delivery status in health facilities

Variables	CHC					PHC					
	Dhundhara	**Jhanwar**	**Luni**	**Salawas**	**Dhawa**	**Bhatinda**	**Guda Bishnoiyan**	**Kherjalikalan**	**Kudi Bhagatasni**	**Satlana**	**Subdand**
Essential manpower, n(%)	18(39)	19(41)	18(39)	19(41)	18(39)	11(84)	11(84)	7(53)	9(69)	11(84)	9(69)
Electricity supply	+	+	+	+	+	+	+	+	+	+	+
Laboratory	+	+	+	+	+	+	+	+	+	+	+
Functional Labour room	+	+	+	+	+	+	+	+	-	+	-
Waiting room for patients	+	+	+	+	+	+	+	-	-	-	+
Minor Operation theatre	+	+	+	+	-	-	+	-	-	-	-

*+ Present, - Absent, * Essential manpower CHC 46, PHC 13 as per IPHS 2012*

There are five CHCs and six PHCs in the Luni block. **Table 3** shows the physical status of health facilities based on the availability of resources. The population covered under CHCs ranged from 27,832 in CHC Dhawa to 58,830 in CHC Jhanwar. Similarly, the total population covered under PHCs was from 13,450 in PHC Satlana to 30,840 in PHC Guda Bishnoiyan. All the healthcare facilities were providing OPD services. All the CHCs had emergency services (24x7). The average beds available in CHCs and PHCs were 27 and 5, respectively. Regarding the Bed Occupancy Rate (BOR), CHCs Salawas had the highest BOR (50), and in PHCs, Guda Bishnoiyan had the highest BOR (15). Average OPD attendance in CHC and PHC were 57 and 22, respectively.

Table 4 shows the service delivery status in health facilities. Average Manpower in CHCs and PHCs were 18.4 and 10, respectively. None of the facilities met the essential human resources criteria of IPHS, which is 46 for CHC and 13 for PHC. All the facilities had electricity connections and laboratory services. The labor room was functional in all the CHCs and four PHCs. Minor Operation Theatre was available in all the CHCs except CHC Dhawa and five PHCs.

5.2.Assessment of water in health care facilities

Table 5 Assessment of Water in health care facilities as per WASH FIT tool - Essential indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Improved water supply piped into the facility or on-premises and available	11 (100)	-	-	11 (100)		-	11 (100)	-	-
Water services are available at all times and of sufficient quantity for all uses	-	11 (100)	-	2 (18.2)	9 (81.8)	-	4 (36.4)	7 (63.6)	-
A reliable drinking water station is present and accessible for staff, patients, and carers at all times and in all locations/wards	3 (27.3)	8 (72.7)	-	3 (27.3)	8 (72.7)	-	7 (63.6)	4 (36.4)	-
Drinking water is safely stored in a clean bucket/tank with a cover and tap	2 (18.2)	5 (45.4)	4 (36.4)	4 (36.4)	5 (45.4)	2 (18.2)	5 (45.4)	6(54.5)	-

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Table 6 Assessment of Water in health care facilities as per WASH FIT tool -Advanced indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Sanitary inspection risk score (using sanitary inspection form 3)	3 (27.3)	8 (72.7)	-	3 (27.3)	8 (72.7)	-	9 (81.8)	2 (18.2)	-
All endpoints (i.e., taps) are connected to an available and functioning water supply	6(54.5)	5 (45.4)	-	6(54.5)	5 (45.4)	-	6(54.5)	5 (45.4)	-
Water services are available throughout year	-	11 (100)	-	2 (18.2)	9 (81.8)	-	3 (27.3)	8 (72.7)	-
Water storage is sufficient to meet the needs of the facility for two days	1 (9.1)	10 (90.9)	-	1 (9.1)	10 (90.9)	-	2 (18.2)	9 (81.8)	-
Water is treated and collected for drinking with a proven technology that meets WHO performance standards	2 (18.2)	5 (45.4)	4 (36.4)	1 (9.1)	8 (72.7)	2 (18.2)	4 (36.4)	5 (45.4)	2 (18.2)
Drinking water has appropriate chlorine residual (0.2 or 0.5 mg/L emergencies) or 0 E. coli/100 ml and is not turbid	-	-	11 (100)	1 (9.1)	2 (18.2)	8 (72.7)	2 (18.2)	4 (36.4)	5 (45.4)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	**PM**	**NM**	**FM**	**PM**	**NM**	**FM**	**PM**	**NM**
The facility water supply is regulated according to national water quality standards	-	-	11 (100)	-	-	11 (100)	-	-	11 (100)
Energy is available for heating water	11 (100)	-	-	11 (100)	-	-	11 (100)	-	-
Energy is available for pumping water	11 (100)	-	-	11(100)	-	-	11 (100)	-	-
At least one shower or bathing area is available per 40 patients in inpatient settings and is functioning and accessible	3 (27.3)	5 (45.4)	3 (27.3)	5 (45.4)	4 (36.4)	2 (18.2)	6(54.5)	2 (18.2)	3 (27.3)
Shower(s) are adequately lit, including at night	-	5 (45.4)	6(54.5)	3 (27.3)	3 (27.3)	5 (45.4)	5 (45.4)	3 (27.3)	3 (27.3)

**FM- Fully Met, PM- Partially Met, NM- Not Met*

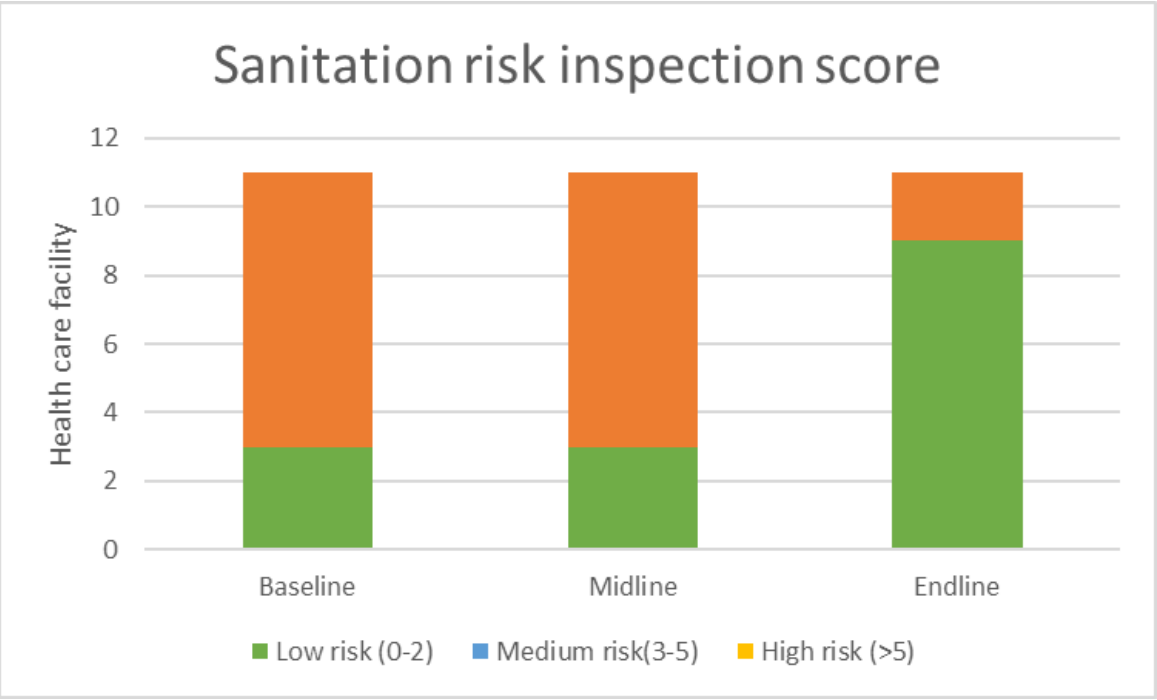

Figure 7: Distribution of facilities according to Sanitation inspection risk score (WASH FIT tool)

**Maximum score 10 and Minimum score 0*

Table 7 Assessment of water in health care facilities as per Kayakalp -Additional indicator (n=11)

Indicator		Baseline, n (%)	Follow up after 3 months, n (%)	Endline, n (%)
Check whether storage tank is adequately sealed and covered?		4 (36.4)	8 (72.7)	9 (81.8)
What is the frequency of cleaning the water tank?	once in six months	4 (36.4)	5 (45.4)	7 (63.6)
	once a year	5 (45.4)	3 (27.3)	4 (36.4)
	more than a year	2 (18.2)	3 (27.3)	-
Is there a system of periodical inspection for water wastage? (Staff assigned duty for periodical inspection of leaking taps).		4 (36.4)	8 (72.7)	9 (81.8)
Check whether pictorial, bilingual directional, and layout signage of drinking water displayed in the facility?		1 (9.1)	2 (18.2)	7 (63.6)
Check whether chlorine level is tested using ortho-toluidine reagent?		-	-	-
Check if IEC is displayed for water conservation in the facility.		-	11(100)	11(100)
Check whether the staff & users are made aware of water conservation and its importance.		7 (63.6)	11(100)	11(100)

The essential indicators for evaluating water quality in healthcare facilities are shown in **Table 5**. All the facilities had improved water supply in the baseline itself. None of the facilities met the fully met water availability criteria at all times for all uses during baseline. But in the endline, it was fulfilled in 4 facilities. The accessible and reliable drinking water station was present in 3 facilities during baseline. With the help of supportive supervision, the count increased to 7 during the end line. Safe storage of drinking water as per WHO standards were observed only in 2 facilities during baseline and improved to 5 facilities during endline

Advanced indicators for the assessment of water in healthcare facilities are shown in **table 6**. During the baseline assessment, the sanitation inspection risk score revealed a low risk in three facilities. At the endline, nine facilities had low risk (Figure 5.1). Drinking water was treated and collected in two facilities using WHO-approved technology during baseline and four facilities during endline. At baseline, three facilities had functional and accessible bathing areas per 40 patients. This increased to six facilities post-intervention.

Table 7 shows additional indicators for assessing water quality in healthcare facilities. During baseline, storage tanks in four facilities were adequately sealed and covered. Following the intervention, it improved to nine facilities. Periodic inspection of water wastage and staff with assigned duties were present in four facilities during baseline, and it improved to nine facilities by endline. During baseline, there was only one facility with pictorial drinking water signage; by the endline, there were seven. None of the facilities sent water for bacteriological testing or chlorination-level testing. During the baseline period, no IEC water conservation material was displayed in any facilities. All the facilities have displayed it with the assistance of intervention.

5.3.Physical, chemical, and bacteriological parameters in drinking water

Table 8 Assessment of Physical & chemical parameters of drinking water as per Bureau of Indian Standards (n=11)

Parameters		Baseline, n (%)	Endline, n (%)
Presumptive coliform count/100ml[#]	Satisfactory (1-3)	3 (27.3)	5 (45.5)
	Suspicious (4-10)	8 (72.7)	6 (54.5)
pH	Acceptable (6.5-8.5)	11 (100)	11 (100)
Chlorine ppm	Acceptable (≤ 0.2 ppm)	6 (54.5)	2 (18.2)
	Permissible (0.3 to 1 ppm)	5 (45.5)	9 (81.8)
Chloride mg/liter	Acceptable (≤ 250 mg/l)	2 (18.2)	4 (36.4)
	Permissible (>250 mg/l)	9 (81.8)	7 (63.6)
Fluoride ppm	Acceptable (≤ 1 ppm)	5 (45.5)	3 (27.3)
	Permissible (> 1 ppm)	6 (54.5)	8 (72.7)
Nitrate ppm	Acceptable (≤ 45 ppm)	11 (100)	11 (100)
Iron ppm	Acceptable (≤ 0.3 ppm)	3 (27.3)	3 (27.3)
	Permissible (0.4-1ppm)	8 (72.7)	8 (72.7)
Hardness mg/litre (300)	Acceptable (≤ 200 mg/l)	2 (18.2)	2 (18.2)
	Permissible (≥200 mg/l)	9 (81.8)	9 (81.8)
Odour	Acceptable	11 (100)	11 (100)

 # Presumptive coliform count by Multiple tube methods

Table 8 shows parameters for assessment of the Physical & Chemical quality of drinking water as per Bureau of Indian Standards. Presumptive coliform count per 100ml was satisfactory in three facilities during baseline and improved to five facilities during endline. All the facilities had acceptable pH, Nitrate, and odour in the baseline. The intervention couldn't improve chlorine, fluoride, iron, and the hardness of water compared to the baseline.

5.4.Assessment of sanitation and health care waste disposals in HCFs

Table 9 Assessment of Sanitation in health care facilities as per WASH FIT tool -Essential indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Number of available and usable toilets or improved latrines for patients	-	6(54.5)	5 (45.4)	-	7 (63.6)	4 (36.4)	1 (9.1)	5 (45.4)	5 (45.4)
Toilets or improved latrines clearly separated for staff and patients	3 (27.3)	6(54.5)	2 (18.2)	3 (27.3)	6(54.5)	2 (18.2)	5 (45.4)	4 (36.4)	2 (18.2)
Toilets or improved latrines clearly separated for male and female	3 (27.3)	4 (36.4)	4 (36.4)	5 (45.4)	2 (18.2)	4 (36.4)	7 (63.6)	-	4 (36.4)
At least one toilet or improved latrine provides the means to manage menstrual hygiene needs	-	2 (18.2)	9 (81.8)	2 (18.2)	5 (45.4)	4 (36.4)	4 (36.4)	4 (36.4)	3 (27.3)
At least one toilet meets the needs of people with reduced mobility	-	3 (27.3)	8 (72.7)	-	3 (27.3)	8 (72.7)	-	3 (27.3)	8 (72.7)
Functioning hand hygiene stations within 5 m of latrines	2 (18.2)	9 (81.8)	-	4 (36.4)	7 (63.6)	-	7 (63.6)	4 (36.4)	-

Table 10 Assessment of Sanitation in health care facilities as per WASH FIT tool- Advanced indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Record of cleaning toilets visible and signed by the cleaners each day	-	-	11 (100)	2 (18.2)	4 (36.4)	5 (45.4)	-	10 (90.9)	1 (9.1)
Wastewater is safely managed through the use of on-site treatment (i.e., septic tank followed by drainage pit) or sent to a functioning sewer system	10 (90.9)	1 (9.1)	-	11 (100)	-	-	11 (100)	-	-
The greywater drainage system is in place that diverts water away from the facility and also protects nearby households	2 (18.2)	-	9 (81.8)	2 (18.2)	-	9 (81.8)	2 (18.2)	-	9 (81.8)
Latrines are adequately lit, including at night	3 (27.3)	6(54.5)	2 (18.2)	4 (36.4)	7 (63.6)	-	5 (45.4)	6(54.5)	-

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Table 11 Assessment of Sanitation in health care facilities as per Kayakalp -Additional indicator (n=11)

Indicators	Baseline	Follow up after 3 months	Endline
Check whether a person is assigned duties for monitoring the housekeeping activities?	7 (63.6)	8 (72.7)	8 (72.7)
Check floors, walls and roof for presence of Dirt/Grease/Stains in corridor, waiting area?	6(54.5)	6(54.5)	6(54.5)
Ask cleaning staff about frequency of cleaning in circulation area and verify?	2 (18.2)	5 (45.4)	9 (81.8)
Check whether corridors are rigorously cleaned with scrubbing / flooding once in a month?	0 (0)	3 (27.3)	5 (45.4)
Check whether wards are cleaned at least thrice a day with a wet mop?	11 (100)	11 (100)	11 (100)
Check whether Surfaces are cleaned at least twice a day / after every surgery	5 (45.4)	5 (45.4)	5 (45.4)
Check whether OPD/Lab are cleaned at least thrice a day with a wet mop	0 (0)	0 (0)	3 (27.3)
Check some of the toilets randomly in indoor and outdoor areas for any visible dirt, grease, stains, or water accumulation?	10 (90.9)	8 (72.7)	4 (36.4)
Check some of the toilets randomly in indoor and outdoor areas for the foul smell	3 (27.3)	4 (36.4)	6(54.5)
Check with cleaning staff if they are getting an adequate supply of cleaning solution	7 (63.6)	7 (63.6)	8 (72.7)
Check whether the cleaning staff uses a correct concentration of cleaning solution.?	5 (45.4)	5 (45.4)	9 (81.8)
Check whether housekeeping Checklist is displayed in the following areas toilet, patient care, procedure area?	0 (0)	6(54.5)	6(54.5)

Essential indicators for assessment of sanitation in health care facilities are shown in **table 9**. During baseline, only three facilities had separate designated toilets for staff and patients. Following the endline, it improved to five facilities. None of the facilities provided the means to manage menstrual hygiene needs during baseline, and it improved to four facilities by endline. Only two facilities had functional hand hygiene stations within 5 meters of the latrine during baseline, but towards the endline, it improved to seven facilities.

Table 10 shows Advanced indicators for the assessment of sanitation in healthcare facilities. During baseline, none of the facilities had displayed the checklist for cleaning toilets. Following the intervention, it was displayed in ten facilities. During baseline, only three facilities had latrines adequately lit at night. Following the intervention, it improved to five facilities.

Additional indicators for assessment of sanitation in health care facilities are shown in **table 11**. An identified person with assigned duties for monitoring the housekeeping activities was present in seven facilities during baseline, which improved to eight facilities during the endline. Circulation areas were cleaned twice in the day during baseline in two facilities. Following the intervention, nine facilities were cleaned twice a day. None of the facilities rigorously cleaned the premises during baseline, but it improved to five facilities during the endline. Ten facilities had visible dirt, grease, and water accumulation in toilets during baseline, which was reduced to four facilities with the help of continuous supportive supervision. The correct concentration of cleaning solution and its application was known by the staff in five facilities during baseline. This improved to nine facilities during endline.

Table 12 Assessment of Health care waste in health care facilities as per WASH FIT tool-Essential indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
A trained person is responsible for the management of healthcare waste in the health care facility	-	2 (18.2)	9 (81.8)	5 (45.4)	5 (45.4)	1 (9.1)	6(54.5)	5 (45.4)	-
Functional waste collection containers near all waste generation point for: non-infectious waste, infectious waste, sharps waste	-	8 (72.7)	3 (27.3)	2 (18.2)	9 (81.8)	-	6(54.5)	5 (45.4)	-
Waste is correctly segregated at all waste generation points	2 (18.2)	4 (36.4)	5 (45.4)	2 (18.2)	9 (81.8)	-	3 (27.3)	8 (72.7)	-
Functional burial pit/fenced waste dump or municipal pick-up available for disposal of non-infectious (non-hazardous/general waste)	-	8 (72.7)	3 (27.3)	3 (27.3)	5 (45.4)	3 (27.3)	5 (45.4)	3 (27.3)	3 (27.3)
Incinerator or alternative technology for the treatment of infectious and sharp waste is functional and of a sufficient capacity	-	5 (45.4)	6(54.5)	-	6(54.5)	5 (45.4)	-	6(54.5)	5 (45.4)
Sufficient energy available for incineration or alternative treatment technologies	-	5 (45.4)	6(54.5)	-	5 (45.4)	6(54.5)	-	5 (45.4)	6(54.5)

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Table 13 Assessment of Health care waste in health care facilities as per WASH FIT tool-Advanced indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Hazardous and non-hazardous waste is stored separately before treatment/disposal	-	3 (27.3)	8 (72.7)	-	6(54.5)	5 (45.4)	1 (9.1)	5 (45.4)	5 (45.4)
All infectious waste is stored in a protected area before treatment for no longer than the default and safe time	1 (9.1)	7 (63.6)	3 (27.3)	-	9 (81.8)	2 (18.2)	-	9 (81.8)	2 (18.2)
Anatomical/pathological waste is put in a dedicated pathological waste/placenta pit, burnt in a crematory, or buried in a cemetery	1 (9.1)	4 (36.4)	6(54.5)	2 (18.2)	5 (45.4)	4 (36.4)	3 (27.3)	4 (36.4)	4 (36.4)
Dedicated ash pits available for the disposal of incineration ash	-	-	11 (100)	-	-	11 (100)	-	-	11 (100)
Protocol or standard operating procedure (SOP) for safe management of health care waste clearly visible and legible	-	6(54.5)	5 (45.4)	4 (36.4)	6(54.5)	1 (9.1)	5 (45.4)	6(54.5)	-
Appropriate protective equipment for all staff in charge of waste treatment and disposal	-	3 (27.3)	8 (72.7)	1 (9.1)	9 (81.8)	1 (9.1)	1 (9.1)	10 (90.9)	-

Table 12 shows the Essential indicator for the assessment of healthcare waste in healthcare facilities. None of the facilities had trained persons with assigned responsibilities for managing healthcare waste during baseline. Following the intervention, it improved to six facilities during the endline. During baseline, none of the facilities had functional waste containers at all generation points, while six facilities had containers for waste disposal in all the areas during the endline. During baseline, waste segregation at all points was practiced in two facilities. Following the intervention, it could improve to only three facilities

Advanced indicators for the assessment of healthcare waste are shown in **table 13**. During baseline, only one facility had a dedicated pit for the disposal of anatomical waste. Post-intervention, it improved to three facilities. None of the facilities displayed protocol for the safe management of healthcare waste during baseline. During the endline, five facilities have displayed the protocol in the facility. During baseline, none of the facilities used personal protective equipment for waste disposal. Following the intervention, personal protective equipment was used in one facility

Table 14 Assessment of Health care waste as per Kayakalp -Additional indicator (n=11)

Indicators	Baseline n (%)	Follow up after 3 months n (%)	Endline n (%)
Check for instructions for segregation of waste in different categories of colour coded bins are displayed at point of use?	4 (36.4)	5 (45.4)	9 (81.8)
Check waste transportation from clinical to storage areas is done in covered trolleys ?.	11 (100)	11 (100)	11 (100)
Check whether the Route of transportation of waste is away from the general traffic in the Facility.?	1 (9.1)	4 (36.4)	4 (36.4)
Check whether staff uses needle cutters for cutting the syringe hub?	2 (18.2)	6(54.5)	7 (63.6)
Check if sharps are put in a disinfectant solution (1% Chlorine Solution or any other suitable disinfectant as per the Facility's policy)?	4 (36.4)	7 (63.6)	7 (63.6)
Check whether staff know about post-exposure prophylaxis (PEP) after a needle stick injury?	4 (36.4)	6(54.5)	7 (63.6)
Check whether the biohazard sign is prominently displayed in the storage area?	-	4 (36.4)	4 (36.4)
Check whether deep Burial Pit is constructed as per BMW rules 1998?	11 (100)	11 (100)	11 (100)
Check whether Lab samples are discarded after treatment with a chloride solution?	2 (18.2)	3 (27.3)	7 (63.6)
Check whether the Facility has valid authorization for BMWM from the pollution control board?	2 (18.2)	2 (18.2)	2 (18.2)
Is any training conducted on BMW management?	6(54.5)	11 (100)	11 (100)

Table 14 shows additional indicators for the assessment of healthcare waste in healthcare facilities. During baseline, four of the facilities had instructions for segregation of waste in different categories of colour coded bins displayed at point of use. Following the intervention, it improved to nine facilities. During baseline, there were two facilities using needle cutters for cutting the syringe hub. Following the intervention, it improved to seven facilities. Sharps disinfection with 1% chlorine solution was practiced in four facilities during baseline. With the help of the intervention, it improved to seven facilities towards the endline. During baseline, post-exposure prophylaxis following needle stick injury was done in fours facilities. Following the intervention, it improved to seven facilities. During baseline, training on BMW management was done in six facilities. During the endline, following training on BMW, it improved to eleven facilities.

5.5.Assessment of hygiene and facility environment, cleanliness, and disinfection in HCFs

Table 15 Assessment of Hygiene in health care facilities as per WASH FIT tool-Essential indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Functioning hand hygiene stations are available at all points of care	-	11 (100)	-	2 (18.2)	9 (81.8)	-	7 (63.6)	4 (36.4)	-
Hand hygiene promotion materials visible and understandable at key places	-	6(54.5)	5 (45.4)	4 (36.4)	7 (63.6)	-	8 (72.7)	3 (27.3)	-

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Table 16 Assessment of Hygiene in health care facilities as per WASH FIT tool- Advanced indicator (n=11)

Indicators	Baseline, n (%)			Follow up after 3 months n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
Functioning hand hygiene stations are available in-service areas	-	11 (100)	-	3 (27.3)	8 (72.7)	-	8 (72.7)	3 (27.3)	-
Functioning hand hygiene stations available in the waste disposal area	-	-	11 (100)	-	-	11 (100)	-	1 (9.1)	10 (90.9)
Hand hygiene compliance activities are undertaken regularly	-	-	11 (100)	1 (9.1)	9 (81.8)	1 (9.1)	-	10 (90.9)	1 (9.1)

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Table 17 Assessment of Hygiene in health care facilities as per Kayakalp- Additional indicator (n=11)

Indicators	Baseline n (%)	Follow up after 3 months n (%)	Endline n (%)
Check whether staffs demonstrate 6 steps of normal hand wash?	3 (27.3)	3 (27.3)	1 (9.1)
Check for the availability of alcohol-based hand-rub and its supply?	8 (72.7)	8 (72.7)	8 (72.7)
Check whether staff is aware of when to hand wash?	5 (45.4)	5 (45.4)	10 (90.9)
Check, if the staff uses gloves, mask, and cap during examination, and while conducting procedures	11 (100)	11 (100)	11 (100)
Check whether staffs demonstrate the correct method of wearing and removing Gloves?	6(54.5)	9 (81.8)	9 (81.8)
Check whether staffs know how to make 1% Chlorine solution?	7 (63.6)	9 (81.8)	7 (63.6)
Check whether instruments are decontaminated with 0.5 chlorine solution?	2 (18.2)	4 (36.4)	5 (45.4)
Check whether staff adhere to Protocols for autoclaving?	6(54.5)	8 (72.7)	8 (72.7)
Check autoclaving records for the use of sterilization indicators	-	1 (9.1)	1 (9.1)
Check whether staff adhere to protocols for management of small spills?	9 (81.8)	11 (100)	11 (100)
Check the Availability of spill management Kit in the facility?	-	2 (18.2)	2 (18.2)
Check for the display of Spill management protocols at points of use	3 (27.3)	11 (100)	11 (100)
Check for maintenance of bed-to-bed distance approx. 3.5 feet between two beds in the ward?	2 (18.2)	7 (63.6)	7 (63.6)
Check for restriction of external footwear in critical areas?	7 (63.6)	8 (72.7)	8 (72.7)
Check whether facility restrict visitors to the Isolation Area?	11 (100)	11 (100)	11 (100)
Check whether facility has documented Antibiotic policy?	2 (18.2)	2 (18.2)	2 (18.2)
Check whether Facility staff are immunized against Hepatitis B?	9 (81.8)	9 (81.8)	8 (72.7)

Table 15 shows essential indicators for the assessment of hygiene in healthcare facilities. None of the facilities during baseline had functional hand hygiene stations available at all points of care. Following the intervention, it improved to seven facilities during the endline. During baseline, none of the facilities displayed hand hygiene promotion material at key places inside the premises. Towards the endline, it was displayed in eight facilities

Advanced indicators for assessment of hygiene in health care facilities are shown in **table 16**. During baseline, none of the facilities had functional hand hygiene stations in the service area. It was available in eight facilities during the endline. There were no compliance activities related to hand hygiene in any facilities during baseline. With the help of supportive supervision, endline compliance activities were established in ten facilities.

Table 17 shows additional indicators for the assessment of hygiene in healthcare facilities. During baseline, five moments of handwashing were known by nursing staff only in five facilities. During the endline, it improved to ten facilities. During baseline, staff from four facilities used gloves during the examination and while conducting the procedure. During the endline, it improved to seven facilities. During baseline, the staff knew the correct method of wearing and removing gloves in six facilities. Following the intervention, it improved to nine facilities. During baseline, recommended temperature, duration, and pressure for autoclaving instruments were known in six facilities. Following the intervention, it improved to eight facilities during the endline. Spill management protocols were displayed in three facilities during baseline. During the endline, it was displayed in all the facilities.

5.6.Microbiological surveillance of labor room

Table 18 Microbiological surveillance of Labour room in healthcare facilities

Labour room(n=7)	**Baseline, n (%)**				**Endline, n (%)**			
Site of swabbing	ASB	GNB	Pseudomonas	Klebsiella	ASB	GNB	Pseudomonas	Klebsiella
Spotlight	5 (71.4)	5 (71.4)	2 (28.6)	1 (14.3)	4 (57.1)	3 (42.9)	1 (14.3)	-
Gauze drum	4 (57.1)	3 (42.9)	4 (57.1)	-	6 (85.7)	4 (57.1)	4 (57.1)	-
Delivery tray	2 (28.6)	6 (85.7)	1 (14.3)	-	2 (28.6)	5 (71.4)	3 (42.9)	1 (14.3)
Fetoscope	5 (71.4)	7 (100)	2 (28.6)	-	3 (42.9)	7 (100)	3 (42.9)	-
Rubber sheet	4 (57.1)	4 (57.1)	3 (42.9)	2 (28.6)	3 (42.9)	3 (42.9)	-	1 (14.3)
Episiotomy Scissors	5 (71.4)	5 (71.4)	2 (28.6)	1 (14.3)	2 (28.6)	4 (57.1)	2 (28.6)	2 (28.6)

Labour room was functional in 7 facilities

ASB – Aerobic Spore Bearers, GNB- Gram-Negative Bacilli

Table 18 shows microbiological surveillance of the labor room (n=7). Surface swabbing was done in 6 sites of the labor room: Spotlight, Gauze drum, Delivery tray, Fetoscope, Rubber sheet, and Episiotomy scissors. The samples drawn from the labor room show the following microbial isolates: Aerobic Spore Bearers, Gram-Negative Bacilli, Pseudomonas, and Klebsiella. These organisms were isolated in the baseline as well as the endline.

Table 19 Assessment of Facility environment, cleanliness, and disinfection in health care facilities as per WASH FIT tool-Essential indicator (n=11)

Indicators	Baseline, n (%)			Midline, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
The exterior of the facility is well-fenced, kept generally clean	-	8 (72.7)	3 (27.3)	2 (18.2)	9 (81.8)	-	4(36.36)	7 (63.6)	-
General lighting sufficiently powered and adequate to ensure safe provision of health care including at night	4(36.36)	7 (63.6)	-	7 (63.6)	4 (36.4)	-	8 (72.7)	3 (27.3)	-
Floors and horizontal surfaces appear clean	-	6(54.5)	5 (45.4)	2 (18.2)	9 (81.8)	-	3 (27.3)	8 (72.7)	-
Appropriate and well-maintained materials for cleaning (i.e., detergent, mops, buckets, etc.) are available	-	11 (100)	-	3 (27.3)	8 (72.7)	-	4 (36.4)	7 (63.6)	-
At least two pairs of household cleaning gloves and one pair of overalls or apron and boots in a good state, for each cleaning and waste disposal staff member	-	2 (18.2)	9 (81.8)	3 (27.3)	4 (36.4)	4 (36.4)	-	11 (100)	-
At least one member of staff can demonstrate the correct procedures for cleaning and disinfection and apply them as required to maintain clean and safe rooms	-	3 (27.3)	8 (72.7)	2 (18.2)	8 (72.7)	1 (9.1)	5 (45.4)	6(54.5)	-
Beds have insecticide treated nets to protect patients from mosquito-borne diseases	-	-	11 (100)	-	-	11 (100)	-	-	11 (100)

**FM- Fully Met, PM- Partially Met, NM- Not Me*

Table 20 Assessment of Facility environment, cleanliness, and disinfection in health care facilities as per WASH FIT tool -Advanced indicator (n=11)

Indicators	Baseline, n (%)			Midline, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
A mechanism exists to track the supply of IPC-related materials to identify stock-outs	-	5 (45.4)	6(54.5)	-	11 (100)	-	-	11 (100)	-
Record of cleaning visible and signed by the cleaners each day	-	-	11 (100)	-	8 (72.7)	3 (27.3)	4 (36.4)	7 (63.6)	-
Laundry facilities are available to wash linen from patient beds	3 (27.3)	3 (27.3)	5 (45.4)	2 (18.2)	4 (36.4)	5 (45.4)	3 (27.3)	3 (27.3)	5 (45.4)
The facility has sufficient natural ventilation and, where the climate allows, large opening windows, skylights, and other vents to optimize natural ventilation	3 (27.3)	5 (45.4)	3 (27.3)	5 (45.4)	3 (27.3)	3 (27.3)	6(54.5)	3 (27.3)	2 (18.2)
Kitchen stores and prepared food is protected from flies, other insects, or rats	-	-	11 (100)	-	-	11 (100)	-	-	11 (100)
Beds for patients should be separated by 2.5 m from the center of one bed to the next and each bed has only one patient	-	6(54.5)	5 (45.4)	3 (27.3)	3 (27.3)	5 (45.4)	4 (36.4)	2 (18.2)	5 (45.4)

5.7.Assessment of management in HCFs

Table 21 Assessment of Management in health care facilities as per WASH FIT tool- Essential indicators (n=11)

Indicators	Baseline, n (%)			Midline, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
WASH FIT or other quality improvements/management plan for the facility is in place, implemented and regularly monitored	-	2 (18.2)	9 (81.8)	1 (9.1)	10 (90.9)	-	-	11 (100)	-
An annual planned budget for the facility is available and includes funding for WASH infrastructure, services, personnel, and the continuous procurement of WASH items (hand hygiene products, minor supplies to repair pipes, toilets) which is sufficient to meet the needs of the facility	5 (45.4)	6(54.5)	-	5 (45.4)	6(54.5)	-	6(54.5)	5 (45.4)	-
An up-to-date diagram of the facility management structure is clearly visible and legible	-	-	11 (100)	-	-	11(100)	-	-	11(100)
Adequate cleaners and WASH maintenance staff are available	3 (27.3)	8 (72.7)	-	5 (45.4)	6(54.5)	-	6(54.5)	5 (45.4)	-

Table 22 Assessment of Management in health care facilities as per WASH FIT tool -Advanced indicator (n=11)

Indicators	Baseline, n (%)			Midline, n (%)			Endline, n (%)		
	FM	PM	NM	FM	PM	NM	FM	PM	NM
A protocol for operation and maintenance, including procurement of supplies, is legible and implemented	-	-	11 (100)	-	10 (90.9)	1 (9.1)	-	11 (100)	-
Regular ward-based audits are undertaken to assess the availability of hand rub, soap, and other hand hygiene resources	-	2 (18.2)	9 (81.8)	-	5 (45.4)	6(54.5)	-	9 (81.8)	2 (18.2)
New health care personnel receive IPC training as part of their orientation programme	-	5 (45.4)	6(54.5)	-	5 (45.4)	6(54.5)	-	4 (36.4)	7 (63.6)
Health care staff are trained on WASH/ IPC each year	-	4 (36.4)	7 (63.6)	-	6(54.5)	5 (45.4)	-	5 (45.4)	6(54.5)
Facility has a dedicated WASH or IPC focal person	-	4 (36.4)	7 (63.6)	-	11 (100)	-	3 (27.3)	8 (72.7)	-
Job description written clearly and legibly, including WASH-related responsibilities, and are regularly appraised	-	2 (18.2)	9 (81.8)	-	3 (27.3)	8 (72.7)	-	2 (18.2)	9 (81.8)
High performing staff are recognized and rewarded	-	3 (27.3)	8 (72.7)	-	5 (45.4)	6(54.5)	3 (27.3)	5 (45.4)	3 (27.3)

**FM- Fully Met, PM- Partially Met, NM- Not Met*

Essential indicators for assessment of facility environment, cleanliness, and disinfection in health care facilities are shown in **table 19**. During baseline, none of the facilities' exterior was well fenced and clean. Following the intervention, during the endline, it improved in four facilities. During baseline, none of the facilities had the clean floor and horizontal work surfaces. During the endline, it improved in three facilities. None of the facility staff during baseline demonstrated the correct cleaning procedure and disinfection procedure. Following the intervention, it improved in five facilities during the endline.

Table 20 shows advanced indicators for assessment of facility environment, cleanliness, and disinfection in health care facilities. During baseline, none of the facilities had records of cleaning visible and signed by staff each day. Following the intervention, it was displayed in four facilities during the endline. During baseline, none of the facilities had beds for patients separated by 2.5 meters from the center. Following the intervention, it improved to four facilities during the endline.

Essential indicators for assessment of management in health care facilities are shown in **table 21**. During baseline, WASH FIT or other quality improvement plan for the facility was in place only in two facilities. Following the intervention, during the endline, it was available in all facilities. Only three facilities had adequate cleaners and WASH maintenance staff available during baseline. Following the intervention, it was made available in six facilities during the endline.

Table 22 shows advanced indicators for assessment of management in health care facilities. During baseline, regular ward-based audits were undertaken only in two facilities. During the endline, it improved to nine facilities during endline. None of the facilities had a dedicated WASH or IPC focal person during baseline. During the endline, dedicated staff was available in three facilities following the intervention. During baseline, highly performing staff are recognized and rewarded in none of the facilities. Following the intervention, it was done in three facilities during the endline.

Table 23 WASH FIT score for Water component in the selected health care facility

Health care facility	Baseline Score (%)	Midline Score (%)	Endline Score (%)	P-value
CHC Dhundhara	35 (77.7)	36 (80.0)	41 (91.1)	0.062
CHC Jhanwar	34 (75.5)	38 (84.4)	41 (91.1)	**0.011**
CHC Luni	32 (71.1)	33 (73.3)	36 (80.0)	0.074
CHC Salawas	34 (75.5)	37 (82.2)	38 (84.4)	**0.030**
CHC Dhawa	32 (71.1)	32 (71.1)	37 (82.2)	0.062
PHC Bhatinda	29 (64.4)	30 (66.7)	31 (68.9)	0.472
PHC Guda Bishnoiyan	31 (68.9)	34 (75.5)	38 (84.4)	**0.005**
PHC Kherjalikalan	29 (64.4)	33 (73.3)	35 (77.7)	**0.018**
PHC KudiBhagatasni	28 (62.2)	29 (64.4)	29 (64.4)	0.368
PHC Satlana	32 (71.1)	33 (73.3)	34 (75.5)	0.223
PHC Subdand	28 (62.2)	29 (64.4)	31 (68.9)	0.097

P- value calculated by Friedman test using mean ranks

Maximum score 45, Minimum score 15

Table 24 WASH FIT score for Sanitation &health care waste component in the selected healthcare facility

Health care facility	Baseline Score (%)	Midline Score (%)	Endline Score (%)	P- value
CHC Dhundhara	43 (65.1)	49 (69.7)	52 (78.8)	0.054
CHC Jhanwar	41 (62.1)	49 (69.7)	50 (75.6)	0.025
CHC Luni	40 (60.6)	48 (72.7)	51 (77.3)	0.001
CHC Salawas	43 (65.1)	50 (75.6)	52 (78.8)	0.001
CHC Dhawa	35 (53.0)	42 (63.6)	52 (78.8)	0.001
PHC Bhatinda	31 (47.0)	33 (50.0)	36 (54.5)	0.150
PHC Guda Bishnoiyan	37 (56.1)	43 (65.1)	46 (69.7)	0.007
PHC Kherjalikalan	30 (45.4)	37 (56.1)	38 (57.6)	0.001
PHC KudiBhagatasni	27 (40.9)	33 (50.0)	34 (51.5)	0.002
PHC Satlana	30 (45.4)	37 (56.1)	38 (57.6)	0.001
PHC Subdand	29 (43.9)	35 (53.0)	36 (54.5)	0.002

P- value calculated by Friedman test using mean ranks

Maximum score 66, Minimum score 22

Table 25 WASH FIT score for Hygiene component in the selected health care facility

Health care facility	Baseline Score (%)	Midline Score (%)	Endline Score (%)	P- value
CHC Dhundhara	32 (59.2)	41 (75.9)	44 (81.5)	0.001
CHC Jhanwar	32 (59.2)	41 (75.9)	43 (79.6)	0.001
CHC Luni	31 (57.4)	37 (68.5)	42 (77.8)	0.001
CHC Salawas	31 (57.4)	38 (70.4)	41 (75.9)	0.001
CHC Dhawa	28 (51.8)	40 (74.1)	40 (74.1)	0.001
PHC Bhatinda	24 (44.4)	30 (55.5)	35 (64.8)	0.004
PHC Guda Bishnoiyan	28 (51.8)	31 (57.4)	40 (74.1)	0.001
PHC Kherjalikalan	25 (46.3)	31 (57.4)	32 (59.2)	0.002
PHC KudiBhagatasni	23 (42.6)	30 (55.5)	33 (61.1)	0.001
PHC Satlana	25 (46.3)	31 (57.4)	32 (59.2)	0.002
PHC Subdand	23 (42.6)	30 (55.5)	33 (61.1)	0.001

P- value calculated by Friedman test using mean ranks

Maximum score 54, Minimum score 18

Table 26 WASH FIT score for Management component in the selected health care facility

Health care facility	Baseline Score (%)	Midline Score (%)	Endline Score (%)	P- value
CHC Dhundhara	17 (51.5)	21 (63.6)	24 (72.7)	**0.008**
CHC Jhanwar	17 (51.5)	21 (63.6)	24 (72.7)	**0.008**
CHC Luni	19 (57.6)	21 (63.6)	21 (63.6)	0.368
CHC Salawas	20 (60.6)	22 (66.7)	22 (66.7)	0.135
CHC Dhawa	18 (54.5)	21 (63.6)	24 (72.7)	**0.022**
PHC Bhatinda	15 (45.4)	17 (51.5)	18 (54.5)	0.247
PHC Guda Bishnoiyan	15 (45.4)	22 (66.7)	21 (63.6)	**0.003**
PHC Kherjalikalan	13 (39.4)	16 (48.5)	16 (48.5)	**0.050**
PHC KudiBhagatasni	13 (39.4)	16 (48.5)	18 (54.5)	**0.022**
PHC Satlana	13 (39.4)	16 (48.5)	16 (48.5)	0.050
PHC Subdand	13 (39.4)	17 (51.5)	18 (54.5)	**0.030**

P- value calculated by Friedman test using mean ranks

Maximum score 33, Minimum score 11

Table 27 Status of WASH in Health care facilities

Health care facility	Baseline (Mean±SD)	Midline (Mean±SD)	Endline (Mean±SD)	P-value*
Water (15-45)	31.27±2.49	33.09±3.05	35.55±4.01	**<0.001**
Sanitation (22-66)	35.09±5.99	41.45±6.76	44.09±7.62	**<0.001**
Hygiene (18-54)	27.45±3.62	34.55±4.8	37.73±4.73	**<0.001**
Management (11-33)	15.73±2.61	19.09±2.63	20.18±3.12	**<0.001**

**P- value calculated by repeated measures ANOVA*

WASH FIT scores for the Water component in a selected healthcare facility are shown in **table 23**. The cumulative score and score percentage were calculated using essential and advanced indicators of the WASH FIT tool. There was a significant improvement in WASH FIT score during the endline in two CHCs (CHC Jhanwar, CHC Salawas) and two PHCs (PHC Guda Bishnoiyan, PHC Kherjalikalan).

WASH FIT scores for Sanitation & healthcare waste disposal component in a selected healthcare facility are shown in **table 24**. The cumulative score and score percentage were calculated using essential and advanced indicators of the WASH FIT tool. There was a significant improvement in WASH FIT score during the endline in four CHCs (CHC Jhanwar, CHC Luni, CHC Salawas, and CHC Dhawa) and five PHCs (PHC Guda Bishnoiyan, PHC Khejalikalan, PHC Kudi Bhagatasni, PHC Satlana, PHC Subdand).

WASH FIT scores for the Hygiene component in a selected healthcare facility are shown in **table 25**. The cumulative score and score percentage were calculated using essential and advanced indicators of the WASH FIT tool. There was a significant improvement in WASH FIT score during the endline in all CHCs and PHCs.

WASH FIT scores for the Management component in a selected healthcare facility are shown in **table 26**. The cumulative score and score percentage were calculated using essential and advanced indicators of the WASH FIT tool. There was a significant improvement in WASH FIT score during the endline in three CHCs (CHC Dhundhara, CHC Jhanwar, and CHC Dhawa) and four PHCs (PHC Guda Bishnoiyan, PHC Khejalikalan, PHC Kudi Bhagatasni, and PHC Subdand).

Table 27 showcases the cumulative scores for all healthcare facilities depicting the status of WASH. From baseline to endline, the mean score of the water, sanitation, hygiene, and management components shows significant improvement in all components following the intervention

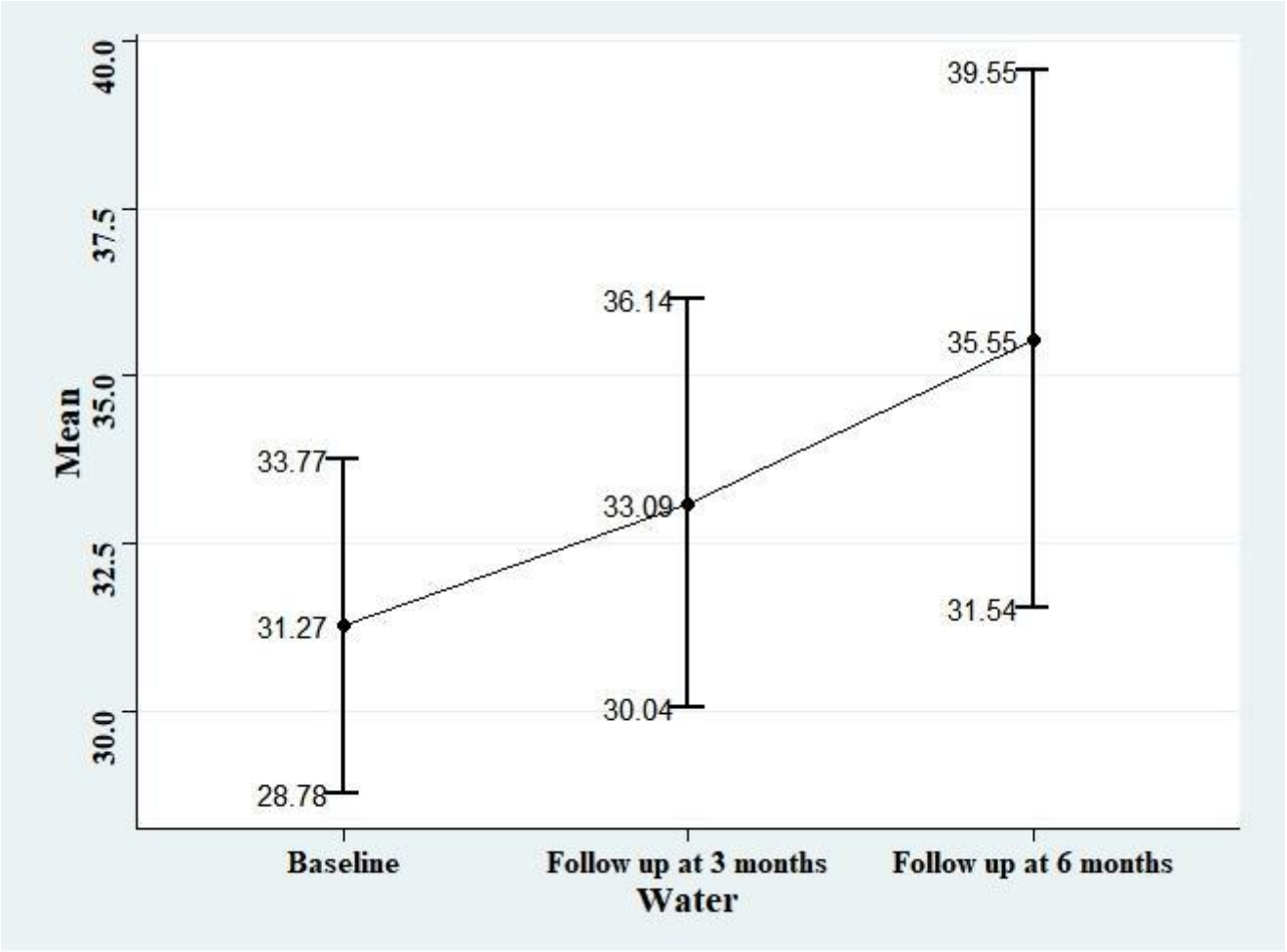

Figure 8 Error plot showing the mean change in Water score across the healthcare facilities

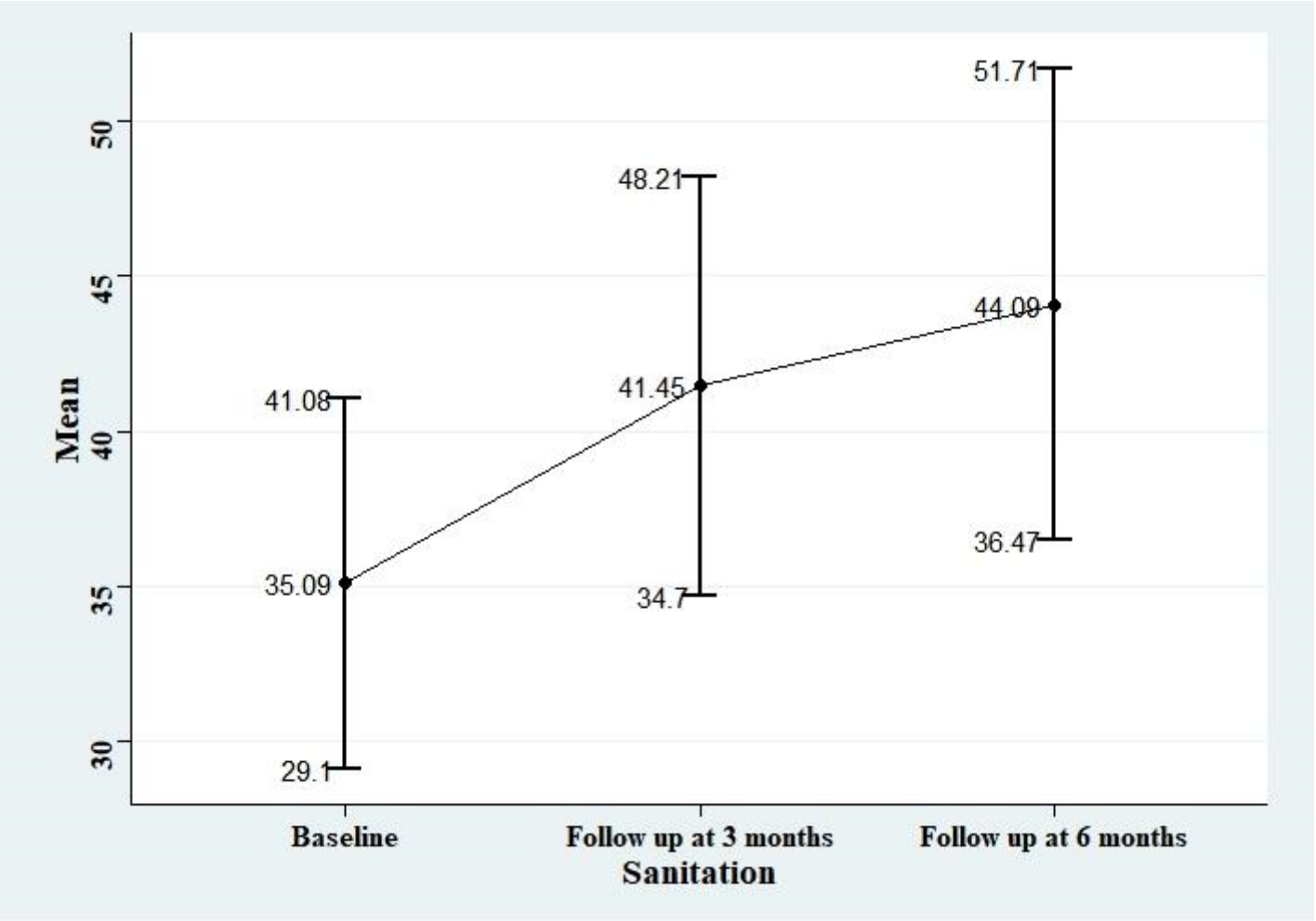

Figure 9 : Error plot showing the mean change in Sanitation score across the healthcare facilities

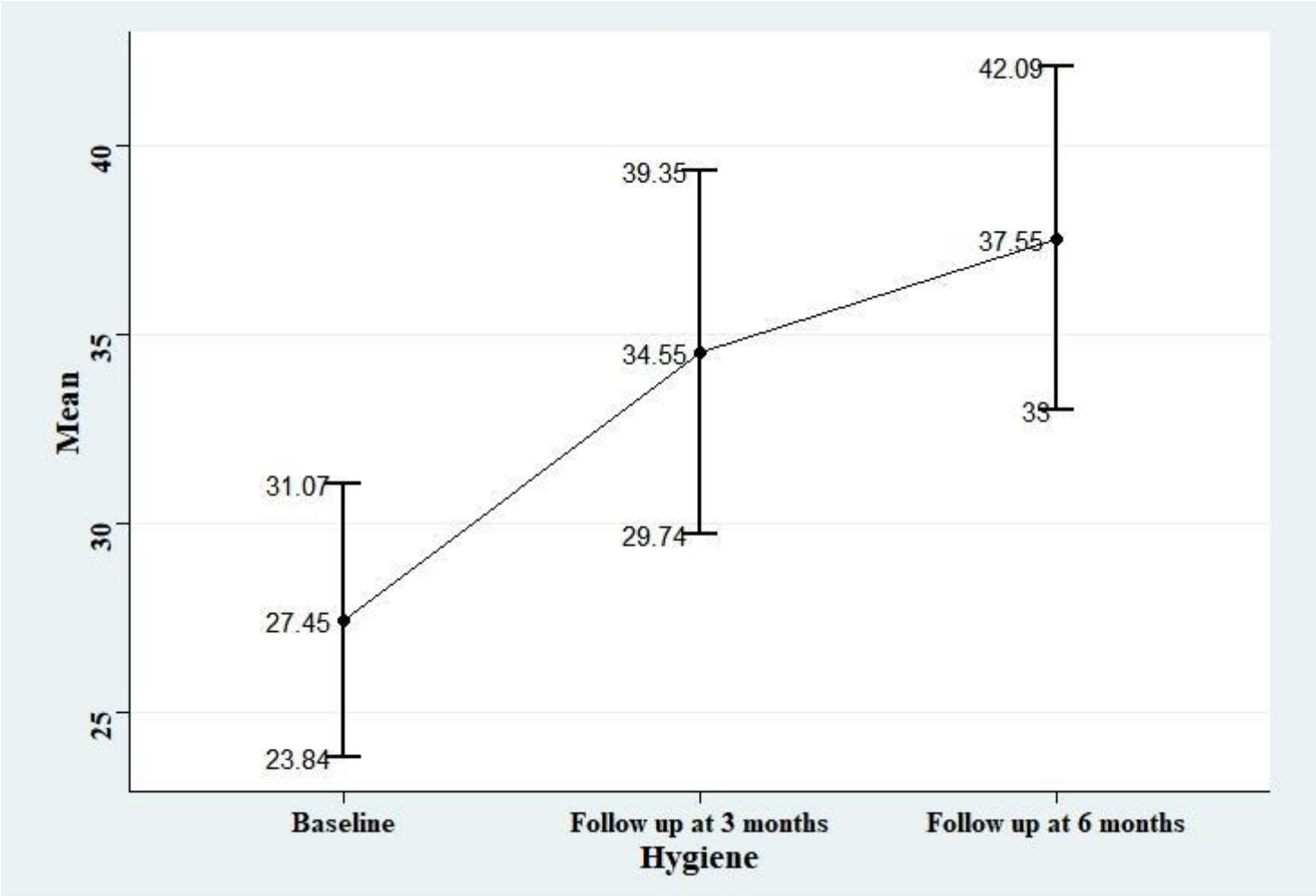

Figure 10: Error plot showing the mean change in Hygiene score across the healthcare facilities

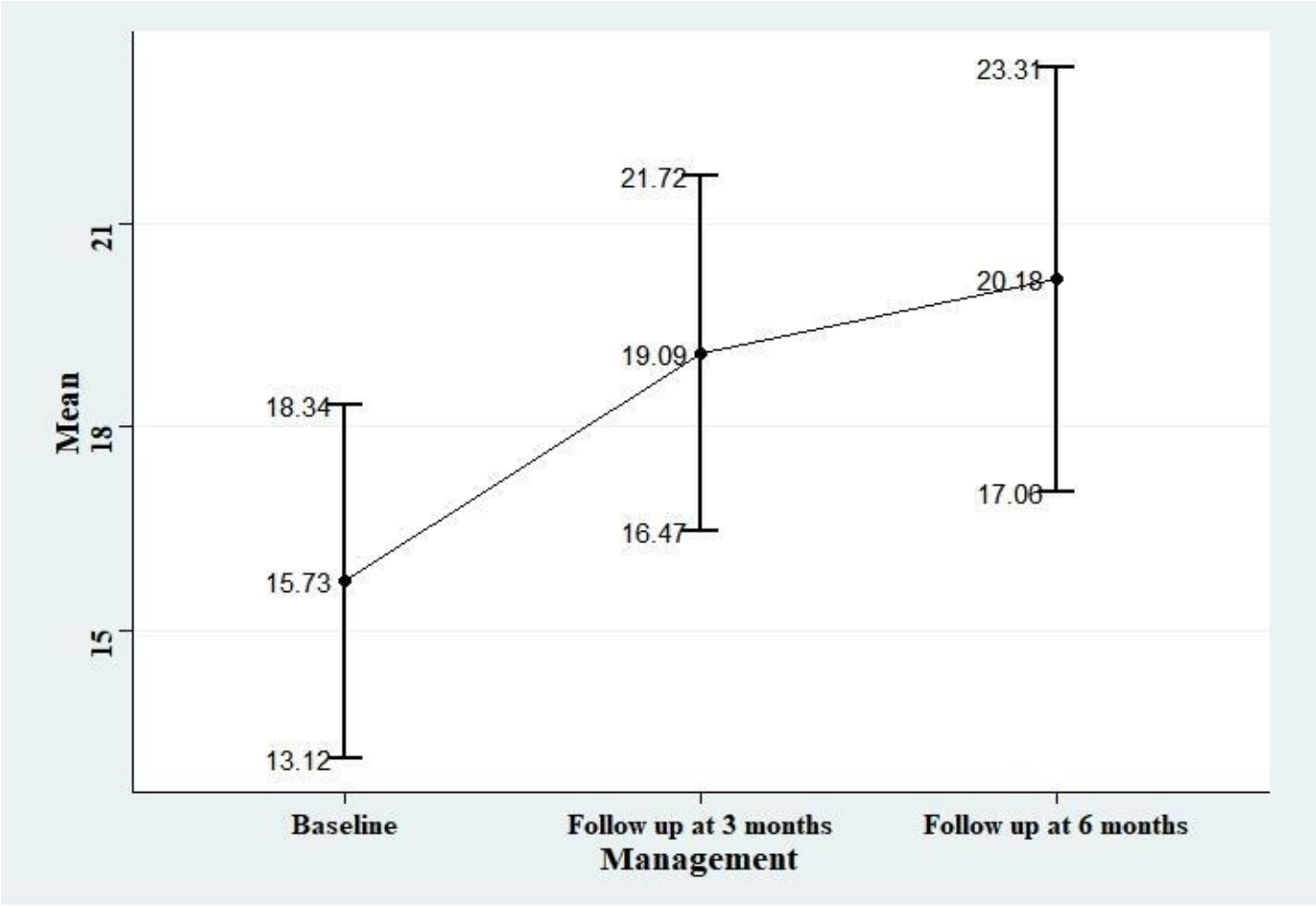

Figure 11: Error plot showing mean change in Management score across the health care facilities

Table 28 Status of WASH in Health care facilities in the selected community development block as per Joint Monitoring Programme Service ladder (n=11)

Domains	Baseline n (%)			Endline n (%)		
	Basic service	Limited service	No service	Basic service	Limited service	No service
Water	11(100)	-	-	11(100)	-	-
Sanitation	3(27.3)	8(72.7)	-	5(45.4)	6(54.5)	-
Hygiene	3(27.3)	8(72.7)	-	7(63.6)	4(36.4)	-
Health care waste	-	9(81.8)	2(18.2)	-	11(100)	-
Environmental cleaning	1(9.1)	10(90.9)	-	9(81.8)	2(18.2)	-

Figure 12: Image showing Sanitation indicators in the HCFs during Baseline and Endline

Chapter 6: DISCUSSION

The present study was a facility-based interventional study conducted in PHCs and CHCs of rural Jodhpur to assess water, sanitation, and infection control practice using the WASH FIT and Kayakalp tool and to improve these practices by supportive supervision. The results of the study favour the multimodal intervention through supportive supervision given in HCFs for the improvement of water, sanitation, and infection control practices.

It was a pre-post interventional study design, where all the healthcare facilities were assessed using the indicators of WASH FIT and Kayakalp tool. Physical status and service delivery status were evaluated for the individual healthcare facilities. These indicators were compared with IPHS for PHCs and CHCs. Most primary and secondary-level healthcare facilities had inadequate human resources and insufficient IPD beds. In this study, none of the facilities had essential manpower as per IPHS 2012. It is vital to have sufficient staffs to put every strategy into effect and to satisfy the additional staff requirements in the event of a surge. These parameters have a direct as well as an indirect role in the establishment of ideal WASH-related practices sustainably in the HCFs. OPD services were available in all facilities observed, and emergency 24x7 services were available in all CHCs as per IPHS. All the facilities have a bed occupancy rate (BOR) of less than 60%. The low BOR observed in the facilities was due to reduced human resources, temporary staff transfers for COVID 19 activities in the district, the lack of essential medications during the study time, and patients who were denied inpatient care out of fear of the pandemic. Average OPD attendance during the study period was also less, which can contribute directly to the reduced BOR. This finding was similar to a study done by **Okello D et al., (1994)** in Uganda which indicated low bed occupancy rate in HCFs due to a lack of trained personnel, supply of drugs and other medical supplies, and a complete breakdown in the transfer and referral system (62).

6.1. Water-related indicators

With various tools and indicators available, the outcomes assessed by the researchers are diverse in nature. While the objective of the evaluation was to assess the status of water, sanitation, and infection control practices in HCFs, it is done by using varied indices,

measuring different domains of WASH. In this study, indicators for the assessment of water were designed using WASH FIT and Kayakalp tool.

From this study, it was evident that piped water supply was the major source of water in all the HCFs. This finding was not surprising, and the Joint Monitoring Programme (JMP) report for 2022 shows 93.6% of HCFs in India had improved water quality within the facility premises (63). Having a water source within the facility premises reduces the risk of water contamination due to storage. It reduces the burden on healthcare workers too who travel and collect water for the HCFs.

During baseline, none of the facilities had sufficient water or availability of water every day, but there was water availability for more than five days per week in all the facilities. As per JMP recommendation, healthcare facilities should have at least 200 litres of water available per bed per day. During the interview with the staff, it was noticed that low BOR was the reason for not maintaining sufficient water reserve. But, towards the end line, after gaining knowledge about this recommendation, many facilities started storing water in their overhead tanks to comply with these standards. Safe drinking water storage in clean tanks or containers was observed in most of the facilities. This finding was similar to the study conducted by **Guo et al (2017)** in sub-Saharan Africa, which showed safe storage and covered storage container in all the countries except Rwanda (64).

Sanitary Inspection Risk Score (SIS) shows low risk in 27.3 % of facilities during baseline, and towards the endline low-risk score was observed in 81.8% of facilities. This reduction in the score can be attributed to assigning a nodal person to look after the water wastage and periodic inspection of drinking water. WHO has endorsed the Sanitary Inspection Risk Score as a simple and cost-effective approach to identifying microbial hazards to water quality. Although the data to support this recommendation has mixed opinions. A study by **Snoad et al (2017)** in West Bengal showed that SIS had a poor ability to identify coliform contamination of water (65).

Similarly, the microbiological assessment done in the study doesn't correlate with the SIS. During baseline, 18.2% of facilities had drinking water treated and collected with proven technology that meets WHO performance standards, namely the Reverse Osmosis (RO) filter. RO filter was present in 90.9% of facilities but was functional and utilized only in 27.3%. The improper utilization was due to clogging of the filter due to the

deposition of the sediments and using sealed water procured from a private agency. In this study, knowledge was provided to HCWs about the importance of using water with WHO-proven technology, after which few facilities have repaired the RO filters. For periodic water testing, chlorine level estimation using a chloroscope was available in 63.6 % of facilities but was not utilized in any. In this study, training was provided to lab technicians to carry out periodic chlorine testing once in 4 months per year. The chlorine residue in drinking water suggests that: 1) adequate chlorine was added to the water to inactivate the bacteria and some viruses that cause diarrheal disease, and 2) the water is protected from recontamination during storage. The presence of free residual chlorine in drinking water correlates with the lack of disease-causing organisms and hence serves as a measure of water potability (66). Following the intervention, periodic chlorine testing was done in 54.5% of facilities, but an acceptable chlorine level of less than 0.2 mg/l was present only in 18.2% of facilities towards the endline.

Kayakalp initiative recommends regularly inspecting leaking taps, pipes, overflowing tanks, and malfunctioning cisterns. It should be ensured that designated personnel at the health facility oversee these activities. The health facility must undertake immediate corrective action for any flaw discovered during the water waste inspection (60). In this study, during baseline, there was no system for periodic inspection of water wastage in 63.6% of facilities. Towards the endline, after assigning duty for periodic inspection of leaking taps and providing knowledge about establishing a system to inspect water wastage, 81.8% of facilities practice periodic inspection for water wastage.

The overhead tanks in health care facilities were inspected, during which it was observed that adequate sealing of storage tanks and twice-yearly cleaning of overhead tanks were done in 36.4% of facilities. Kayakalp initiative recommends manual cleaning of overhead tanks once in six months. After cleaning, the cleaning date and the next cleaning schedule should be displayed on the water tank (60). In this study, a checklist was made to increase adherence towards periodic cleaning and inspection of overhead tanks by the concerned staff. Information, Education & Communication (IEC) is an effective medium for generating awareness; IEC regarding water conservation was displayed in HCFs.

The drinking water's physical, chemical, and microbiological quality should be assessed periodically as per the Bureau of Indian Standards (BIS) (67). Presumptive coliform

count/100 ml estimated using multiple tube method in this study shows that 72.7% of facilities and 27.3% of facilities had suspicious category (MPN 4-10) and satisfactory category (MPN 1-3) during baseline. A cross-sectional study done by **Akkina et al., (2020)** in Andra Pradesh shows all the ten water samples tested have crossed the permissible MPN count, indicating water was not potable for drinking (68). Some disinfectants, such as chlorine, can be easily monitored and controlled. So, frequent monitoring is recommended wherever chlorination is practiced. During baseline, an acceptable chlorine level of ≤ 0.2 ppm was present in 54.5% of facilities. Another important chemical parameter tested in drinking water was chloride. Chloride originates from natural sources and other industrial sources. Excessive chloride levels can have a corrosive effect on metals in the distribution system and can alter the taste of drinking water. The acceptable chloride concentration in drinking water should be ≤250 mg/l. In this study, only 18.2% of facilities had acceptable chloride levels during baseline.

Fluoride in drinking water will be an extremely valuable reference source for all those responsible for the management of fluoride-containing drinking water and the health effects of its consumption, including water sector managers and practitioners, as well as health sector staff at the policy and implementation levels (69). Fluoride is a vital element for humans, and it's beneficial for the prevention of dental caries. However, elevated fluoride levels can cause adverse effects on bones and teeth. (67,70–73) The minimum protective concentration of fluoride in drinking water should be less than 0.5mg/l (73). This acceptable fluoride concentration of ≤ 1 ppm was present in 45.5% of facilities.

During water is one of the important sources of nitrate in humans. Nitrate has a protective role in scavenging a variety of gastrointestinal microorganisms. But at the same time, nitrate has a role in the occurrence of methemoglobinemia in bottle-fed infants (74,75). According to BIS, the nitrate level in drinking water should be ≤ 45 ppm (73). In this study, all the facilities had nitrate within acceptable levels. The hardness of water is mainly due to calcium, magnesium cations, and other dissolved polyvalent metallic ions (76). There is a dearth of studies to comment on the protective effect of hardness on cardiovascular mortality (61). According to BIS, acceptable hardness ≤ 200 ppm was present in 18.2% of the facilities during baseline

6.2. Sanitation related indicators

An estimated 1.7 billion people (about 21% of the world's population) lack basic sanitation worldwide (77). 79% of healthcare facilities lack basic sanitation in the least developed countries. According to the JMP report, basic sanitation service is defined as "*Improved sanitation facilities are usable, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for people with limited mobility*." As per essential indicators of the WASH FIT tool, facilities should have four or more toilets in outpatients and one per 20 users' inpatients. In this study, none of the facilities during baseline fully met these guidelines. Despite the fact that all HCFs had adequate sanitary infrastructure to fulfill this criterion, none of the HCFs during baseline had accessibility and good sanitary conditions. After a detailed investigation into this issue, interviews with health workers revealed that patients were denied entry to the toilet in some facilities because it was kept locked to ensure their cleanliness. A study done by **Huttinger et al., (2017)** showed that five out of the ten HCFs met this guideline (78). During the endline, toilets were made accessible with the help of supportive supervision, and it fully met this guideline in 9.1% of the health care facilities.

Guidelines also recommend that, there should be separate toilets for patients and staff separately. This study found that all the health care facilities had separate toilets, but they were not clearly demarcated and displayed. During baseline, only 27.3% of HCFs fully met this guideline. Following the intervention, posters demarcating the toilets for staff and patients were displayed in 45.4% of HCFs during the endline. Similarly, sex-separated toilets were available in 27.3% of HCFs during baseline. During the endline, 63.6% of health care facilities had separate latrines for male and female. A study done by **Huttinger et al., (2017)** showed that only five out of the ten HCFs assessed had sex-separated toilets (78).

This study depicts that none of the facilities during baseline provided means to manage menstrual hygiene needs, including dustbins for disposal of sanitary napkins. Menstrual hygiene has been identified as one of the most neglected aspects of WASH, as women have specific sanitary requirements (79). This issue is hardly addressed by policymakers (80). Amid mounting awareness of the problem, further action and execution are frequently hampered due to the sensitive nature of the issue (81). In this study, menstrual

hygiene management-related posters were displayed in the female toilets, and dustbins for the disposal of sanitary napkins were placed in the HCFs. Toward the endline, with the support of HCWs in the respective facilities, 36.4% of the HCFs were able to provide means to manage menstrual hygiene needs. A study conducted by **Kohler et al (2014)** in Uganda underlined that inappropriate disposal of menstrual hygiene products, such as dumping into toilets and throwing them out windows, causes a lot of discomfort across all user groups in the hospital (82).

Based on ISO 21542:2021, "Building construction — Accessibility and usability of the built environment," - A toilet can be assumed to meet the needs of people with limited mobility if the following conditions are met: Accessibility without the use of stairs, handrails for support are appended to the floor or sidewalls, the door should be at least 80 cm wide, the toilet has a slightly elevated seat around 40-48 cm from the floor, the cubicle has space for circulation/manoeuvring (150 x 150 cm) and, a backrest. The sink, tap, and outside water should be accessible. The top of the sink should be 75 cm from the floor (with knee clearance). Light switches, where applicable, should be at the height of around a maximum of 120 cm (83). In this study, none of the facilities fully met the needs of people with reduced mobility, but it was partially met in 27.3% of the HCFs. According to JMP recommendations, a functional hand hygiene station with soap and water should be available within 5 meters of the latrine in HCFs. In this study, 18.2% of the facilities had functional hand hygiene stations during baseline. During the intervention, the importance of maintaining a functional hand hygiene station near the toilet was reinforced to the HCWs. With the help of the Infection Control Committee, towards the endline, 63.6% of the facilities fully met this recommendation.

A housekeeping checklist with records of cleaning toilets should be visible and signed by the cleaners every day. In this study, none of the facilities during baseline fully or partially met this guideline. During the intervention, a housekeeping checklist was prepared using Kayakalp facility improvement tools and displayed in all the HCFs (17). But none of the facilities could consistently fill the checklist on a daily basis. To make this intervention sustainable for illiterate cleaners, it should be more simplified with pictorial illustrations.

According to the Kayakalp facility improvement tool, there should be an identified person with duties assigned to monitor the housekeeping checklist (17). The person assigned can be a nursing officer, paramedical staff, pharmacist, or anyone working the HCFs. The person in charge of housekeeping should assign responsibilities to the staff, keep track of the housekeeping checklist, monitor the frequency of cleaning, and emphasize the proper use of particular cleaning agents (17). During baseline assessment, 63.6% of facilities had a person with assigned duties for monitoring housekeeping activities in HCFs.

Guidelines for implementation of the Kayakalp initiative recommend the usage of the correct concentration of cleaning solution by housekeeping staff in HCFs. The staff should be trained in the preparation of cleaning solutions, and records should be maintained for the same. In this study, correct usage of cleaning solutions by cleaning staff was practiced only in 45.4% of the HCFs during baseline. The intervention was provided using a chart containing information about the name of the chemicals, dilution to be used, and specific areas of application in the facility. Education was provided regarding its preparation, storage of disinfectant chemicals and cleaners, cleaning equipment, and standard cleaning methods (17,60,84–86). The usage was continuously monitored by the staff assigned for supervision of the housekeeping activities supervision. Following this, 81.8% of the facilities started using the correct concentration of cleaning solution.

6.3. Healthcare waste disposal-related indicators

Healthcare waste generated from the hospital can be infectious, non-infectious, sharps, radiological, pathological waste, and general waste. Safe segregation, pre-treatment, transport, and disposal of healthcare waste are prerequisites for disease transmission prevention (87). Globally one-third of healthcare facilities do not practice safe waste segregation in HCFs (88). In developing countries, seven out of ten facilities lack basic healthcare waste management (88). Improper management of healthcare waste exposes healthcare professionals, waste handlers, and the public to infections, harmful effects, and injuries. It also leads to the potential spread of microorganisms from the HCFs to the environment. Ineffective waste management in health care has been compounded by increased production and consumption of health-related items in COVID-19 pandemic.

Investing in waste management and transportation is necessary to combat the additional requirements and ensure their sustainability.

According to WASH FIT recommendation, there should be a trained person responsible for monitoring health care waste in the facilities. During the baseline assessment, none of the facilities fully met this guideline, and only 18.2 percent partially met it. The intervention was provided in a health care facility to assign a key person to look after biomedical waste disposal activities. All the HCWs were encouraged to participate in a training session of BMW conducted in the HCFs periodically by the investigator. Demonstrations and enacting were done along with innovative games to reinforce the correct methods of BMW management. The HCWs were encouraged to download an android application developed by All India Institute of Medical Sciences, New Delhi, named "Biomedical waste," which enables easy understanding whenever required (89). Following the intervention, 54.5% of the facilities fully met this guideline.

According to JMP, functional waste collection containers should be near all the waste generation points for infectious, non-infectious, and sharps waste. The lids should be leakproof with clearly distinguishable colour codes (63,77,90). During baseline, none of the facilities fully met this recommendation. However, during the endline, with the help of the nodal person found to look after BMW management activities, 54.5% of the facilities fully met it. JMP service ladder for monitoring WASH in HCFs deems a facility a basic service in health waste management if it safely segregates waste into three categories in appropriate coloured bins; infectious and sharps waste are treated and disposed of safely (90). Segregation is the most crucial step to managing BMW properly at the waste generation point. In this study, only 18.2% of the facilities were correctly segregating the waste during baseline. A cross-sectional study by **Somaiah et al., (2016)** using the Kayakalp assessment tool in the district hospital of south India showed an 80% score in segregation of BMW (86). Another study conducted in a tertiary care hospital; in Mumbai showed a segregation score of 40.3% (17). A study by **Sharma N et al., (2017)** showed the awareness among healthcare staff during baseline assessment was only 38.9% (91).

According to WASH FIT, healthcare facilities should have incinerators or alternate treatment technology to dispose of infectious and sharp waste (90). Approximately 85%

of the waste generated by healthcare facilities is non-hazardous waste (92). Under some conditions, open burning and incineration of medical waste can release dioxins, furans, and particulate matter. None of the facilities assessed in this study had incinerators or alternate treatment technology for the disposal of infectious and sharp waste. In this study, during baseline assessment, protocol, or standard operating procedure for managing health care waste was not present or displayed in any facilities. Following the intervention, it was displayed in 45.4% of the healthcare facilities.

To avoid exposure to an infectious agent appropriate personal protective equipment like gloves, aprons, and tough rubber boots should be worn by all the staff involved in waste treatment and disposal (89,90). This population is vulnerable to sharps injuries, exposure to infectious agents such as blood and other body fluids, and chemical spills. Using PPE decreases these risks and the likelihood of contracting or transferring an illness (86,89,93). In this study, none of the facility staff were using personal protective equipment for waste disposal and treatment during baseline. Towards the endline, 9.1% of the facilities staff started using personal protective equipment during waste handling.

6.4. Hygiene related indicators

According to "Progress on WASH in health care facilities, 2000–2021: Special focus on wash and infection prevention and control report", half of the HCFs globally have basic hand hygiene services (63,87). Basic hand hygiene services are defined as the availability of functional hand hygiene facilities at points of care and within five meters of toilets. In developing countries, one-third of HCFs had access to basic hygiene services (63,87). JMP recommends functional hand hygiene stations with sink, tap, soap, and water should be available in all points of care in HCFs (90). Point of care consists of three elements: consultation room, delivery room, operating room, and laboratories. In wards with more than 20 beds, at least two hand hygiene stations should be available. A nationwide survey conducted by **Unicomb et al., (2018)** showed that basic hand hygiene services were available in 68% of the facilities but only 27% for patients or caregivers (94). A national hygiene baseline survey conducted in Bangladesh showed that 78-92% of HCFs had soap available at handwashing stations for HCWs and 4-30% for patients and caregivers (95).

In this study, during the baseline assessment, none of the facilities had functional hand hygiene stations available in the in-service area. In many of the facilities, a sink with a tap was present, but soap or hand rub was not placed in the hand hygiene station. With the help of the Infection Control Committee, there was continuous reinforcement to keep soap or hand rub in these key areas. So, during the endline, 63.6% of facilities had fully met this guideline. A study conducted by **Huttinger et al., (2017)** in rural healthcare facilities showed that some service areas shared sinks due to close proximity, and seven out of ten facilities had water available for hand washing. But only one-third of the hand washing stations had soap (78).

To promote hand hygiene compliance, posters related to the WHO five moments of Hand Hygiene, six steps of hand washing, and the importance of handwashing should be displayed visibly in the facility at key places. According to the WASH FIT tool, if hand hygiene promotion material is displayed in all the key areas (point of care, facility entrance, the waiting room, and within 5 m of latrines), it is considered fully met (90). In this study, none of the facilities during baseline fully met this recommendation. Following intervention towards the endline, the hand hygiene posters were displayed at key places in 72.7% of the facilities.

According to the Kayakalp facility implementation tool, autoclave records and sterilization logs should be maintained in the HCFs (17). During baseline assessment, in this study, recommended temperature, pressure, and duration for autoclaving instruments were known only by 54.5 % of the HCWs, and records were not maintained in any of the facilities. During the training session, a demonstration was done regarding recommended temperature, duration, and pressure of autoclaving instruments. Following this, during endline assessment, it was found that 72.7% of the HCWs were concerned with the sterilization of instruments.

6.5. Facility environment, cleanliness, and disinfection-related indicators

The cleanliness of healthcare facilities is an essential element of Quality of Care (18). One of the most significant markers of patient satisfaction is their perception of hygiene and cleanliness in healthcare facilities. An important infection control and prevention principle is environmental cleaning in healthcare facilities. Healthcare facilities with

contaminated surfaces play an important role in transmitting healthcare-associated infection by pathogens like pseudomonas, clostridium species, staphylococcus aureus, and other gram-negative bacilli (96–98). The WHO standards for health care facilities recommend SOP and guidelines for cleaning surfaces and fittings to ensure facilities are visually clean, as well as toilet cleaning, and yet no guidelines for garbage collection and disposal are provided (99).

JMP recommends exterior of the facility should be well-fenced and kept free from waste, water logging, and feces of human or animal, in or around the premises (90). In this study, during baseline, none of the facilities' exteriors were kept fully clean. With the help of intervention, water logging, continuous monitoring of facility premises, and adopting appropriate methods of solid waste disposal, 36.36% of the HCFs fully met this recommendation. The facility's floors and work surfaces should appear visibly clean, and surfaces contaminated with blood and other body fluids should be cleaned with standard disinfectant solutions as per WASH FIT guidelines. Swachhta guidelines for public health facilities recommend standards for preparation for cleaning, frequency of cleaning, direction of cleaning, and a few practical suggestions for clean hospitals (18). In this study, during baseline, none of the facilities had the clean floor and horizontal surfaces in all the areas. In the following intervention in this study, 27.3% during endline assessment had a clean floor and horizontal surfaces.

Appropriate, well-maintained materials for cleaning should be available and in good condition in the healthcare facilities. In this study, none of the facilities had well-maintained cleaning materials. The intervention was provided using the standard operating procedure for cleaning the HCFs manual consisting of guidelines for the cleaning of the patient care area, cleaning of Operation Theatre, Labour room, toilets, isolation area, and water coolers (17). During the endline, appropriate, well-maintained materials for cleaning were available in 36.4% of the health care facilities. According to WASH FIT recommendation, at least two pairs of household gloves, aprons, and boots in a good state for cleaning and waste disposal should be available. In this study, none of the facilities had personal protective equipment in good state for staff handling cleaning and waste disposal (90). Though gloves and aprons were available, boots were not available in any of the facilities, so it does not fully meet WASH FIT criteria.

6.6. Management related indicators

WASH FIT recommends that quality improvement or management plans be implemented and monitored regularly. These indicators for facility improvement should be monitored by the health care worker assigned by the hospital Infection Control Committee. During baseline, none of the facilities had a complete management plan implemented. For intervention, a series of interviews and meetings were conducted with healthcare workers periodically. The hospital-level management team consisted of a Medical Officer, a Nursing officer, a pharmacist, and a Lab Technician to look after water quality, periodic cleaning of water filters and storage points, and health waste disposal-related indicators (100). This management committee works incongruously with the infection control committee to monitor waste segregation, hand hygiene, cleaning the facility, and training HCWs.

Chapter 7: STRENGTHS AND LIMITATIONS

Strengths

1. It is one among the very few studies which involves a facility-based interventional study for improving WASH conducted related practices in PHCs and CHCs of rural India.
2. This study has provided scientific evidence that about the effectiveness of the supportive supervision in improving WASH related practices in HCFs.
3. This study has helped to identify evidence-based gaps and provided a pragmatic solution to improve WASH in primary and secondary-level healthcare facilities.

Limitations

1. The score assigned to a few of the individual indicators is based on observation, so the possibility of interobserver variations could not be ruled out.
2. To a substantial extent, adherence to essential WASH practices can be attributed to the Hawthorne effect.

Chapter 8: CONCLUSION

Practices related to water, sanitation, hygiene, and infection control in health care facilities of rural Jodhpur were not satisfactory. There were specific gaps all these domains.

The major issues in water-related practices were quality, accessibility, safe storage, periodic testing of chlorine residue, and sanitation inspection risk score. Unable to meet menstrual hygiene-related needs, improper records of cleaning, lack of responsibility for management of sanitation and health care waste, and inadequate usage of PPE for waste disposal were significant gaps in sanitation-related practices. The unavailability of functional hand hygiene stations, non-adherence to hand hygiene compliance activities, and inadequate knowledge regarding the correct concentration of cleaning solution were identified as potential lacunae related to hygiene.

The intervention in the form of capacity building of healthcare workers, formation of Infection Control Committee, and continuous supportive supervision was found effective in significantly improving the practices related to water, sanitation, and hygiene in health care facilities.

Chapter 9: RECOMMENDATIONS

Recommendations for Service & Policy

1. An Infection Control Committee can be created in all the HCFs for adhering to the existing infection prevention and control standards. This will ingrain a culture of periodic evaluation, peer review, and thus improvement of sanitation, hygiene, and infection control practices in HCFs.
2. Periodic capacity-building workshops for HCWs for WASH related practices need to be organized along with the development and implementation of supportive supervision and monitoring framework to improve the adherence to infection prevention and control practices.
3. Though India has IPHS standards for minimum standards to be maintained by any HCF. But, as far as the WASH related practices are concerned, there are multitude of indicators. Uniform indicators and country-specific tool for the assessment and implementation of WASH services can be developed by amalgamation of different indicators from existing tools.

Recommendations for Future Research

1. The study revealed a massive scope of improvement in water, sanitation, and infection control practices in rural HCFs. There is a need and scope to expand the study at multicentric level for gap identification and improvement of WASH related practices at country level.

2. There is also an urgent need to explore the predictors of poor WASH related practices in HCFs adopting mixed methods study designs.

3. Future studies can be planned to explore and improve the WASH related practices in HCF in urban area.

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ANNEXURES

Annexure 'A': Ethical Clearance Certificate

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर
All India Institute of Medical Sciences, Jodhpur
संस्थागत नैतिकता समिति
Institutional Ethics Committee

No. AIIMS/IEC/2021/3513 **Date: 12/03/2021**

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: **AIIMS/IEC/2021/3348**

Project title: **"Water, Sanitation and infection control practices in rural health facilities of Jodhpur district: An intervention through supportive supervision"**

Nature of Project:	**Research Project Submitted for Expedited Review**
Submitted as:	**M.D. Dissertation**
Student Name:	**Dr. Sridevi G**
Guide:	**Dr. Manoj Kumar Gupta**
Co-Guide:	**Dr. Pankaj Bhardwaj, Dr. Srikanth S, Dr. Akhil Dhanesh Goel & Dr. Vidhi Jain**

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project.

Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the PI may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation.

If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

Dr. Praveen Sharma
Member Secretary

Member secretary
Institutional Ethics Committee
AIIMS,Jodhpur

Annexure 'B': Permission from -CMHO, Jodhpur

OFFICE OF THE CHIEF MEDICAL & HEALTH OFFICER , JODHPUR

No./General/2021/ 5041-09 Date :- 08-04-2021

Dr. Manoj Kumar Gupta,
Associate Professor,
Department of Community Medicine & Family Medicine,
AIIMS, Jodhpur

Sub :- Permission related to conduct the assess and improve the water, sanitation and infection control practices of PHC's and CHC's in Luni Block for academic research purpose

Ref :- Your letter no. AIIMS/JDH/CMFM/2021/300 dated 08-04-2021

With referance to the above cited subject, permission with regard to thesis concerning "Water, Sanitation and Infection control practices in heatlh care facilites of rural Jodhpur (Luni Block)" in favour of Dr. Sri Devi, PG student, Dept. of Com. Med. & Family Med., AIIMS, Jodhpur is hereby granted, which will involve she visiting the PHC's and CHC's in Luni block of Jodhpur and conducting studies pertaining to the concerned curiculam based on her research/thesis.

Duration of the thesis will be 18 months starting from April, 2021. It would be mandatory to submit the thesis report to this office after the research is over.

(Dr. Balwant Manda)
Chief Medical & Health Officer,
Jodhpur (Raj.)

No./General/2021/ Date :- 08-04-2021

Copy forwarded to the following for information & necessary action.

1. Dr. Pankaj Bharadwaj, Additional Professor, Community Medicine & Family Medicine, AIIMS, Jodhpur.
2. BCMO, Salawas(Luni), Dist. Jodhpur for information and necessary action. (Enclosure - referenced letter)
3. MOIC, CHC/PHC, Block Salawas (Luni)
4. DPO-III (IDSP), Office Desk.
5. Dr. Sri Devi, PG student (Dept. of CM&FM) AIIMS, Jodhpur.

Chief Medical & Health Officer,
Jodhpur (Raj.)

Annexure 'C': Participant information sheet (English)

All India Institute of Medical Sciences Jodhpur, Rajasthan

PARTICIPANT INFORMATION SHEET (PIS)

Title of the Project: Water, Sanitation and Infection Control Practices in Rural health facilities of Jodhpur District: An Intervention through Supportive Supervision

Name of the Principal Investigator: Dr. Sridevi G, Postgraduate Resident,

Department of Community Medicine and Family Medicine

Ph:7598086919

This study is being conducted to assess the water, sanitation and infection control practices in rural health care facilities which will help to improve the health care outcomes.

For this a number of questions will be asked to you about the current practices being followed in health care facility.

I would like you to know that this study will not provide you any monetary benefit, but it will help to generate data for the benefit of the community. You can refuse to answer any question and can withdraw yourself from the study at any point of time.

The data obtained from you and the beneficiaries will be used for the purpose of the study only. All the records will be kept confidential.

For further details or any other query, you may contact the following person who is the Guide for my study:

Dr. Manoj Kumar Gupta

Mobile No- 8003996087

Annexure 'D': Participant information sheet (Hindi)

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर

प्रतिभागी सूचना पत्र

शोध प्रबंध का शीर्षक – जोधपुर जिले की ग्रामीण स्वास्थ्य सुविधाओं में जल, स्वच्छता और संक्रमण नियंत्रण प्रथाएं: सहायक पर्यवेक्षण के माध्यम से एक हस्तक्षेप।

स्नातकोत्तर छात्र - डॉ. श्रीदेवी,

सामुदायिक चिकित्सा और परिवार चिकित्सा विभाग

दूरभाष : 7598086919

परिचय-

मुझे प्रधान अन्वेशक द्वारा मेरी अपनी भाषा में इस अध्ययन के बारे में समझा दिया गया है। उन्होंने मुझे बताया है कि इस अध्ययन से जोधपुर जिले की ग्रामीण स्वास्थ्य सुविधाओं में जल, स्वच्छता और संक्रमण नियंत्रण प्रथाएं: सहायक पर्यवेक्षण के माध्यम से एक हस्तक्षेप। यदि आप सहमति देते हैं तो मैं आप में से कुछ को गहराई से साक्षात्कार और फोकस समूह चर्चा में भाग लेने के लिए आमंत्रित करूंगा। यदि आप सहमति देते हैं तो मैं साक्षात्कार प्रक्रिया को ऑडियो-रिकॉर्ड करूंगा।

मैं बताना चाहूंगा कि यह अध्ययन आपको कोई मौद्रिक लाभ प्रदान नहीं करेगा, लेकिन इससे हमें समुदाय के लाभ के लिए डेटा उत्पन्न करने में मदद करेगा। आप किसी भी प्रश्न का उत्तर देने से इंकार कर सकते हैं और किसी भी समय अपने आप को अध्ययन से हटा सकते हैं।

आपसे प्राप्त डेटा का उपयोग केवल अध्ययन के उद्देश्य के लिए किया जाएगा। आपके सभी रिकॉर्ड गोपनीय रखे जाएंगे।

अधिक जानकारी या किसी अन्य प्रश्न के लिए, आप निम्न व्यक्ति से संपर्क कर सकते हैं:

डा मनोज कुमार गुप्ता
सामुदायिक चिकित्सा और परिवार चिकित्सा विभाग
मोबाइल नंबर- 8003996087

Annexure 'E': Informed consent form – HCWs (English)

All India Institute of Medical Sciences Jodhpur, Rajasthan
Informed Consent Form

Title of Project: Water, Sanitation and Infection Control Practices in Rural health facilities of Jodhpur District: An Intervention through Supportive Supervision

Name of Principal Investigator: Dr Sridevi G, Postgraduate Resident,
Department of Community Medicine and Family Medicine
Ph: 7598086919

Volunteer Identification No.: _____

I, _____S/o or D/o _____, give my full, free, voluntary consent to be a part of the study titled: Water, Sanitation and Infection Control Practices in Rural health facilities of Jodhpur District: An Intervention through Supportive Supervision, the procedure and nature of which has been explained to me in my own language to my full satisfaction.

I confirm that I have had the opportunity to ask questions.

I understand that my participation is voluntary and I am aware of my right to opt out of the study at any time without giving any reason.

I understand that the information collected from me and any of the records about Water, Sanitation and Infection Control Practices in health facilities provided by me may be looked at by a responsible individual from AIIMS, Jodhpur or from regulatory authorities. I give permission to these individuals to have access to my records and undertake all study related procedures.

Date: _____ Place: _____ Signature / Left thumb impression of Participant	Date: _____ Place: _____ Signature of Investigator
Witness 1 Signature / Thumb impression Name: Date:	Witness 1 Signature / Thumb impression Name: Date:

Annexure 'F': Informed consent form – HCWs (Hindi)

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर

सूचित सहमति प्रपत्र

शीर्षक - जोधपुर जिले की ग्रामीण स्वास्थ्य सुविधाओं में जल, स्वच्छता और संक्रमण नियंत्रण प्रथाएं: सहायक पर्यवेक्षण के माध्यम से एक हस्तक्षेप।

स्नातकोत्तर छात्र - डॉ. श्रीदेवी,
सामुदायिक चिकित्सा और परिवार चिकित्सा विभाग
दूरभाष : 7598086919

पहचान क्रमांक:_____

_____ S / o या D / o
_____, अपनी पूर्ण, मुक्त, स्वैच्छिक सहमति को जोधपुर जिले की ग्रामीण स्वास्थ्य सुविधाओं में जल, स्वच्छता और संक्रमण नियंत्रण प्रथाओं के शीर्षक का हिस्सा बनने के लिए दे: सहायक पर्यवेक्षण के माध्यम से एक हस्तक्षेप। प्रक्रिया और प्रकृति जिसकी मुझे मेरी अपनी संतुष्टि के लिए अपनी भाषा में समझाई गई है।

मैं पुष्टि करता हूं कि मुझे प्रश्न पूछने का अवसर मिला है।

मैं समझता हूं कि मेरी भागीदारी स्वैच्छिक है और किसी भी कारण के बिना, किसी भी समय अध्ययन से बाहर निकलने के मेरे अधिकार से अवगत हूं।

मैं समझता हूं कि मेरे द्वारा प्रदान की गई जानकारी और मेरे द्वारा प्रदान की गई स्वास्थ्य सुविधाओं में जल, स्वच्छता और संक्रमण नियंत्रण प्रथाओं के बारे में किसी भी रिकॉर्ड को एम्स, जोधपुर के एक जिम्मेदार व्यक्ति या नियामक अधिकारियों से देखा जा सकता है। मैं इन व्यक्तियों को अपने रिकॉर्ड तक पहुंचने और अध्ययन संबंधी सभी प्रक्रियाओं को करने की अनुमति देता हूं।

तिथि: _____ _____
स्थान: _____ हस्ताक्षर / बाएं अंगूठे का निशान

यह प्रमाणित किया जा रहा है कि उपर्युक्त अनुमति मेरी उपस्थिति में प्राप्त की गई है –

तिथि: _____ _____
स्थान: _____ स्नातकोत्तर छात्र के हस्ताक्षर

1. गवाह

_____
हस्ताक्षर
नाम _____
निवासी_____

2. गवाह

_____
हस्ताक्षर
नाम _____
निवासी_____

Annexure 'G': Essential and advanced indicators for assessment of HCFs using WASH FIT Tool

1	Indicators	Meets target (3)	Partially meets target (2)	Does not meet target (1)
1.1*	Improved water supply piped into the facility or on premises and available	Yes, improved water supply within facility and available	Improved water supply on premises, (outside of facility building) and available	No improved water source within facility grounds, or improved supply in place but not available
1.2*	Water services available at all times and of sufficient quantity for all uses	Yes, every day and of sufficient quantity	More than five days per week or every day but not sufficient quantity	Fewer than five days per week
1.3*	A reliable drinking-water station is present and accessible for staff, patients and carers at all times and in all locations/wards	Yes, at all times/ wards and accessible to all	Sometimes, or only in some places or not available for all users	Not available
1.4*	Drinking-water is safely stored in a clean bucket/tank with cover and tap	Yes	All available drinking-water points are safely stored	Not safely stored in any water points or no drinking-water available

1.5	Sanitary inspection risk score (using sanitary inspection form 3)	Low risk	Medium risk	High or very high risk
1.6	All endpoints (i.e. taps) are connected to an available and functioning water supply	Yes, all are connected and functioning	More than half of all endpoints are connected and functioning	No, less than half of all endpoints connected and functioning
1.7	Water services available throughout the year (i.e. not affected by seasonality, climate change-related extreme events or other constraints)	Yes, throughout the year	Water shortages for one to two months	Water shortages for three months or more
1.8*	Water storage is suflcient to meet the needs of the facility for two days	Yes	More than 75% of needs met	Less than 75% of needs met
1.9*	Water is treated and collected for drinking with a proven technology that meets WHO performance standards	Yes	Treated but not regularly	Not treated
1.10 *	Drinking-water has appropriate chlorine residual (0.2mg/L or 0.5mg/L in emergencies) or 0 *E. coli*/100 ml and is not turbid	Yes	Chlorine residual exists, but is <0.2mg/L	Not treated/do not know residual/do not have capacity to test residual/no

				drinking-water available
1.11 *	The facility water supply is regulated according to national water quality standards (mark not applicable if no standards exist)	Yes, and water meets national standards	Yes, regulated but water does not meet standards	No regulation or testing takes place or no standards exist
1.12	Energy is available for heating water (mark if not applicable)	Yes, always	Yes, sometimes	Never
1.13	Energy is available for pumping water (mark if not applicable)	Yes, always	Yes, sometimes	Never
1.14 *	At least one shower or bathing area is available per 40 patients in inpatient settings and is functioning and accessible	Yes	Showers available, but no water or in disrepair or showers available but fewer than one	No showers
1.15	Shower(s) are adequately lit, including at night	Yes	Lighting infrastructure exists, but not functioning	Not adequately lit or no lighting infrastructure
2.1*	Number of available and usable toilets or improved latrines for patients	Four or more (outpatients) and one per 20 users(inpatients)	Sufficient number present but not all functioning or insufficient number	Less than 50% of required number of latrines available and functioning

2.2	Toilets or improved latrines clearly separated for staff and patients	Yes	Separate latrines are available but not clearly separated	No separate latrines
2.3	Toilets or improved latrines clearly separated for male and female	Yes	Latrines are separated for male and female, but not clearly separated	No separate latrines
2.4*	At least one toilet or improved latrine provides the means to manage menstrual hygiene needs	Yes	Yes, but toilet is not clean or in disrepair	No
2.5*	At least one toilet meets the needs of people with reduced mobility	Yes	Yes, but not available or in disrepair	No toilets for disabled users
2.6*	Functioning hand hygiene stations within 5 m of latrines	Yes	Present, not functioning or no water or soap	Not present
2.7*	Record of cleaning toilets visible and signed by the cleaners each day	Yes	Toilets cleaned but not recorded	No record/toilets cleaned less than once a day
2.8*	Wastewater is safely managed through use of on-site treatment (i.e. septic tank followed by drainage pit) or sent to a functioning sewer system	Yes	Present but not functioning	Not present
2.9*	Greywater (i.e. rainwater or washwater) drainage system is in place that diverts water away from	Yes	Yes, but not functioning and obvious pools of water	Not present

	the facility (i.e. no standing water) and also protects nearby households			
2.10 *	Latrines are adequately lit, including at night	Yes	Lighting infrastructure exists, but not functioning	Not adequately lit or no lighting infrastructure
2.11	A trained person is responsible for the management of health care waste in the health care facility	Yes, presented and adequately trained	Appointed but not trained	Not appointed
2.12 *	Functional waste collection containers in close proximity to all waste generation points for: • non-infectious (general) waste • infectious waste • sharps waste	Yes	Separate bins present but lids missing or more than three quarters full; only two bins (instead of three); or at some but not all waste generation points	No bins or separate sharps disposal
2.13	Waste correctly segregated at all waste generation points	Yes	Some sorting but not all correctly or not practised throughout the facility	No sorting
2.14	Functional burial pit/fenced waste dump or municipal pick-up available for disposal of	Yes	Pit in facility but insufficient dimensions; overfilled or not fenced and locked;	No pit or other disposal method used

	non-infectious (non-hazardous/general waste)		irregular municipal waste pick up, etc.	
2.15 *	Incinerator or alternative treatment technology for the treatment of infectious and sharp waste is functional and of a sufficient capacity	Yes	Present but not functional and/or of a sufficient capacity	None present
2.16	Sufficient energy available for incineration or alternative treatment technologies (mark if not applicable)	Yes, always	Yes, sometimes	Never
2.17	Hazardous and non-hazardous waste are stored separately before being treated/disposed of or moved off site	Yes, separated storage areas available	Separated storage areas are available but with insufficient capacity or overfilled	No separated storage areas available
2.18 *	All infectious waste is stored in a protected area before treatment, for no longer than the default and safe time	Yes	Treated between 24–48 hours	Treated after 48 hours or not treated at all
2.19 *	Anatomical/pathological waste is put in a dedicated pathological waste/placenta pit, burnt in a crematory or buried in a cemetery (mark if not applicable)	Yes	Pit is present but not used or functional or overfilled or not fenced and locked	None present

2.20 *	Dedicated ash pits available for disposal of incineration ash (mark if not applicable)	Yes	Present but not functional or overfilled or not fenced and locked	None present
2.21	Protocol or standard operating procedure (SOP) for safe management of health care waste clearly visible and legible	Yes, visible and implemented	Written but not visible or implemented	No protocol/SOP in place
2.22	Appropriate protective equipment for all staff in charge of waste treatment and disposal	Yes,	Some equipment available, but not for all staff, or available but damaged	None
3.1*	Functioning hand hygiene stations are available at all points of care	Yes	Stations present, but no water and/ or soap or alcohol handrub solution	Not present
3.2*	Hand hygiene promotion materials clearly visible and understandable at key places	Yes	Some places but not all	None
3.3*	Functioning hand hygiene stations are available in service areas	Yes	Stations present, but no water and/ or soap or alcohol handrub solution	Not present
3.4*	Functioning hand hygiene stations available in waste disposal area	Yes	Stations present, but no water and/ or soap	Not present

3.5	Hand hygiene compliance activities are undertaken regularly	Yes	Compliance activities in policy, but not carried out with any regularity	No compliance activities
3.6	The exterior of the facility is well-fenced, kept generally clean (free from solid waste, stagnant water, no animal and human faeces in or around the facility premises, etc.)	Yes	Partly but improvements could be made/yes, sometimes	Not kept clean at all
3.7	General lighting sufficiently powered and adequate to ensure safe provision of health care including at night (mark if not applicable)	Yes, always	Yes, sometimes	Never
3.8*	Floors and horizontal work surfaces appear clean	Yes	Some floors and work surfaces appear clean but others do not	Most and/or all floors and surfaces are visibly dirty
3.9	Appropriate and well maintained materials for cleaning (i.e. detergent, mops, buckets, etc.) are available	Yes	Yes, available but not well maintained	No materials available
3.10 *	At least two pairs of household cleaning gloves and one pair of overalls or apron and boots in a good state, for	Yes	Available but in poor condition	Not available

	each cleaning and waste disposal staff member			
3.11	At least one member of staff can demonstrate the correct procedures for cleaning and disinfection and apply them as required to maintain clean and safe rooms	Yes	Procedure is known but not applied	Procedure not known or applied
3.12	Beds have insecticide treated nets to protect patients from mosquito-borne diseases	Yes, on all beds	Available on some but not all beds, or available but with rips and or holes	No bed nets available
3.13	A mechanism exists to track supply of IPC-related materials (such as gloves and protective equipment) to identify stock-outs	Yes	Mechanism exists but is not enforced	No mechanism exists
3.14	Record of cleaning visible and signed by the cleaners each day	Yes	Record exists, but is not completed daily or is outdated	No record of floors and surfaces being cleaned
3.15	Laundry facilities are available to wash linen from patient beds between each patient	Yes	Facilities exist, but are not working or not being used	No facilities and/or no linen
3.16	The facility has sufficient natural ventilation and where the climate allows, large opening windows,	Yes	Some ventilation but not well maintained or insufficient to	No

	skylights and other vents to optimize natural ventilation		produce natural ventilation	
3.17	Kitchen stores and prepared food is protected from flies, other insects or rats	Yes		No
3.18	Beds for patients should be separated by 2.5 m from the centre of one bed to the next and each bed has only one patient	Yes, all beds meet this guidance	Some but not all beds fit this criterion	No beds meet this criterion
4.1	WASH FIT or other quality improvement/management plan for the facility is in place, implemented and regularly monitored	Yes	Complete but has not beenimplemented and/or is not monitored, or incomplete	No plan
4.2*	An annual planned budget for the facility is available and includes funding for WASH infrastructure, services, personnel and the continuous procurement of WASH items (hand hygiene products, minor supplies to repair pipes, toilets, etc.) which is sufficient to meet the needs of the facility	Yes	Yes, but budget is insufficient	No budget

4.3	An up-to-date diagram of the facility management structure is clearly visible and legible	Yes	Yes, but not up to date	Not available
4.4	Adequate cleaners and WASH maintenance staff are available	Yes	Some available, but not adequate or not skilled/motivated	None available
4.5	A protocol for operation and maintenance, including procurement of WASH supplies is visible, legible and implemented	Yes	Protocol exists but not implemented	No protocol
4.6	Regular ward-based audits are undertaken to assess the availability of handrub, soap, single use towels and other hand hygiene resources	Yes	Undertaken less than once a week or assessment is incomplete	Not undertaken
4.7	New health care personnel receive IPC training as part of their orientation programme	Yes	Some but not all staff	No training
4.8	Health care staff are trained on WASH/ IPC each year	Yes	Staff are trained but not every year or only some staff are trained	No training
4.9	Facility has a dedicated WASH or IPC focal person	Yes	Yes, but focal point does not have sufficient time, resources or	No

			motivation to carry out duties	
4.10	All staff have a job description written clearly and legibly, including WASH-related responsibilities and are regularly appraised on their performance	Yes	Some, but not all, staff have a job description or their performance is not appraised	No job description written
4.11	High performing staff are recognized and rewarded and those that do not perform are dealt with accordingly	Yes	Either high or low performers addressed but not both	No action or recognition of staff based on performance

Annexure 'H': Additional indicators for assessment of HCFs using Kayakalp facility assessment tool

Water related indicator	
Check whether storage tank is adequately sealed and covered?	
What is the frequency of cleaning the water tank?	once in six months
	once a year
	more than a year
Is there a system of periodical inspection for water wastage? (Staff assigned duty for periodical inspection of leaking taps).	
Check whether pictorial, bilingual directional, and layout signage of drinking water displayed in the facility?	
Check whether the water is sent for bacteriological examination periodically?	
Check whether chlorine level are tested using ortho-toluidine reagent ?	
Check if IEC is displayed for water conservation.	
Check whether the staff & users are made aware of water conservation and its importance.	
Sanitation related indicators	
Check whether a person is assigned duties for monitoring the housekeeping activities?	
Check floors, walls and roof for presence of Dirt/Grease/Stains in corridor, waiting area?	
Ask cleaning staff about frequency of cleaning in circulation area and verify?	
Check whether corridors are rigorously cleaned with scrubbing / flooding once in a month?	
Check whether wards are cleaned at least thrice a day with a wet mop?	
Check whether Surfaces are cleaned at least twice a day / after every surgery	
Check whether OPD/Lab are cleaned at least thrice a day with a wet mop	
Check some of the toilets randomly in indoor and outdoor areas for any visible dirt, grease, stains, or water accumulation?	
Check some of the toilets randomly in indoor and outdoor areas for the foul smell	

Check with cleaning staff if they are getting an adequate supply of cleaning solution

Health care waste related indicators
Check for instructions for segregation of waste in different categories of colour coded bins are displayed at point of use?
Check waste transportation from clinical to storage areas is done in covered trolleys ?.
Check whether the Route of transportation of waste is away from the general traffic in the Facility.?
Check whether staff uses needle cutters for cutting the syringe hub?
Check if sharps are put in a disinfectant solution (1% Chlorine Solution or any other suitable disinfectant as per the Facility's policy)?
Check whether staff know about post-exposure prophylaxis (PEP) after a needle stick injury?
Check whether the biohazard sign is prominently displayed in the storage area?
Check whether deep Burial Pit is constructed as per BMW rules 1998?
Check whether Lab samples are discarded after treatment with a chloride solution?
Check whether the Facility has valid authorization for BioMedical Waste Management from the pollution control board?
Is any training conducted on BMW management?

Hygiene related Indicators
Check whether staffs demonstrate 6 steps of normal hand wash?
Check for the availability of alcohol-based hand-rub and its supply?
Check whether staff is aware of when to hand wash?
Check, if the staff uses gloves, mask, and cap during examination, and while conducting procedures
Check whether staffs demonstrate the correct method of wearing and removing Gloves?
Check whether staffs know how to make 1% Chlorine solution?
Check whether instruments are decontaminated with 0.5 chlorine solution?
Check whether staff adhere to Protocols for autoclaving?
Check autoclaving records for the use of sterilization indicators
Check whether staff adhere to protocols for management of small spills?

Check the Availability of spill management Kit in the facility?
Check for the display of Spill management protocols at points of use
Check for maintenance of bed-to-bed distance approx. 3.5 feet between two beds in the ward?
Check for restriction of external footwear in critical areas?
Check whether facility restrict visitors to the Isolation Area?
Check whether facility has documented Antibiotic policy?
Check whether Facility staff are immunized against Hepatitis B?
Indicators
Check whether staffs demonstrate 6 steps of normal hand wash?
Check for the availability of alcohol-based hand-rub and its supply?
Check whether staff is aware of when to hand wash?
Check, if the staff uses gloves, mask, and cap during examination, and while conducting procedures

Annexure 'I': Intervention material

Water

- Watersupply is adequate in Quantity& Quality
- Watersupply systemis maintainedin the Hospital
- Thereis a systemof periodicalinspectionfor water wastage
- Hospitalpromoteswaterconservation

INSPECTION & MAINTENANCE OF WATERSUPPLY

Water wastage

Quantity

340 liters per bed per day

Quality

Chloroscope

Current practice

Ideal practice

Current practice

Ideal practice

Frequency of cleaning

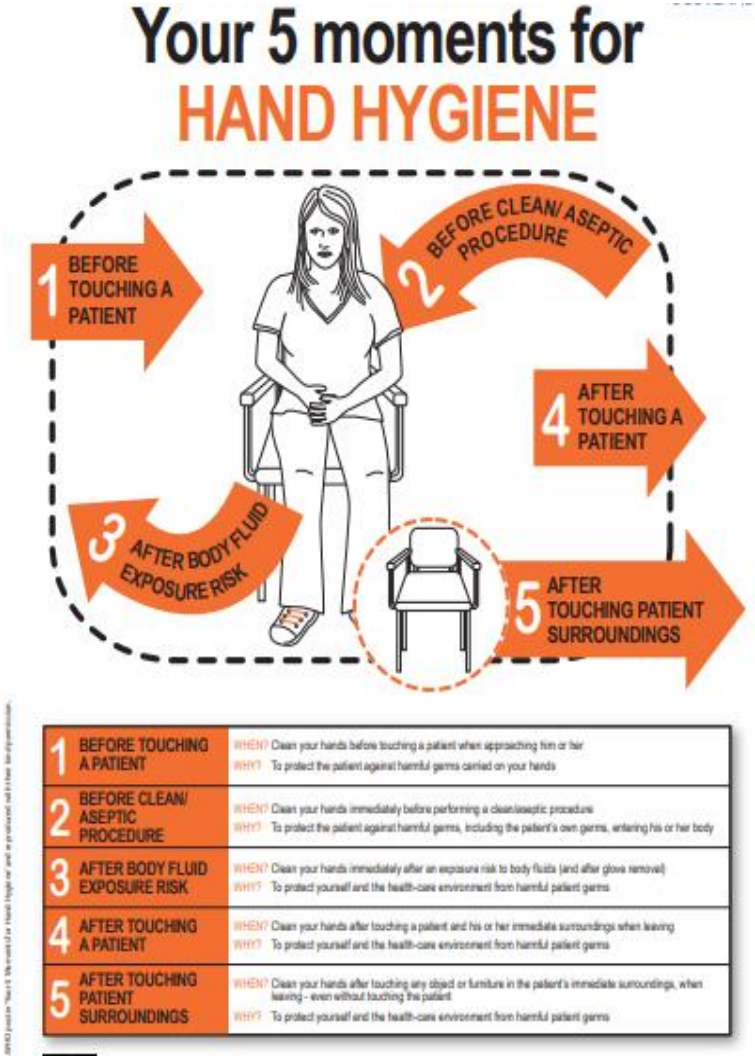
	Activity	**Frequency**	**Agents used**
1	Garbage Removal	Thrice a day and more when bags are 3/4th full	As per BMW guidelines
2	Cleaning of Instruments	After every procedure with	Soap & water followed by sterilization
3	Cleaning of clean areas and corridors of complex	Twice a day/ as & when required	Damp Mop with detergent and water/ 0.5% Chlorine
4	Mopping of OT/Labour room	Thrice a day and after each procedure	Damp mop with detergent and water / 0.5% Chlorine

Frequency of cleaning

	Activity	**Frequency**	**Agents used**
5	Fumigation	Once a month/ After Infected case surgery	-Formaldehyde
6	Cleaning of OT table and OT stretcher	Twice a day/ after each surgery	0.5% chlorine /70% Isopropyl alcohol
7	Doctor's / nurses / technician room	Twice a day	Detergent & water
8	Washroom & wash basins cleaning	Thrice a day and as & when required	Wash with Soap & water, then dry, wipe with 0.5% chlorine

A . Cleaning solution demonstration


B.Preparation of 0.5% chlorine solution
PREPARATION OF 1 LITRE BLEACHING SOUTION
Wear utility gloves and plastic apron.
Take 1 litre of water in plastic bucket.
Make thick paste in a plastic mug with 3 level tea-spoons of bleaching powder and some water from the bucket.
Mix paste in the bucket of water to make 0.5% chlorine solution.
Maintain same ratio for larger volumes.


Your 5 moments for
HAND HYGIENE
1 BEFORE TOUCHING A PATIENT
2 BEFORE CLEAN/ ASEPTIC PROCEDURE
3 AFTER BODY FLUID EXPOSURE RISK
4 AFTER TOUCHING A PATIENT
5 AFTER TOUCHING PATIENT SURROUNDINGS
1 BEFORE TOUCHING A PATIENT
WHEN? Clean your hands before touching a patient when approaching him or her
WHY? To protect the patient against harmful germs carried on your hands
2 BEFORE CLEAN/ ASEPTIC PROCEDURE
WHEN? Clean your hands immediately before performing a clean/aseptic procedure
WHY? To protect the patient against harmful germs, including the patient's own germs, entering his or her body
3 AFTER BODY FLUID EXPOSURE RISK
WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal)
WHY? To protect yourself and the health-care environment from harmful patient germs
4 AFTER TOUCHING A PATIENT
WHEN? Clean your hands after touching a patient and his or her immediate surroundings when leaving
WHY? To protect yourself and the health-care environment from harmful patient germs
5 AFTER TOUCHING PATIENT SURROUNDINGS
WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving - even without touching the patient
WHY? To protect yourself and the health-care environment from harmful patient germs

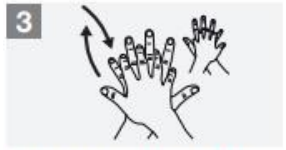
WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds

Wet hands with water;

Apply enough soap to cover all hand surfaces;

Rub hands palm to palm;



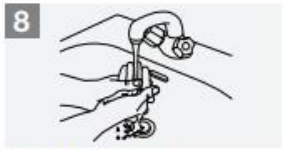
Right palm over left dorsum with interlaced fingers and vice versa;

Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;

Rotational rubbing of left thumb clasped in right palm and vice versa;

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Rinse hands with water;

Dry hands thoroughly with a single use towel;

Use towel to turn off faucet;

Your hands are now safe.

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

How to Remove Gloves

To protect yourself, use the following steps to take off gloves

Grasp the outside of one glove at the wrist. Do not touch your bare skin.

Peel the glove away from your body, pulling it inside out.

Hold the glove you just removed in your gloved hand.

Peel off the second glove by putting your fingers inside the glove at the top of your wrist.

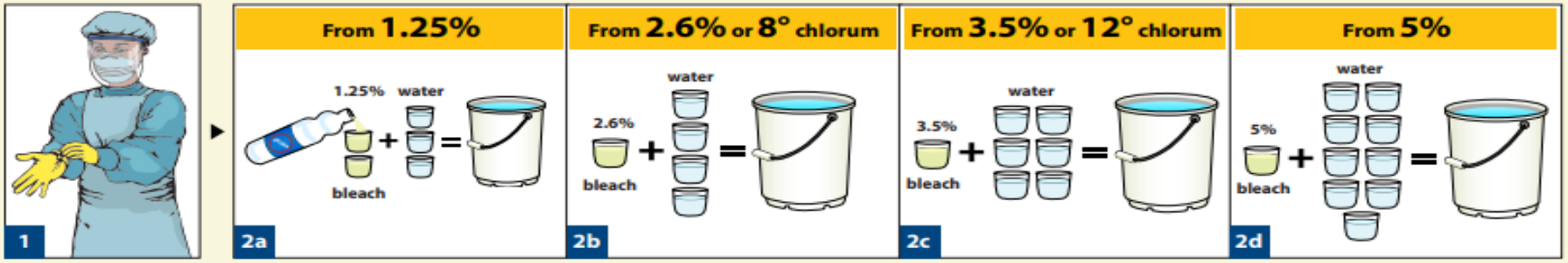
Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.

Dispose of the gloves safely. Do not reuse the gloves.

Clean your hands immediately after removing gloves.

How to Make Strong (0.5%) Chlorine Solution from Liquid Bleach

Use strong (0.5%) chlorine solution to clean and disinfect surfaces, objects, and body fluid spills.
Make new strong (0.5%) chlorine solution every day. Throw away any leftover solution from the day before.



Make sure you are wearing **extended PPE**.

Pour 2 parts liquid bleach and 3 parts water into a bucket. Repeat until full.

Pour 1 part liquid bleach and 4 parts water into a bucket. Repeat until full.

Pour 1 part liquid bleach and 6 parts water into a bucket. Repeat until full.

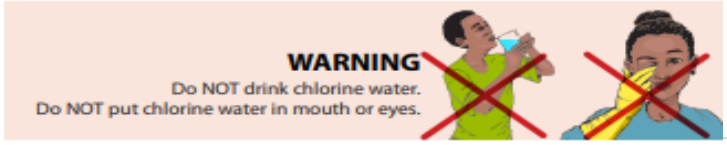
Pour 1 part liquid bleach and 9 parts water into a bucket. Repeat until full.

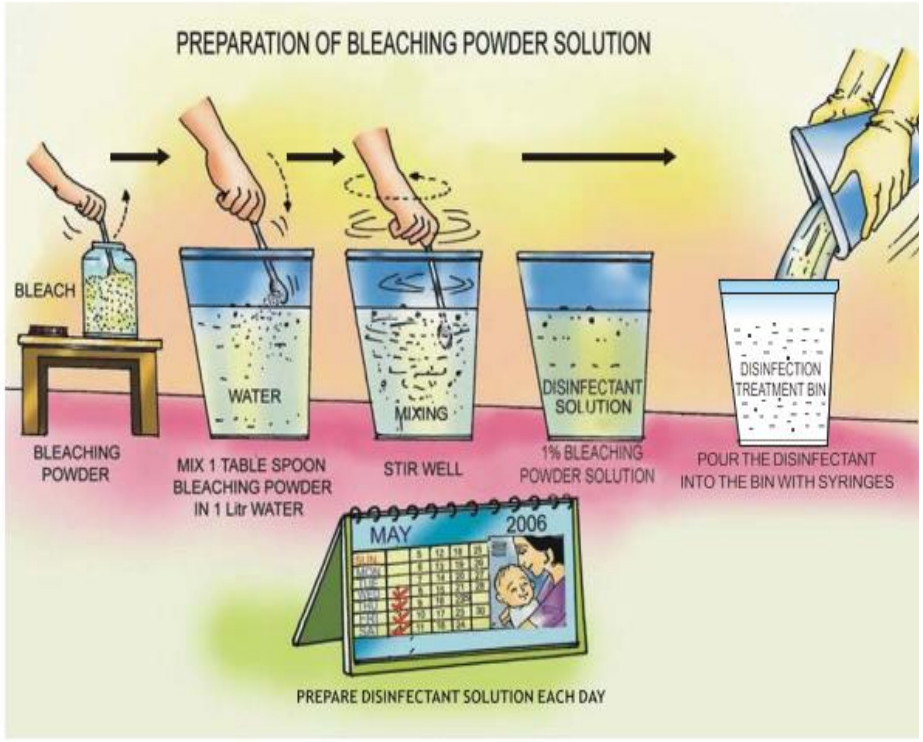
Stir well for 10 seconds.

Label bucket **"Strong (0.5%) Chlorine Solution - Cleaning."**

Cover bucket with lid.

Store in shade. Do not store in direct sunlight.




PREPARATION OF BLEACHING POWDER SOLUTION
BLEACH
BLEACHING POWDER
WATER
MIX 1 TABLE SPOON BLEACHING POWDER IN 1 Litr WATER
MIXING
STIR WELL
DISINFECTANT SOLUTION
1% BLEACHING POWDER SOLUTION
DISINFECTION TREATMENT BIN
POUR THE DISINFECTANT INTO THE BIN WITH SYRINGES
MAY
2006
PREPARE DISINFECTANT SOLUTION EACH DAY


Sterilization of Reusable Equipments
Used instruments
AUTO CLAVE
Sterilization of used instruments
O.T.
STERILE INSTRUMENTS
AUTO CLAVE

KEEP HOSPITALS CLEAN AND SAFE BY IDENTIFYING HAZARDS AND RISKS OF BIOMEDICAL WASTE

अपने अस्पताल को स्वच्छ एवं सुरक्षित बनाए रखने के लिए बायोमेडिकल कचरे से सम्बंधित खतरों एवं संकट को समझें

Anatomical waste, chemical waste, soiled waste, chemotherapy waste, discarded linen and medicines and laboratory waste

शारीरिक, रासायनिक, गंदा कपड़ा, दवाइयों सम्बंधित एवं प्रयोगशाला कचरा

Contaminated plastic waste

दूषित प्लास्टिक कचरा

Glass waste and metallic implants

कांच की वस्तुएं एवं धातु प्रत्यारोपण

Metal sharps

धारदार धातु कचरा

Place the waste in designated colour coded bins

कचरे को उचित कूड़ेदान में ही डालें

Hazardous and Other waste*

परिसंकटमय और अन्य कचरा

Recyclable General waste

पुनर्चक्रण योग्य कचरा

Biodegradable General waste

स्वाभाविक तरीके से सड़ने वाला सामान्य कचरा

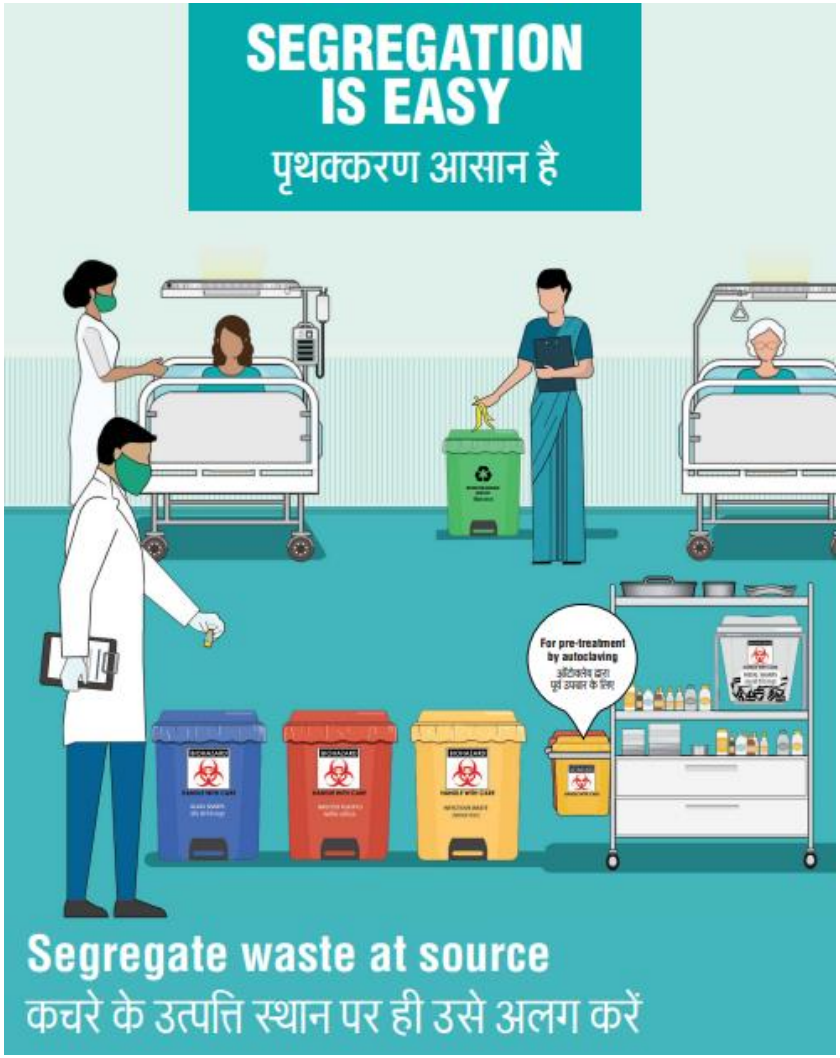
RULES WHEN FOLLOWED PROTECT OUR HEALTH AND SAFETY

नियम हमारे जीवन को सुरक्षित बनाते हैं

Give your biomedical waste to the Common Biomedical Waste Treatment and Disposal Facility (CBWTF) for complete treatment and disposal as per Biomedical Waste Management (BMWM) Rules, 2016

बायोमेडिकल कचरे को, बायोमेडिकल वेस्ट मैनेजमेंट नियम 2016 के अनुसार, साझा जैव चिकित्सा अपशिष्ट उपचार सुविधा में भेजें

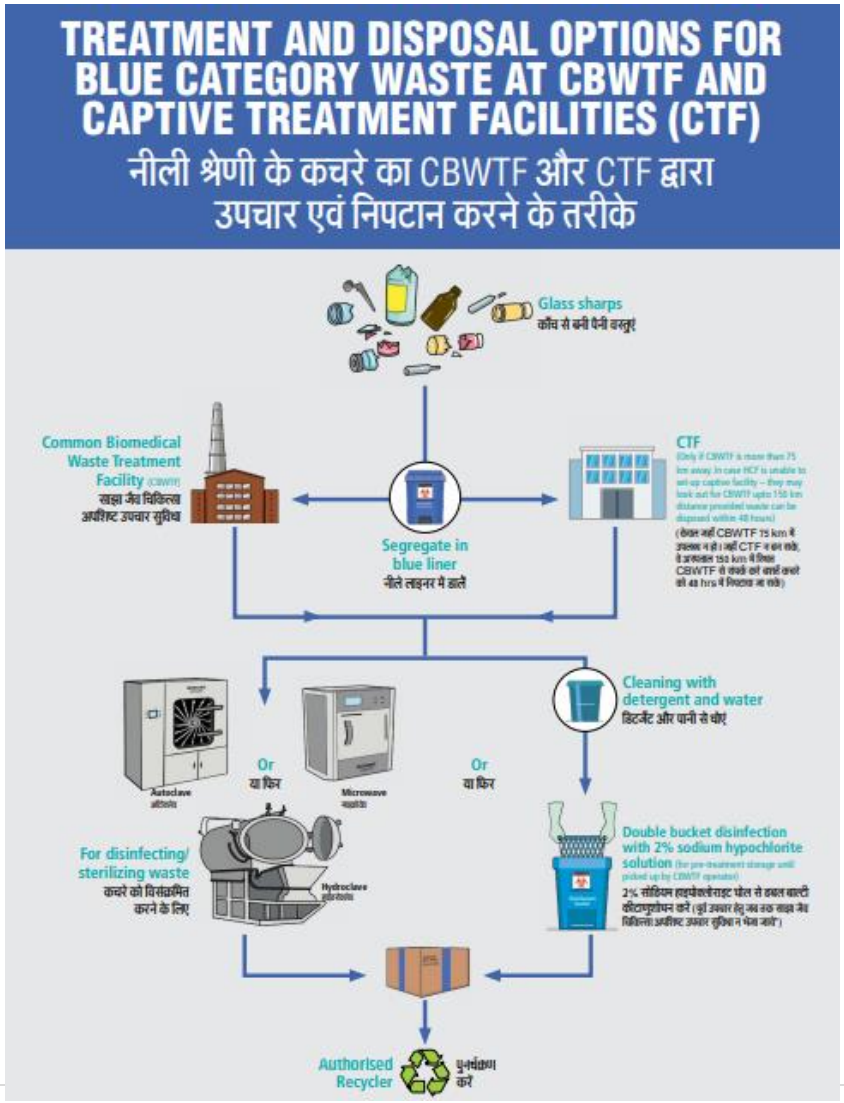

MANAGE BIOMEDICAL WASTE AS PER BMWM RULES
अस्पताल के कचरे का प्रबंधन बायोमेडिकल वेस्ट मैनेजमेंट नियम 2016 के अनुसार करें
LET'S KEEP OUR HOSPITAL CLEAN AND HYGIENIC
For pre-treatment by autoclaving
ऑटोक्लेव द्वारा पूर्व उपचार के लिए
BIOHAZARD
HANDLE WITH CARE
INFECTED PLASTICS
INFECTIOUS WASTE
Segregate waste in correct coloured liners (non-chlorinated)
कचरे को उचित रंग के थैले में ही डालें


SEGREGATION IS EASY
पृथक्करण आसान है
For pre-treatment by autoclaving
ऑटोक्लेव द्वारा पूर्व उपचार के लिए
Segregate waste at source
कचरे के उत्पत्ति स्थान पर ही उसे अलग करें


SEGREGATE WASTE IN CORRECT LINERS FOR SUITABLE TREATMENT
कचरे को सही रूप से उपचार करने हेतु उसे उचित लाइनर में डालें
Anatomical waste, chemical waste, soiled waste, chemotherapy waste, discarded linen and medicines and laboratory waste (Yellow)
Human & animal anatomical waste, liquid waste and other biological infectious waste (Pre-treat petri dishes and blood bags)
शरीरिक, रासायनिक, गंदा कपड़ा, दवाइयों सम्बंधित एवं प्रयोगशाला कचरा (पीला)
Contaminated plastic waste (Red)
Disposable items such as tubing, plastic bottles, intravenous tubes and catheters, cannulas, syringes without needles
दूषित प्लास्टिक कचरा (लाल)
Glass waste and metallic implants (Blue)
Glassware such as broken and discarded vials, bottles, slides, glass petri dishes etc.
कांच से बनी वस्तुएं एवं धातु प्रत्यारोपण (नीला)
Metal sharps
Waste sharps such as needles and blades (in puncture proof container)
धारदार धातु कचरा
Hazardous and Other waste (Black)
Used containers of disinfectants and pesticide, used CFL bulb/tube light, lithium ion /alkaline batteries etc.
परिसंकटमय और अन्य कचरा (काला)
* Labelling as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016


NEVER MIX WASTE DURING COLLECTION AND TRANSPORTATION
कचरे को इकट्ठा करने व लाने-ले जाने के समय उसे मिश्रित न करें

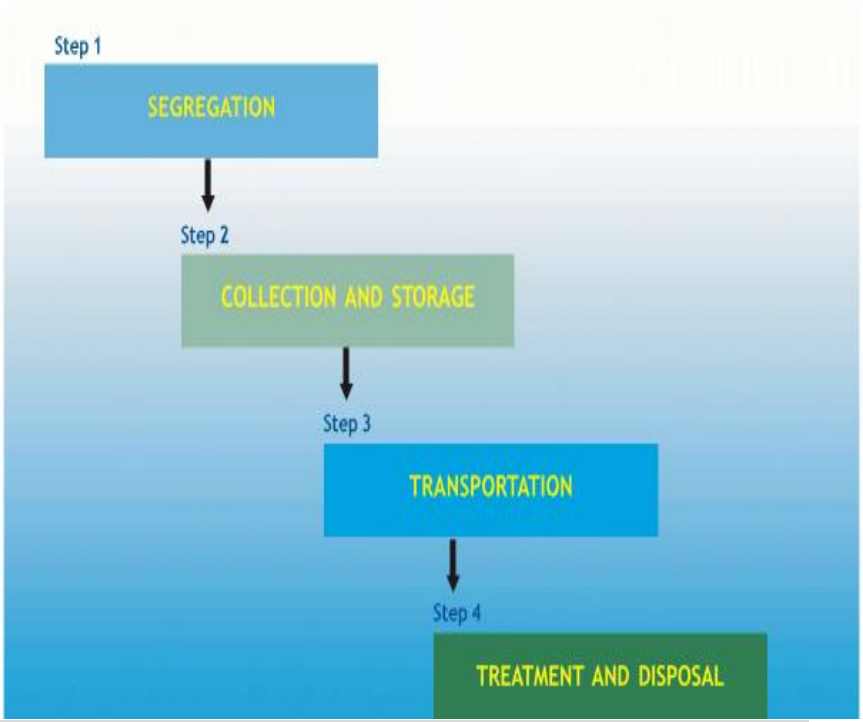

MANAGE SPILLAGE RIGHT AWAY!
बिखरे हुए तरल पदार्थों का तुरन्त प्रबंधन करें!
CHEMICAL SPILLAGE
रासायनिक स्राव
Isolate, neutralise and clean thoroughly
जगह खाली करें तथा स्राव को निष्प्रभाव कर के अच्छे से साफ़ करें
Collect in separate liner for incineration
अलग लाइनर में इकट्ठा करें
BODY FLUID SPILLAGE
शारीरिक द्रव स्राव
Isolate, mop with absorbent cloth/paper and disinfect appropriately
जगह खाली करें तथा सोखने वाले कपड़े या कागज़ से साफ़ करें
Collect in separate liner for incineration
अलग लाइनर में इकट्ठा करें
*MERCURY SPILLAGE
पारा स्राव
Remove gold jewellery, wear gloves and suck with needle-less syringe
सोने के आभूषण निकालें, दस्ताने पहनें और बिना सुई वाले सीरींज से खींचें
Store in 5-10 ml water
5-10 मि. लि. पानी में रखें
Send to CBWTF
साझा जैव-चिकित्सा अपशिष्ट उपचार सुविधा में भेजें


TREATMENT AND DISPOSAL OPTIONS FOR BLUE CATEGORY WASTE AT CBWTF AND CAPTIVE TREATMENT FACILITIES (CTF)
नीली श्रेणी के कचरे का CBWTF और CTF द्वारा उपचार एवं निपटान करने के तरीके
Glass sharps
काँच से बनी पैनी वस्तुएं
Common Biomedical Waste Treatment Facility (CBWTF)
साझा जैव चिकित्सा अपशिष्ट उपचार सुविधा
Segregate in blue liner
नीले लाइनर में डालें
CTF
Autoclave
Or
या फिर
Microwave
Or
या फिर
Cleaning with detergent and water
डिटर्जेंट और पानी से धोएं
For disinfecting/ sterilizing waste
कचरे को विसंक्रमित करने के लिए
Hydroclave
Double bucket disinfection with 2% sodium hypochlorite solution
Authorised Recycler
पुनर्चक्रण करें

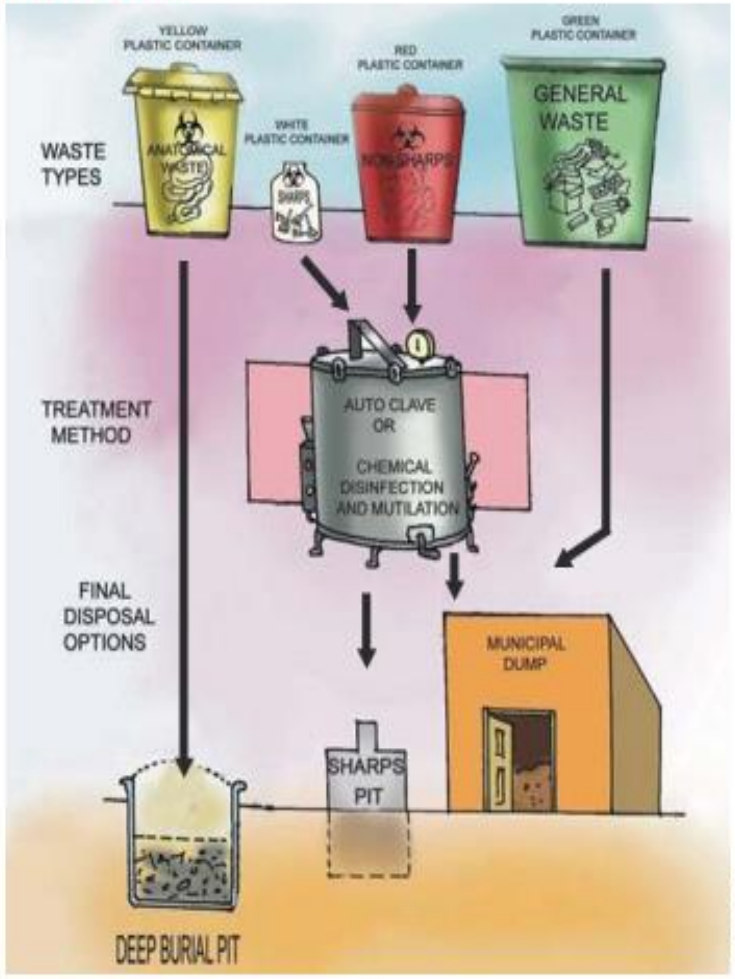

SAFETY FIRST!
PROTECTIVE GEAR FOR HEALTHCARE WORKERS
सुरक्षा पहले!
स्वास्थ्यकर्मी के लिए सुरक्षात्मक गियर
Mask
मास्क
Face shield
मुखड़ा कवच
Goggles
चश्मे
Cap
टोपी
Gloves
दस्ताने
Boots
जूते
Apron
एप्रन


UNTREATED BIOMEDICAL WASTE IS A RISK TO ENVIRONMENT AND HEALTH
अनुपचारित चिकित्सा कचरा वातावरण एवं स्वास्थ्य के लिए जोखिम पैदा कर सकता है।
For pre-treatment by autoclaving
ऑटोक्लेव द्वारा पूर्व उपचार के लिए
Careless handling of waste can lead to spread of infectious diseases such as Hepatitis, AIDS and Tuberculosis (TB)
कचरे के रख-रखाव में लापरवाही के कारण हेपेटाइटिस, एड्स और ट्यूबरकलोसिस (टीबी) जैसी बीमारियां हो सकती हैं
HOSPITAL
Infection acquired from hospital
अस्पताल द्वारा प्राप्त संक्रमण
Biomedical waste should never get mixed with municipal solid waste. Waste collectors trying to retrieve valuables from waste can inadvertently injure themselves and catch infection
बायोमेडिकल कचरे को साधारण कचरे में कभी भी ना मिलने दें। कूड़ा बीनने के समय कूड़ा बीनने वाले को चोट लग सकती है और जिसके कारण उन्हें बीमारियां हो सकती हैं
Waste littering can lead to spread of infections
कचरे को अनुचित जगह पर फेंकने से बीमारियां फैल सकती हैं

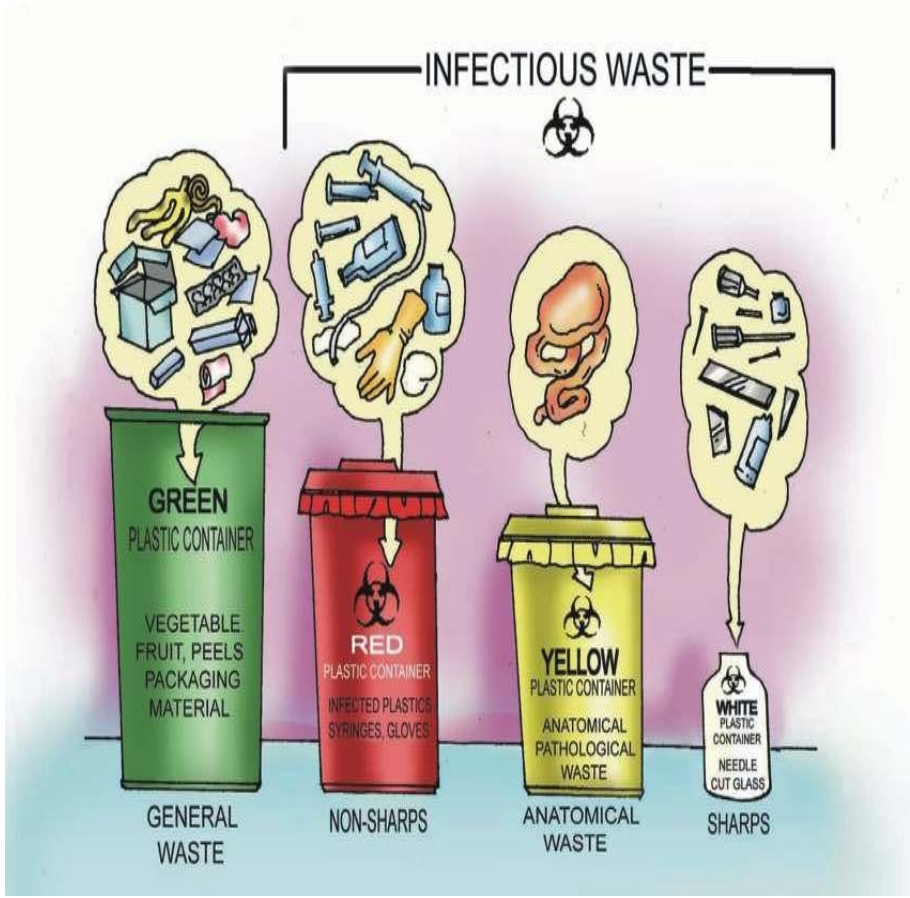
1. Steps For Waste Management



Treatment and Disposal



Segregation



Collection and Storage

Bad: Don't overfill the bins

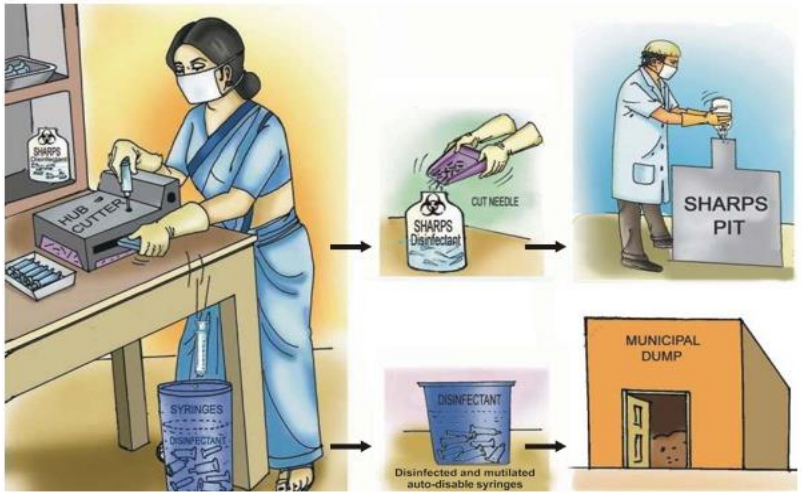
Good: Always fill only 3/4th bin

Transportation

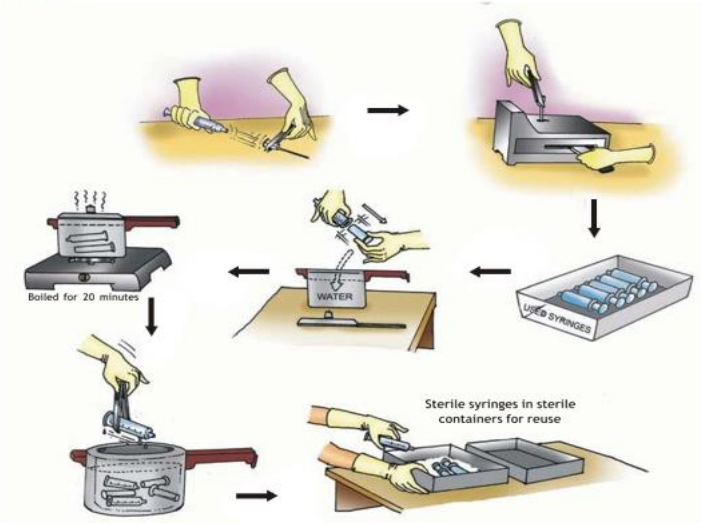
Bad - Don't carry waste in open bags, and never carry it through crowded areas

Good - Always carry the waste in secure sealed containers/bags

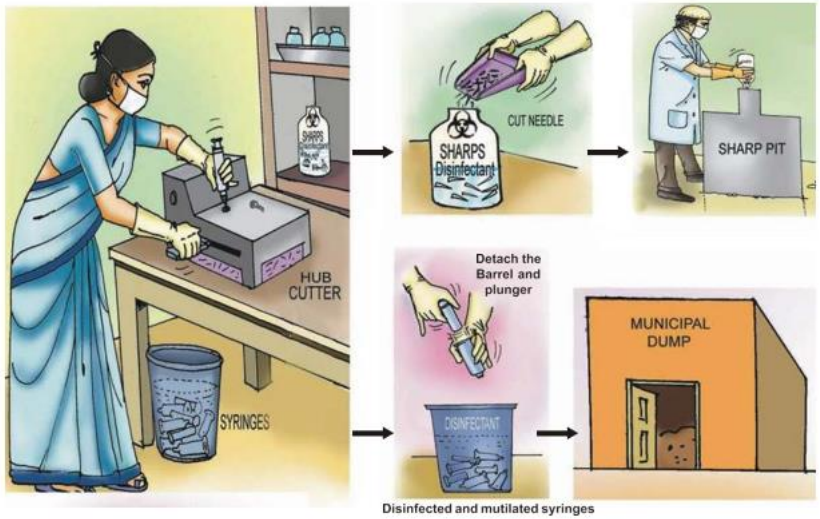
Auto-disable Syringes

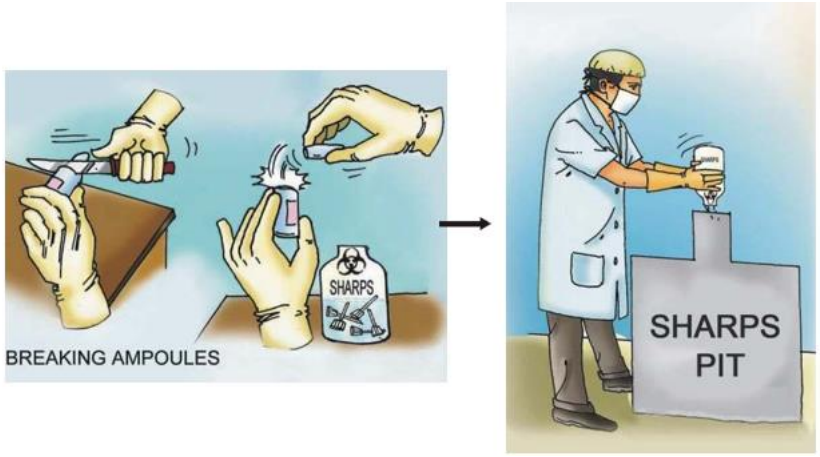


Glass Syringes



Disposable Syringes





Annexure 'J': ICMR Financial Support for MD Thesis

ICMR
INDIAN COUNCIL OF MEDICAL RESEARCH

भारतीय आयुर्विज्ञान अनुसंधान परिषद
स्वास्थ्य अनुसंधान विभाग, स्वास्थ्य और परिवार कल्याण मंत्रालय, भारत सरकार

Indian Council of Medical Research
Department of Health Research, Ministry of Health and Family Welfare, Government of India

No.3/2/June-2021/PG-Thesis-HRD (06) Date: 20/09/2021

MD21JUN-0179
Dr. Sridevi G,
Department of Community Medicine and Family Medicine,
All India Institute of Medical Sciences,
Basni Industrial Area,
Jodhpur-342005 Rajasthan

Subject: Award of ICMR Financial Support for the MD/MS/DM/MCh/DNB/DrNB/MDS thesis for the June 2021 batch- reg.

Dear Dr. Sridevi G,

This is in with reference to your application seeking financial assistance from the ICMR for MD/MS/DM/MCh/DNB/DrNB/MDS thesis entitled **"Water, sanitation and infection control practices in PHCs and CHCs of rural Jodhpur- An intervention through supportive supervision".**

I am glad to inform you that, based on the recommendation of Expert Committee, the Director General, ICMR has approved your application for the financial support of **Rs. 50,000/- (Fifty thousand only)** for the thesis as stated above, which will be disbursed in two/three installments. Initial amount of **Rs. 30,000/-** will be released after receipt of the Undertaking as per the guidelines and remaining amount of **Rs. 20,000/-** on receipt of the electronic copy and summary of work done of your thesis duly approved by the University/Institute along with one publication in an indexed Journal. Mandatory requirement to avail this opportunity is to provide us with an Undertaking duly forwarded through the Guide, to the undersigned, enabling us to release the grant.

The amount will be released after submission of the UNDERTAKING, GUIDE DETAILS as well as the MANDATE FORM (available on ICMR website) along with a photocopy of a Cancelled Cheque (Please ignore, if already submitted) LATEST BY 15th October 2021 for receiving e-payment for purpose of verification of the concerned bank account where money is to be remitted.

Yours faithfully

(Bal Ugrin Sah)
Administrative Officer-HRD

For Director General

Copy to:

1. Guide: Dr. Manoj Kumar Gupta, Associate Professor, Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Basni Industrial Area, Jodhpur- 342005 Rajasthan.

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APPENDIX

Appendix i: Sanitation inspection risk score

Indicators	Baseline (n=11)	Follow up after 3 months(n=11)	Endline (n=11)
1. Does the tap leak?	2	2	1
2. Is the tap or are attachments insanitary?	6	5	5
3. Does spilt water accumulate around the tap stand?	9	9	8
4. Is the area around the tap stand polluted by waste, faeces or other materials?	0	1	1
5. Is the area around the tap stand unfenced, allowing animals to access the area?	9	8	8
6. Is there a sewer or a latrine at an unsafe distance from the tap stand?	4	4	4
7. Are there any signs of leaks in the inspection area?	6	6	4
8. Are any of the pipes exposed above ground in the inspection area?	1	2	2
9. Have users report any pipe breaks within the last week?	0	1	0
10. Has there been discontinuity in the last 10 days?	3	2	3