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WASH ASSESSMENT AND SURVEILLANCE SYSTEM IN HEALTH FACILITIES IN THE GAZA STRIP

Water, Sanitation and Hygiene Assessment and Water Borne Diseases Surveillance System in 16 Primary Health Care Centers and 5 Hospitals in the Gaza Strip

MAY 2019

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This study was conducted by WeWorld-GVC Gaza and Ramallah team: Dr. Dalia Abu Jahel (Health Expert), Ismael Snounu (Programmes Officer), Ghassan Qishawi (Technical Coordinator), Karam Matar (Field Coordinator), Marwa Joudah (Hygiene Promotion Officer), Nayef A. Al-Adsi (Local Administrator), Anna Crescenti (WASH Expert), Vincenzo Paladino (Area Manager), Giovanni Cesari (Emergency Coordinator), Liù Fornara (Country Representative). The study was funded by ECHO under the management of UNICEF and conducted in coordination with MOH, PWA, WHO, WASH and Health Clusters (coordinators and partners) and UNRWA. WeWorld-GVC would like to express appreciation to all who assisted in the data collection and implementation of this work.
Authors: Dalia Abu Jahel, Ismael Snounu.

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ACRONYMS

Cl	**Chloride**
CMWU	**Coastal Municipalities Water Utility**
GVC	**Gruppo di Volontariato Civile**
HCAI	**Health Care Associated Infection**
HCF	**Health Care Facility**
ICAT	**Infection Control Assessment Tool**
ICRC	**International Committee of the Red Cross**
JICA	**Japan International Cooperation Agency**
JMP	**Joint Monitoring Programme**
L/C/D	**Litres per Capita per Day**
MCM	**Million Cubic Meter**
MoH	**Ministry of Health**
NGO	**Non-governmental Organization**
NICU	**Neonatal Intensive Care Unit**
NO_3	**Nitrate**
OCHA	**Office for the Coordination of Humanitarian Affairs**
PHC	**Primary Health Care**
PWA	**Palestinian Water Authority**
PWD	**People with Disability**
SARA	**Service Availability and Readiness Assessment**
SHC	**Secondary Health Care**
SOPs	**Standard Operating Procedures**
TDS	**Total Dissolved Solids**
UNICEF	**United Nations Children's Emergency Fund**
UNRWA	**United Nations Relief and Works Agency**
USAID	**United States Agency for International Development**
WASH	**Water, Sanitation and Hygiene**
WBD	**Water Borne Diseases**
WHWG	**WASH-in-Health Working Group**
WHO	**World Health Organization**
WW-GVC	**WeWorld – GVC**

EXECUTIVE SUMMARY

Improved Water, Sanitation and Hygiene (WASH) in healthcare facilities (HCFs) is crucial to ensure the quality and safety of the provided health services and to minimize the risk of infection to patients and their caretakers, healthcare workers and the surrounding communities. In the Gaza Strip, poor water supply and quality, combined with insufficient wastewater treatment, exacerbated by poor infrastructure, have dangerous implications for public health. There is an increased risk of waterborne diseases resulting from trace contaminants in the water. Furthermore, information gaps on conditions and functioning of water and sanitation infrastructures, as well as hygiene practices in health care facilities, are being highlighted which could limit the provision of adequate WASH services.

As such WW-GVC, with the support of UNICEF, has conducted the first WASH assessment for health institutions run by the Ministry of Health (MoH) and an evaluation of the Water Borne Disease Surveillance Mechanism managed always by MoH in the Gaza Strip. The main objectives were to:

- Assess WASH conditions in 21 HCFs through identifying the real status of drinking water, domestic water, water for immunocompromised patients, distilled water, wastewater, solid wastes sanitation and hygiene practices among health workers, as well as finding areas for quality improvement in facilities, including strengthening WASH and Infection prevention and Control (IPC) policies and standards that will lead to lower infection rates, better health outcomes for patients and improved safety for staff members, all exercised in compliance with medical ethics.
- Evaluate the national communicable disease surveillance system and its sensitivity and ability to detect and trigger a response to outbreak of waterborne diseases in a community.

ASSESSMENT METHODOLOGY

This assessment was a cross-sectional survey of 21 selected HCFs, including 16 PHCs and five SHCs run by the MoH distributed all over the Gaza Strip**.** The study used triangulation of qualitative and quantitative information to allow a realistic translation of the data that would lead to more comprehensive results and generating evidence-based policy options for actions. The survey used face-to-face interviews with key personnel in each HCF including the medical and/or nursing director, admin director, IPC committee member and head of engineering and maintenance department. In addition, a walk-through checklist inspection was conducted to the main WASH infrastructures and amenities by qualified engineers, hygiene and health experts. The data were analyzed in line with indicators that assessed the availability and quality of WASH services showing the following: 1) JMP Core indicators for availability of basic WASH services in HCFs, 2) Advanced indicators from WASH in HCFs (WHO WASH FIT), 3) Investment's costs in the WASH infrastructure (an estimation for the coast of investments in WASH infrastructure rehabilitation, please consult paragraph 4.4). In addition, the assessment included key informant interviews with key personnel in the Ministry of Health (MoH), Palestinian Water Authority (PWA) and Coastal Municipalities Water Utility (CMWU) in order to evaluate the waterborne disease surveillance system implemented at the MoH and its ability to trigger an outbreak as well as roles and responsibilities of stakeholders in the response.

MAIN FINDINGS

- **Water**

All assessed HCFs had basic water services: receiving water from an improved source accessed on premises. Sixteen out of the 21 assessed health care facilities receive piped water from the municipality networks while five of them had onsite-protected wells. One of the assessed local wells has high risk for contamination (section 3.2.3). Only one of the assessed HCFs has back up source for drinking water and ten of them had

back up source for domestic water that could affect water availability at time of emergencies. Water quality monitoring at the HCFs was not regularly carried out by the environmental unit department and only nine of them received feedback results proving that water meets the set standards. Water treatment units are available in nine of the assessed HCFs, where four of them do not have the adequate skilled staff nor supplies to run the treatment. About 37% of the assessed water storage reservoirs at the HCFs had low risk of contamination while 57% have medium risk of contamination and 6% have high risk levels. The main risk factor in more than 63% of the assessed reservoirs was lack of cleaning and disinfection of the water reservoirs. Energy for water heating is another identified gap related to the poor electricity situation and fuel shortages, which negatively impact the hygiene and environmental cleaning practices, especially in winter times. Three of the HCFs did not have a functional energy source for water heating and in six of them hot water was not always available (section 3.2.1)

- **Sanitation**

Four out of the 21 assessed HCFs had basic sanitation services. Sixteen of them had no toilets dedicated for people with limited mobility, while in 11 of them staff and patients are using the same toilets. None of the assessed facilities have toilets that are adapted for children use. Twenty of the assessed HCFs had their wastewater system connected to the municipality networks. However, the 20 facilities did not have wastewater pretreatment units, therefore infectious and toxic wastewater was discharged to the municipality networks without being treated for infectious and toxic waste. Only one HCF had a wastewater treatment unit, which performs primary, secondary and tertiary treatments. Five of the assessed HCFs (1 hospital and 4 PHCs) had wastewater systems aged between 26 to 50 years with lack of maintenance. Ten of the assessed HCFs (6 PHCs and 4 hospitals) witnessed frequent flooding and clogging of the system due to bad design and lack of continuous maintenance of the system, especially in the seven facilities where wastewater and storm water were not separated. The water drainage system and surface run are well designed in eight of the assessed HCFs, while in 10 of them the system could carry contamination outside the health care settings; furthermore, obvious puddles were seen especially where lack of policies and procedures that regulates the cleaning works is evident.

- **Hygiene**

All assessed HCFs had basic hand hygiene services: functional hand hygiene facilities (with water and soap and/or alcohol-based hand rub) were available at points of care, and within 5 meters of toilets. In respect to the environmental cleaning, MoH has a service contract with a private company in charge of supervising the process including supplies. However, the environmental cleaning services in the assessed 21 HCFs were limited due to lack of well disseminated protocols for cleaning and lack of training of health care providers and non-health care providers. None of the health facilities kept regular cleaning records. Regarding the vectors control, seven facilities complained that the applied measures were not effective. (section 3.2.3 and 3.2.4).

- **Medical waste management**

All assessed HCFs had limited health care waste management services. Onsight separation and treatment of sharp waste is strictly applied in all assessed HCFs. There was limited onsite separation between infectious waste and general waste in all assessed HCFs; despite color-coded bins were available in all of them, infectious waste is still discharged with general waste. In nine of the assessed HCFs, staff was trained on health care waste management while in 11 facilities staff members were not adequately trained and in one facility no one has been trained. The area which was dedicated for waste collection and storage was well identified but not properly protected in 15 of the HCFs, and not properly identified nor protected in six of the

HCFs. Waste related injuries are not reported through official forms in 16 of the HCFs but managed according to the preventive medicine procedures in all of them- (section 3.2.5).

- **Waterborne diseases surveillance system**

All assessed PHCs are implementing passive surveillance system for communicable diseases through voluntary filling forms. In the assessed hospitals, no forms are filled. However, hospitals are connected to the underdeveloped health information system where data about the diseases under surveillance are collected directly from the system. A passive surveillance system is facing limitations such as underreporting and lack of commitment of staff to fill the forms, inflexible HIS and lack of resources (staff, supplies and others). These limitations are hindering the system too week to timely detect and trigger a response to a waterborne disease outbreak.

RECOMMENDED INTERVENTIONS

Conditions of water supply, sanitation services and hygienic practices in the surveyed HCFs are seriously inadequate and exacerbate the risk of infection among patients and caretakers. These observations reflect on a much broader picture of the situation of WASH in healthcare facilities around the Gaza Strip. The WASH conditions observed and the implication to hygiene and health safety in the healthcare environment calls for urgent action at the level of the HCFs, the MoH, WASH cluster, Health cluster and stakeholders. The following key actions are recommended to be tackled in response to the needs revealed by the current study:

- The MoH, in cooperation with the WASH and Health cluster, should develop and enforce national policies, guidelines, standards and tools to improve WASH in HCFs and establish a process of monitoring WASH services in light of IPC standards and their impact on the health services outcome through monitoring of health care associated infections (HCAIs).
- Standard operating procedures need to be developed and adapted for each HCF in order to improve the WASH services and regular WASH training should be conducted on yearly basis for all staff members.
- Develop national WASH in emergency plans and operational guidelines; establish a training for all staff members on WASH in emergency and risk management.
- Establish a process of regular, preventive and corrective maintenance of WASH infrastructures inside the health facilities by allocating a fund for the procurement of the needed supplies and materials.
- Ensure regular monitoring of the water quality at the HCFs, as recommended by international standards for both drinking and domestic water.
- Fundraise to renovate and rehabilitate WASH infrastructures inside the HCFs where gaps are detected and are affecting the quality of service and the health environment, especially for most vulnerable group as children, elderlies and people with disabilities.
- Improve medical waste management starting from onsite segregation by applying the MoH national standards and staff training; establish a process of monitoring in order to improve staff commitment.

CHAPTER 1: INTRODUCTION

"WASH in health care facilities" refers to the provision of water, sanitation, health care waste management, hygiene and environmental cleaning infrastructure, and services across all parts of a facility. Health care facilities encompass 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. Basic WASH services in health care facilities are fundamental to support core universal health care aspects of quality, equity, and dignity for all people[1]. Effective sanitation, hygiene and infection prevention measures are one of the five objectives of the WHO Global Action Plan on antimicrobial resistance.

In 2015, WHO and UNICEF assessed the status of WASH in HCFs for the first time, targeting 54 low- and middle-income countries. The results showed that nearly 40% of HCFs in low- and middle-income countries do not have an improved water source within 500 meters, 19% do not have improved sanitation[2], 35% do not have water and soap for handwashing and 42% do not have adequate systems for safe disposal of healthcare waste. This lack of basic WASH services negatively affects the availability and quality of basic and routine health services, resulting in, for example, maternity and childbirth with high outbreak of HCAIS[3] especially in hospitals. National planning for WASH in HCFs is lacking, while very few data is available, especially for sanitation and hygiene. The report called for an urgent action to improve WASH services in HCFs in low- and middle-income countries (Figure 1).

Figure 1: Adequate WASH in Health Care Facilities, WHO 2015[1]

Therefore, the availability of basic WASH services in all HCFs aimed to prevent and control infection, tackling antimicrobial resistance, is considered a prerequisite for achieving universal health coverage (UHC).[4] The importance of WASH in HCF is increasingly globally recognized and integrated in the 2030

[1] WASH in Health Care Facilities, WHO, 2015.

[2] 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.

[3] Water, Sanitation and Hygiene in Health Care Facilities - Status in low and middle-income countries and way forward, WHO, 2015.

[4] WASH in Health Care Facilities -Global Action Plan, WHO and UNICEF, 2015.

Agenda for Sustainable Development. The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) is authorized for monitoring global progress on Sustainable Development Goals (SDGs) targets 6.1 (drinking water) and 6.2 (sanitation and hygiene) (Figure 2). This will involve compiling and reporting data also from non-households' places such as schools, HCFs and other settings. Adequate WASH in HCFs is also important for meeting several targets under SDG 3 (Figure 2).

GOALS	TARGETS
 **6: Ensure availability and sustainable management of water and sanitation for all**	6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all
	6.2: By 2030 achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 **3: Ensure healthy lives and promote well-being for all at all ages**	3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

Figure 2: Global Goals and Targets Related to WASH in HCFs

1.1 WASH SITUATION IN THE GAZA STRIP

The Gaza Strip is facing immense humanitarian crisis caused by years of socio-economic decline, protracted conflict and blockade of borders. Several consecutive rounds of conflicts, followed by massive destruction, and 11 years of blockade compounded by the Palestinian political and geographical division, are directly affecting the health care system in Gaza.

The total water supply from domestic use in the Strip is about 96,308 MCM in 2017 coming from 273 municipal water wells (78.791 MCM), nine UNRWA wells (2.911 MCM), Mekorot (10.566 MCM) and from brackish and seawater desalination plants (4.039 mcm)[5]. The mean value of network distribution efficiency is 62.3% where the highest is in KhanYounis governorate (71%). Access to safe water is a critical concern, where the Coastal Aquifer, recharged mainly by rainfall, results to be the main water source for the entire Strip (95% of all the water consumed). Until the 90s, the aquifer provided Gaza Strip inhabitants with drinkable tap water. However, only 3.9% (11 of 282 wells) of the domestic groundwater supply in 2017 was matching with WHO drinking limit in terms of Cl and NO3. In addition, only 18.41% of the water supplied from the different sources (3.25% groundwater, 10.97% Mekorot and 4.19% desalinated water) is matching with WHO drinking limit.[6] According to 2018 early warning indicator[7]s, the energy crisis has led to reduced water supply from 84 L/C/D to about 72 L/C/D after slightly improvement in the electricity supply following the provision of funding by the government of Qatar. Furthermore, piped water supply has reached eight hours every one to three days compared to four to six hours every three to five days in 2017. The primary contamination of the aquifer is its longstanding exploitation, which amounts to almost three times more than

[5] Gaza Water Status Report, PWA, 2017.

[6] Status Report of Water Resources in the Occupied State of Palestine, PWA, 2012.

[7] Gaza Strip: Early Warning Indicators – UN OCHA, December 2018.

their natural time of recharging, leading to a severe decline of groundwater level to 15-18 meters below the sea level. Besides, most of the coastal area and including territory with a distance of about 3 km in land was affected by the seawater intrusion phenomena with different degree.[8]

The immense electricity deficit affecting the Gaza Strip, alongside the longstanding shortage of adequate sanitation infrastructure, continues to result in the daily discharge of 100-108 million liters of poorly treated sewage water into the sea (Figure 4 and 5). The sea also flushes back to the shores of Gaza large amounts of untreated or insufficiently treated sewage that is dumped into the sea.[9] The current operation of wastewater treatment plants may be undermined further in the near future due to the funding gaps facing UN programme of emergency fuel to run backup generators at critical facilities, as well as the recent tightening of the blockade. Open sewage runoff water and agrichemicals also seep into the aquifer. The level of salinity and nitrates found in the aquifer has been rising continuously over the last two decades, and nowadays they show critical excess respect to the WHO standards.

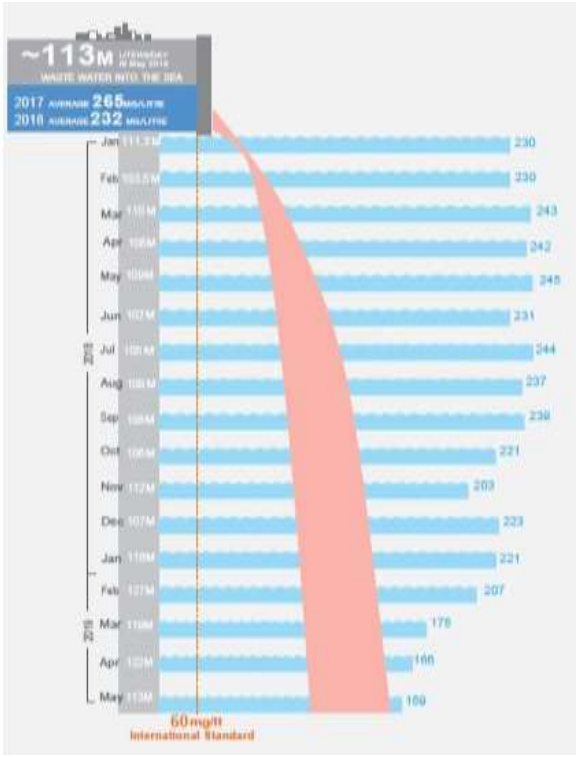


Figure 3: Pollution Level of Wastewater Flows into the Sea (mg/litre of BOD), OCHA 2018

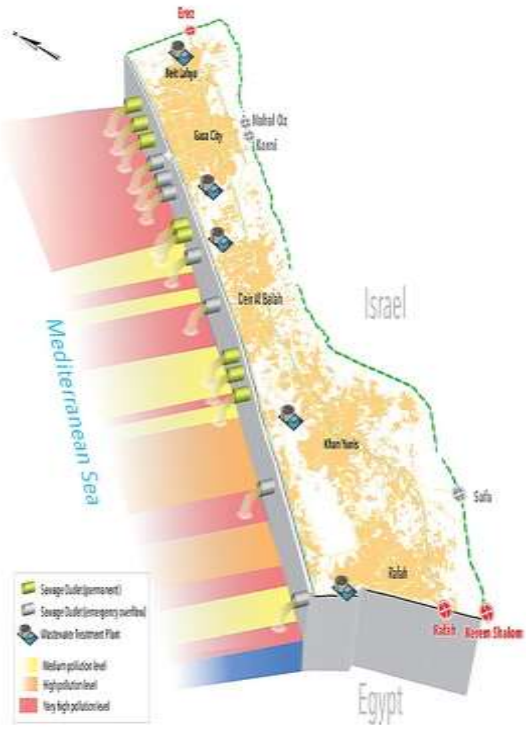


Figure 4: Gaza Strip Seawater Pollution, PEQA

1.2 CONTEXT OF THE STUDY

The Gaza Strip is a narrow zone of land, located on the south of Palestine, the strip borders with Egypt on the southwest and with Israel on the south, east and north. It is about 41 km long, and between 6 to -12 km wide, with a total area of 365 km^2. It is divided into five governorates; North Gaza, Gaza, Middle Area, Khan Younis and Rafah. There are four towns, eight refugees' camps and 14 villages.

[8] Gaza Water Status Report, PWA, 2017.

[9] Terms of Reference for the Associated Works for Gaza Desalination Project, PWA, April 2014.

Demographic Characteristics:

According to the Palestinian Central Bureau of Statistics in 2017 the total population of the Gaza Strip was 1,943,398, where the male to female ratio was 103.4:100 (with a density of 5,324 people/km$^{2)}$. The fertility rate was around 4.5 births per woman. The average household size was 5.7 people. The crude birth rate was 36/1000 population while the crude death rate was 3.3/1000. The percentage of individuals aged between 0-14 constituted 42.6%. The elderly population aged (60 years and above) constituted 3.8%. About 9.4% of households were headed by females. The Population, Housing and Establishments Census 2017 data showed that only 11.4% of the households in the Gaza Strip used safe drinking water according to the indicators of SDGs[10].

Map 1: The Gaza Strip Map, Global Water Forum, 2018

Socioeconomic Situation:

The socio-economic situation in the Gaza Strip suffers from chronic needs, de-development and donor aid dependency. This situation has been increasingly worsening since 2007 by the effect of Israeli land, sea and air blockade. Unemployment reached 54.9% in the third quarter of 2018. In Q3/2018 Gaza's economy accounted for 19.9% of the Palestinian economy, down from 21.2% of 2017, whereas the real Gross domestic

[10] Palestinian Central Bureau of Statistics, Final Results of the Population, 2017.

product (GDP) was 692.8 M$, nominal GDP per capita was 357.1 $ and rate of change in real GDP (year-on-year) was 6.5%.[11]

1.3 HEALTH CARE SYSTEM

The health care services are provided at three different levels, primary, secondary and tertiary. The primary health care (PHC) is provided through 49 centers run by the MoH, 22 centers run by UNRWA and 70 centers run by the Non-governmental organizations providing primary health care services at four levels of care:

- **Level 1:** Preventive services: Mother and child health care and immunization, Curative services: first aid
- **Level 2:** Preventive services: Mother and child health care and immunization, Curative services: first aid. Laboratories are available in the clinic.
- **Level 3:** Preventive services: mother and child health care immunization, Family planning; Curative services: General Practitioner (GP) medical care, dental services and Laboratory in some clinics.
- **Level 4:** Preventive services: mother and child health care immunization; Family planning; Curative services: General Practitioner (GP) and medical specialist care, dental care, Gynecology and Obstetrics, Laboratory/ Radiology/ Health Education, Emergency Medical Services (EMS)

The secondary and tertiary health care is provided by MoH, NGOs, Police Medical Services (PMS) and the private sectors. There are 31 hospitals in the Gaza Strip: 14 of which are run by the MoH. Hospitals managed by MoH have a total capacity of 1,993 beds (82.4%), by NGOs 334 (13.8%), by PMS 72 (3.0%), and private 20 (0.8%).

Table I: Primary, Secondary and Tertiary Health Care Facilities in the Gaza Strip

Health facilities	MoH	UNRWA	NGO	PMS	Total
Primary Heath Care	49	22	70	5	146
Secondary and Tertiary Health Care	14	0	15	2	31

According to OCHA Monthly Humanitarian Bulletin (Dec 2018), in the wake of the "Great March of Return" weekly demonstrations started in March 30, 2018, Gaza's already overstretched health sector has been struggling to cope with the mass influx of casualties and injuries. This burden has exacerbated the long-term shortage, reaching lack of 42% in essential drugs and 23% of medical disposables consumables, lack of quality medical equipment and insufficiency of resources to maintain the infrastructure of the health care facilities, driven by the huge electricity deficit and the on-going salary crisis affecting government employees. The number of doctors, nurses, and hospital beds, relative to the population, declined by 15%, 12%, and 5% respectively, between 2010 and 2017.

1.4 WATERBORNE DISEASES NATIONAL SURVEILLANCE SYSTEM

Waterborne diseases surveillance system is part of the national communicable disease surveillance system that was initiated in 2011. It aims at improving the ability to early detect and respond unusual increase in water borne diseases (WBD). The system is mainly managed by the Epidemiology Department in the MoH and goes hand on hand with another surveillance system for water quality monitoring system implemented by the Environmental Department, which detects any biological or chemical contamination in drinking water.

[11] UNESCO Socio-Economic Report: Overview of the Palestinian Economy in Q3/2018.

The surveillance system is implemented in all MoH and UNRWA Primary health care clinics and MOH hospitals as well as some NGO and private clinics and covers all the population in the Gaza strip. The surveillance disease, which could be considered of water source, are classified under the three groups: Group A: requires immediate notification by phone or fax with using special forms. Group B: should be notified on weekly basis using special forms. Group C: should be notified on monthly basis. Laboratory confirmation is required to detect the causative organism for certain diseases and based on the available resources. The Gaza strip is considered free from cases of poliomyelitis, cholera (class A diseases), In year 2017, the incidence of hepatitis A was 17.6/100,000. Diarrheal diseases incidence in children less than 3 years was 142.2/1000, with noted decline in the incidence by 20.3%, due to the introduction of rotavirus vaccine in 2016, and 12.4/1000 in children above the age of 3 years. The incidence of bloody diarrhoea was 294.9/100000 and amebiases was 304.6/100000 in 2017[12]. WBD are not among the directly reported leading causes of mortality. However, it is important to recognize that waterborne pathogens can also cause other health outcomes, such as: aseptic meningitis (enteroviruses), respiratory symptoms (enteroviruses), Hemolytic Uremic syndrome HUS (E. coli O157:H7), myocarditis (Coxackie viruses), diabetes (Coxackie viruses), reactive arthritis (Yersinia, Shigella, Salmonella), peptic and duodenal ulcers (Helicobacter pylori), stomach cancer (Helicobacter pylori), and Guillain-Barre syndrome (Campylobacter)[13].

1.5 JUSTIFICATION OF THE ASSESSMENT

Recent findings of the 2018 Humanitarian Needs Overview and the WASH cluster highlight information gaps on conditions and functioning of water and sanitation infrastructures as well as hygiene practices in HCFs, limiting the provision of adequate WASH services. This data gap continues to trigger a major threat to human health and the ability of HCFs to provide quality health services at time of emergencies and outbreaks, while risks of insurgence of preventable health care associated infections among staff, patients, and surrounding communities are high and frequently reported. In October 2018, at Al Shifa hospital, the biggest hospital in the Strip, it was reported that water is frequently unavailable and that surgeons were unable to wash their hands prior to surgeries due to lack of clean water. The water available from the network has insufficient quality and is salty, causing rust and malfunction of medical tools and equipment. Equipment replacement is difficult to obtain due to funding shortages, access-related limitations and the short life span of equipment due to the ongoing water crisis.[14] Moreover, there is also an increased risk of waterborne diseases resulting from trace contaminants in the water, including acute diarrhea, parasite infections, liver and kidney diseases, and methemoglobinemia ("blue baby syndrome"). Poor water supply and quality, combined with insufficient wastewater treatment, have dangerous implications for public health in Gaza. The possible risk of disease transmission through waterborne pathogens is exacerbated by poor infrastructure and limited access to improved or clean water sources. It is worth mentioning that 46.2% of Gaza's population are children (age 0-17) who are the most vulnerable

Up to the date of assessment, the information related to WASH operation and management or WASH infrastructures in the HCFs in the GS were limited and not complete.

[12] Communicable Diseases Report, MoH 2017.

[13] WHO, Technical Guidance of Waterborne Disease Surveillance, 2011.

[14] The Monthly Humanitarian Bulletin - Occupied Palestinian Territory, October 2018.

Picture 1: Medical Staff showing rusty water available through water network, Al Shifa Hospital, Gaza OCHA- November 2018

1.6 GOALS AND OBJECTIVES

1.6.1 GOALS

The main goal is to assess WASH conditions in 21 health institutions through identifying the current status of WASH operation and management, categorizing water, sanitation, hygiene, and medical waste management. The study is also evaluating the waterborne diseases surveillance system aiming to identify gaps and provide suggestions and responsive action to improve the actual mechanism.

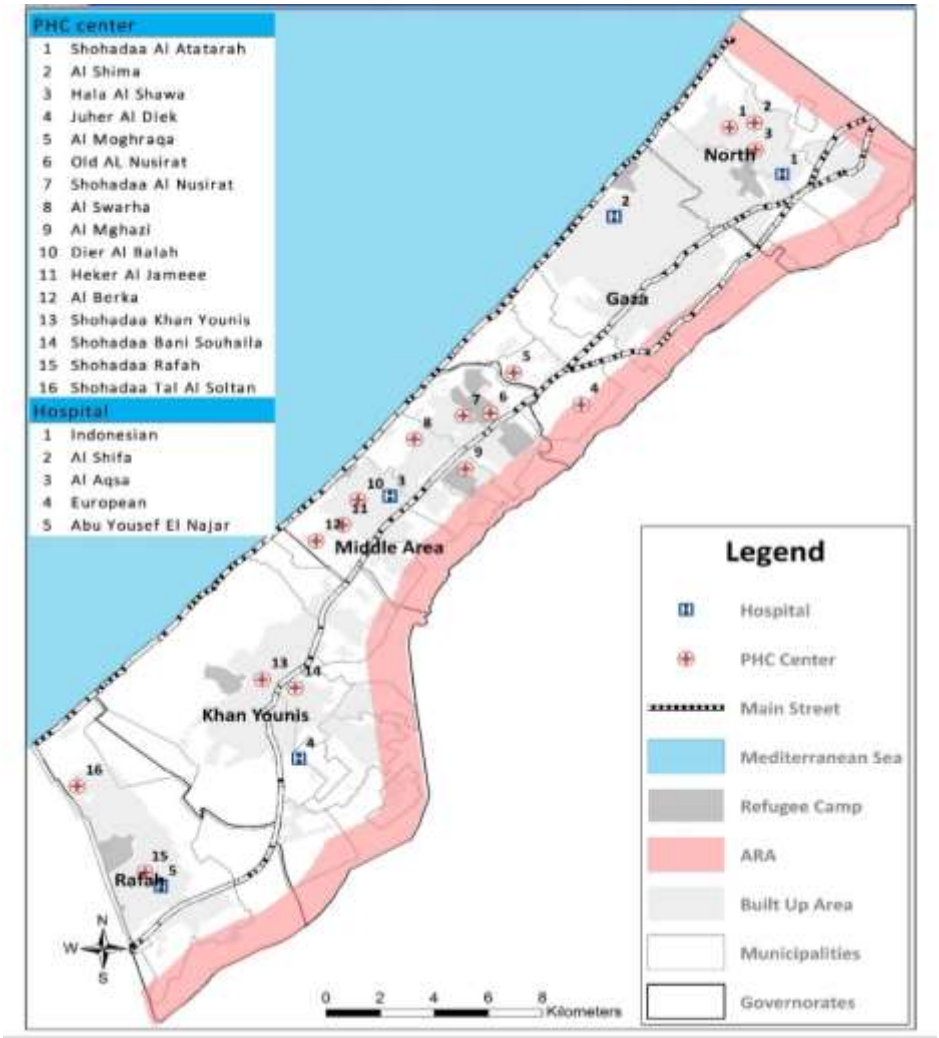
1.6.2 OBJECTIVES

1. Identifying areas for quality improvement in facilities, including strengthening WASH and IPC policies and standards that will lead to lower infection rates, better health outcomes for patients and improved safety and morale for staff members.
2. Providing a framework to develop, monitor and continuously implement an improvement plan and prioritize specific actions when resources are limited.
3. Strengthening the WASH standard operating procedures (SOPs) in the MoH institutions in Gaza.
4. Evaluate the national communicable disease surveillance system and its sensitivity and ability to detect and trigger a response to outbreak of waterborne diseases in a community.

CHAPTER 2: METHODOLOGY

2.1 STUDY DESIGN AND SETTING

This is a cross-sectional survey of 21 selected HCFs, including 16 PHCs and five SHCs run by the MoH, distributed all over the Gaza Strip (MAP 2). Three PHCs were located in the North Gaza governorate, two PHCs located in Gaza city, seven PHCs in the Middle zone, two PHCs in Khan Younis and two PHCs in Rafah. The hospitals were five: one from each Governorate, focusing on hospitals, which have maternity, and nursery services, hemodialysis and surgeries. The 21 HCFs represent 33% of the facilities run by MoH and 12% of all facilities in all of Gaza. Targeted PHCs treated 32% of cases (59,000 cases) while targeted hospitals treated 57% of cases (4,600,000 cases) received at the MoH run facilities.



Map 2: WASH Assessment Targeted Health Facilities

2.2 STUDY APPROACHES

The approach adopted for data collection and analysis was triangulation of methods combining quantitative and qualitative approaches. The survey included face-to-face interviews with key personnel in each HCF,

including the medical and/or nursing director, admin director, IPC committee member and head of engineering and maintenance department. The survey included a walk-through checklist inspection to the main WASH infrastructures and amenities. The qualitative approach was intended to help capturing information on:

- The WASH operations and management and its impact on the health services outcome and the working environment.
- The existing availability, quality and coverage of safe water supply, sanitation infrastructure, hand washing facilities and hygienic practices in HCFs.

Water quality samples were taken and assessed physically, chemically (Nitrates, TDS, PH, EC, hardness and Free chlorine) and biologically (Total coliform, Fecal coliform, Pseudomonas). Samples of water from the source, pretreatment, storage and critical end-users' points were withdrawn by the environmental health department of MoH under the supervision of WW-GVC technical staff and were transported to the water laboratory.

2.3 SURVEY FRAMEWORK

The framework adopted for this assessment consists of four main consequent stages implemented over seven months as shown in Table II: a) preparation; b) data collection; c) data analysis; d) report writing.

Table II: Timeline for WASH Assessment in the Health Facilities

Stage #	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019
Preparation									
Data Collection									
Data Analysis									
Reporting									

a) Preparation and sourcing out of the assessment tools

Pre-meetings with stakeholders to introduce the project and learn from their experience in implementing similar and related activities. After several meetings, started from May 2018, a kick-off meeting of the WASH-in-Health Working Group was held on November 12th, 2018 to endorse the ToR, final objectives, structure and required outputs.

Development of the survey questionnaire and other tools was sourced out from international approved tools for assessment of Health care facilities in general, and specifically WASH in HCFs, including:

- JPM indicator/core questions and indicators for monitoring WASH-in-Health care facilities in the Sustainable Development Goals, 2016.
- Water and Sanitation for Health Facility Improvement Tool, WHO 2017.
- Essential environmental health standards in health care, WHO, 2008.
- Service Availability and Readiness Assessment (SARA), WHO, 2015.
- Infection Control Assessment Tool (ICAT), USAID, 2009.
- WHO drinking water quality Guidelines volume 4.
- WHO Technical guidance on water-related disease surveillance, 2011.
- Policy guidance on water-related disease surveillance, 2011.

A survey questionnaire (Annex 2) was specifically designed for the assessment to tackle different aspects of WASH in health facilities in the Gaza Strip taking in consideration the differences between PHC and SHC facilities. The questionnaire was divided into 6 sections: Health Facility profile, WASH management, Water, Sanitation, Hygiene, Medical Waste Disposal (Table III). The survey questionnaire is designed of closed-ended and open-ended questions, in order to better explore the real status of WASH inside the health facilities. The assessment targets the infrastructure for WASH, staff availability and training, WASH protocols, WASH supplies, equipment and WASH monitoring and management. The data are analyzed in line with indicators that assess the availability and quality of WASH services, showing the following:

- ✓ JMP Core indicators for availability of basic WASH services in HCFs.
- ✓ Advanced indicators from WASH in HCFs.
- ✓ Investment's costs in the WASH infrastructure.

Table III: Main Aspects of the Questionnaire

Section	Items
Facility Profile	• Targeted facility name and type • General information: (level, address, catchment area, Scope of work) • Number of staff working /day desegregated as male, female and PWDs • Average number of outpatients, inpatients, surgeries, deliveries, occupancy rate • WASH monitoring teams, staff • Operation of WASH Facilities
WASH Management	• WASH Standard operating procedures • WASH in Emergency plan • WASH allocated budget • WASH staff adequacy, skills, safety • WASH auditing and monitoring
Water Status	• Main and Back up source of drinking and domestic water • Water quantity and availability • Water storage • Water quality; chemical and biological • Drinking and domestic water storage conditions • Water treatment • Monitoring of water safety and quality • Water amenities and access to hot water
Sanitation Status	• The availability of toilets disaggregated per patients and staff and per male and females and for PWD • Access to toilets • Availability of water and hygiene materials • Wastewater disposal system • Wastewater disposal capacity • Wastewater treatment • Inspection of the conditions of toilets
Hygiene Status	• Cleaning schedules • Staff training and supervision • Cleaning equipment and supplies and PPE • Cleaning practices • Food storage and preparation • Infant formula preparation • Hygiene promotion among staff and patients • Inspection of hand washing station supplies and sink condition • Inspection of environmental cleaning high touch areas
Medical Waste Management Status	• Trained staff • Segregation facilities • Waste zone/area • Medical waste treatment

	• Medical waste related injuries documentation and reporting • Inspection of waste onsite segregation in patient care areas and delivery rooms
Waterborne diseases	• Water borne diseases surveillance system

The questionnaire was endorsed by the WHWG (please consult Annex 1 for the ToR) to review the indicators, the structure of the assessment questionnaire and the methodology.

The identified team of data collectors was trained on using the data collection tools. The training included orientation to the HCFs structure focusing on critical and high risk areas especially in hospitals and the WASH standards for each type of facility as per the WHO environmental health standard.[15] Operational definitions of some of the technical terms used in the questionnaire were explained, as well as the source of verification for each indicator question, which entails reviewing of some documents in some indicators and onsite inspection in other indicators. Ethical considerations during health facility visits were discussed with the team to ensure our assessment will not trespass medical staff nor patients' privacy and/or confidentiality.

Data was collected by tablets using ODK[16] software. The initial phase included the testing of the tool in order to assess the use of the tablets in data collection process and the ease of asking questions and receiving replies, evaluate the needed internal coordination to be communicated to the MoH before visiting any facility and ensure that all the aspects of WASH in Health was included and adapted to the context. Piloting of the questionnaire was conducted in Al Shifa hospital on December 17th. After pre-testing, the data collection tools were refined by improving them to ensure they were ready for use in the actual data collection process.

b) Data Collection

Data were collected in December 2018, and January 2019, with a team of 5 trained data collectors led by a Public Health Expert. Data were collected from the 21 selected HCFs through interviews with key personnel as well as direct observation checklists during facility walkthroughs.

Six inspection check list forms were used during facility walkthrough in order to assess WASH infrastructures and help create a deep descriptive picture of the situation and areas of investments and improvements.

Desk review of **Secondary** resources was conducted for further details and findings related to WASH in health from other assessments and studies implemented by other agencies that provided additional details not originally obtained during the field survey, including:

- ✓ WASH assessment at Household Level in The Gaza Strip, WW-GVC 2017.[17]
- ✓ The Final Report of the Japanese Expert on the Study on Medical Waste in Gaza, Palestine, JICA 2016.
- ✓ Strategy for Establishment of a Cohesive and Integrated Water and Health Monitoring Programme for the Gaza Strip, PWA 2016.
- ✓ Survey of Private and Public Brackish Desalination Plants in Gaza Strip, Which Will Provide the Necessary Data and Information to Improve the Drinking Water Supply in the Gaza Strip, PWA 2015.
- ✓ National communicable diseases surveillance system data, 2017-2018.

[15] Essential Environmental Health Standards in Health Care, WHO, 2008.

[16] Open Data Kit (ODK) is a suite of tools that allows data collection using Android mobile devices and data submission to an online server, even without an Internet connection or mobile carrier service at the time of data collection.

[17] WASH Assessment at HH Level in the Gaza Strip, WW-GVC, 2017.

Complementary data also included key informant interviews with key personnel in the public health department and its district offices as well as PWA and CMWU. This is done in order to evaluate the waterborne diseases surveillance system as part of the national communicable diseases surveillance system by the MoH inside clinics and hospitals and its synergism and synchronization with national water quality surveillance system implemented by CMWU. The aim of this activity is to evaluate the ability of the system to detect and trigger a response to WBD outbreaks and highlight the role and responsibilities of different actors and stakeholders in the response in light of the WHO recommendations.

c) Data Analysis

Data was retrieved from the server (uploaded from the ODK data collection methodology) cleaned and analyzed to compute the indicators, sub-indicators and other necessary variables. Forty-eight indicators were used in order to capture the WASH in the health facilities. Each sector includes indicators and sub indicators for achieving minimum standards for maintaining a safe and clean environment. These standards are based on global core indicator standards as set by the JMP, WHO Essential environmental health standards in health care (WHO, 2008) and Water and Sanitation for Health Facility Improvement Tool (WASH FIT). Two indicators were added in order to assess the availability and the implementation of surveillance system for water borne diseases and for health care associated infections. Data from the two surveillance systems were retrieved for the last three years and cross-checked with the current results of the survey, as well as WASH Assessment at HH Level in the Gaza Strip, 2017,[18] and Water Safety Plan, 2019,[19] both implemented by WW-GVC.

- The indicators were analysed in two levels:
  - Core indicators for WASH in HCFs (Table V)
  - Advanced indicators for WASH in HCFs (Table VI)
- The rating system of the indicators was performed by using the traffic light colours: Red, Yellow, Green based on certain criteria under each indicator.

Table IV: Rating System of WASH Indicators

Traffic Light Colour	Criteria
Unimproved Services/Doesn't meet target	HCF has made few or no progress towards achieving the indicator
Limited Services/Partially meets the target	HCF has made some progress towards achieving the indicator.
Basic Services/Fully meets the target	HCF has achieved the indicator.

- The inspection forms targeting the wells, water storage containers, infants' formula preparation areas were analysed by risk score that entails count the number of risk factors in to four levels of risk: very high risk, high risk, medium risk, low risk.
- Inspection forms for the desalination units and the toilets were translated into investment' costs.
- Water quality results were analysed based on the WHO standards for chemical and biological water analysis.
- Key informant interviews were translated into an evaluation report for surveillance system and response in light of the WHO standards and recommendations.

[18] WASH Assessment at HH Level in the Gaza Strip, WW-GVC, 2017.

[19] WW-GVC, Approach to the Water Safety Plan, Pilot Study – the Gaza Strip, WW-GVC, 2019.

Table V: List of Core Indicators for WASH in HCFs

Sector	**Water**
Proportion of HCFs with water available from an improved water supply located on premises and water is available throughout the year.	
Sector	**Sanitation**
Proportion of HCFs with improved and usable sanitation facilities, 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 users with limited mobility.	
Sector	**Hygiene**
Proportion of HCFs with functional hand hygiene facilities available at one or more points of care and within 5 meters of toilets. Proportion of HCFs, which have protocols for cleaning, and staff with cleaning responsibilities have all received training on cleaning procedures.	
Sector	**Medical Waste disposal**
Proportion of HCF with waste correctly segregated in the consultation area.	

Table VI: List of Advanced Indicators

WASH MANAGEMENT
1. Number/percentage of HCFS where standard operating procedures (sops) of water sanitation, hygiene and health waste management facilities 2. Number/percentage of HCFs where an annual budget is planned to include WASH infrastructure services, personnel and the continuous procurement of WASH item which is sufficient to meet the needs of the facility. 3. Number/percentage of HCFs which have wash Emergency preparedness and response plan that includes for example WASH stored items to be used during Emergency. 4. Number/percentage of HCFs where Regular ward-based audits are undertaken to assess the availability of hand rub, soap, single use towels and other hand hygiene resources. 5. Number/percentage of HCFs where Regular hand hygiene compliance activities are undertaken regularly among all health care staff. 6. Number/percentage of HCFs where health care staff are trained on WASH/ IPC each year 7. Number/Percentage of HCFs where each cleaning and waste disposal staff member is provided with the basic personal protective clothes. 8. Number/Percentage of HCFs where WASH staff exposed to health risks vaccinated against Hepatitis B
WATER
9. Number/Percentage of HCFs where water quality is monitored regularly regarding chemical and biological parameters. 10. Number/Percentage of HCFs where water is treated that have sufficient supplies and adequately trained staff to carry out treatment. 11. Number/Percentage of HCFs where Energy is available for heating water**.**
SANITATION
12. Number/Percentage of HCFs with wastewater drainage system functioning (sufficient capacity and well designed). 13. Number/Percentage of HCFs where the surface run-off drainage system avoids carrying contamination outside the health-care setting 14. Number/Percentage of HCFs with wastewater pretreatment units like grease traps, septic tanks and so on 15. Number/Percentage of HCFs where toxic wastes (e.g. reagents from a laboratory) are treated as health-care waste. 16. Number/Percentage of HCFs where infectious liquid wastes (e.g. blood or body fluids) are treated as health-care waste
HYGIENE
17. Number/Percentage of HCFs where Record of cleaning visible and signed by the cleaners each day. 18. Number/Percentage of HCFs which has effective and regular vector control measures
Medical Waste Management
19. Number/Percentage of HCFs where adequately trained person is responsible for the management of health care waste in the health care facility 20. Number/Percentage of HCFs which have monitoring system to ensure the segregation facilities used effectively 21. Number/Percentage of HCFs where a well identified, sited and protected (fenced) waste zone/area for waste collection and storage. 22. Number/Percentage of HCFs where waste-related injuries along the waste management chain correctly are reported.
Waterborne disease surveillance
23. Number/Percentage of HCFs where waterborne diseases surveillance system is implemented and completed.

CHAPTER 3: RESULTS AND DISCUSSION

3.1 GENERAL HEALTH CARE FACILITY INFORMATION

A total of 21 health care facilities were enrolled in the study which represents 33% of the MoH run facilities and 11.7% of all health facilities in the Gaza Strip (Map 2). The facilities included 16 primary health care (PHC) facilities (32% of MoH run PHCs) and 5 hospitals (35% of MoH run hospitals). One hospital in each Governorate was assessed randomly with capacity ranging from 65 beds in Al Najjar hospital to 439 beds in Al Shifa Hospital. Twenty-one interviews with HCFs key persons including the medical director, the admin director, the head of the IPC committee, the head of engineering and maintenance department and operational staff were carried out. Two hundred and eighty-five observational checklists and interviews with head of units were completed. Ten key informant interviews were conducted at regional and district levels including the public health department, the environmental unit department, the PWA, the CMWU, WASH cluster, Health Cluster and WHO.

3.1.1 PRIMARY HEALTH CARE FACILITIES (PHCS)

Sixteen primary health care facilities were included in the study; three PHCs located in North Gaza Governorate, two PHCs located in Gaza Governorate, seven PHCs in the Middle Area Governorate, two PHCs in Khan Younis and two in Rafah Governorate (Table VII). The PHCs included eight facilities providing level 2 services, five facilities providing level 3 services and three PHCs providing level 4 services. The total number of staff members working in the targeted PHC facilities is 267; representing 16% of the total staff working in MoH run PHC facilities. Around 54% of them are male, 45% are female while 1% are PWD. An average number of people served in the targeted PHC clinics ranges from 600 to 2,000 in the level 2 PHCs, 2,000 to 6,000 in the level 3 targeted PHCs and 6,000 to 13,000 in the level 4 targeted clinics. In 2018, the selected facilities reported a total number of 59,000 cases which represents 32% of all cases seen in the MoH run facilities. The main source of electricity in all the assessed PHCs is the public network, supported with generators as back up source; in addition, two PHCs have also solar panels.

Table VII: Targeted PHCs, Levels and Catchment Area

#	Targeted PHC Facility	Level	Catchment area	Locality	Governorate
1.	**Shohadaa Al Atatarah**	2	25,961	Al Atatrah	North Gaza
2.	**Al Shima**	3	42,614	Al Shima	
3.	**Hala Al Shawa**	2	32,500	Mashrou Beit lahia	
4.	**Juher Al Diek**	2	1,665	Juer Al Diek	Gaza
5.	**Al Moghraqa**	2	9,201	Al Moghraqa	
6.	**Al Berka**	2	5,931	Al Berka	Middle Area
7.	**Dier al Balah**	4	75,367	Deir Al Balah	
8.	**Heker Al Jamee**	2	10,935	Al Heker	
9.	**Al Mghazi**	2	18,291	Al Mghazi	
10.	**Al Swarha**	2	7,070	Al Sawarha	
11.	**Shohadaa Al Nusirat**	3	22,126	Al Nusirat west	
12.	**Old Al Nusirat**	3	46,070	Al Nusirat East	
13.	**Shohadaa Khan Younis**	4	64,719	Khan Younis	Khan Younis
14.	**Shohadaa Bani Souheila**	3	43,082	Bani Souheila	
15.	**Shohadaa Tal Alsoltan**	3	43,125	Tal Al Soltan	Rafah
16.	**Shohadaa Rafah**	4	98,582	Rafah	

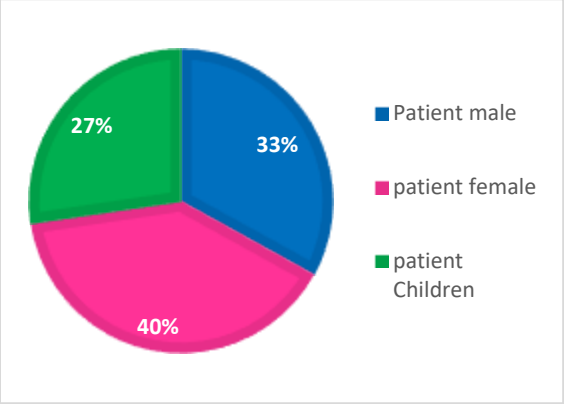


Figure 5: Average Number of Patients seen at the Targeted PHCs

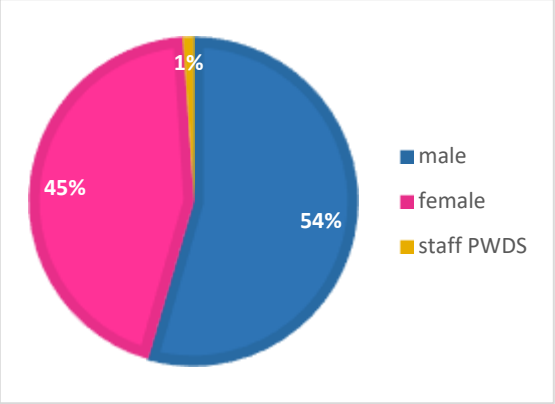


Figure 6: Average Number of Heath Staff Working at the Targeted PHCs

3.1.2 SECONDARY HEALTH CARE FACILITIES - HOSPITALS

Five secondary health care (SHC) facilities were included in the assessment with an average of one facility per each Governorate: Indonesian hospital in the North Governorate, Al Shifa hospital in Gaza Governorate, Shohadaa Al Aqsa hospital in the Middle Area Governorate, European Hospital in Khan Younis Governorate and Al Najjar Hospital in Rafah Governorate. The total number of staff members working in the targeted SHC facilities is 3,779 representing 65% of the total staff working in the MoH run hospitals. Around 55% of the staff is male, 45% is female, while 1% out of 100% are men and women with disabilities.

An average number of cases served/month in the targeted hospitals ranged from 11,000 in Al Najjar Hospital to more than 39,000 in Al Shifa hospital. Based on the 2018 facilities report[20] a total number of 4,626,858 cases were seen in the targeted facilities, which represents 57% of all cases seen in the MoH run facilities. The targeted hospitals provide both inpatient and outpatient services as well as emergency departments working 24 hours/day for surgical and medical patients, two of them providing maternity and delivery services and four of them providing haemodialysis facilities with an average of 2.5 session per week for each patient (Figure 9). The main source of electricity in all of the assessed five hospitals is the public network supported with generators as back up source; three hospitals are supported with solar panels as backup energy.

Table VIII: Targeted Hospitals, Bed Capacity and Population Served

#	Targeted hospital	Bed capacity	Governorate	Population	Total number of Hospitals/governorates
1	**Indonesian hospital**	110	North Gaza	368,978	2
2	**Al Shifa**	439	Gaza	652,597	7
3	**Shohdaa Al Aqsa hospital**	166	Middle Area	273,200	1
4	**European hospital**	248	Khan Younis	370,638	2
5	**Al Najjar hospital**	65	Rafah	233,878	2

[20] HeARM Health Opt Dash Board, 2018.

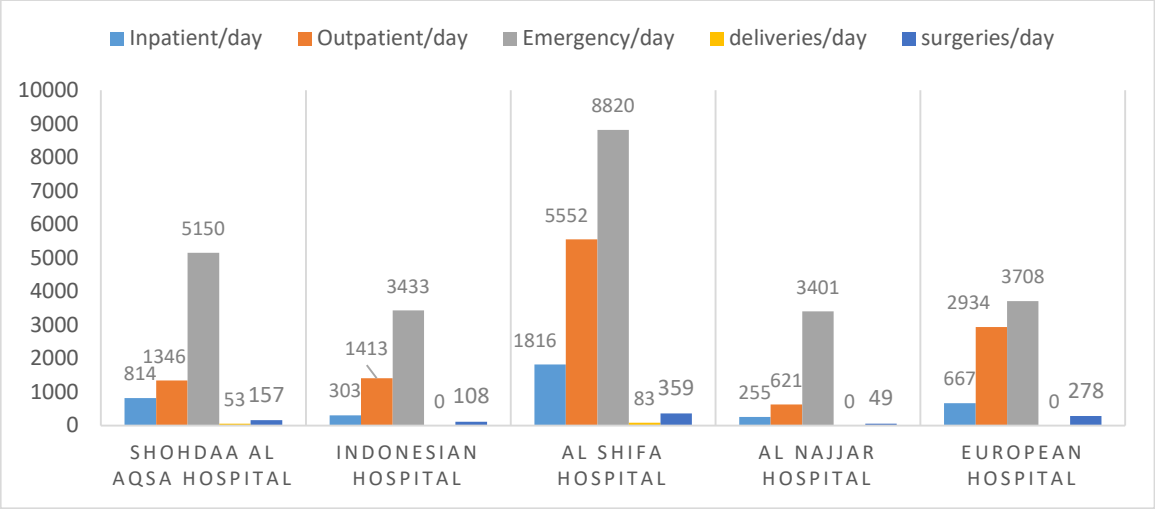


Figure 7: Average Number of Patients Seen in the Assessed Hospitals

3.2 CORE INDICATORS FOR WASH IN HEALTH

3.2.1 BASIC WATER INDICATOR

Proportion of HCFS with water available from an improved water source located on premises and water is available throughout the year.

Improved water sources are those which, by nature of their design and construction, have the potential to deliver safe water including: piped water, boreholes or tube wells, protected dug wells, protected springs, rainwater, and packaged or delivered water**. On premises** water is accessed within buildings, or within the facility grounds. **Available Water** from the main water source is available on the day of the survey or questionnaire[21].

Advance service	**To be defined at national level (e.g. water is available when needed, accessible to all, free from contamination, etc.)**
Basic service	**Water from an improved source is available on premises**
Limited service	**There is an improved source, but it is not on premises or water is not available**
No service	**No water source or an unimproved source**

Figure 8: JMP Service Ladder for Water Supply in Health Care Facilities, 2017[22]

[21] Global WASH in Health Care Facility Indicators, WHO & UNICEF, 2018.

[22] Wash In Health Care Facilities Global Baseline Report, WHO & UNICEF 2019.

All the assessed 21 HCFs are receiving water supply from improved water sources through piped water from the municipality networks or Mekorot. In addition, seven HCFs were having onsite wells including two PHCs and five hospitals (European Hospital was using the well as back up source for water) (Figure 12). Water is accessible onsite inside all departments and was available at the time of the survey in all the facilities.

On the other side, 12 of the assessed HCFs[23] are not using the main source of water for drinking purpose, they are instead receiving drinking water from unimproved water resources through water trucking. The remaining nine HCFs had onsite desalination units, including five hospitals and 4 PHCs (Figure 11). In the Al Shifa Hospital water from the desalination unit is supplied through all networks of water, while in the other 8 HCFs, special networks for water from desalination units are separated from the networks supplied from the main source directly. In the Shohadaa Al Aqsa hospital, one of the two wells are considered an unimproved source of water as the design of the well receives water from rainwater harvesting without treatment. Although the well is not used as a source of water for hospital use, following an official decision from the MoH, the well is still occasionally used for construction and engineering departments work. There is a need to separate the hospital networks from this water source. Moreover, distilled water used for equipment in certain department such as ICUs and laboratory work are another gap in the water supply chain especially in departments with lack of special water treatment. Water handling policies are essential to be put in place in order to ensure safety of water while transportation.

WHO recommends that water for drinking, cooking, personal hygiene, medical activities, cleaning and laundry should be safe for the intended purpose.[24] The JMP recommends safe drinking water should always be regularly monitored and be free from pathogens and elevated levels of toxic substances. Drinking water is defined as water used for drinking, cooking, food preparation and personal hygiene. The principal indicator of water safety used by the JMP is the absence of fecal indicator bacteria in a 100 mL sample[25]. In order to assess the safety of water supplied to the HCFs an in-depth analysis of quality of water used for drinking, domestic and hemodialysis was performed through all the water supply chain from source to consumer which questioned the quality and safety of water (section 3.2.6).

Following the JMP 'ladder' of water facility, 100% of the assessed health care facilities had basic water services at the times of the assessment (Figure 8, Table IX). Five[26] of the assessed HCFs reported that availability of water throughout the year was affected by the electricity cuts, which was mostly noticed in summertime.

Table IX: Number of Assessed HCFs with Basic Water Services

Indicator Score	Criteria	PHCs	Hospitals
Basic services	Available from an improved source located on premises	16	5
Limited services	An improved water source is within 500 meters of the facility, but not all requirements are met	0	0
No services	unimproved source; or an improved source more than 500 m from the facility; or the facility has no water source	0	0

[23] Shohadaa Al Atatarah Clinic, Al Berka, Heker Al Jamee, , Al Shima, Hala Al Shawa, Al Maghazi, Juhor Al Diek, Al Swarha, Shohadaa Al Nusirat, Old Al Nusirat, Shohadaa Tal Alsoltan, Bani Suheila.

[24] WHO Environmental Health Standards, 2008.

[25] Safely Managed Drinking Water - Thematic Report on Drinking Water, WHO-UNICEF, 2017.

[26] Hala Al Shawa, Shohadaa Al Nusirat Clinic, AL Sawarha, Shohadaa Tal Al sultan, Shohadaa Khanyounis.

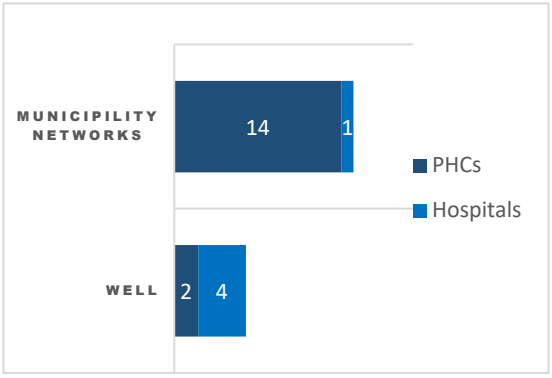


Figure 9: Domestic Water Sources in the Assessed HCFs

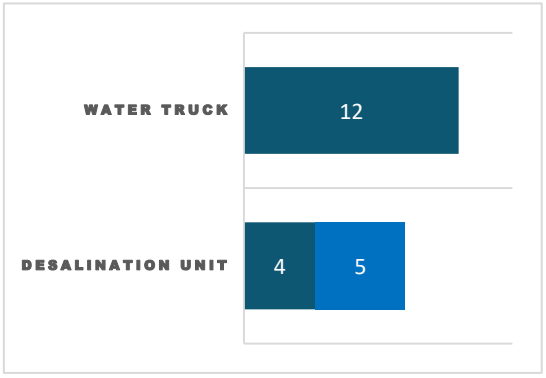


Figure 10: Drinking Water Sources in the Assessed HCFs

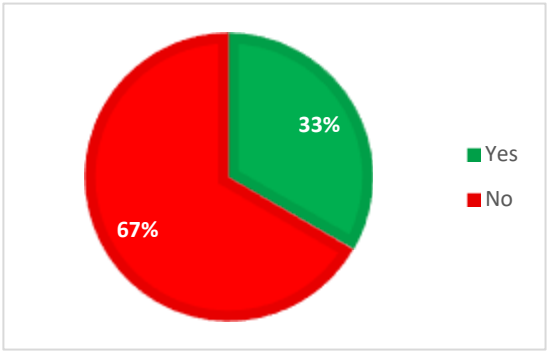


Figure 11: Domestic Water Sources in the Assessed HCFs

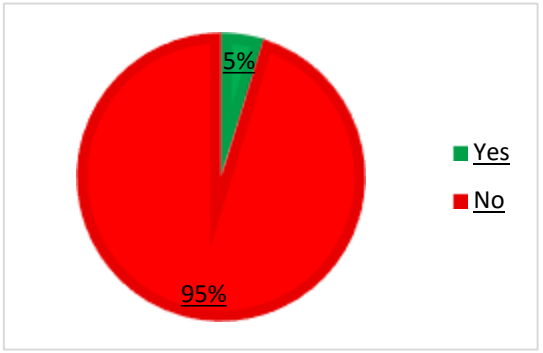


Figure 12: Percentage of Assessed HCFs with Backup Source for Drinking Water

3.2.2 BASIC SANITATION INDICATOR

Proportion of HCFs with improved and usable sanitation facilities 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 users with limited mobility.

Improved sanitation facilities are those designed to hygienically separate excreta from human contact including flush/pour flush to piped sewer system, septic tanks or pit latrines, ventilated improved pit latrines, composting toilets or pit latrines with slabs. **Usable toilets** are available on premises; doors are unlocked or a key is not available at all times; functional, not broken, the toilet hole is not blocked, no cracks or leaks in the toilet structure and water is available for flush/pour-flush toilets; privacy with doors that can be locked from the inside and no large gaps or holes in the structure on the day of the survey or questionnaire. **Dedicated for staff** means that there are separate toilet facilities dedicated for patient and staff use, sex-separated with menstrual hygiene facilities. **At least one toilet is separated for use by women/girls only**, which has a bin with a lid on it and/or water and soap available in a private space for washing. **Accessible for users with limited mobility**: meet relevant national or local standards. In the absence of such standards, toilets should be accessible without stairs or steps, have handrails for support attached to either the floor or sidewalls, a door, which is at least 80 cm wide, and the door handle and seat within reach of people using wheelchairs or crutches/sticks.

SANITATION	
Basic Services	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.
Limited Services	At least one improved sanitation facility is available, but not all requirements for basic service are met.
No Services	Toilet facilities are unimproved (e.g. pit latrines without a slab or platform, hanging latrines, bucket latrines) or there are no toilets.

Figure 13: JMP Service Ladder for Sanitation in Health Care Facilities, 2019

The WHO environmental health standards recommend, that the ratio of one toilet per 20 people should be used as a planning guideline in inpatient areas. In outpatient settings, a suitable arrangement is often as follows: one toilet for staff (two if separate toilets are required for male and female staff), one toilet for male patients, one toilet for female patients, and one child's toilet.

All assessed HCFs had improved toilets, represented mainly by flush toilet to sewer system, and all were located on premises. Fifteen (71%) of the assessed HCFs (11 PHCs and four hospitals) had toilets that were separated for males and females. Nine (42%) of the assessed HCFs (five PHCs and four hospitals) had toilets that were separated for staff and patients. Four (19%) of the assessed HCFs (two PHCs and two hospitals) had at least one toilet meeting the needs of people with limited mobility in the patient areas. In two hospitals, PWDs adapted toilets were only available in certain departments mainly the orthopedic departments.

Moreover, the ratio of toilets per patients in inpatient areas in the assessed 5 hospitals is almost meeting the WHO standards (1:20) at normal times. The ratio is not met during emergency and overcrowding situations. In 3 assessed PHCs[27], the number of toilets is less than the recommended. In old Al Nusirat clinic, only 2 toilets are available for staff and patients. "*Female staff are unable to use the toilets and one of them goes to her house next to the clinic during work to use the toilet*" said the admin director of the clinic. It is worth mentioning, that there were no toilets adapted for children in any of the assessed HCFs, not even in paediatric departments.

In details, 136 toilets were assessed in the 21 health care facilities. Regarding privacy and safety, only 22% of the toilets were clearly separated by a signage for females and males, 25% were defined as a separate toilet for males or females but without a clear signage and 53% were toilets used by males and females without separation (Figure 15). On the other side, 12% were clearly separated by a signage for staff and patients and 25% were defined as separate toilets for staff or patients but without a clear signage while 63% were used by staff and patients without separation (Figure 14).

All toilets have a closable door, but 62% had no door locks from inside. In addition, 59 toilets were in bad conditions and require renovation of main parts and maintenance of plumping systems, doors, walls and tiles, electrical fittings, lightings, windows and ventilation. Fifty percent of the assessed toilets were not visibly clean.
Following the JMP ladder for sanitation: four (19%) of the assessed HCFs (two PHCs and two hospitals[28]) had basic sanitation services as defined by the JMP. The rest of the 17 assessed HCFs (14 PHCs and three hospitals) had limited basic sanitation services as not all the requirements for basic service are met.

[27] Al Sawarha, Al Mughraqa, Heker El Jamee, Old Al Nusirat.

[28] Al Shifa Hospital, Shohadaa Al aqsa Hospital, Juher Al Diek, Shohadaa Al Nusirat.

Table X: Number of Assessed HCFs with Basic and Limited Sanitation Services

Indicator Score	Criteria	PHCs	Hospitals
Basic services	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.	2	2
Limited services	At least one improved sanitation facility, but not all requirements for basic service are met.	14	3
No services	Toilet facilities are unimproved (pit latrines without a slab or platform, hanging latrines and bucket latrines), or there are no toilets or latrines at the facility.	0	0

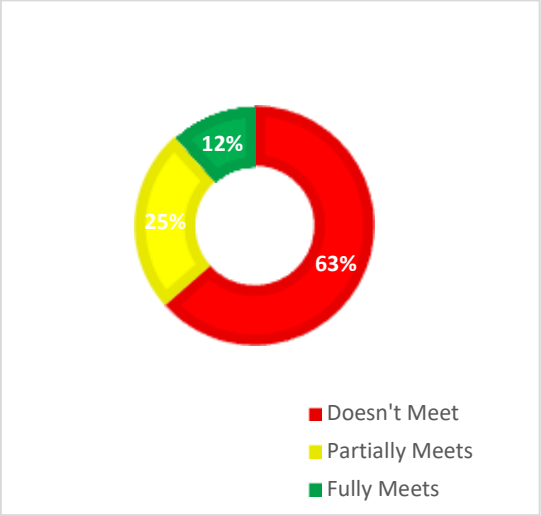


Figure 14: Percentage of Assessed Toilets that are clearly separated for Staff and Patients

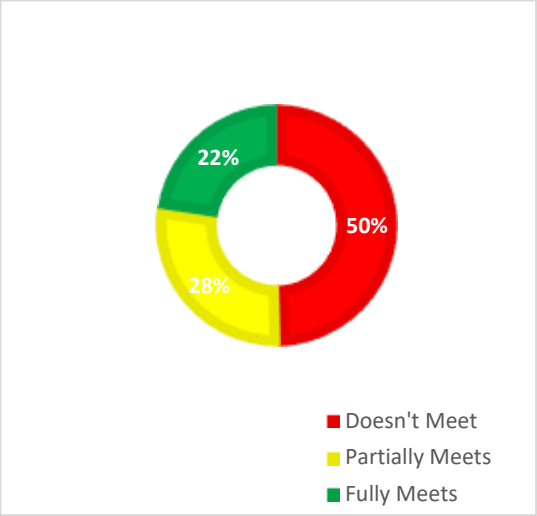


Figure 15: Percentage of Toilets that are clearly Separated for Males and Females

3.2.3 BASIC HYGIENE INDICATOR

Proportion of HCFs with functional hand hygiene facilities available at one or more points of care and within 5 meters of toilets.

A hand hygiene facility is any device that enables staff and patients to effectively clean their hands, such as a sink with tap, water tank with tap, bucket with tap or other similar devices. Alcohol based hand rub dispensers are also hand hygiene facilities, whether they are fixed or portable.

Functional: hand hygiene facilities at points of care must have either alcohol-based hand rub, or soap and water. If alcohol-based hand rub is used, health care staff may carry a dispenser around between points of care. Hand hygiene facilities at toilets must have soap and water available within 5 m from toilets. Alcohol-based rub is not considered adequate for hand hygiene at toilet, as it does not remove faecal matter from

hands. Chlorinated water (a prepared solution of chlorine suspended in water) is not considered an adequate substitute for soap and water, or for alcohol-based hand rub.

Points of care are any location in the health care facility where care or treatment is delivered (e.g. consultation/exam rooms).

Within 5 m of toilets: hand hygiene facilities at toilets must be located no more than 5 metres from the toilets.

HYGIENE	
Basic Services	Functional hand hygiene facilities (with water and soap and/ or alcohol-based hand rub) are available at points of care, and within five meters of toilets.
Limited Services	Functional hand hygiene facilities are available either at points of care or toilets but not both.
No Services	No functional hand hygiene facilities are available either at points of care or toilets.

Figure 16: Basic Hygiene Services Ladder for Health Care Facilities, JMP 2019

All Assessed HCFs had a functional hand hygiene facility available at all points of care which includes sink with tap and/or portable alcohol hand dispensers. In addition, all toilets had hand washing facility within 5 meters equipped with soap dispensers. Following the JMP ladder, 100% of the assessed HCF had basic hygiene services as defined by the JMP (Table XI).

In details, 61 hand hygiene facilities were assessed randomly inside the 21 HCFs through walk checklist regarding the availability of running clear water, soap and soap dispensers, disposable towels, poster explaining correct hand hygiene, poster explaining the 5 moments of hand hygiene, sink cleanliness, taps and drainages pipes not leaking. The inspection showed that 100% of the assessed sinks had clear running water at time of the assessment, 97% of the assessed sinks had disposable soap dispensers filled with soap although in 28% of the sinks the dispensers were not new or clean. In 54% of the assessed sinks, disposable towels were available at the time of the assessment, while poster for explaining the "WHO 5 moments of hand hygiene" and "correct way for hand hygiene" were only available in 18% and 20% of the assessed sinks respectively. Moreover, 84% of the assessed sinks were in good condition at time of assessment and 74% were noted visibly clean while the taps and the pipes were leaking in 31% and 21% of assessed sinks respectively (Figure 17).

Table XI: Number of HCFs with Basic Hygiene Services

Indicator Score	Criteria	PHCs	Hospitals
Basic services	Functional hand hygiene facilities (with water and soap and/or alcohol based hand rub) are available at points of care, and within 5 meters of toilets	16	5
Limited services	Functional hand hygiene facilities are available at either points of care or toilets, but not both	0	0
No services	No functional hand hygiene facilities are available at either points of care or toilets	0	0

The continuous provision of hand hygiene supplies is the responsibility of the contracted cleaning company including liquid soap and towels. The MoH issues clear instruction on the type and quality of materials to be used. However, staff in the HCF were unsatisfied with the quality and continuous availability of the hand hygiene supplies. "*Paper towel is only 1-meter roll which is not enough for the load of work and made of poorly absorbable materials while Soap and alcohol rubs' dispensers are easily lost*" said one staff member at the Al Shifa Hospital. The installation of high-quality wall mounted dispenser, which can be cleaned easily and are able to support the load of work, requires high costs. Alcohol-based hand rubs (ABHRs) supplies are provided through the central MoH pharmacy. Continuous availability of ABHRs faces budget shortages for the procurement of essential supplies and medications by the MoH.

Moreover, three of the assessed hospitals, that host Neonatal intensive care units (NICUs) within its premises, were evaluated by an in-depth assessment of the formula preparation in light of the WHO standards[29]. Al Shifa Hospital is the only hospital which has a designated separate area for infant formula preparation that was established by UNICEF funds. In Shohadaa Al Aqsa no designated area for infant formula preparation is available and the feeds are prepared on time of feeding. In European Hospital, feeds are prepared in the staff kitchen. The main identified gaps are mostly lack of clear instruction on hand hygiene, washing of feeding and preparation equipment, as well as lack of instruction posters on the preparation of infant formula. In European and Al Shifa hospitals, feeds are prepared in unsuitable containers. Moreover, reuse of intralipid empty bottles (after sterilization in the autoclave) for preparation and storage of milk was observed in European Hospital (Table XII).

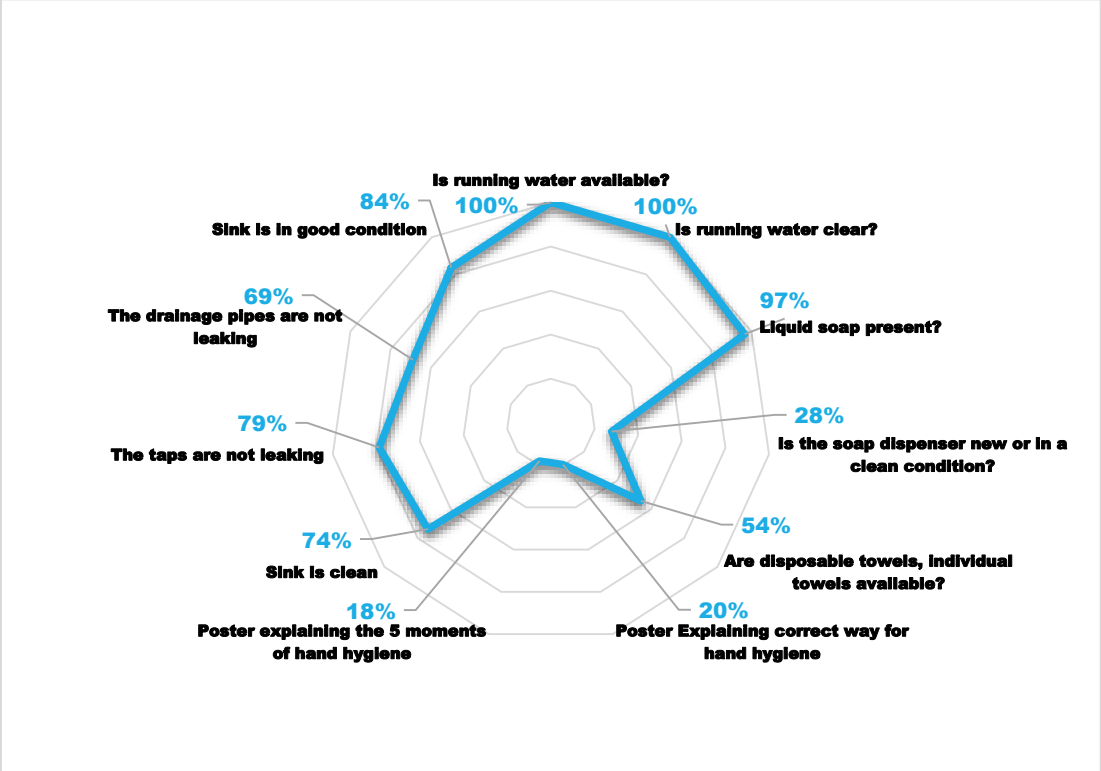


Figure 17: Inspection of Sinks in the Assessed HCFs

[29] Safe Preparation, Storage and Handling of Powdered Infant Formula Guidelines, WHO, 2007.

Table XII: Assessment of Infant Formula Preparation Hygiene Standards in 3 Hospitals

Indicator	Shohadaa Al Aqsa	European Hospital	Al Shifa Hospital
Clean dedicated area for preparation and storage of infant formula	No	Yes	Yes
Hands washing station with soap and water	Yes	Yes	Yes
Clear instruction posters on hand hygiene washing	No	No	No
Clear instruction posters on wash feeding and preparation equipment (e.g. cups, bottles, teats and spoons)	No	No	No
Sterilizing equipment is available	No	No	Yes
Sterile thermometer is available	No	No	No
Clear instruction posters on the preparation of infant formula are available and updated	No	No	No
If making a batch in a larger container: the container should have been cleaned and sterilized. It should be no larger than 1 liter, be made from food-grade material and be suitable for pouring hot liquids.	feed by feed	Not adequate (reuse of Intralipids bottles)	Not suitable
The temperature of the refrigerator should be no higher than 5 °C and should be monitored daily.	No storage	No monitor	No monitor
Date of preparation is documented on each bottle	feed by feed	Yes	Yes
Feeds stored in the refrigerator more than 24 hours.	feed by feed	Yes	Yes

3.2.4 BASIC ENVIRONMENTAL CLEANING

Proportion of HCFs which have protocols for cleaning, and staff with cleaning responsibilities have all received training on cleaning procedures.

Protocols should include: step-by-step techniques for specific tasks, such as floor and sink cleaning, spillage of blood or body fluids cleaning and a cleaning roster or schedule, specifying the frequency at which cleaning tasks should be performed.

Staff with cleaning responsibilities includes non-health care providers, such as cleaners, as well as health care providers who, in addition to their clinical and patient care duties, are responsible for cleaning.

Training refers to structured training plans or programs led by a trainer or appropriately qualified supervisor.

ENVIRONMENTAL CLEANING	
Basic service	Basic protocols for cleaning are available, and staff with cleaning responsibilities have all received training.
Limited service	There are cleaning protocols and/or at least some staff have received training on cleaning.
No service	No cleaning protocols are available and no staff have received training on cleaning.

Figure 18: Basic Environmental Cleaning Services Ladder for Health Care Facilities, 2019

The MoH outsources the hygiene and cleaning service in all the MoH run health facilities from private cleaning companies through service contracting. The cleaning companies are responsible for recruitment of

all the human resources (cleaners and supervisors), management and logistics, including the provision of cleaning materials and vector control procedures based on certain specification and requirements. In each facility, the admin directors are responsible for monitoring and supervising the quality of cleaning materials, the intensity of cleanliness and the proper distribution of hand hygiene supplies inside patient areas.

Protocols for environmental cleaning are adopted from the WHO accredited protocols: the Jordanian national IPC protocols. Policies and procedures for environmental cleaning of different zones of the HCFs were developed in written form in all five assessed hospitals by the IPC teams. Policies and procedures for environmental cleaning were defined inside the assessed 16 PHCs but not disseminated in written form due to lack of IPC teams to monitor the hygiene and infection control standards.

In 48% of the assessed HCFs (nine PHCs) all cleaners had received training on policies and procedures for environmental cleaning at the start of their job by the hiring company, while in 52% of the assessed HCFs (five hospitals and six PHCs [30]) not all cleaners received training. In 52% of the assessed HCFs (five hospitals and six PHCs), not all health care providers were trained on cleaning requirements and practices. Moreover, in 48% (12 PHCs[31]) none of the health care providers had ever received training on cleaning practices. This is caused by the load of work, lack of budget to perform the trainings, staff with long experience not requiring undergoing training, lack of commitment and lack of awareness among health care providers besides lack of well qualified supervisors to perform the trainings, especially in PHCs.

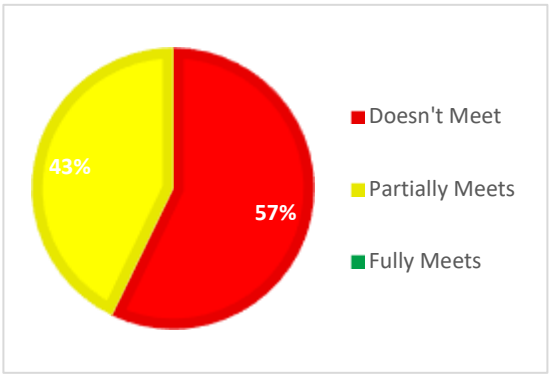


Figure 19: HCFs where Nursing Staff trained on Cleaning Procedure

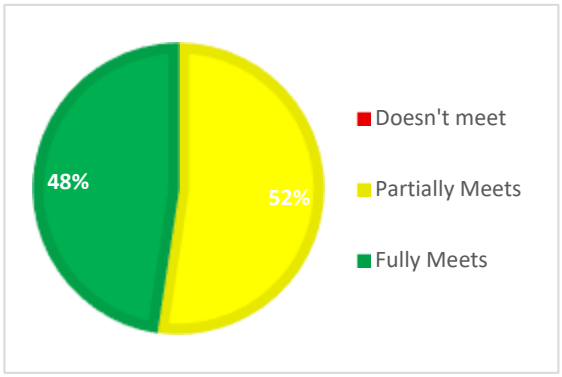


Figure 20: HCFs where Cleaners Staff trained on Cleaning Procedures

Following the JMP ladder of basic environmental cleaning, all the assessed health care facilities had limited environmental cleaning services, where cleaning protocols were available at the MoH but policies and procedures were not disseminated in written form among facilities, or where only some staff had received training on cleaning requirements and practices.

[30] Shohadaa Al Atatarah Clinic, Al Moghraqa, Al Berka, Deir al Balah, Heker Al Jamee, Shohadaa Tal Alsoltan, Hala Al Shawa.

[31] Shohadaa Al Atatarah Clinic, Hala Al Shawa, Al Moghraqa, Al Berka, Deir al Balah, Heker Al Jamee, Juhor Al Diek, Al Swarha, Shohadaa Al Nusirat, Old Al Nusirat,, Shoahaa Bani Suheil.

Table XIII: Number of Assessed HCFs with Basic Environmental Cleaning Services

Indicator Score	Criteria	PHCs	Hospitals
Basic Services	Basic protocols for cleaning available, and staff with cleaning responsibilities have all received training.	**0**	**0**
Limited Services	There are cleaning protocols, or at least some staff have received training on cleaning.	**16**	**5**
No Services	No cleaning protocols are available, and no staff have received training on cleaning.	**0**	**0**

An in-depth assessment of 36 inpatient areas and 136 toilets inside the HCFs through inspection checklist of environmental cleaning and hygiene standards showed weaknesses in maintaining intensity of cleanliness in the inpatient departments especially in high touch zones (telephones, light switch, medication trolley). About 42% were not visibly clean in between patients and 53% bedding has not been changed in between patients. Lack of sufficient supplies of waterproof cover mattresses was very much critical in surgical and obstetric departments. Fluid and blood oozing from the wounds into the mattresses are a media for bacteria and worms' growth. "*I had to change all the mattresses of the beds with other mattresses which do not fit the beds 'sizes because of the bad smell and worms' growth in the mattresses*" said a midwife in Shohdaa Al Aqsa. Bedside lockers and curtains had visible contamination in 63% and 67% of the inpatient areas respectively. Bedside equipment (suction and oxygen) were not clean or changed in between patients, where water inside the humidifier could be a source of Legionella Pneumophilia growth and infection. Nurses complained about absence of sufficient supplies of disposable nasal cannulas and oxygen masks to be changed in between patients. Cleanliness of toilets was not optimal, posing high risk on patients especially in inpatient areas, where toilets are available inside the patient rooms. (Figure 21)

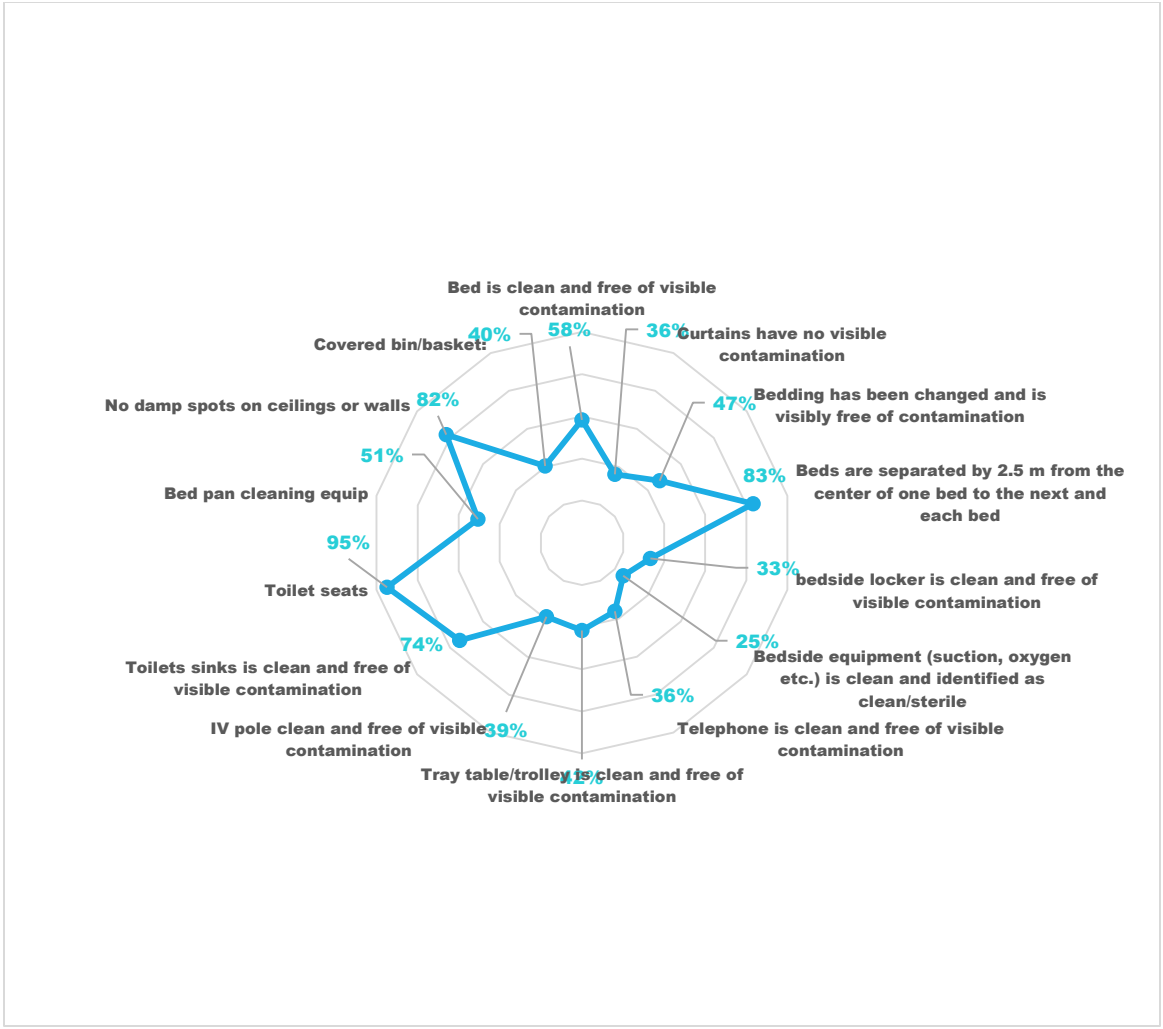


Figure 21: Inspection of Hygiene Standards in Inpatient Areas

3.2.5 BASIC MEDICAL WASTE SERVICES

Proportion of HCF with waste correctly segregated in the consultation area

Safely segregated in consultation area: at least three clearly labelled or colour coded bins should be in place to separate (i) sharps waste, (ii) infectious waste, and (iii) non-infectious general waste. Bins should be no more than three quarters (75%) full, and each bin should not contain waste other than that corresponding to its label. Bins should be appropriate to the type of waste they contain; sharps containers should be puncture-proof and others should be leak-proof. Bins for sharps waste and infectious waste should have lids.
Consultation areas are rooms or areas within the health care facility where care or treatment is delivered.
Safe treatment and disposal methods include incineration, autoclaving, and burial in a lined, protected pit. Wastes may also be collected and transported off-site for medical waste treatment and disposal.

WASTE MANAGEMENT	
Basic service	Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely.
Limited service	There is limited separation and/or treatment and disposal of sharps and infectious waste, but not all requirements for basic service are met.
No service	There are no separate bins for sharps or infectious waste, and sharps and/or infectious waste are not treated/disposed of safely.

Figure 22: Basic Hygiene Services Ladder for Health Care Facilities, JMP 2019

In all the 21 assessed HCFs, coloured coded bags in half flip covered bins were used for general and infectious waste collection, and disposable boxes made of heavy-duty puncture proof kraft paper and cardboard material were used for sharp waste inside all consultation areas. Black coloured bags were used for general waste, yellow ones were used for infectious waste and red ones were used for chemical waste. The continuous supply of the bags and bins is the responsibility of the cleaning company. An inspection walkthrough was conducted to 51 patient areas in the assessed 21 HCFs in order to evaluate the availability of the waste bins with coloured bags and the segregation of waste showing that in 100% of the patient areas waste bins with coloured bags were available in all patient areas within 5 m from points of generation. In 25% of the patient areas, waste bins were not labelled and in 59% the waste bag colour was not corresponding to the label on the bin. Correct waste disposal was observed in 100% of sharp boxes containers and in 88% of areas sharp waste was correctly segregated in the sharp boxes. Moreover, correct segregation of infectious and general waste was observed in 49% of the areas. In 25% of the assessed patient areas, posters explaining the right method of medical waste classification were hanging on the walls.

Sharp boxes are safely collected and transported to incineration treatment facilities at Shifa hospital or Nasser hospital. However, infectious wastes segregated onsite into yellow coloured plastic bags are not separately transported to treatment facility but are discharged into municipal waste collection services with general waste segregated in black coloured bags. These results came in line with a study that was conducted by the Japan International Cooperation Agency (JICA) on Medical Waste in the Gaza Strip in 2016[32]. JICA has established a pilot project with MoH and the Joint Service Council for Solid Waste Management (JSC) in November 2018, in UNRWA and MoH run PHCs and the haemodialysis department in Al Shifa Hospital. The project envisaged three categorical separation of medical waste (sharp, infectious and general waste) and the JSC will be responsible for the collection and treatment of infectious and sharp waste. Capacity building of staff members was conducted; guidelines and posters for medical waste separation and collection were distributed. Up to the date of the assessment, the targeted PHCs have started to segregate and collect the infectious waste separately from the general waste but eventually they had to discharge it with general waste. Following the JMP ladder for medical waste management, all of the assessed HCFs have shown limited separation and/or treatment and disposal of sharps and infectious waste.

[32] The Final Report of the Japanese Expert on the Study on Medical Waste in Gaza, Palestine, June 2016.

Table XIV: Number of HCFs with Basic Medical Waste Services

Indicator Score	Criteria	PHCs	Hospitals
Basic Services	Waste is safely segregated into at least three bins and sharps and infectious waste are treated and disposed of safely.	0	0
Limited Services	There is limited separation and/or treatment and disposal of sharps and infectious waste, but not all requirements for basic service are met.	16	5
No Services	There are no separate bins for sharps or infectious waste, and sharps and/or infectious waste are not treated/disposed of.	0	0

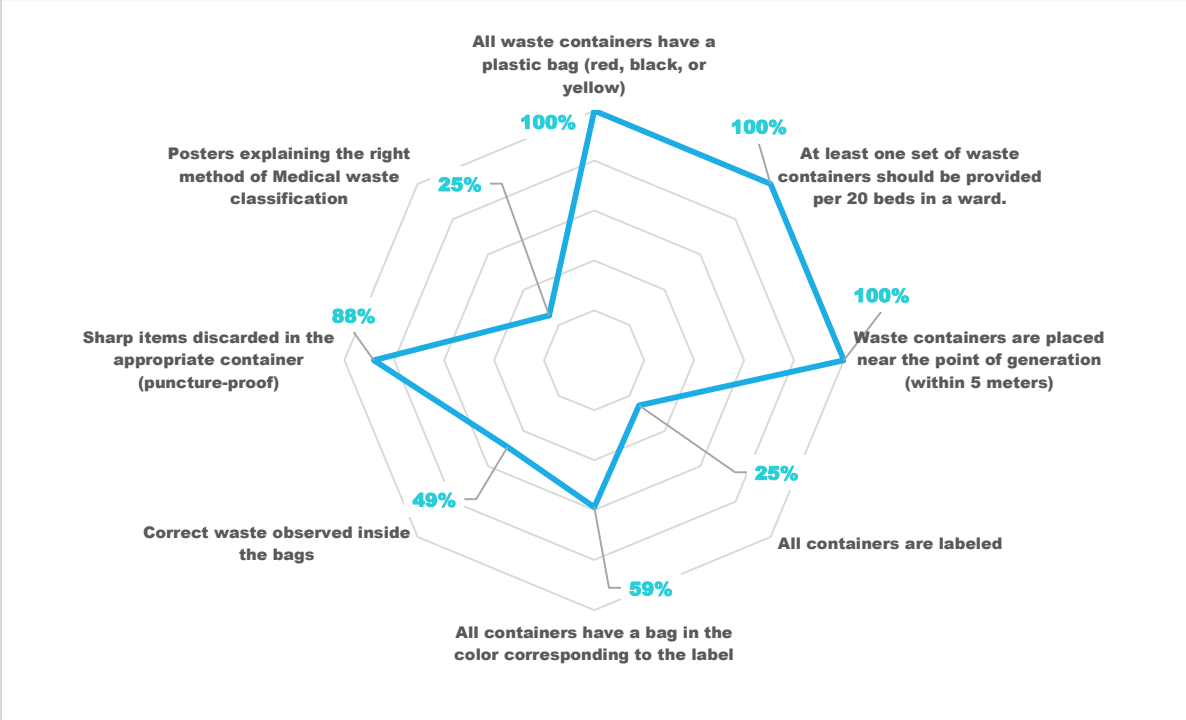


Figure 23: Inspection of Medical Waste Compliance in the assessed HCFs

3.3 ADVANCED INDICATORS FOR WASH IN HEALTH

Indicator	Meets Target	Partially meets Target	Doesn't meet Targets	Comments
WASH MANAGEMENT				
1. Number/percentage of HCFS where standard operating procedures (SOPs) of water sanitation, hygiene and health waste management facilities are complete, implemented and regularly monitored.	Yes complete, implemented & regularly monitored	Complete but not implemented or incomplete or not monitored	Not available	"A Standard Operating Procedure (SOP) is a document which describes the regularly recurring operations to ensure that the operations are carried out correctly (quality) and always in the same manner (consistency)" [33] . SOPs were available in hospitals related mainly to hygiene and environmental cleaning as well as medical waste management with lack of SOPs for water management. At PHCs, where no IPC teams were available at time of the assessment, SOPs were not available. Please consult annex 5 – SOP – Drinking Water in Health Care Facilities.
	0%	24% (5 Hospitals)	76% (16 PHCs)	
2. Number/percentage of health facilities where an annual budget is planned to include WASH infrastructure services, personnel and the continuous procurement of WASH item which is sufficient to meet the needs of the facility.	Yes & budget is sufficient	Yes, but budget is insufficient	No Budget	There is no allocated budget for WASH services in any of the assessed PHCs. In hospitals, the budget is part of the engineering and maintenance department budget which is not sufficient and only targeting corrective maintenance.
	0%	24% (5 Hospitals)	76% (16 PHCs)	
3. Number/percentage of health facilities which have wash Emergency preparedness and response plan that includes for example WASH stored items to be used during Emergency.	Yes & regularly updated	Yes, but not updated	No plan	"In emergency situations, HCFs may quickly become overcrowded with injured people or people suffering from infectious disease. It is important to restore & strengthen standards of WASH to avoid HCFs becoming the epicenter of outbreaks of diseases [34]"
	0%	0%	100% (16 PHCS & 5 Hospitals	

[33] WHO SOP-2014, Adapted from "FAO. Standard Operating Procedures". http://www.fao.org/docrep/W7295E/w7295e04.html.

[34] Technical Notes on Drinking Water, Sanitation and Hygiene in Emergencies, WHO, 2015.

Indicator	Meets Target	Partially meets Target	Doesn't meet Targets	Comments
4. Number/percentage of health facilities where Regular ward-based audits are undertaken to assess the availability of hand rub, soap, single use towels and other hand hygiene resources.	Yes complete & regularly	Undertaken less than once a week or not complete	No audits	An important cause of poor compliance to hand hygiene inside the HCFs may be the lack of user-friendly hand hygiene equipment as well as poor logistics leading to limited procurement and replenishment of consumables [35].
	0%	52% 6 PHCs & 5 Hospitals	48% (10 PHCs)	
5. Number/percentage of health facilities where Regular hand hygiene compliance activities are undertaken regularly among all health care staff.	Yes complete & regularly	Undertaken less than once a week or not complete	No compliance activities	Failure to perform appropriate hand hygiene is considered to be the leading cause of HCAI and the spread of multi-resistant organisms and has been recognized as a significant contributor to outbreaks[36].
	0%	24% (5 Hospitals)	76% (16 PHCs)	
6. Number/percentage of HCFs where health care staff are trained on WASH/ IPC each year	Yes	Not all staff	No training	WASH should be included in all IPC training and target both medical and non-medical health staff to be aware of the importance of their role & how to apply the basic principles of infection control to their daily work.[37]
	0%	0%	100% (16 PHCS & 5 Hospitals	
7. Number/Percentage of health facilities where each cleaning and waste disposal staff member is provided with the basic personal protective clothes.	Yes	Available but not in good condition	No	WHO recommends that at least two pairs of household cleaning gloves and one pair of overalls or apron and boots in a good state should be provided for each cleaner.
	24% (5 PHCs)	76% (11 PHCs & 5 Hospitals)	0%	
8. Number/Percentage of WASH and health staff exposed to health risks vaccinated against Hepatitis B	All staff	Not all staff	No records or no one is vaccinated	Hepatitis B Vaccine was introduced into the national Palestinian schedules in 1993. Any staff at health risk older than this year should be vaccinated.
	10% (2 Hospitals)	57% (9 PHCS & 3 Hospitals)	33% (7 PHCS)	
WATER				
9. Number/Percentage of HCFs where water quality is monitored regularly regarding chemical and biological parameters	More than once a week and meet the standards	Not regular but meets the standards	Not monitored or doesn't meet the standards	Water quality monitoring is the responsibility of the Environmental Unit department in each governorate that is done on irregular basis. Feedback to the facilities is only received in case of positive results of contamination. There
	0%	71% (11 PHCs & 4 Hospitals)	29% (1 Hospital and 5 PHCs	

[35] WHO Guidelines on Hand Hygiene in Health Care: a Summary, 2009.

[36] WHO Guidelines on Hand Hygiene in Health Care: a Summary, 2009.

[37] WHO Environmental Health Standards, 2008.

Indicator	Meets Target	Partially meets Target	Doesn't meet Targets	Comments
				is no regular monitoring system for free Chlorine nor E coli nor turbidity.
10. Number/Percentage of HCFs where water is treated that have sufficient supplies and adequately trained staff to carry out treatment.	Yes	Not sufficient or not adequately trained	Not sufficient and not adequately trained	5 Hospitals and 4 PHCs have desalination units for water treatment. The only facility that has the capacity is one hospital where the desalination unit is still under the warranty.
	11% (1 Hospital)	44% (4 hospitals)	44% (4 PHCs)	
11. Number/Percentage of HCFs where energy is available for heating water.	Yes Always available	Yes, but not always available	Never	The energy heating system in some facilities is depending on solar heating systems that is affected by the fuel crisis.
	57% (9 PHCs and 3 Hospitals	29% (5 PHCs and 1 Hospitals)	14% (2 PHCs & 1 Hospital)	
SANITATION				
12. Number/Percentage of HCFs with wastewater drainage system functioning (sufficient capacity and well designed)	Yes, sufficient capacity , well designed and regularly maintained	Not sufficient capacity or not well designed or not regularly maintained	Doesn't meet all criteria	Lack of Policies and Procedures for cleaning and dislodging wastewater network, aging of the wastewater networks in old facilities and the quality of medical waste water. (Section 3.2.5)
	48% (10 PHCs)	43% (4 PHCs & 5 Hospitals)	9% (2 PHCS)	
13. Number/Percentage of HCFs where the surface run-off drainage system avoids carrying contamination outside the health-care setting	Yes and functioning well	Yes, but not functioning and obvious pools of water	No system exists	Rainwater and surface run-off may be drained and disposed of separately if the system in place for wastewater cannot cope with additional water from sudden heavy rains or rainwater and surface run-off. In that case, it must be managed in a way that does not carry contamination from the health-care setting to the outside surrounding.
	38% (6 PHCs and 2 SHCs)	62 % (10 PHCS and 3 hospitals)	0%	
14. Number/Percentage of HCFs with wastewater pretreatment units like grease traps, septic tanks and so on	Yes and functioning well	Yes but not functioning well	No	(Section 3.2.5)
	0%	5% (1 Hospital)	95% (6 PHCs and 4 Hospitals)	
15. Number/Percentage of HCFs where toxic wastes (e.g. reagents from a laboratory) are treated as health-care waste.	Yes and functioning well	Yes but not functioning well	No	
	0%	5% (1 Hospital)	95% (6 PHCs and 4 Hospitals)	

Indicator	Meets Target	Partially meets Target	Doesn't meet Targets	Comments
16. Number/Percentage of HCFs where infectious liquid wastes (e.g. blood or body fluids) are treated as health-care waste	Yes and functioning well	Yes but not functioning well	No	
	0%	5% (1 Hospital)	95% (6 PHCs and 4 Hospitals)	
HYGIENE AND ENVIRONMENTAL CLEANING				
17. Number/Percentage of HCFs where Record of cleaning visible and signed by the cleaners each day	Records exist and completed daily	Record exists, but is not completed daily or is outdated	No Records	A monitoring system should use a limited set of indicators that are easily and frequently measured to identify problems and correct them in a timely way
	0%	0%	100% (16 PHCS & 5 Hospitals	
18. Number/Percentage of HCFs which has effective and regular vector control measures	Regular and effective	Not regular or not all areas	Not Effective	Mosquitoes and flies can effectively be excluded from buildings by covering opening windows with fly screens and fitting self-closing doors to the outside. Any use of chemical controls requires specialist advice within the ministry of health.
	48% (10 PHCs)	19% (4 Hospitals)	33% (6 PHCs and 1 Hospital)	
MEDICAL WASTE MANAGEMENT				
19. Number/Percentage of HCFs where adequately trained person is responsible for the management of health care waste in the health care facility	Adequately trained	Not adequately trained	No one was trained	The first edition of the National Guidelines for Medical waste management was developed by MoH and UNRWA with the cooperation of JICA in 2018. [38]
	43% (9 PHCS)	52% (6 PHCs & 5 Hospitals)	5% (1 PHCs)	
20. Number/Percentage of HCFs which have monitoring system to ensure the segregation facilities used effectively	Regular monitoring	Not regular	Not monitored	The role of the infection control committee in ensuring regular monitoring of environmental health conditions is critical. In PHCs the IPC committees are not well structured, and the role of monitoring is mainly led by the admin director within its role to monitor the work of the cleaning company.
	0%	100 % (16 PHCs and 5 Hospitals)	0%	

[38] National Guidelines for Medical Waste Management, JICA, 2018.

Indicator	Meets Target	Partially meets Target	Doesn't meet Targets	Comments
21. Number/Percentage of HCFs where a well identified, sited and protected (fenced) waste zone/area for waste collection and storage.	Well identified, sited and protected	Not protected	No defined area	The waste-disposal zone should be fenced off; concrete floor under it and it should have a water point with soap or detergent and disinfectant for handwashing or to clean and disinfect containers.
	0 %	71% (10 PHCs & 5 Hospitals)	29% (6 PHCs)	
22. Number/Percentage of HCFs where waste-related injuries along the waste management chain correctly are reported and acted on.	Yes, Always	Not Always	Not reported	
	24% (5 Hospitals)	28% (6 PHCs)	48% (10 PHCs)	Waste related injuries are mainly due to improper segregation and disposal of sharp objects. Clear policies should be available and implemented in all HCFS on how to act and report in case of waste related injuries,

3.4 WASH INFRASTUCTURE ASSESSMENT

3.4.1 WATER WELLS

Seven of the assessed PHCs had a water well as a main source of water (six HCFs) or a backup source of water (European hospital), including two facilities that had more than one well (Shohadaa Al Aqsa has two wells and Al Shifa Hospital has two wells and a third one under construction). A total of nine wells in the seven HCFs were assessed for the capacity, availability and functionality of their main parts as well as the risk of being contaminated or polluted, based on number of risk factors. The capacity of the assessed nine wells ranges from 6 m^3/hour (in Shohadaa Rafah clinic) to 30 m^3/hour (in Al Shifa hospital). The assessment included the availability and the functionality of the main parts of the wells, and specifically the (i) well flow meter, (ii) well manifolds, (iii) well pump pressure gauge, (iv) one way valve, (v) chlorine dosing unit, (vi) water sand filter, (vii) electrical high pressure switch, and (viii) well water level measuring port. In some HCFs 88% of these parts are not available/functioning. In details, lack of funds for operation and maintenance of major parts is the main reason, which is aggravated by the low quality of already available materials in the local markets in front of the water salinity levels, especially at Al Shifa hospital, where the salinity is around 23,000 mg/l, causing recurrent damage of the water pumps.

Table XV: Assessment of the Main Parts of the 9 Water Wells

Health Facility	Indonesian hospital	Tal Al Sultan	Al Shifa 1	Al Shifa 2	Shohdaa Al Aqsa 1	Shohdaa Al Aqsa 2	European hospital	Rafah	Al Najjar hospital
Well capacity m3/hour	10	7	30	28	7	7	20	6	10
Well flowmeter	No	No	Yes	Yes	No	No	No	No	No
Well manifold	Yes	No	No	No	No	No	No	No	No
Well pump pressure gauge	Yes	No	Yes, but not functioning	Yes	No	Yes	No	No	No
One way valve	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chlorine dosing uni	No	No	No	No	Yes, but not functioning	Yes	No	No	No
Water sand filter	No	No	No	No	No	No	No	No	No
Electrical high pressure switch	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Well water level measuring port	No	No	No	No	No	No	No	No	No

Regarding the risk of contamination eight of the assessed wells (eight wells) have low risk of being contaminated, while one well was at high risk of contamination. The main risk factor that appeared in four of the assessed wells is that the floor of the pump house is permeable to water, while an evident source of pollution was noted in three of the assessed well either from surface water or rubbish. The only well that is at high risk of contamination is at Shohadaa Al Aqsa Hospital.

Table XVI: Risk Assessment of Wells in the HCFs

Health Facility	low risk (0-1)	Moderate Risk (2-3)	High risk (4-5 risks)	Very High Risk (6 Risks)
Shohdaa Al Aqsa Hospital	1	0	1	0
Indonesian Hospital	1	0	0	0
Al Shifa	2	0	0	0
Shohadaa Rafah Clinic	1	0	0	0
Tal Al Soltan	1	0	0	0
Al Najjar Hospital	1	0	0	0
European Hospital	1	0	0	0

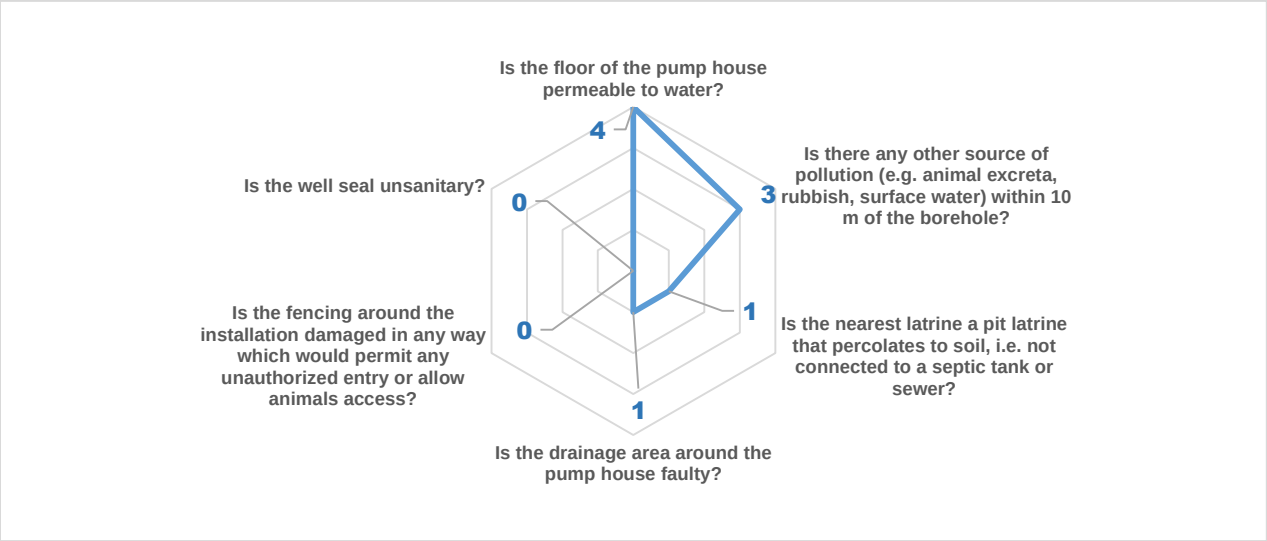


Figure 24: Risk Assessment of the 9 Wells

3.4.2 DESALINATION PLANTS

Nine of the assessed HCFs (five hospitals and four PHCs) had desalination plants for water treatment. A total number of 22 desalination units were assessed on the capacity of the plant, availability and functionality of the main parts of the plants. Number of desalination plants in each facility varies, where Al Shifa hospital hosts eight desalination plants, Al Aqsa hospital hosts six plants, Al Najjar hospital hosts two plants and the European hospital, Indonesian hospital, Shohadaa Deir al Balah clinic, Shohadaa Rafah clinic, Shohadaa Bany Suheila clinic and Shohadaa Khanyounis clinic host one desalination plants each. The desalination plants' capacity is also variable, where the greater is at Al Shifa with a main desalination plant reaching 500 m^3/day, and the lowest is at Shohdaa Bany Suheila clinic providing 0.2 m^3/day. Only at Al Shifa Hospital, desalinated water is supplied through all networks.

The assessed brackish desalination plant's efficiency ratio ranges from 25 to 70%, meaning that there is a problem in the setting of the plant or membrane fouling. This will need also a membrane replacement or/and a re-adjustment of the unit setting. Noting that seawater desalination unit's efficiency ratio is within the standards.

The assessment highlighted the following points:

- Pre-treatment units (disinfection unit (chlorine) and/or sodiumbisulfite (SBS) unit and/or antiscalant unit) do not exist or are nonfunctional in all plants. As a result, (i) water is not disinfected, and microbial

contamination leads to microbial fouling through the formation of biofilms on membrane surfaces, as well as a bad water quality; (ii) water is hard where high concentrations of the dissolved solids control the performance of the membrane. Higher concentrations mean higher osmotic pressure, higher tendency of suspended solids to coagulate precipitate on membrane surface, and higher likelihood of scaling to take place. Scaling influences production capacity, product quality and energy consumption. Also, pH influences the precipitation of scaling compounds where pH value is more than 6.5 of feed water in all plants, which indicate that water is still hard. This forces MoH to replace the membrane very frequently causing a further economic burden.

- Unavailability of post treatment units (limestone filter and caustic soda dosing unit (pH adjustment)) where the desalinated water is acidic to both water pipes and digestive systems. Consequently, the desalinated water could cause pipe corrosion and it can be harmful to human health as well.
- Unavailability/non functionally of pressure gauge that monitor unit's performance such as dual media filter, cartridge filter and high pressure pump.
- Lacking personal protective equipment for all assessed units such as gloves; masks; first aid kits; fire extinguisher; weight devices; storage for chemicals. In addition, lacking water quality testing kit, to tests pH, TDS and free chlorine in order to monitor of desalination plant's performance as well as the quality and safeness of the produced water.
- Basic O&M functions are insufficient (managed by unskilled people (specifically technical expertise on water treatment), inadequately funded, unavailability of spare parts), and generate serious consequences.

3.4.3 WATER STORAGE

Water needs vary depending on the type of facility and number of patients, as well as the purposes of use: hand hygiene, cleaning, laundry, drinking and cooking. The actual quantities of water required depends on several factors, such as climate, availability and type of water use facilities (including type of toilets), level of care and local water use practices. The minimum quantity of water required for different health situations in HCFs is calculated as follows: Outpatients (5 L/consultation), inpatients (40–60 L/patient/day), operating theatre or maternity unit (100 L/intervention), dry or supplementary feeding center (0.5–5 L/consultation depending on waiting time), cholera treatment center (60 L/patient/day)[39]. WHO recommends that the storage capacity for each facility should be sufficient to meet the needs of the facility for two days.

- **Water quantity and storage capacity**

As a result of the assessment, 90% of the assessed HCFs have storage capacity sufficient to meet the needs of the facility for 2 days and more. 2 hospitals (Shohadaa Al Aqsa Hospital and Indonesian Hospital) have storage capacity sufficient for 1.1 to 1.3 days respectively ,which can put these two facilities at risk of water shortages in case of emergency or technical problems in the water source.

Table XVII: Hospitals' Water Needs and Storage Capacity

HCF	Average Inpatient /day	Average Outpatient /day	Average Emergency /day	Average Deliveries /day	Average Surgeries /day	Minimum Water required (m^3)	Available Storage capacity (m^3)	Number of days

[39] Environmental Health Standards, WHO, 2008.

Al Shifa	1816	5552	8820	83	1816	225	536	2.4
Shohdaa Al Aqsa hospital	814	1346	5150	53	814	102	113.5	**1.1**
European hospital	667	2934	3708	0	667	101	563	5.5
Indonesian hospital	303	1413	3433	0	303	53	71	**1.3**
Al Najjar hospital	255	621	3401	0	255	40	108	2.7

On the other hand, all 16 assessed PHCs have water storage capacity exceeding the requirements for 2 days where in some facilities if the all the storage capacity is used, the water quantity is enough to be utilized by the facility for more than one month. Excessive water age in many storage facilities is probably the most important factor related to water quality deterioration. Long detention times, resulting in excessive water age, can be conducive to microbial growth and chemical changes.

Table XVIII: Health Clinics Water Needs and Storage Capacity

HCF	Average number of visitors/days	Minimum Water required (m^3)	Available Storage capacity (m^3)	Number of days
Shohadaa Khan Younis	591	3.5	23.5	6.7
Shohadaa Rafah	288	1.7	16.5	9.7
Bani Souheila	273	1.6	10	6.3
Shohadaa Tal Alsoltan	237	1.4	20	14.3
Al Shima	232	1.4	5	3.6
Dier Al Balah	184	1.1	25.5	23.2
Old Al Nusirat	140	0.8	3	3.8
Shohadaa Al Atatarah	100	0.6	5	8.3
ShohadaaAl Nusirat	80	0.5	17.5	35.0
Hala Al Shawa	73	0.4	13	32.5
Al Mghazi	69	0.4	4	10.0
Al Moghraqa	45	0.3	4	13.3
Heker Al Jamee	42	0.3	6.2	20.7
Al Berka	36	0.2	6	30.0
Al Swarha	32	0.2	3.5	17.5
Juher Al Diek	27	0.2	7.5	37.5

- **Storage Reservoir Type and risk assessment:**

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 for water to be extracted without the use of hands or other potentially contaminated surfaces touching the water (i.e. through use of a tap). The manufacturing of the tanks should be made from materials that are certified to be used in contact with water, regarding their effect on the quality of the water and should also comply with the requirements of potable-water standard. The storage tank should be washed with soap and water, and then the whole of the inside wiped using 0.5% chlorine solution. This should occur three or four times per year or directly after any maintenance.

As a result of the assessment, 62 tanks were assessed regarding to the type and risk of being contaminated: 23 water tanks for drinking water and 39 for domestic water uses. Domestic water tanks: 89% were made of Polyethylene (PE), while 11% were made of concrete. Drinking water: 60% were made of PE, 35% were made of stainless-steel (SS) and 5% were concrete. A special concern should be paid for tanks that are made of concrete where lack of maintenance can impair the water quality, chemically and biologically. Moreover, 37% of the assessed tanks have a low risk of being contaminated, while 57% have moderate risk and the remaining 6% are at high risk of contamination. The most common risk factor noted is the lack of cleaning and disinfection (63%). The identified reason is the poor design and installation of the water storage system which made the storage difficult to be cleaned due to lack of flushing system besides the absence of fund to recruit a cleaning company. Other risk factors for water reservoir contamination are: uncovered air vents (52%), absence or damage of the screen covering the overflow pipes (100% of concrete tanks), absence of the water level controller (68% of PE tanks), cover visibly dirty (11%), damaged or absent (9%), scum or foreign object in the storage reservoir (12%), physical infrastructure of the storage reservoir cracked and leaking (9%) or leakage of the pipe between source and storage reservoir (12%).

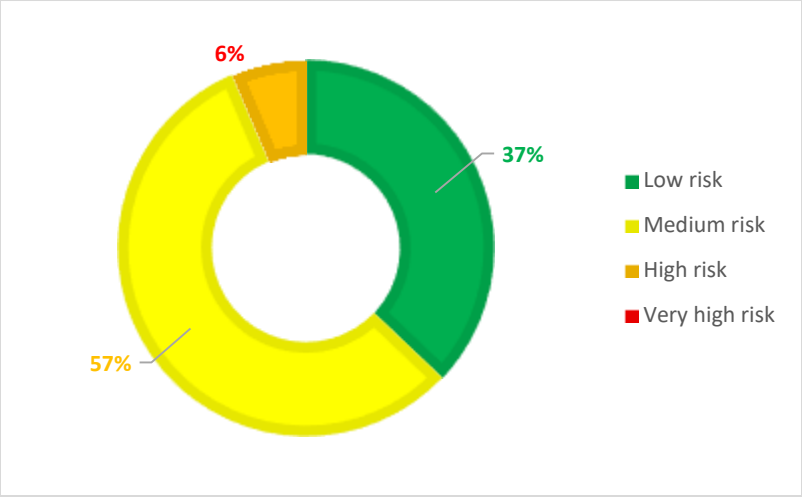


Figure 25: Risk Assessment of Water Tanks

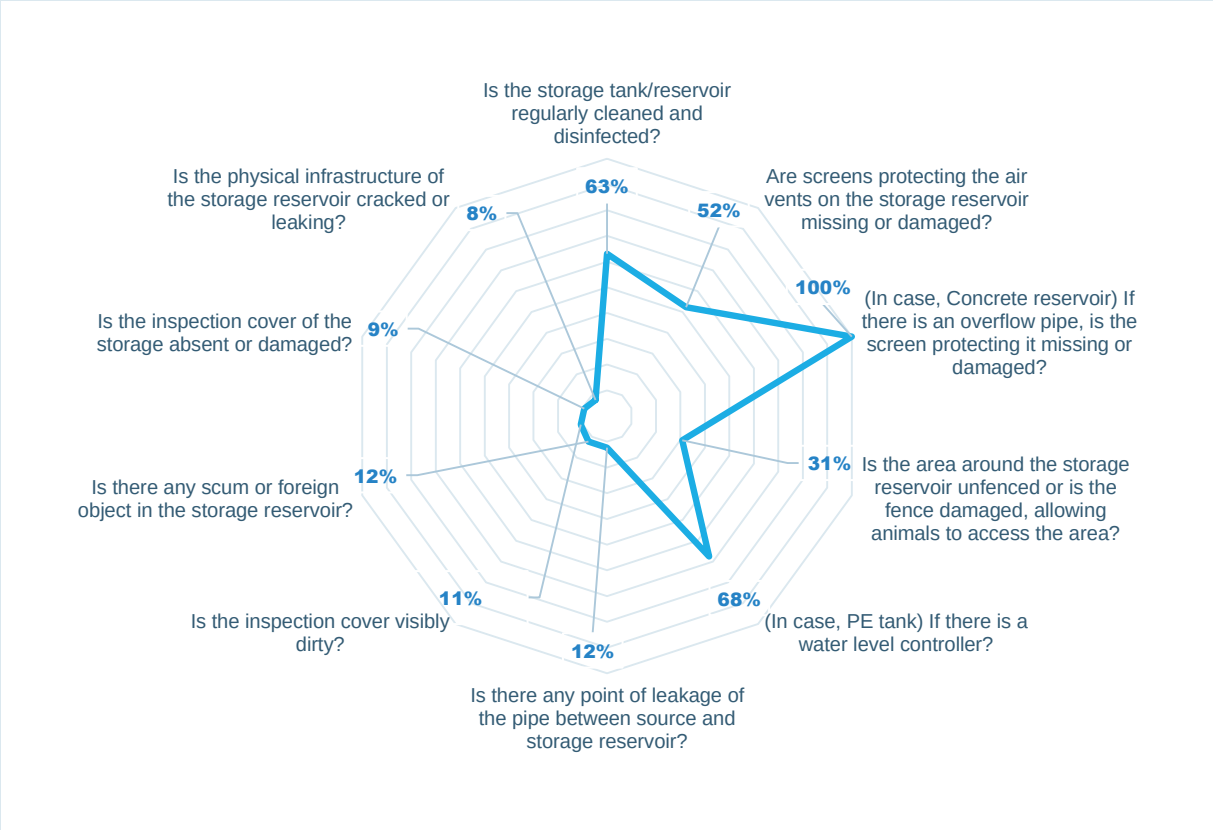


Figure 26: Storage Reservoirs Risk Assessment Criteria and Results

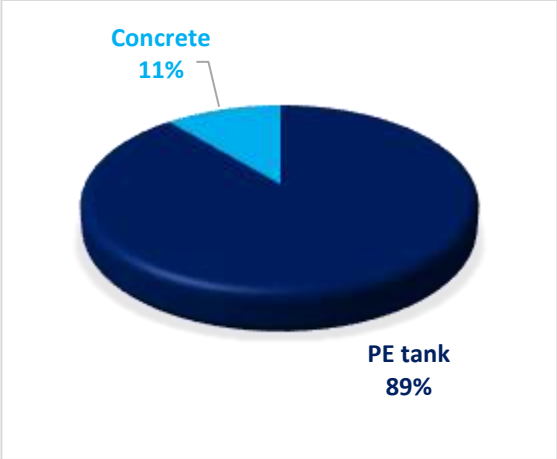


Figure 27: Type of Domestic Storage Reservoirs

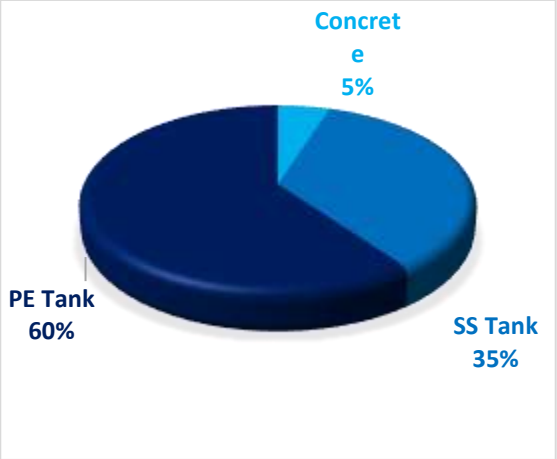


Figure 28: Type of Drinking Storage Reservoir

3.4.4 WATER NETWORKS

WHO recommends that all pipes, valves, taps and other fittings used for the supply of drinking water or the removal of wastewater must not contain harmful substances above the specified amount that could leach into the water. The pipes, valves, taps and other fittings must be capable of conveying water at a nominated pressure within a prescribed environment, and must be of sufficient strength to contain anticipated internal pressures. They must also be able to withstand external pressures if they are to be buried. The impact of environmental factors such as heat, cold, expansion, contraction, corrosion, pH and bacteria levels also need to be considered.[40]

The plumping system inside the assessed 21 HCFs was made of steel in 45% of drinking water systems and 50% of domestic water systems, and of High Density Polyethylene (HDPE) in 50% of Drinking water systems and 45% of domestic water systems. Internal and external corrosion is a particular problem of plumping systems made of steel, which affects the water quality and quantity mainly by changing the colour and taste of the water. Drinking water pipes are the mostly affected because the water flow is slow or static for periods of time due to rust. Moreover, steam pipes corrosion was noticed in European hospital where high pressure steam was flowing out of corroded pipes threatening the safety of workers in the laundry department.

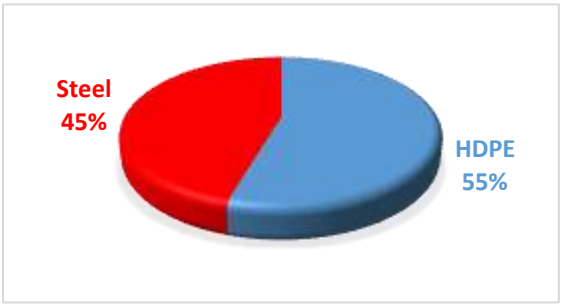


Figure 29: Type of Drinking Water Network

Figure 30: Type of Domestic Networks

3.4.5 WASTEWATER DRAINAGE SYSTEM

Improper management, collection, treatment and disposal of wastewater and sludge will result in the pollution of local water sources with pathogens. Segregation, minimization and safe storage of hazardous materials are just as important for liquid wastes as they are for solid wastes. Discharging wastewater generated from a health-care facility into the municipal sewage system should be done only after adequate pretreatment for chemical and infectious waste. WHO recommend minimum requirements for discharging into a municipal sewerage system are:

- The municipal sewers should be connected to efficient sewage-treatment plants with primary, secondary and tertiary treatment;
- A central treatment plant ensures at least a 95% removal of bacteria;
- The sludge resulting from sewage treatment should be subjected to further treatment, such as anaerobic digestion, leaving no more than one helminth egg per liter in the digested sludge;
- The waste-management system of the health-care facility maintains high standards, ensuring only low quantities of toxic chemicals, pharmaceuticals, radionuclides, cytotoxic drugs and antibiotics in the discharged sewage. If these requirements cannot be met, the wastewater should be managed and treated.

[40] Standards for Materials Used in Plumbing Systems, WHO, 2006.

Assessment of the wastewater systems in the 21 HCFS showed that only one HCF (European Hospital) has a wastewater treatment plant that includes primary, secondary and tertiary treatment of wastewater. The effluent wastewater is used for irrigation of fruitless trees. However, operational staff at the hospital is facing many challenges in operation and maintenance of plants, especially with the growth of algae in water ponds and mosquitoes, mainly in summertime where those are difficult to eradicate.

Moreover, improper management, collection, treatment and disposal of wastewater is posing a major threat on the public health in the GS. The wastewater system of the remaining 20 HCFs is connected to the municipality network directly without being pre-treated. Five of the assessed HCFs (1 hospital and 4 PHCs) have wastewater systems aged between 26 to 50 years with lack of maintenance. Ten of the assessed HCFs (6 PHCs and 4 hospitals) have witnessed frequent flooding and clogging of the system due to bad design and lack of continuous maintenance of the system. In addition, 7 of the assessed HCFs have storm water system connected to the wastewater system which put an extra load on the wastewater drainage especially in the hospitals where sewage pumps are used (Indonesian and Al Najjar Hospitals).

In details, Al Shifa hospital (the biggest hospital in the GS) discharges an estimated amount of 700 m^3 of non-treated medical wastewater into the municipality networks, plus 1000 m^3 as brine water from the desalination units. A case study[41] on the characteristics of the medical wastewater from Al Shifa hospital in 2017 showed: 1) high salinity (18,400 to 27,300 ℧S/cm); 2) low pH with a great influence on the lifetime of the piping system; 3) high TSS specially from surgery departments (3,008), blood bank (1,630) and surgery theater (1,873) exceeding the recommended Palestinian Environmental Quality Affairs PEQA range (600 mg/l); 4) the BOD measured from different departments shows strong pollution reaching up to 1150 mg/l in the surgical departments; 5) the COD values nearly four times higher than the BOD (PEQA recommends BOD and COD should not exceed 600 and 1500 mg/L respectively); 6) TKN is high especially from surgery theater, nephrology/dialysis, and internal medicine units where more than 85 mg/liter is considered highly polluted; 7) incredible pollution from the wastewater from the engineering and maintenance workshop, where the parameters are comparable to industrial wastewater. Another previous study in 2006 has highlighted the contribution of Al Shifa medical wastewater to the increasing problem of antibiotic resistance where high resistant strains of E. coli (30.5%), Enterococcus species (21.4%), Klebsiella species (10.4%) and Proteus species (4.5%) were isolated[42].

3.4.6 WATER QUALITY

Chemical constituents and microbial quality of drinking and domestic water are overriding importance for infection control in health-care settings. The water should not present a risk to health from pathogens and should be protected from contamination inside the health-care setting itself. The local department of environmental health should work with IPC committees to monitor the chemical and microbiological quality of the water in HCFs, as part of a routine surveillance and control program. In circumstances where WHO or national guidelines for drinking-water quality cannot be met immediately, an assessment should be made of the risks caused to patients and staff, given the levels of contamination, the length of exposure (longer for staff than for patients) and the degree of susceptibility of individuals (some patients may be highly susceptible to some contaminants).

Water quality analysis was conducted in 21 HCFs (Tables XIX-XXIII) and tested at the Public Health Laboratory affiliated by the MoH. Samples were taken from source to end user points including the whole water chain inside the facilities. All water quality parameters were compared with Palestinian Standards of water. The water quality parameters that were tested are:

[41] Medical Wastewater Characterization in the Gaza Strip Al-Shifa Medical Complex as a Case Study, Islamic University 2017.

[42] Contribution of Hospital Wastewater to the Spread of Antibiotic Resistance in Comparison to Non-Health Institution, Al Aqsa University 2006.

1. **Chemical Parameters**: free chlorine was tested in the field using Chlorine digital photometer. A special concern was paid to facilities which host water well and water treatment plants. PH, Electric conductivity, TDS using digital testers were tested in the field as well as specific samples were sent to the laboratory from the water wells and pretreatment to be tested with other chemical parameters.

Table XIX: MoH Chemical Water Quality Parameters

Test	Unit	Max value
Free Chlorine (field test)	mg/L	0.2mg/L- 0.8mg/L
pH	-	6.5-8.5
Electric conductivity (EC)	Micro mho/cm	2500
Total Dissolved Solids (TDS)	ppm	1000
Nitrate	ppm as NO_3	50
Total Hardness	Ppm as Ca CO_3	300

2. **Biological parameters:** two microbiological samples (250 ml) were taken from each water point to be tested for the availability of total coliform, fecal coliform and pseudomonas aeruginosa (the most common health care associated infection).

Table XX: Biological Water Quality Parameters

Test	Unit	Max value
Total Coliform	CFU/250 ml	Must not be detectable in any 100-ml sample[43]
Fecal Coliform	CFU/250 ml	Must not be detectable in any 100-ml sample
Pseudomonas Aeruginosa	CFU/250 ml	Must not be detectable in any 100-ml sample for immunocompromised Infectious dose $10^8 – 10^9$ CFU in liter[44]

Water Quality Results

One hundred and six water quality samples were tested for chemical and biological parameters. Samples of the whole water supply chain were taken from the water sources, pre-treatment, post treatment, storage and end-user points. In general, safely management of water inside all health care facilities was not met due to the following:

1. Limitations in taking water samples from the water networks and desalination plants were faced due to non-availability of water sampling taps in the design of the water networks.
2. Lack of application of WHO standards for water quality monitoring.
3. Lack of adequate training and enough supplies to perform continuous monitoring of water quality.
4. Ageing or insufficient infrastructure

The general results shows that water quality results were negatively affected in HCFs which hosts water wells and water treatment units where biological contamination was detected in form of total coliform (suggesting

[43] WHO Drinking Water Quality Guidelines, Vol. 4, 2011.

[44] WHO Environmental Health Standards, 2008.

contamination with Citrobacter, Enterobacter, Hafnia, Klebsiella or Escherichia), fecal coliform (suggesting contamination with bacteria originating in feces e.g E. coli) and pseudomonas Aeruginosa.

1. Drinking chemical constituents' water at end-user points meet the national standards concerning all chemical constituents, except for Nitrate, which appeared in 30 samples. Nitrate is linked to drinking water methemoglobinemia (Blue baby syndrome) amg/effecting bottle fed infants younger than 4 months.

Table XXI: Sample Sites where Nitrate Levels are exceeding 50 ppm as NO_3

Sample site	Number	HCF
Wells	8	• Indonesian Hospital, • Al Shifa(south) • Al Najjar Hospital, • Shohadaa al Aqsa (2) • European Hospital • Shohadaa Tal Al Soltan • Shohadaa Rafah clinic
Pretreatment	5	• Al Shifa (concrete store mix) • Shohadaa Al aqsa • Al Najjar • Shohadaa Rafah
Water tanks	8	• Al Najjar (Concrete store), • Indonesian Hospital (domestic store), • Shohadaa Al Aqsa (domestic storage, Concrete store, NICU storage Drinking store), • Shohadaa Al Atatrah, domestic storage • Shohadaa KhanYounis, domestic storage • Shohadaa Tal Al Sultan domestic storage
Post Treatment and End use	9	• Al Najjar (End Use Domestic, End use Drinking), • Shoahdaa Rafah (end use Kitchen), • Shohadaa Al Aqsa (post treatment, End Use Domestic ER, End Use Domestic ICU, End Use Drinking ICU, End use Surgical Department drinking) • Shohadaa Tal Al Sultan, (End Use Domestic)

2. The water quality results show a presence of high levels of TDS in domestic water points are objectionable to patients and health staff owing to the resulting taste and to excessive scaling (water hardness) in water pipes, heaters, boilers, and other HCFs appliances which could run with less efficiency. This often leads to higher power needs and even damaged appliances. The clogs can lead to leaks in the pipes and shorten the lifespan of HCFs appliances. High level of TDS was noted in Al Shifa Hospital wells reaching more than 25,000 ppm and 12,454 ppm in the 2 wells. Frequent damage of the water pumps was reported with lack of resources to procure high quality water pumps.

3. Total coliform was detected in 24 out of 106 samples including European Hospital, Al Najjar, Indonesian Hospital, Shoahdaa Rafah, Heker El Jamee, Shohadaa Al Aqsa, Al Sawarha and Dier al Balah.

Table XXII: Water Sample Sites where Total Coliform was detected

Sample site	Number	HCF
Wells	5	• Indonesian Hospital, • Al Najjar Hospital, Shohadaa al Aqsa (2) and Shohadaa Rafah clinic
Pretreatment	3	• Al Najjar Hospital, • Shohadaa Rafah • Shohadaa Khanyounis

Sample site	Number	HCF
Water Tanks	7	• Al Najjar (Concrete store), • Indonesian Hospital (domestic store), • Heker El Jamee (drinking Tank), • Shohadaa Al Aqsa (drinking store gyne), • Al Sawarha (domestic store), • Dier Al Balah (domestic store), • European Hospita (Mekorot store out)
Post Treatment and End use	9	• European Hospital (post treatment), • Al Najjar (post treatment-pretreatment for Hemodialysis desalination unit, End Use Domestic, End use Drinking), • Indonesian Hospital end use (nursing room), • Shoahdaa Rafah (end use Kitchen), • Shohadaa Al Aqsa (Outpatient department kitchen drinking end use) • Al Sawarha, (end use domestic), • Dier Al Balah (end use domestic)

4. Fecal coliform was detected in 4 biological samples from Al Najjar hospital (post treatment, End use Drinking) Shoahdaa Rafah (end use Kitchen) and Heker El Jamee (Drinking Tank) suggesting mostly contamination with E. Coli.

5. Pseudomonas Aeorginosa is the most common cause of health care associated infection. Biofilm formation allows the microorganism to persist in hospital water systems for extended periods, which have been associated with nosocomial infections. Recent studies have shown that there is a close genotypic proximity of clinical and tap water isolates[45]. Pseudomonas aeruginosa colony forming units were detected in 36 water quality samples. The infectious doses of pseudomonas aeruginosa based on WHO recommendations is 10^8–10^9 colony forming units/liter. In 9 of the samples, more than 100 CFU/250ml were detected.

Table XXIII: Sample Sites with more than 100 CFU of Pseudomonas Aeruginosa

Health Care Facilty	Sample sites
Shohadaa Al Aqsa	End User Outpatient Drinking
	Mekorot Out
European Hospital	End Use Drinking Kitchen
	Domestic Store
Dier Al Balah	Drinking Store
	End Use Drinking
	End Use Domestic
Shohadaa Khanyounis	Pre Treatment
	Desalination Unit Main Post

[45] The Formation of Biofilms by Pseudomonas aeruginosa: A Review of the Natural and Synthetic Compounds Interfering with Control Mechanisms, available on the web site https://www.hindawi.com/journals/bmri/2015/759348/.

3.5 WATERBORNE DISEASE SURVEILLANCE TRIGGERING AND RESPONSE

Number/Percentage of HCFs where waterborne diseases surveillance system is implemented and completed regularly.

Surveillance is the ongoing systematic collection, analysis, and interpretation of outcome specific data for use in planning, implementing and evaluating public health policies and practices[46]**. Water-related disease** is any significant adverse effects on human health, such as death, disability, illness or disorders, caused directly or indirectly by the condition, or changes in the quantity or quality, of any waters.[47]

In the assessed HCFs, the implemented surveillance system represents a passive system. This means that the system relies on voluntary participation of health workers or laboratories to report specific infections, cases (symptoms or illness) or events (clusters of cases that may indicate an outbreak) to the MoH. WHO is funding the central database system (MoH Database Access with Visual Basic 1997). Data collected include the total number of cases and diagnostic laboratory investigations besides health outcomes where in case of mortality more detailed needed investigations.

The data collection passes through 2 levels: 1) from health facilities to district environmental units' offices. 2) from the district offices to the main environmental department at the MoH. At PHCs: reporting sheets are filled by the health care providers; at Hospital: through the Health Information system, data are collected by the environmental department from the system.

Table XXIV: Water borne surveillance reporting system in the assessed HCFs

PHCs	Hospitals
Reporting sheets are filled by the health care providers.	No reporting sheets are filled by the health care providers
Health Information system: none of the assessed clinics is connected to a health information system.	Health Information System: data are collected by the public health department from the system.

An in-depth evaluation of the surveillance system was conducted through key informant interviews with key personnel in the MoH, PWA and CMWU. The WBD surveillance system is part of the national communicable diseases surveillance system and is implemented in all MoH and UNRWA primary health care clinics, MOH hospitals and in some NGO and private clinics. This covers all the population in the Gaza Strip. The diseases reported by the surveillance system, which could be considered of water source, are classified under the three groups:

Group A: requires immediate notification by phone or fax with using special forms.

Group B: should be notified on weekly basis using special forms.

Group C: should be notified on monthly basis.

Laboratory confirmation is required to detect the causative organism for certain diseases and based on the available resources. Gaps were identified on 1) the availability of investigations to detect the viruses, which is the most common causative organisms for WBDs in general and diarrheal diseases in specific. 2) medical doctors' practices who provide treatment without investigations. 3) lack of commitment from medical staff for filling forms. Data retrieved from the Public health department district offices for WBD incidence in the last 3 years

[46] Guide To Monitoring and Evaluating Communicable Disease Surveillance and Response Systems, WHO 2006.

[47] Technical Guidance on Water-Related Disease Surveillance, WHO 2011.

showed underreporting from some clinics and with different reporting forms. The most prominent gap was noted in Gaza city where there is lack of compliance from health staff to fill and submit the reporting forms. The Gaza offices relies on data from the health information system for some clinics and hospitals connected to the server. However, collecting data in such way is faced by limitation from the system where there is no international classification of diseases (ICD 10) of the surveyed diseases and difficulty to filter the variables.

Table XXV: Waterborne diseases included in the national surveillance system[48]

Class A	• Acute poliomyelitis (Acute Flaccid Paralysis) • Cholera
Class B	• Hepatitis A • Typhoid fever
Class C	• Diarrhoea (laboratory confirmation for bloody diarrhoea) • Amebiasis • Giardiasis

Moreover, a drinking water quality surveillance system is implemented by the CMWU which collects data on biological contamination on monthly basis. Around 560 testing points are taken annually from the municipality wells and distribution lines representing 90% of all networks. No samples are taken at household levels. The environmental unit at the MoH conduct Randomized Monthly Biological samples and Bi Yearly chemical samples. Analysis and reports about water quality are done on irregular basis; every three months, or immediately after an accident. The water quality monitoring system is facing lack of resources (human and financial) for monitoring and corrective actions adding to that failure to adequately implement O&M bring serious consequences leading to operational and/or infrastructure failures and frequent contamination events.

During 2018, the environmental unit has collected 3391 water samples all over the GS from Municipality wells, municipality reservoirs, private desalination plants and schools. The results showed contamination with faecal coliform in 11.8% of the samples and total coliform in 28.8%. It also showed that more than 8% of the municipality wells and more than 15% municipality reservoirs were contaminated with faecal coliform. Based on the HNO 2019 report more than 89% are depending on desalination plants as main source of drinking water. The water quality results from the PDPs showed more than 34% of the samples were contaminated with total coliform and more than 15% were contaminated with faecal coliform. This draws a critical risk of prevalence and outbreak of water borne diseases in vulnerable communities and requires strong, synchronized and well-coordinated surveillance systems for waterborne disease and water quality to be able to trigger a timely response.

WHO recommends that all surveillance systems for waterborne disease outbreaks need to include a method for evaluating the evidence that an outbreak is indeed the result of contaminated water or whether it may be due to another transmission route within certain criteria. Since the system is passive, it only provides retrospective identification of outbreaks when the data are compiled and analysed. For instance, peaks in disease incidence should be investigated, even retrospectively, and crosschecked with water quality results in the same catchment areas to determine if a failure in water treatment occurred or if other risk factors were involved. However, sensitivity is low (does not exceed 40% based on the public health department) because only a small percentage of cases provide stool specimens and are diagnosed and reported.

[48] National Guideline for Communicable Disease Surveillance, Palestinian National Authority, MoH, 2011.

Table XXVI: Criteria for strength of association of water with human infectious disease[49]

Event	Strength association
a) Pathogen found in human case samples also found in water b) Documented water quality failure or water treatment failures c) Suggestive evidence of association from a descriptive epidemiological study d) Significant result from analytical epidemiological study (case-control or cohort)	• Strong association if a+c, a+d or b+c • Probable association if b+d only c or only a • Possible association if b+d

The overall problem in the current implemented surveillance system by the MoH can be summarized as follows:

1. Many waterborne disease outbreaks may never be recognized. Even if recognized, they may not be investigated or reported because of lack of resources and shortage of trained health personnel available to work on waterborne diseases within local health departments.
2. Except for group A diseases, which are immediately notifiable, the trends, outbreaks and epidemics of diseases are detected through retrospective analysis at district and central level. Analysis is done in light of few indicators, which does not include risk factors of the disease.
3. The system in its current structure has not the proper ability for evaluating that an outbreak comes from contaminated water or whether other transmission route component.
4. The system has not shown any flexibility, which is attributed to lack of resources: human and financial.

Outbreak Management Team (OMT) has been established by the MoH, UNRWA and under the supervision of WHO as part of the health emergency preparedness and response plan. However, the multidisciplinary management of an outbreak is not fully represented by members from the environmental authority, civil defence, media, UNICEF and other stakeholders. A national guideline for communicable diseases outbreak is available at the MoH. Simulation exercises are done occasionally without full presentation from different actors and all levels of the system. The importance of such exercise is to develop, assess and test functional capabilities of emergency systems, procedures and mechanisms.

As a preparedness for water borne disease outbreak, site specific risk factors and high-risk communities should be previously identified where Geographic Information System (GIS) data for the water supply systems from the source to the customer tap are easily accessed and documented for all areas. The GIS system is still under development and updating in the municipalities. MoH has defined camps and areas near to sewage treated stations as high risk communities for water borne diseases based on trends of WBDs.

MoH is the only body who has the responsibility to declare an outbreak of WBD. The triggering events for outbreak of communicable diseases in general and waterborne diseases in specific are as follows:

1. An increase in the number of cases of a particular potentially water-related disease being reported through the surveillance system
2. Drinking-water sample results exceeding microbiological or chemical limits
3. Unusual events in the catchment area –extreme rainfall and run-off, flooding, sewage.
4. Clusters of customers' complaints from one supply zone concerning changes in quality of tap water

[49] Compiled from Department of Health survey data relating to national surveillance for water-related diseases in England and Wales.

5. Effects due to war may also affect water supply safety
6. The threat or use of biological and/or chemical weapons within armed conflicts
7. The detection of unusual and high potential microorganisms (particularly E. coli 0 157:H7)

However, relevant technical failures in water treatment or distribution facilities comprise failure in the water treatment, which could be a great risk factor for outbreak of water borne diseases. This is not usually reported from the field to the MoH, which with lack of clear chart of reporting what to whom.

Table XXVII: Roles and responsibilities in response to WBD outbreak

Activity	Roles and Responsibilities
Trigger event: outbreak detection and confirmation	MoH
Alerting responsible authorities and establishing cooperation	MoH
Making a tentative and final (etiological) diagnosis	MoH, Environmental unit (EU) and Public Health Department
Characterizing the outbreak (who, where, when and what)	MoH: analysis of the data
Identifying the population at risk	MoH
Formulating hypotheses about the source of infection	MoH
Testing the hypotheses and identifying the source	MoH: analysis of the data
Deciding on control measures	MoH
Making arrangements for the commitment of personnel and resources	MoH through cooperation with local authorities
Monitoring the implementation and effectiveness of measures taken	MoH
Deciding when the outbreak has ended	MoH
Preparing a report and making recommendations for future prevention.	MoH
Communicating to the media and press	MoH

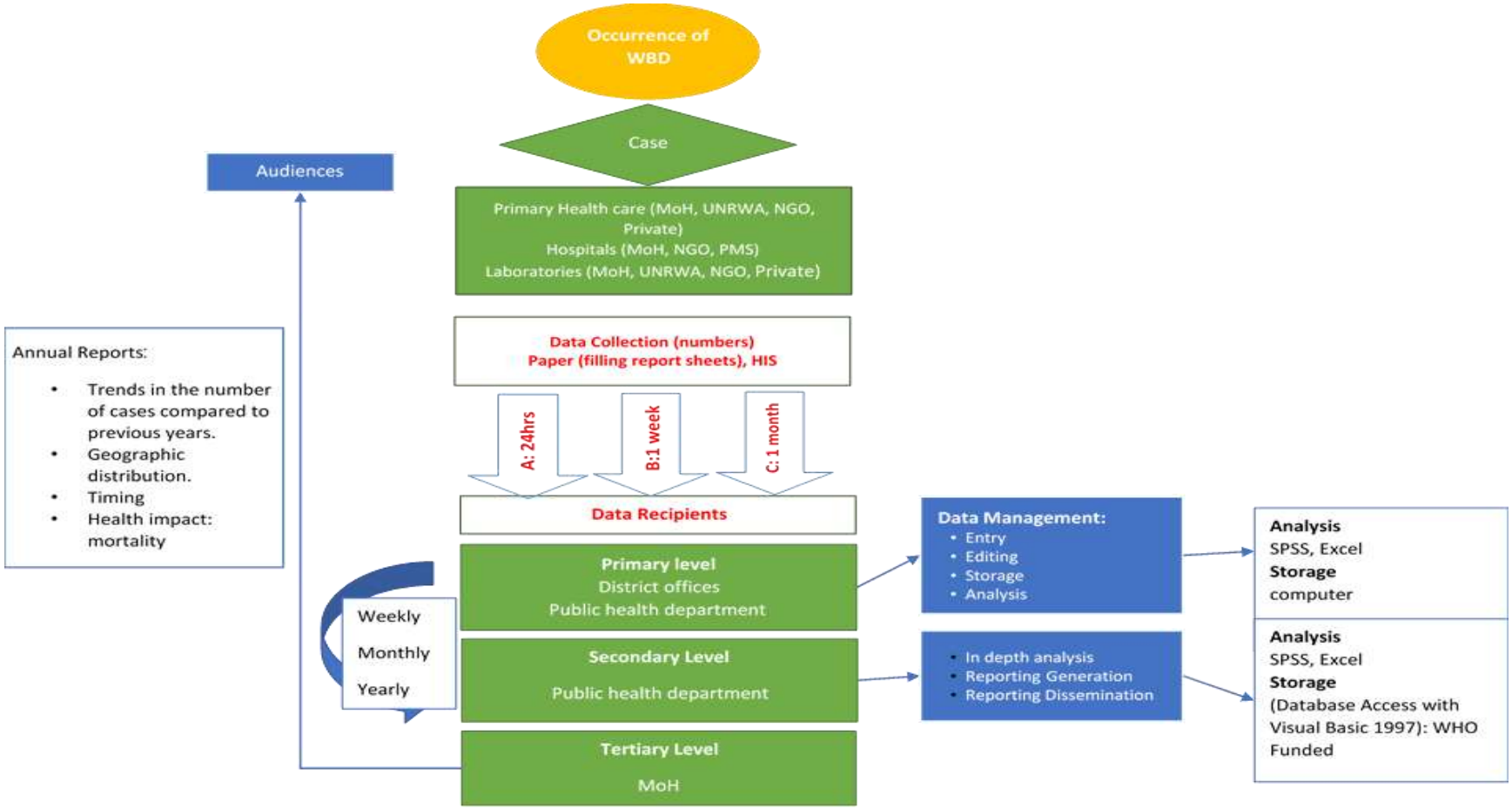


Figure 31: Flow chart of the surveillance system with timelines

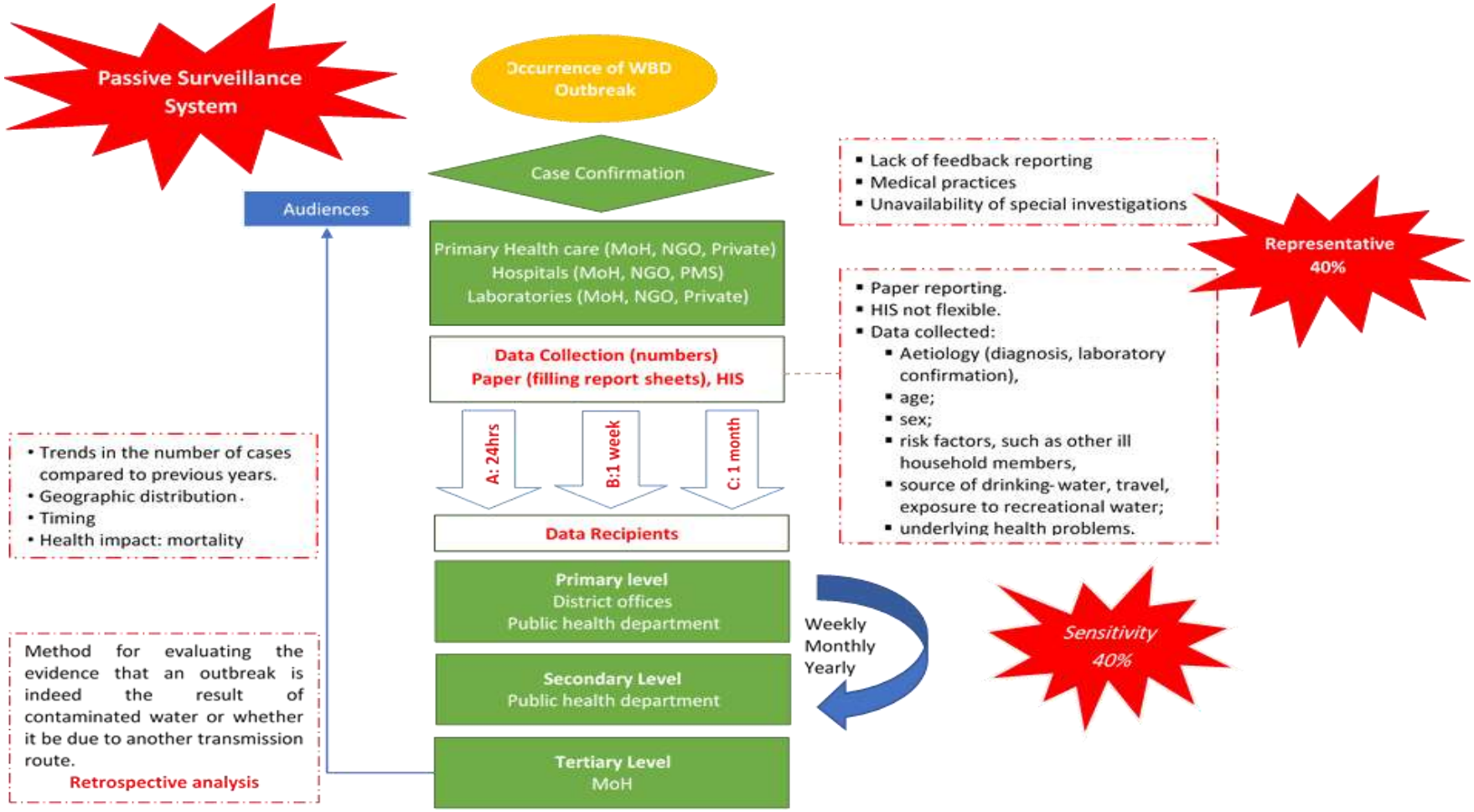


Figure 32: Main gaps in water borne diseases surveillance system

CHAPTER 4: CONCLUSION AND RECCOMENDATIONS

Despite some limitations, this study provides useful information and evidence for further improvement of WASH in HCFs in the GS in particular facilities run by the MoH. It assessed the WASH situation in the study of PHCs and hospitals, identified gaps and related constraints and suggested potential solutions to bridge the gaps and address the constraints. In addition, this study allows drawing lessons for strengthening the national guidelines and stressed on the importance of development tools for assessment and monitoring of WASH in HCFs in light of the JMP global indicators. Moreover, the findings from this study can be used as baseline data for establishing national WASH in Health indicators.

Although the findings suggest that the main water sources supplying the assessed HCFs is reasonably improved sources, the water quality from this source is neither of potable quality nor meeting the WHO standards for drinking water. It draws a high risk of water borne diseases in facilities which is depending on unimproved sources for drinking water (water trucking), especially in emergency situations given the limited monitoring capacity of the MoH on the water companies supplying the HCFs. Complexity of the water system in Al Shifa hospital (8 water treatment plants) and Shohadaa Al Aqsa Hospital (6 water treatment plants) is overloading and difficult to control. Adding to that, the situation of water infrastructure is remarkably worrying especially in hospitals. Main reasons are lack of spare parts for water disinfection and treatment in the plants and lack of sufficient supplies and skills of operators. Sanitation in the assessed HCFs is relatively good but still not meeting the JMP-defined criteria for basic sanitation, due to lack of well-defined segregated toilets between staff and patients, males and females as well as lack of adapted toilets for PWDs. Much more concern should be paid to the medical wastewater final disposal, which poses critical risk on the public health aggravating the already catastrophic situation of wastewater in the GS.

Unlike water supply and sanitation, the hygiene situation, particularly in hand hygiene, is fully meeting the JMP criteria. However, regular auditing of hand hygiene compliance among staff members and the availability of hand hygiene supplies is still poor. On the other hand, environmental cleaning situation is considered poor, especially because of the lack of well disseminated SOPs for environmental cleaning and inadequate trained health staff and cleaners. MoH needs to strengthen the supervision and monitoring of the cleaning companies especially in the PHCs by assigning well trained IPC focal points to work had on hand with the admin directors. Health care waste management in the assessed HCFs is poor compared with national and international standards and more resources should be directed for improving the safe segregation, collection, storage and final disposal of the medical waste.

Although critical gaps in WASH were identified in both PHCs and hospitals, the situation is more significant in hospitals and requires more urgent interventions due to the type and quality of health services provided. In addition, health services at the hospitals become more overloaded at time of emergencies. It is essential that preparedness actions are undertaken to ensure sufficient resilience to withstand potential disasters. Any incident which causes loss of infrastructure, energy supply, equipment, staff or staff attrition, interruption to supply chains, or patient surge - such as sudden communicable disease epidemics, natural disasters (e.g. floods, earthquakes), or conflict - requires a holistic health response and recovery effort which includes actions to assess and restore basic WASH services[50].

The role of health care facilities in monitoring and reporting of WBDs to the public health department is crucial. Looking at the water crisis, a great attention should be paid to improving, upgrading and expanding the surveillance system to be more sensitive and representative. A joint collaboration should be encouraged between the MoH, CMWU and PWA in order to capture all the triggering events and establish corrective actions before an outbreak.

To sum up, WASH in HCFs requires serious improvement and collaborative approach in order to ensure safety and quality of care, thereby contributing to achieving quality UHC and health SDGs as well as to mitigating antimicrobial resistance and improve outcome of health services by reducing preventable causes of morbidity and mortality.

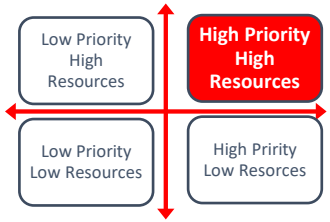
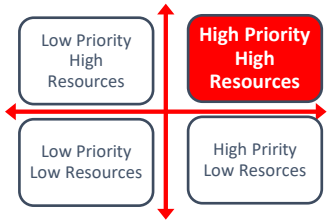
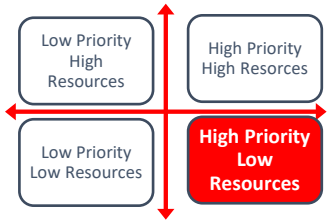
[50] Technical Notes on Drinking Water, Sanitation and Hygiene in Emergencies, WHO, 2013.

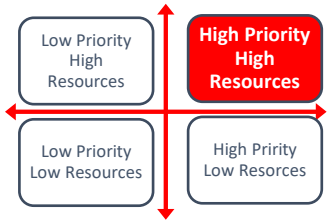
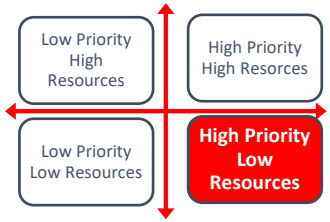
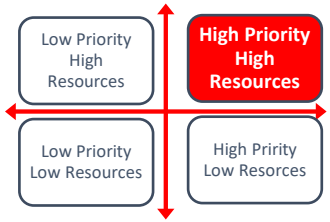
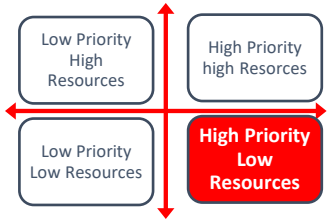
4.1 CONSIDERATIONS FOR FUTURE NATIONAL POLICIES AND ACTIONS

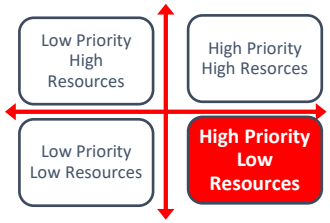
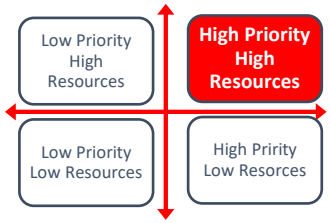
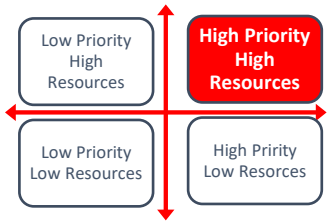
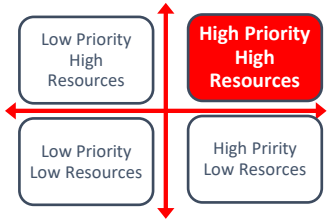
The first immediate action should be to clearly set up national standard operating procedures (SOPS) for WASH in HCFs (including norms and standards for WASH-related infrastructure, facilities, supplies and practices), taking into account the Gaza context and the JMP recommendations for basic WASH in HCFs services, as well the WHO environmental health standards. It is more recommended to define additional national advanced indicator for WASH in HCFs capturing all aspects of WASH services that are important to improve health outcomes, increase the quality of care and protect health care workers and patients.

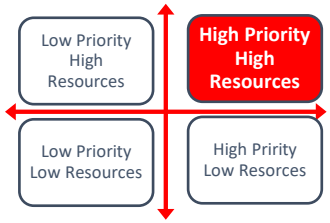
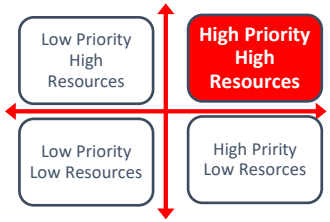
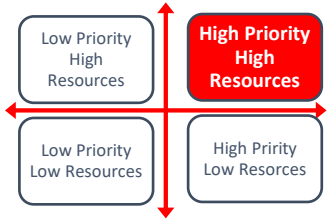
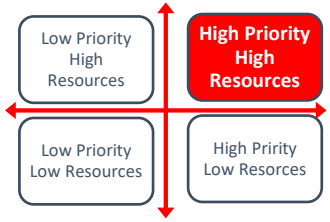
- Further development and strengthening of WASH- related organizational structure and institutional arrangements through establishing a multidisciplinary management and monitoring of WASH in HCFs, by strengthening collaboration between infection prevention and control committees, admin directors and engineering departments and initiate a national WASH monitoring and evaluation framework, as also recommended by the recent situation analysis.
- Establish a national database system for WASH assessment and monitoring that is linked to all HCFs in order to provide updates and early warnings and enhance WASH in health preparedness and response interventions.
- Further expand WASH and IPC training in PHCs and Hospitals staff; not only for clinical staff, but including also cleaners, to improve their knowledge and awareness about the importance of WASH in HCFs to ensure that all staff (medical and non-medical) are receiving at least yearly training. Such training can be provided as training of trainers and assign focal point in PHCs and Hospitals' departments to conduct future trainings and monitoring.
- For water supply, along with further improvement in main water sources, further construction and maintenance of back up sources for domestic and drinking water to address the shortages of water supply as well as ensure that safe water is supplied to all HCFs at normal and emergency situations.
- Ensure regular monitoring of the water quality at the HCFs, as recommended by international standards for both drinking and domestic water.
- Particular attention should be made to the number of toilets and their specifications (e.g. separation between clients and staff, between for men and women, with facilities to manage menstrual hygiene, and meeting the needs of people with reduced mobility as well as children) in order to ensure dignity, safety and privacy of staff and patients.
- Strengthening the implementation of WHO Multimodal Hand Hygiene Improvement Strategy in all HCFs. The main priority is improving the supplies to ensure the availability of water and soap for hand washing, and alcohol-based hand rubs at all points of care.
- In addition to training and coaching, adequate supplies of appropriate cleaning materials and detergent is also vital for improving the general cleanliness of floors, surfaces and toilets.
- Improve the medical waste management in HCFs starting from onsite segregation to final disposal of sharp and infectious waste as a replication of the current project implemented by JICA.
- Develop national WASH in emergency plans and operational guidelines and establish a training for all staff on WASH in emergency and risk management.
- Fundraise to renovate and rehabilitate WASH infrastructures inside the HCFs where gaps are detected and are affecting the quality of service and the health environment. Establish a process of regular, preventive and corrective maintenance of WASH infrastructures inside the health facilities by allocating funds for the procurement of the needed supplies and materials.
- Improvement in staff motivation and commitment through establishing a mechanism to incentivize best WASH practices in HCFs. This includes a routine and systematic evaluation of the WASH situation in HCFs, awarding certificates of appreciation, and financial incentives.

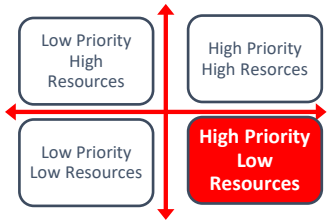
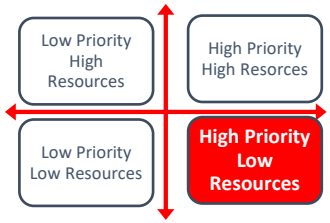
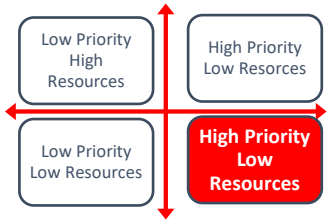
4.2 FRAMEWORK FOR WASH IN HCFS IMPROVEMENT

Gaps/Hazards	Risk	Risk Level	Recommendation	
			HCF	National level
JMP CORE INDICATORS				
3.2.1 Drinking water services are not safely managed	**Risk of waterborne diseases on staff, patients as well as carers.**		• **Definition of WASH/IPC focal points with clear TOR.** • **Establish a regular monitoring program for water quality.**	• **A water safety plan that aims at assessing and managing water systems, and ensuring effective operational monitoring, should be designed, developed and implemented to prevent microbial contamination in water and its ongoing safety.** • **Secure safe, improved drinking water sources for HCFs.** • **High level of monitoring of municipality water resources supplying the HCFs,**
3.2.2 Sanitation services are limited.	**Inadequate sanitation facilities for all raise the risk of waterborne diseases as well as improper safety, security and privacy measures.**		• **Clearly identification and separation of toilets for staff, patients, males and females.** • **Adaptation of at least one toilet for PWDs in each HCF and one toilet in each ward in the hospitals.** • **Mobilize resources for maintenance of toilets basic infrastructures.**	**Application of WHO standards in the design of HCFs to ensure the availability of enough segregated toilets for staff and patients taking in consideration the special needs of females and PWDs as well as children.**
3.2.3 Improper compliance to hand Hygiene among health care providers. **3.3.4 Environmental cleaning services are limited**	**Risk of HCAIs on staff, patients and carers due to poor hygiene standards and environmental cleaning practices.**		• **Mobilize resources for maintenance of hand washing facilities.** • **Definition of WASH/IPC focal points with clear TOR.** • **Visibility of hygiene promotion materials.** • **Hygiene promotion activities.** • **Training on hygiene and infection control standards.**	• **Establish a national regular training program for hygiene and environmental cleaning on yearly basis that includes all health working staff: medical and non-medical.** • **Clear instructions and high level monitoring of the cleaning company practices to ensure the application of the WHO/national IPC guidelines.**

Gaps/Hazards	Risk	Risk Level	Recommendation	
			HCF	National level
3.3.5 Basic medical waste services are limited	Risk of blood borne disease on staff, patients and caregivers as well as the community.		• Visibility of medical waste segregation materials. • Regular monitoring of staff compliance to segregation activities.	• Fund raising to improve the medical waste management in HCFs starting from onsite segregation to final disposal of sharp and infectious waste as a replication of the current project implemented by JICA. • Clear instruction to the cleaning companies to distribute safety bins of heavy duty materials.
WASH MANAGEMENT				
23. Lack of standard operating procedures (SOPS) of water sanitation, hygiene and health waste management facilities	Weak operation and management of WASH infrastructure leading to risks of HCAIs on staff and patients as well as caregivers either due to poor quality of WASH services.		• Definition of WASH/IPC focal points with clear TOR. • Ensure the operation and management of WASH facilities in accordance to WHO/national standards.	• Ensure national SOPs for water sanitation and hygiene activities are available updated and well disseminated. • Periodic review and update policies, standards, training contents, evaluation and monitoring tools.
24. Lack of annual budget for WASH infrastructure services, personnel and the continuous procurement of WASH item	Inability to perform regular preventive maintenance of WASH infrastructure leading to risks of HCAIs on staff and patients as well carers.		• Allocate budget for continuous procurement of WASH supplies and maintenance.	• Provide resources and facilitate funding for WASH operation and management.
25. Lack of WASH emergency preparedness and response plan	Failure restore and strengthen standards of WASH during emergency causing health-care facilities becoming the epicenter of outbreaks of diseases.		• Define a set of targets, policies and procedures for WASH operation and management at time of emergencies based on past experiences and lessons learnt and WHO recommendations • Seek funding for planned improvements and preparedness measures.	• Review national plans/standards for emergency preparedness and response, and incorporate WASH disaster preparedness and risk reduction plan. • Provide resources and/or facilitate funding for national WASH in Health emergency preparedness and response plan.

Gaps/Hazards	Risk	Risk Level	Recommendation	
			HCF	National level
26. Lack of Regular ward-based audits for the availability of hand rub, soap, single use towels and other hand hygiene resources 27. Lack of Regular hand hygiene compliance activities. 28. Lack of regular training on WASH/ IPC each year	Poor hygiene standards and practices leading to risk of HCAIs on staff, patients as well as caregivers.		• Mobilize resources for maintenance of hand washing facilities. • Definition of WASH/IPC focal points with clear TOR. • Visibility of hygiene promotion materials. • Hygiene promotion activities. • Training on hygiene and infection control standards.	• Establish a national regular training program for hygiene and environmental cleaning on yearly basis and includes all health working staff: medical and non-medical. • Clear instructions and high level monitoring of the cleaning company's practices to ensure the application of the WHO/national IPC guidelines.
29. Inadequate personal protective equipment for cleaning and waste disposal staff. 30. Hepatitis B vaccination doesn't cover all WASH and health staff exposed to health risks	Health staff are at risk of blood borne diseases.		• Promote a working climate that encourages patient and staff safety. • Provision of high quality personal protective equipment for cleaning and waste disposal staff suitable with seasons as well ensuring of staff compliance. • All staff must be vaccinated against hepatitis B.	• Clear instructions and high level monitoring of the cleaning company's practices to ensure the application of the WHO/national IPC guidelines.
WATER				
31. Lack of regular monitoring of water quality chemically and biologically.	Inability to detect and treat poor water quality leading to risk of waterborne diseases/ HCAIs on staff patients and caregivers especially in HCFs which have water treatment plants		• Strengthen the water quality-monitoring program especially in HCFs hosting water wells and water treatment plans. • Expand the role of IPC committees to include supervision of regular monitoring of water quality and safety.	• Mobilize resources or seek funding to strengthen water quality monitoring and proper management of water resources.
32. Lack of sufficient supplies and adequately trained staff to carry out water treatment.	Staff and patients as well as caregivers at risk of infection from unsafe managed water.		• Seek funding to establish a WASH store for all WASH supplies including supplies for desalination plants. • Capacity building of operation staff and engineers.	• High level supervision and monitoring on the functionality of the water treatment plans and the capacity of the operation and engineering staff. • Ensure end user training of all operation staff as a part of the contract with the supplier of the desalination plants.

Gaps/Hazards	Risk	Risk Level	Recommendation	
			HCF	National level
33. Lack of energy for heating water	Lack of hot water for sterilization, hygiene and environmental cleaning practices leading to risk of HCAIs on staff, patients as well as caregivers.		• Ensure enough supplies of hot water for critical departments in the HCFs.	• Mobilize resources for the use of modern green energy and low power consumption techniques for water heating to mitigate the energy and electricity crisis.
SANITATION				
34. Wastewater drainage system is not functioning well (sufficient capacity and well designed)	Frequent flooding and clogging of the wastewater system leading to risk of waterborne diseases and blood borne diseases on staff, patients and caregivers inside the HCFs as well as the community surrounding the HCFS.		• Establish regular cleaning and preventive maintenance of wastewater drainage systems and surface run off.	• Application of WHO standards in the design of HCFs and take in consideration the future expansions and surge capacity at time of emergencies in designing the wastewater infrastructures.
35. Surface run-off drainage system carries contamination outside the health-care setting	Risk of waterborne diseases and blood borne diseases on staff, patients and caregivers inside the HCFs as well as the community surrounding the HCFS			
36. Unavailability of Wastewater pretreatment units like grease traps, septic tanks and so on 37. Toxic wastes (e.g. reagents from a laboratory) are not treated as health-care waste.	Risk of waterborne diseases and blood borne diseases on the whole population extends up to contamination of the aquifer and sea where untreated		• Seek fund for establishing onsite wastewater treatment units.	• Provide resources and facilitate funding for establishing onsite wastewater treatment unit in all HCFs. • Ensure the design of all HCFs future wastewater pretreatment units in accordance with WHO standards.

Gaps/Hazards	Risk	Risk Level	Recommendation	
			HCF	National level
38. Infectious liquid wastes (e.g. blood or body fluids) are not treated as health-care waste	wastewater is finally disposed.			
HYGIENE AND ENVIRONMENTAL CLEANING				
39. Record of cleaning visible and signed by the cleaners each day	Improper monitoring of quality of hygiene practices leading to risk of HCAIs.		• Strengthening of the environmental cleaning monitoring inside the HCFs.	• Periodic review and update of policies, standards, training contents, evaluation and monitoring tools.
40. Ineffective or irregular vector control measures	Risk of spread of vector borne infection is predicted in case on any outbreak.		• Regular maintenance of vector borne barriers (window nets, trap covers). • Regular vector borne measures	• Appropriate and effective methods for excluding or reducing vector numbers. • Clear instructions on vector control measures to the cleaning company.
MEDICAL WASTE MANAGEMENT				
41. Inadequately trained health staff on the management of health care waste in the health care facility. 42. Lack of monitoring system to ensure the segregation facilities used effectively. 43. Lack of well identified, sited or protected (fenced) waste zone/area for waste collection and storage 44. Lack of reporting of waste-related injuries along the waste management chain.	Inadequate management of medical waste lead to risk of waste related injuries and blood borne disease on staff, patients, caregivers as well as the community		• Capacity building of all health staff on medical waste management on yearly basis. • Strengthen local monitoring program for medical waste segregation and disposal. • Improve the waste collection and storage areas safety. • Strengthening of the application of WHO/national standards for waste related injuries recording and management.	• High level monitoring on medical waste management in all HCFs.

4.3 CONSIDERATIONS FOR WBD SURVEILLANCE, OUTBREAK TRIGGERING AND RESPONSE

The Humanitarian Response Plan for the occupied Palestinian territory (oPt) for 2019 requests a total of US$350 million. Without funding for interventions to provide clean and safe water, up to one million people in Gaza could be exposed to severe public health risks, including an outbreak of waterborne diseases. The high risk of water borne diseases outbreak requires mobilization of resources to strengthen the currently implemented systems for water borne diseases and water quality surveillance systems in order to early trigger any increase in the trends of WBDs above a certain threshold.

Gaps in WBD surveillance:

Active surveillance systems should be supported. Data collection through HIS can be alternatively supported which requires upgrading the health information system (friendly use) and expanding to cover all the Gaza Strip (Hardware, Software). Laboratory supplies (main causative organism Viral) should be made enough for both microbiological and water quality laboratory in the MoH. The water quality monitoring system needs to be expanded to include water monitoring at household level to ensure evaluation at the whole water supply chain. Regular national capacity building program should be conducted and can be strengthened by staff incentives to encourage the good practices. Operational monitoring should be tailored on the water supply (type, location, frequency, who is responsible, corresponding critical limits and corrective actions, who receives and assesses the results etc.). Clear chart and communication mechanism among stakeholders should be identified and agreed on. Collaboration between research institutes and nongovernmental organization could strengthen the system especially in improving information management. Their role can also include regular evaluation of the surveillance system to identify areas of quality improvement.

Gaps in Outbreak management:

The outbreak management team should be multidisciplinary including representatives from the health, environmental authorities, civil defence and others with clear comprehensive TOR that includes roles and responsibilities of different actors. Regular simulation exercises should be arranged and facilitated. The GIS system implemented at the municipalities should be upgraded where it can give an actual estimation of Site-specific risk factors and high-risk communities. Research centres (Universities) can participate in confirmation of the outbreaks through studies.

MoH and UNRWA are the two leading health providers in the Gaza Strip and are responsible to respond to any diseases outbreak. However, role and responsibilities of other actors like health NGOs should be identified. Lessons learnt from previous experience either outbreaks or hyperendemic or emergencies should be adopted in terms of prepositioning, health messages, emergency medical teams and others. The response should be multidisciplinary where different stakeholders should participate in evaluating the needs and their role in response at the side of WASH interventions: Correction of Treatment failures, Additional water disinfection step, Activation of an alternate water supply, Provision of hygiene kits. (UN/NGOs, etc.). it is recommended to set an operational response plan for an epidemic by both and WASH and health cluster to support local authorities in case of an outbreak similar to the response plan for conflict emergencies.

4.4 WASH IN HEALTH INVESTMENTS' COSTS

Costs of investments were calculated based on major gaps that were identified during the inspection walkthrough to the main WASH infrastructures that includes the following:

1. Water: rehabilitation/construction of wells, rehabilitation/installation of desalination units, rehabilitation of water reservoirs and water networks
2. Sanitation: rehabilitation/adaptation of toilets, rehabilitation of wastewater networks and construction of wastewater pretreatment units.
3. Hygiene: rehabilitation of hand washing stations, supplies for hygiene and environmental cleaning.
4. Medical waste management: personal protective equipment, rehabilitation of waste collection zone.

The investments do not include soft activities (trainings, manuals, monitoring tools and supplies) which are essential to meet some of the indicators of WASH in HCFs and ensure sustainability and quality of the interventions.

Table XXVIII: Investment's Cost in WASH Infrastructures inside 21 HGFs

#	HCF	Water	Sanitation	Hygiene	Medical waste management	Total
1	Indonesian hospital	$ 55,680	$ 396,300	$ 19,620	$ 5,000	$ 476,600
2	Al Shifa	$ 137,930	$ 1,265,750	$ 62,520	$ 5,000	$ 1,471,200
3	Shohdaa Al Aqsa hospital	$ 55,930	$ 585,250	$ 29,650	$ 5,000	$ 675,830
4	European hospital	$ 239,220	$ 697,300	$ 33,750	$ 5,000	$ 975,270
5	Al Najjar hospital	$ 49,570	$ 293,900	$ 9,200	$ 5,000	$ 357,670
1	Shohadaa Al Atatarah	$ 9,480	$ 26,300	$ 640	$ 1,000	$ 37,420
2	Al Shima	$ 9,110	$ 43,750	$ 760	$ 1,000	$ 54,620
3	Hala Al Shawa	$ 10,590	$ 26,950	$ 640	$ 1,000	$ 39,180
4	Al Moghraqa	$ 9,110	$ 26,300	$ 430	$ 1,000	$ 36,840
5	Juhor ad Dik	$ 8,850	$ 4,550	$ 430	$ 1,000	$ 14,830
6	Shohadaa' An Nuseirat	$ 12,070	$ 44,250	$ 700	$ 1,000	$ 58,020
7	Old An Nuseirat	$ 8,740	$ 35,250	$ 430	$ 1,000	$ 45,420
8	Al Maghazi	$ 9,110	$ 36,300	$ 430	$ 1,000	$ 46,840
9	Al Swarha	$ 7,740	$ 25,650	$ 430	$ 1,000	$ 34,820
10	Al Berka	$ 8,480	$ 36,300	$ 430	$ 1,000	$ 46,210
11	Deir al Balah	$ 15,110	$ 49,500	$ 760	$ 1,000	$ 66,370
12	Heker Al Jamee	$ 8,850	$ 35,650	$ 430	$ 1,000	$ 45,930
13	Bani Suheila	$ 9,850	$ 21,150	$ 760	$ 1,000	$ 32,760
14	Khan Younis	$ 16,590	$ 47,200	$ 640	$ 1,000	$ 65,430
15	Shohadaa Rafah	$ 9,320	$ 24,950	$ 760	$ 1,000	$ 36,030
16	Shohadaa Tal Alsoltan	$ 6,920	$ 19,400	$ 760	$ 1,000	$ 28,080
	Total	$ 698,250	$ 3,741,950	$ 164,170	$ 41,000	$ 4,645,370

ANNEX 1

سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY

GVC | We World

WASH Cluster
Water Sanitation Hygiene

WASH in Health Working Group

Terms of Reference

Background

Several major rounds of consecutive destructive conflicts and 11 years' blockade have led to a severe deterioration in access to basic WASH and Health services in the Gaza Strip. As a result, the Gaza Strip is facing immense challenges related to WASH and health sectors and the limited capacity of public health care providers, which pose significant health risks to its residents, affecting public hospitals and clinics and deteriorated the health system.

The lack of WASH services compromises the ability to provide safe and quality care, places both health care providers and those seeking care at substantial risk of infection-related morbidities and mortality, and poses a significant economic and social burden.

In order to provide quality of care and reduce infections, health care facilities must have the appropriate infrastructure and staff capacities to provide safe, effective, and equitable services. WASH services strengthen the resilience of health care systems to prevent disease outbreaks, allow effective responses to emergencies (including natural disasters and outbreaks) and bring emergencies under control when they occur. Emerging and growing threats from antimicrobial resistant infections and infectious disease outbreaks can also be significantly reduced by improving WASH services.

Information gaps on the conditions and functioning of water and sanitation infrastructures and hygiene practices in health care facilities limit the provision of adequate WASH services. This lack of availability of information on the provision of water and sanitation and hygiene practices increases the risks of site related or preventable infections among health care facility staff, patients, and the wider community. WASH and Health actors needed to access reliable information to design adequate WASH services in health care facilities which is essential to provide and sustaining quality care.

In light of the critical situation, the WASH cluster considered essential to have a clear picture of the whole situation. A joint task force from the WASH and Health Clusters (including MoH) will be established to guide and supervise the technical implementation of WASH installation status and to ensure the ultimate institutionalization of WASH in Health surveillance mechanism.

The WASH in Health Working Group (WHWG) is chaired by the Palestinian Water Authority (PWA), with the support of the WW-GVC, under the strategic guidance of UNICEF, and the overall collaboration of the WASH Cluster Coordinator and the WASH cluster members, the Health Cluster, MoH, PWA, WHO, UNRWA, ICRC, along with the active Working Groups from WASH and Health Clusters.

Objectives

The main of objectives of WHWG are:

1. To establish well-coordinated mechanism among WASH/Health actors for ensuring proper implementation and monitoring of WASH in Health interventions.
2. To -strengthen the surveillance mechanism for WASH in Health facilities and support its institutionalization by the MoH and other key stakeholders.
3. To review baseline indicators and data collection tools for monitoring WASH in healthcare facilities to generate the needed information for reporting against the SDGs.
4. identify areas for quality improvement related to the WASH within the health facilities, that contribute to lowering the health care associated infection rates, having better health outcomes for patients and improving staff safety and morale.
5. To establish a robust platform for information and knowledge sharing related to WASH in healthcare facilities among WASH and Health Actors.

Structure

- The WASH in Health Working Group (WHWG) is chaired by Palestinian Water Authority (PWA), with the support of UNICEF and WW-GVC, with full collaboration of the WASH Cluster Coordinator.
- WHWG will be formed initially from, MoH, WHO, UNRWA, Oxfam ACF, CMWU, PHG, ICRC, and other related WASH & health cluster parties.
- The MoH, as a main institutional technical health counterpart, will provide additional support to the WHWG, especially through sharing information/knowledge and facilitate access to health facilities.
- The WHO will provide health-related technical support to the WHWG.

Tasks and Responsibilities

- The WHWG; will review and update the ToR for WASH in Health Working Group on a yearly basis
- Support and enhancing the coordination & communication mechanism related WASH - Health issues.
- Guide and follow up WASH - Health assessments in order to identify WASH needs/gaps in health institutions in regular basis, starting from collecting a baseline information for future WASH - Health interventions as a reference point for strengthening the preparedness and response capacity and enable to rapidly address the WASH needs in case of an emergency.
- Review the methodology, indicators, tools, applied procedures, data process, and work plan of the WASH in Health surveillance system.
- Support and strengthen of a concurrent monitoring system and surveillance mechanism, which would ultimately be institutionalized with MoH, in close coordination of the key WASH stakeholders.
- Guiding capacity building activities based on actual needs resulted from assessments & plans in order to develop the capacity of health workers in terms of knowledge, skills, attitudes to adopt life-saving WASH practices.
- Establish platform for WASH - Health information/knowledge sharing
- Provide coordination for the technical support in line with the international relevant standards, procedures and approaches which agreed within all members of the WHWG.
- Ensure that effective and coherent WASH assessment data is accessible to all relevant partners to reduce duplication of efforts.
- Ensuring Engagement of community-based organizations for triggering positive changes in WASH practices at households.
- Ensure mainstreaming of cross cutting issues in all WASH in health care facilities assessment tools and methodologies developed.

ANNEX 2

WASH Assessment in Health Institution in the Gaza Strip

Questionnaire

1. **Face to Face Interview with key personnel in the health facilities including**: Facility director, engineering department, IPC committee and quality improvement team leaders.
2. **Inspection check list for WASH facilities infrastructures and supplies (Coasted investments).**

Resources:

1. Core questions and indicators for monitoring WASH-in-Health care facilities in the Sustainable Development Goals.
2. Infection Prevention and Control Assessment Framework at The Facility Level (IPCAF), WHO, 2018.
3. WASH Assessment at Household Level in The Gaza Strip, WW-GVC, 2017.
4. Service Availability and Readiness Assessment (SARA), WHO, 2015.
5. Infection Control Assessment Tool (ICAT), USAID, 2009.
6. Essential environmental health standards in health care, WHO, 2008.
7. WHO drinking water quality Guidelines volume 4.

Facility Profile

Name of the Facility:				**Type:**	□ PHC □ SHC			**Number of buildings:**			□□	
Scope of Work (multiple response possible):				□ Medical □ Surgical □ Maternity □ Pediatric								
Address:				□ Gaza □ North □ Middle □ Khan-Younis □ Rafah								
Catchment area name:						**Number of populations:**			□□□□□□			
Total number of staffs	**Doctor**	**Male**	□□	**Nurses**	**Male**	□□	**Tech**	**Male**		**Admin**	**Male**	
		Female	□□		**Female**	□□		**Female**			**Female**	
		PWDs	□□		**PWDs**	□□		**PWDs**			**PWDs**	
Total number of beds	**Inpatient**	**Male**		□□□		**Operation Rooms**	□□			**Day Care**	□□	
		Female		□□□								
Total number of patients'/month male, female, children/Day	**Inpatient**			**Outpatient**			**Emergency**			**Deliveries**		
	Male	**Female**	**Children**	**Male**	**Children**	**Female**	**Male**	**Children**	**Female**			
	□□	□□	□□	□□	□□	□□	□□	□□	□□	□□		
Number of Surgeries/Day	**Number of Deliveries/Day**			**Occupancy Rate**					**Average Length of stay (ALOS)**			
□□□	□□□			□□□%					□□□□**days**			

Management

Indicator	Question	Fully met	Partially met	Not met
1. Number/percentage of Number/percentage of health facilities where protocol for operation and maintenance of Water Sanitation, hygiene and Health waste management facilities*	**Does this facility have protocol for operation and maintenance of WASH facilities.?**	**Yes**	**Complete but not implemented or incomplete or not monitored.**	**No**
	If yes, is it updated regularly?			
	If yes, is it implemented?			
	If yes, is it regularly monitored?			
2. Number/percentage of health facilities where an annual budget is planned to include WASH infrastructure services, personnel and the continuous procurement of WASH item which is sufficient to meet the needs of the facility.*	**Does this facility have an annual planned budget include WASH infrastructure services, personnel and the continuous procurement of WASH item which is sufficient to meet the needs of the facility?**	**Yes**	**Yes but budget is insufficient**	**No Budget**
3. Number/percentage of health facilities which have wash Emergency preparedness and response plan that includes for example WASH stored items to be used during Emergency.	**In case of emergency situation, DO you have Emergency preparedness and response plan that includes stock for the cleaning materials needed taking into consideration women, children, disabled specific needs**	**Yes**	**Yes, but not updated**	**No plan**

Indicator	Question	Fully met	Partially met	Not met
4. Number/percentage of health facilities where Policies are in place to ensure that Adequate number cleaners and WASH maintenance staff are available and meeting the needs.*	**Policies are in place to ensure that Adequate number cleaners and WASH maintenance staff are available and meeting the needs**	**Yes**	**Not adequate or not skilled**	**No**
5. Number/percentage of health facilities where Regular ward-based audits are undertaken to assess the availability of hand rub, soap, single use towels and other hand hygiene resources.*	**Regular ward-based audits are undertaken to assess the availability of hand rub, soap, single use towels and other hand hygiene resources**	**Yes**	**Undertaken less than once a week or not complete**	**No**
6. Number/percentage of health facilities where Regular hand hygiene compliance activities are undertaken regularly among all health care staff.**	**Regular hand hygiene compliance activities are undertaken regularly among all health care staff**	**Yes**	**Undertaken less than once a week or not complete**	**No**
7. Number/percentage of health facilities where Health care staff are trained on WASH/ IPC each year*	**Health care staff are trained on WASH/ IPC each year**	**Yes**	**Not All staff**	**No**
8. 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[51]*	**Do you provide the needed cleaning and personal protective equipment for each cleaning and waste disposal staff member**	**Yes**	**Available but not in good condition**	**No**
9. Percentage of WASH staff exposed to health risks vaccinated against Hepatitis B ****	**Number of vaccinated staff/Number of exposed staff %**			
Notes and comments				

Water

Indicator	Question	Fully met	Partially met	Not met
1. Proportion of health care facilities with water available from an improved water source[52] located on premises and water is available throughout the year*.	**Where is the main water source for the facility?**	**On premises**	**Within 500 m**	**Further than 500 m**
	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**
2. Proportion of health care facilities with a back source for domestic water***	**Number of health care facilities with back up source of domestic water/total number of assessed facilities %**			
3. Proportion of health care facilities with a back source for drinking water***	**Number of health care facilities with back up source of drinking water/total number of assessed facilities %**			

[51] Two bowls – one with clean water; the other with soapy water, Cloths and/or mop, A container or bag intended for dirty bed linen, Rubber gloves, water proof Apron, boots, Should not use sterile or non-sterile gloves.

[52] Improved water sources are those that, by nature of their design and construction, have the potential to deliver safe water. Improved sources include: piped water, boreholes or tube wells, protected dug wells.

Indicator	Question	Fully met	Partially met	Not met
4. Proportion of health care facilities which have local wells as water source are of low risk. (based on assessment checklist) *	Water Check list 2	**Low risk**	**Medium Risk**	**High Risk**
5. Proportion of health care facilities which have Water treatment unit are functioning well. (based on assessment checklist) ******	**Number of health care facilities with water treatment plant/Total number of assessed facilities %**			
	Water Check list 1	**Low risk**	**Medium Risk**	**High Risk**
6. Number/percentage of Health care facilities where water quality is monitored regularly regarding chlorine, turbidity, PH and fecal coliform[53]*	**What is the minimum frequency for testing the Chemical composition &biological composition of domestic and drinking water ?**	**More than once a week and meet the standards**	**Not regular but meets the standards**	**Not monitored or doesn't meet the standards**
7. Number and percentage of health care facilities where water storage is of low risk (based on an inspection checklist)*	Water Check list 3	**Low risk**	**Medium Risk**	**High Risk**
8. Number and percentage of health care facilities where public yard tabs and piped distribution are of low risk (based on an inspection checklist) *	Water Check list 4	**Low risk**	**Medium Risk**	**High Risk**
9. Number/Percentage of health care facilities where Energy is available for heating water	**Energy is available for heating water**	**Yes, always**	**Yes, sometimes**	**Never**

Sanitation

Indicator	Question	Fully met	Partially met	Not met
1. Proportion of health care facilities were toilets are clearly separated for staff and patient. *	Sanitation Check list 1	**Clearly separated with a signage**	**Separate latrines are available but not clearly separated**	**No separate latrines**
2. Proportion of health care facilities were toilets are clearly separated for staff and patient. *	Sanitation Check list 1	**Clearly separated with a signage**	**Separate latrines are available but not clearly separated**	**No separate latrines**
3. Proportion of health care facilities were at least one toilet provide the means to manage menstrual hygiene needs. *	Sanitation Check list 1	**Available**	**Available bit not clean or in disrepair**	**Not available**
4. Proportion of health care facilities were at least one toilet meet the needs of PWDs*	Sanitation Check list 1	**Available**	**Available bit not clean or in disrepair**	**Not available**
5. Number of toilets that are visibly cleaned and signed by the cleaners each day *	Sanitation Check list 1	**All clean and signed**	**Clean but not recorded**	**No record/toilets are cleaned less than once a day**

[53] PH: 6.5-8.5, turbidity<5 NTU, Chlorine 0.2-0.5 mg/l, and E. coli 0/100 ml.

Indicator	Question	Fully met	Partially met	Not met
6. Proportion of health care facilities with wastewater drainage system functioning (sufficient capacity and well designed) *	**Does the wastewater drainage system functioning (sufficient capacity and well designed)?**	**Yes**	**Not sufficient capacity, not well designed**	**No**
7. Proportion of health care facilities with wastewater pretreatment units like grease traps, septic tanks and so on *	**Are there any wastewater pretreatment units like grease traps, septic tanks and so on**	**Yes**	**Present but not functioning**	**No**
8. Number/percentage of health facilities where the surface run-off drainage system avoids carrying contamination outside the health-care setting*	**Does the surface run-off drainage system avoid carrying contamination outside the health-care setting?**	**Yes**	**Yes, but not functioning and obvious pools of water**	**No**
9. Number/percentage of health facilities where toxic wastes (e.g. reagents from a laboratory) are treated as health-care waste.	**toxic wastes (e.g. reagents from a laboratory) are treated as medical waste**	**Yes**	**Not in all departments**	**No**
10. Number/percentage of health facilities where infectious liquid wastes (e.g. blood or body fluids) are treated as health-care waste.	**infectious liquid wastes (e.g. blood or body fluids are treated as medical waste**	**Yes**	**Not in all departments**	**No**
Notes and comments				

Indicator	Question	Fully met	Partially met	Not met
1. Proportion of health care facilities with functional hand hygiene facilities available at one or more points of care and within 5 meters of toilets *	Sanitation Check list 1	**Present and functioning**	**Present and not functioning or no water or soap**	**Not present**
2. Proportion of health care facilities which have protocols for cleaning, and staff with cleaning responsibilities have all received training on cleaning procedures. *	**Do you have protocols/procedures for cleaning in place and disseminated among relevant staff?**	**Yes**	**Yes, but not disseminated**	**No**
3. Proportion of health care facilities where cleaning requirements/ procedures of different zones of the HF defined[54].*	**Are the cleaning requirements/procedures of different zones of the HCS defined?**	**Yes**	**Defined but applied**	**No**
4. Proportion of health care facilities where nursing staff and operational staff are trained in cleaning procedures. *	**Is the nursing staff trained in cleaning procedures?**	**Yes**	**Yes, but not all**	**No**
	Is the operational staff (e.g., cleaners) trained in cleaning procedures?	**Yes**	**Yes, but not all**	**No**
5. Proportion of health care facilities where operational staff are monitored or supervised when cleaning. *	**Is the operational staff monitored or supervised when cleaning?**	**Yes**	**Yes, But not in all departments**	**No**
6. Number and percentage of health care facilities where Record of cleaning visible and signed by the cleaners each day*	**Record of cleaning visible and signed by the cleaners each day**	**Yes**	**Record exists, but is not completed daily or is outdated**	**No**

[54] Number and sex of cleaners, type of cleaning materials and equipment and methodology of cleaning, frequency of cleaning.

7. Number/percentage of health facilities which has effective and regular vector control measures. *	**Are there any vector control measures taken? (rats, mosquitos, others)**	**Yes**	**not regular or not effective, not all areas**	**No**
8. Number of Health facilities where powdered infant formula is prepared appropriately. *	Hygiene Check list	**Yes**		**No**
9. Percentage of sinks that are operational and in good condition. *	Hygiene Check list	**All are operational and in good condition**	**More than 50%**	**Less than 50%**
Notes and comments				

Hygiene

Medical Waste Management

Indicator	Question	Fully met	Partially met	Not met
1. Number/percentage of facilities where adequately trained person is responsible for the management of health care waste in the health care facility*	**Trained person is responsible for the management of health care waste in the health care facility**	**Yes, adequately trained**	**Yes, not adequately trained**	**No**
2. 3. Proportion of HCF with waste correctly segregated in the consultation area*	**Are there clearly identified (by color, name) waste buckets/containers for the different types of waste (sharps, soft organic and domestic)**	**Yes**	**No, bins are present but do not meet all requirements or waste is not correctly segregated**	**No**
3. Number/percentage of facilities which have monitoring system to ensure the segregation facilities used effectively*	**Does your facility have monitoring system to ensure the segregation facilities used effectively?**	**Yes**	**Yes, not regularly monitored**	**No**
4. Proportion of HCF where infectious and sharp waste are safely treated or disposed[55]*	**Does this facility treat and/or dispose of sharps and infectious waste safely?**	**Yes**	**Present but not functional or insufficient capacity**	**No**
5. Proportion of patient areas that are correctly specify solid waste*****	Hygiene Check list			
6. Proportion of health care facilities where a Well identified, sited and protected (fenced) waste zone/area with concrete floor and a designated area within the zone with access to soap/disinfectant for hand washing. *	**Well identified, sited and protected (fenced) waste zone/area with concrete floor**	**Yes**	**Not protected**	**No**
7. 9. Proportion of health care facilities where waste-related injuries along the waste management chain correctly are reported and acted on. *	**Are waste-related injuries along the waste management chain correctly reported and acted on?**	**Yes always**	**not always**	**No**
Notes and comments				

[55] Safely Disposed: Autoclaved, Incinerated, burning in a protected pit, not treated, but buried in lined, protected pit, Not treated, but collected for medical waste disposal off-site, Not safely disposed: Open dumping without treatment, Open burning, Not treated and added to general waste.

1-Desalination unit Functionality check list				
1	**Desalination unit capacity (cubic meter /hour)**		**Desalination unit feeding departments**	
2	**Pre-treatments Units**			
2.1	Raw water storage tank	**YES**	**Yes, but not functioning**	**No**
2.2	Raw water booster pumps	**YES**	**Yes, but not functioning**	**No**
2.3	Dual media filters with backwash equipment	**YES**	**Yes, but not functioning**	**No**
2.4	DMF pressure gauge	**YES**	**Yes, but not functioning**	**No**
2.5	Backwash water tank	**YES**	**Yes, but not functioning**	**No**
2.6	Backwash water tank	**YES**	**Yes, but not functioning**	**No**
2.7	Flocculant dosing unit	**YES**	**Yes, but not functioning**	**No**
2.8	Sodiumbisulfite dosing unit	**YES**	**Yes, but not functioning**	**No**
2.9	Antiscalant dosing unit	**YES**	**Yes, but not functioning**	**No**
2.10	Chlorine dosing Unit	**YES**	**Yes, but not functioning**	**No**
3	**Reverse Osmosis Desalination plant**			
3.1	5 micron cartridge filter	**YES**	**Yes, but not functioning**	**No**
3.2	Cartridge filter differential pressure	**YES**	**Yes, but not functioning**	**No**
3.3	RO vessels status	Good	bad	Very bad
3.4	RO membrane elements			
3.5	RO membrane differential pressure	**YES**	**Yes, but not functioning**	**No**
3.6	Skid mount status (good, bad	Good	Bad	
3.7	RO piping connection system (good or bad)	Good	Bad	
3.8	High Pressure Pump Inlet Pressure gauge	**YES**	**Yes, but not functioning**	**No**
3.9	High Pressure Pump Outlet pressure gauge	**YES**	**Yes, but not functioning**	**No**
3.10	Permeate flow meter (number)unit	**YES**	**Yes, but not functioning**	**No**
3.11	Brine flow meter (number)unit	**Number**		
3.12	Low pressure switch	**YES**	**Yes, but not functioning**	**No**
3.13	High pressure switch	**YES**	**Yes, but not functioning**	**No**
3.14	Built on lab instrument devices	**YES**	**Yes, but not functioning**	**No**
4	**Post treatment**			
4.1	Permeate storage tank	**YES**	**Yes, but not functioning**	**No**
4.2	Chlorine dosing unit	**YES**	**Yes, but not functioning**	**No**
4.3	Limestone filter	**YES**	**Yes, but not functioning**	**No**
4.4	Caustic soda dosing unit	**YES**	**Yes, but not functioning**	**No**
5	**Potable water storage pump**	**YES**	**Yes, but not functioning**	**No**
6	**Power supply and control system**			
6.1	Plant control System	**YES**	**Yes, but not functioning**	**No**
6.2	PLC system	**YES**	**Yes, but not functioning**	**No**
6.3	Classic control	**YES**	**Yes, but not functioning**	**No**
7	**Safety tools**			
7.1	Fire extinguishers	**YES**	**Yes, but not functioning**	**No**
7.2	Thick Utility Gloves	**YES**	**Yes, but not functioning**	**No**
7.3	Eye Goggles	**YES**	**Yes, but not functioning**	**No**
7.4	Mask	**YES**	**Yes, but not functioning**	**No**
7.5	First aid kit	**YES**	**Yes, but not functioning**	**No**
7.6	Chemical storage safety	**YES**	**Yes, but not functioning**	**No**
7.7	Weight device	**YES**	**Yes, but not functioning**	**No**

2-Inspection of Wells		
Number of wells		
Location and/or name of well:		
If there is more than one well accessed by the facility, fill separate sheet		
Assessment Questions	Yes/No	Comments
Manifold status		
Well capacity -flowmeter- (cubic meter/hour)		
Well pump pressure gauge		
One-way valve		
Surge tank		
Chlorine dosing unit		
Water cyclone filter		
Electrical high-pressure switch		
Well water level measuring port		
Air release valve		
Is the nearest latrine a pit latrine that percolates to soil, i.e. not connected to a septic tank or sewer?		
Is there any other source of pollution (e.g. animal excreta, rubbish, surface water) within 10 m of the borehole?		
Is the drainage area around the pump house faulty?		
Is the fencing around the installation damaged in any way which would permit any unauthorized entry or allow animals access?		
Is the floor of the pump house permeable to water?		
Is the well seal unsanitary?		

3-Inspection of Distribution and Storage Conditions		
Location and/or name of storage reservoir		
Storage capacity in cubic meter		
Type of water (domestic drinking or both)		
Type/make of the storage container		
If there is more than one storage reservoir used in your facility, use one form for each reservoir		
Assessment Questions	Yes/No	Comments
Is there any point of leakage of the pipe between source and storage reservoir?		
Is the physical infrastructure of the storage reservoir cracked or leaking?		
Is there inspection cover of the storage reservoir?		
Is the inspection cover visibly dirty?		
Are screens protecting the air vents on the storage reservoir missing or damaged?		
If there is an overflow pipe, is the screen protecting it missing or damaged? concrete		
If there is a water level controller? PE		
Is there any scum or foreign object in the storage reservoir?		
Is the area around the storage reservoir unfenced or is the fence damaged, allowing animals to access the area?		
Is the storage reservoir not regularly cleaned and disinfected?		
Piped distribution	Yes/No	Comments
Are there any signs of leaks in the inspection area (for example, accumulating water)?		
Are any of the pipes exposed above ground in the inspection area?		
Have users report any pipe breaks within the last week?		

4-OBSERVATION CHECKLIST FOR ASSESSING TOILETS CONDITIONS					
Building			**Floor No**		
Number of toilets usable/unusable			**department**		
Number of staff	**Male**		**Average Number of patients**	**Male**	
	Female			**Female**	
	PWDs			**Children**	
At least one toilet meets the needs of people with reduced mobility		**1-**	**Yes**	Comments:	
		2-	**Yes, but not available or in disrepair**		
		3-	**No**		
For Each toilet fill a separate sheet of					
clearly separated for staff and patients by a signage		**1-**	**Yes**	Comments:	
		2-	**Separate latrine but not clearly separated by signage**		
		3-	**No**		
Clearly defined male and female by a signage		**1-**	**Yes**	Comments:	
		2-	**Separate latrine but not clearly separated by signage**		
		3-	**No**		
Status of toilet(s)	**1- Good**	**2- Bad**		**3- Very Bad**	
What type of toilet?	**1- Flush toilet**	**2- Flush toilet (but no water)**		**3- Pit latrine with slap**	
Toilet Area	_____*_____	**Door switch:**			
What type of toilet components are in need to be repaired?	**1- European W.C**	**4- Arabic W.C**		**7- Flushing box**	**10- Washing basin**
	2- Shower	**5- Roof isolation**		**8-Plastering-painting**	**11- Sanitary basic installations**
	3- Ground tiles	**6- Wall tiles**		**9-Door**	**12- Window**
Safety/privacy	**1- Electrical fittings (Yes/No)**	**2- lightings (Yes/No)**		**3- door locks (Yes/No)**	
Ventilation	**1-Window**			**2-Ventillation fan, Size:**	
Is the toilet suitable for persons with disabilities?		**1-**	**Yes**	Comments:	
		2-	**Yes, but not available or in disrepair**		
		3-	**No**		

Are they equipped with handwashing facilities, including soap or hand rub?	**1-**	**Yes**	Comments:
	2-	**No soap or hand rub**	
	3-	**No**	
Are there any leaks/ cracks in plumbing system?	**1-**	**Yes**	Comments:
	2-	**No**	
Record of cleaning toilets visible and signed by the cleaners each day	**1-**	**Yes**	Comments:
	2-	**Toilet is clean but no record**	
	3-	**Toilet is cleaned less once a day**	
Sinks is clean and free of visible contamination	1-	**Yes/No**	
Bathroom and patient room light switches	2-	**Yes/No**	
Bath room hand rails	**3-**	**Yes/No**	
Toilet seats	**4-**	**Yes/No**	
Bed pan cleaning equip	**5-**	**Yes/No**	
No damp spots on ceilings or walls	**6-**	**Yes/No**	

5-Inspection of Hygiene conditions		
Building		
Department		
Floor No		
Number of Showers		
Number of Washing stations		
Average number of Users		
Number of Reliable drinking water stations		
Use separate sheet for every hygiene station		
Assessment Questions	**Yes/No**	**Comments**
Is running water available?		
Is running water clear?		
Liquid soap present?		
Is the soap dispenser new or in a clean condition?		
Are disposable towels, individual towels available?		
Poster Explaining correct way for hand hygiene		
Poster explaining the 5 moments of hand hygiene		
Sink is clean		
The taps are not leaking		
The drainage pipes are not leaking		
Sink is in good condition		
Use separate sheet for every room		
Bed is clean and free of visible contamination		
Curtains have no visible contamination		
Bedding has been changed and is visibly free of contamination		

Beds are separated by 2.5 m from the center of one bed to the next and each bed		
bedside locker is clean and free of visible contamination		
Bedside equipment (suction, oxygen etc.) is clean and identified as clean/sterile		
Telephone is clean and free of visible contamination		
Tray table/trolley is clean and free of visible contamination		
IV pole clean and free of visible contamination		
Segregation of medical waste		
All waste containers have a plastic bag (red, black, or white)		
At least one set of waste containers should be provided per 20 beds in a ward.		
Waste containers are placed near the point of generation(within 5 meters)		
All containers are labeled		
All containers have a bag in the color corresponding to the label		
Correct waste observed inside the bags		
Sharp items discarded in the appropriate container (puncture-proof)		
Posters explaining the right method of Medical waste classification		
Less than 75% full		

6-if Infant Formula is prepared in the facility		
Clean dedicated area for preparation and storage of infant formula	**Yes/No**	**Comments**
Hands washing station with soap and water	**Yes/No**	**Comments**
Clear instruction posters on hand hygiene washing	**Yes/No**	**Comments**
Clear instruction posters on wash feeding and preparation equipment (e.g. cups, bottles, teats and spoons)	**Yes/No**	**Comments**
Sterilizing equipment is available, sterile thermometer is available	**Yes/No**	**Comments**
Clear instruction posters on the preparation of infant formula are available and updated	**Yes/No**	**Comments**
If making a batch in a larger container: the container should have been cleaned and sterilized. It should be no larger than 1 litre, be made from food-grade material and be suitable for pouring hot liquids.	**Yes/No**	**Comments**
The temperature of the refrigerator should be no higher than 5 °C and should be monitored daily.	**Yes/No**	**Comments**
Date of preparation is documented on each bottle	**Yes/No**	**Comments**
Feeds stored in the refrigerator more than 24 hours.	**Yes/No**	**Comments**

ANNEX 3

Table XXIX: Desalination Plants' Capacity, Efficiency and Feeding Departments

Health Facility	DP capacity (m3/day):	DP efficiency	DP feeding department/s?	Pre-treatment						5-micron cartridge filter	Cartridge filter pressure gauge	HPP Inlet Pressure gauge	HPP Outlet pressure gauge	Post treatment		
				Dual media filters/sediment filter	DMF pressure gauge	Backwash water tank	Chlorine unit	(SBS) unit	Antiscalant unit					Chlorine / UV unit	Limestone filter	Caustic soda unit (pH adjustment)
Indonesian hospital	20	**48**	Al Departments	Yes	Yes	Yes	No	No	No	Yes	No	No	No	Yes	No	No
Al Shifa	500	**44**	Al Departments	Yes	Yes	Yes	Yes, but not functioning	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Al Shifa	180	**40**	Laundry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes, but not functioning	Yes	Yes	Yes	No	No
Al Shifa	120	**48**	Hemodialysis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Al Shifa	50	**56**	Hemodialysis	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes, but not functioning	Yes	No	No
Al Shifa	35	**50**	Hemodialysis	Yes	Yes	No	No	No	Yes	Yes	No	Yes, but not functioning	Yes	Yes	No	No
Al Shifa	20	**50**	Hemodialysis	Yes	Yes	No	No	No	No	Yes	Yes	No	No	Yes	No	No
Al Shifa	5	**42**	Sterilization unit	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No
Al Shifa	5	**50**	Sterilization unit and the laboratory	No	No	No	No	No	Yes	Yes	No	No	No	Yes	No	No
Shohdaa Al Aqsa hospital	25	**26**	Hemodialysis	Yes	Yes, but not functioning	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

Health Facility	DP capacity (m3 /day) :	DP efficiency	DP feeding department/s ?	Pre-treatment						5-micron cartridge filter	Cartridge filter pressure gauge	HPP Inlet Pressure gauge	HPP Outlet pressure gauge	Post treatment		
				Dual media filters/sediment filter	DMF pressure gauge	Backwash water tank	Chlorine unit	(SBS) unit	Antiscalant unit					Chlorine / UV unit	Limestone filter	Caustic soda unit (pH adjustment)
Shohdaa Al Aqsa hospital	25	**39**	Main building	Yes	No	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
Shohdaa Al Aqsa hospital	25	**57**	Main building and sterilization	No	No	No	No	Yes	Yes	No	No	No	No	Yes	No	No
Shohdaa Al Aqsa hospital	10	**70**	Main building	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No
Shohdaa Al Aqsa hospital	5	**25**	Sterilization unit	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No
Shohdaa Al Aqsa hospital	50	**25**	Gynecology department	Yes	Yes	No	No	No	Yes	Yes	Yes	yes	Yes	Yes	No	No
Deir al Balah	12	**64**	Al Departments	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No
Bani Suheila	0.2	**33**	Kitchen	No	No	No	No	No	No	Yes	No	No	No	No	No	No
Khan Younis	21	**43**	Al Departments	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No
European hospital	10	**32**	Al Departments	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Al najjar hospital	10	**26**	Hemodialysis	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Al najjar hospital	6	**36**	Al Departments	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Rafah	10	**25**	Al Departments	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No

ANNEX 4

Table XXX: Water Quality Results

Name of facility	Sample Site	RC	PH	EC	TDS	NO_3	$CaCO_3$	TC	FC	Pseudomonas
Indonesian Hospital	Well	0	7.52	1460	905	75	434	2	negative	negative
	DU Post Treatment	0	6.37	102	51	11	12	negative	negative	negative
	DU Store Post	0						negative	negative	16
	Domestic Store	0						25	negative	3
	End Use Domestic (Nursing Room)	0						30	negative	negative
Al Shifa	Well South	0	7.46	20200	12524	127	3200	negative	negative	negative
	Well North	0	7.2	40400	25048	49	5600	negative	negative	negative
	Concrete Store Mix	0	7.44	37400	23188	80	5300	negative	negative	negative
	Drinking Store Main	0	7.37	1245	772	3	26	negative	negative	negative
	DU Building 8 Post	0	7.61	10	5	0	2	negative	negative	negative
	Laundry Du Post	0	8.52	3310	2052	12	236	negative	negative	negative
	Hemodialysis DU Post	0	7.94	34	17	0	12	negative	negative	5
	ICU End Use Drinking	0	8.11	252	126	27	27	negative	negative	50
	OR End Use Drinking	0	7.39	1242	770	4	40	negative	negative	negative
	Nicu End Use	0	7.33	1223	758	4	26	negative	negative	1
	Infant Formula Kitchen End Use (Drinking Out Source)	0	7.49	258	129	32	22	negative	negative	35
	Infant Formula Kitchen Store (Drinking Out Source)	0	7.14	215	108	3	8	negative	negative	5
	Cleaning Company Store	0	7.78	187	94	11	13	negative	negative	negative
Shohadaa Al Aqsa	Well Gyne	0	7.45	4630	2871	84	650	20	negative	1
	Well	0	7.45	5050	3131	293	1120	60	negative	negative
	Municipility Line	0	7.87	3770	2337	90	496	negative	negative	negative
	Pretreatment Gyne	0	8.07	4520	2802	69	620	negative	negative	85
	Domestic Storage	0	7.84	4720	2926	240	910	negative	negative	negative
	Concrete Store	0	7.68	4820	2988	264	940	negative	negative	negative
	Hemodialysis DU (Post)	0	5.9	12	6	0.5	0	negative	negative	negative
	Du	0	7.2	348	174	54	19	negative	negative	negative
	Drinking Store Gyne	0						1	negative	55
	NICU Storage	0	7.87	4230	2623	237	812	negative	negative	negative
	Drinking Store	0	7.04	349	175	56	20	negative	negative	negative
	End Use Domestic Er	0	7.77	4550	2821	241	840	negative	negative	negative
	End Use Domestic Icu	0	7.33	4580	2840	243	840	negative	negative	negative
	End Use Drinking Icu	0	6.87	355	178	54	18	negative	negative	negative

Name of facility	Sample Site	RC	PH	EC	TDS	NO_3	$CaCO_3$	TC	FC	Pseudomonas
	End Use Surgical Department Drinking	0	7.07	357	179	54	26	negative	negative	negative
	End User Outpatient Domestic	0						negative	negative	3
	End User Outpatient Drinking	0						1	negative	100
European Hospital	Mekorot In	0						negative	negative	40
	Mekorot Out	0						5	negative	>100
	Well	0	7.8	4300	2666	180	334	negative	negative	80
	DU Post	0	8.9	103	51	0	11	4	negative	80
	End Use Drinking Kitchen	0						negative	negative	>100
	End Use Domestic Kitchen	0						negative	negative	negative
	End Use Drinking NICU	0						negative	negative	negative
	End Use Domestic NICU	0						negative	negative	negative
Al Najjar	Well	0	7.5	5530	3429	167	1400	6	negative	negative
	Concrete Store	0	8	4950	3069	148	764	8	negative	negative
	Pretreatment	0	8.12	5040	3125	171	1760	4	negative	negative
	Post Treatment(Pretreatment For HD)	0	8.04	481	241	54	16	50	25	60
	End Use Domestic	0	8.12	4910	3044	155	812	3	negative	2
	End Use Drinking	0	8.04	560	280	57	37	50	25	60
Al Shima	Drinking Store	0						negative	negative	negative
	Domestic Storage	0						negative	negative	negative
	End Use Drinking	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
Hala Al Shawa	Store	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
Shohadaa Al Atatrah	Store	0	7.59	3140	1947	139	932	negative	negative	negative
	Store	0						negative	negative	negative
	End Use Laboratory	0						negative	negative	negative
Al Mughraga	Storage	0						negative	negative	negative
	End Use	0						negative	negative	negative
Juhr Al Diek	Drinking Store	0						negative	negative	negative
	Municipility Store	0						negative	negative	6
	End Use Domestic	0						negative	negative	negative
Heker El Jamee	Domestic Storage	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
	Drinkig Tank	0						1	1	30
Al Berka	Drinkig Tank	0						negative	negative	negative

Name of facility	Sample Site	RC	PH	EC	TDS	NO_3	$CaCO_3$	TC	FC	Pseudomonas
	Domestic Storage	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
Shohadaa Al Nusirat	Drinkig Tank	0						negative	negative	negative
	Domestic Storage	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
Old Nusirat	Drinkig Tank	0						negative	negative	negative
	Domestic Storage	0						negative	negative	negative
	End Use Domestic	0						negative	negative	negative
Al Sawarha	End Use Domestic	0						3	negative	3
	Domestic Store	0						8	negative	27
	Drinking Store	0						negative	negative	negative
Al Maghazi	End Use Domestic	0						negative	negative	negative
	Domestic Store	0						negative	negative	negative
	Drinking Store	0						negative	negative	negative
Dier Al Balah	Domestic Store	0						10	negative	>100
	Drinking Store	0						negative	negative	>100
	End Use Domestic	0						10	negative	25
	End Use Drinking	0						negative	negative	>100
	End Use Domestic	0						negative	negative	>100
Shohadaa Khanyounis	Mnunicipility Storage	0	8.79	644	322	76	44	negative	negative	50
	Pre Treatment	0						5	negative	>100
	DU Main Post	0						negative	negative	>100
	End Use Kitchen	0						negative	negative	negative
	End Use Drinking	0						negative	negative	negative
Shohadaa Bany Suhiela	Storage	0	8.77	207	104	13	28	negative	negative	negative
	DU Post	0						negative	negative	negative
	End Use Gyne Room	0						negative	negative	negative
	End Use Ex Room	0						negative	negative	negative
Tal Al Sultan	Well	0	7.85	3020	1812	149	608	negative	negative	negative
	Drinking Storage	0	8.49	188	94	9	24	negative	negative	negative
	Domestic Storage	0	7.88	2620	1624	132	612	negative	negative	negative
	End Use Domestic	0	7.91	2220	1376	115	616	negative	negative	negative
Shoahdaa Rafah	Well	0	8.03	4010	2486	58	298	1	negative	50
	Pretreatment	0	8.28	3920	2430	73	322	2	negative	negative

Name of facility	Sample Site	RC	PH	EC	TDS	NO_3	$CaCO_3$	TC	FC	Pseudomonas
	Post Treatment	0	6.97	42	21	2	3	negative	negative	**15**
	End Use Kitchen	0	7.99	4200	2604	83	316	8	3	**2**
	End Use Drinking	0	7.25	61	31	3	5	negative	negative	**60**

ANNEX 5

STANDARD OPERATING PROCEDURES

Drinking Water in Health Care Facilities

May, 2019

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LIST OF ACRONYMS

DPD	Diethyl Paraphenylene Diamine
HCAIs	Health Care Associated Infection
HCF	Health care Facility
IPC	Infection Prevention and Control
NTU	Nephelometric Turbidity Units
ppm	parts per million
PWA	Palestinian Water Authority
RC	Residual Chlorine
SOP	Standard Operating Procedure
TDS	Total dissolved solids
UV	Ultraviolet
WDS	Water Distribution System
WHO	World Health Organization
WQ	Water Quality
WTP	Water Treatment Plant

DEFINITIONS

Residual Chlorine	Residual chlorine remaining in the water at the end of a specified period.
Coliform Bacteria	Coliforms are a group of bacteria found in plant material, water, and soil. Coliforms are also present in the digestive tracts and feces of humans and animals. Most of the time, these bacteria are not harmful.
Total coliforms	Another term for the full group of coliforms. They are indicators of possible water contamination.
Fecal coliforms	One type of coliform bacteria found mainly in animal digestive tracts and feces. Fecal coliform tests are a more specific indicator of water contamination.
E. coli	Species of fecal coliform bacteria. E. coli nearly always comes from animal feces and is considered the best indicator of fecal water contamination. If E. coli is present, harmful bacteria or other pathogens may also be present
Contamination	Introduction into water of toxic materials, bacteria or other deleterious agents that make the water hazardous and therefore unfit for human use.
Organoleptic properties	Aspects of substances as experienced by the senses, including taste, sight, smell, and touch.
Parts per million (ppm)	Concentrations of dissolved or suspended matter in water. The parts per million (ppm) is a weight to weight or volume to volume relationship. Except in highly mineralized water, this quantity would be same as milligram per litre. This is preferable, since it indicates how it is determined in the laboratory.

pH of water	Expression of the Hydrogen ion concentration. Alkaline water is with pH of above 7 and acidic water has pH of below 7; whereas water with pH 7 is neutral.
Pollution	Introduction into water of substance in sufficient quantity to affect the original quality of water, make it objectionable to sight, taste, smell or make it less useful.
Potable Water	Satisfactory water for drinking purposes from the standpoint of its chemical, physical and biological characteristics.

1. OPERATIONAL MONITORING OF WATER QUALITY

Operational monitoring is ideally preventative, that is, intended to provide an early indication that a control measure is failing, or about to fail, so that timely corrective action may be taken before unsafe water is supplied to the consumer. For example, if the limit of acceptability for filtered water turbidity is defined as 5 NTU, preventative operational monitoring may set the critical limit to 3 NTU, such that corrective action can be taken (e.g. filter backwash) before the 5 NTU limit of acceptability is exceeded.

1.1 WATER QUALITY TEAM

A water quality team should be made up of a combination of internal and external resources. Every healthcare facility is different and the positions and titles allocated in Figure 1 below may not necessarily apply to all facilities. However, it is important that the internal resources cover more than just an engineering component. Internal knowledge regarding the hydraulic systems of a facility may be well known, however, the interpretation of microbial test results, applying these to determine level of risk and response, ongoing treatment options, human resources and outrage management, and consideration of the system in a holistic sense may be a significant challenge for many facilities. It is important to identify these gaps in knowledge and experience and source external advice early.

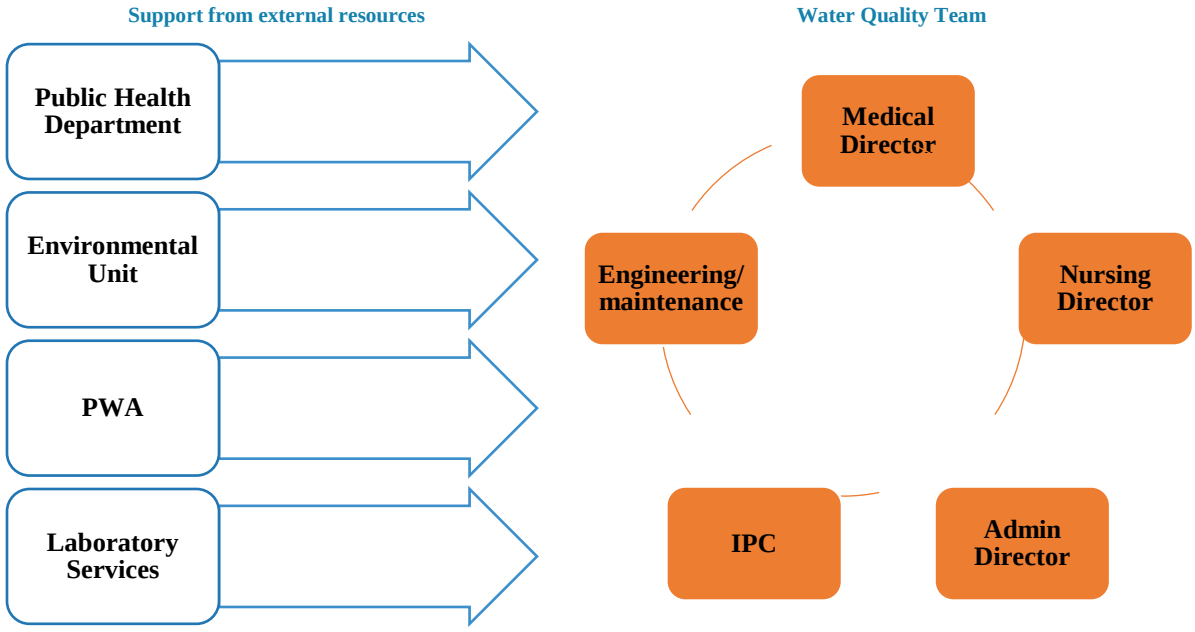
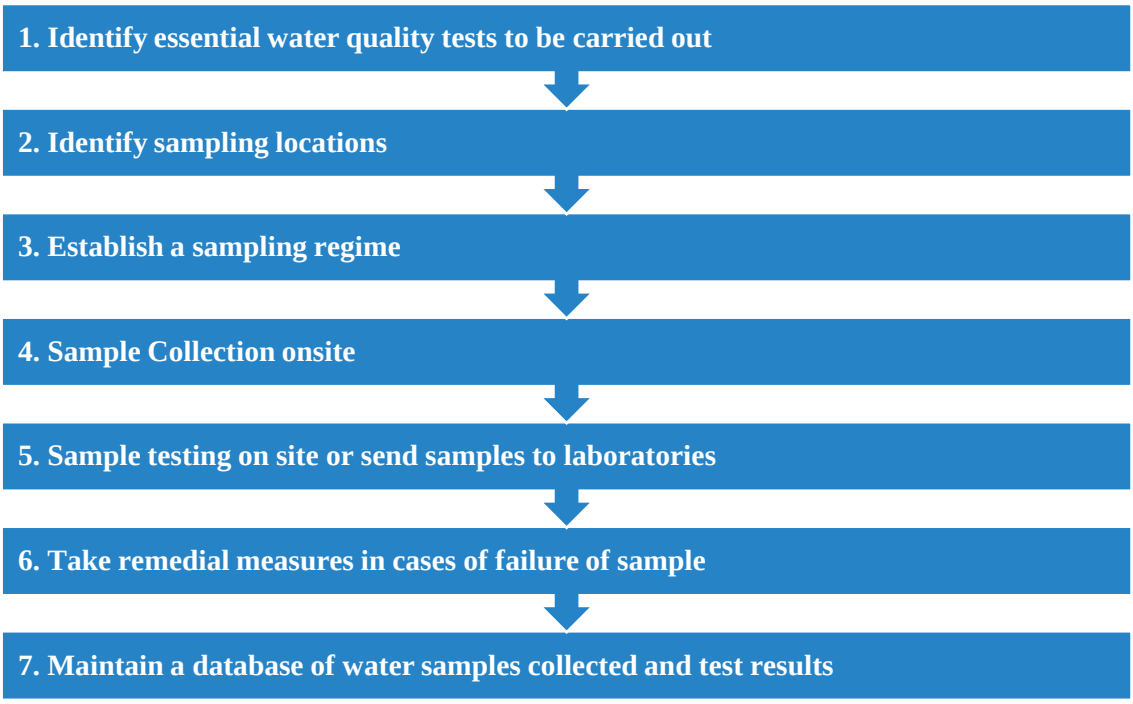


Figure 1 A Multi-Disciplined Approach for WQ Monitoring

1.2 WATER SAMPLING AND TESTING PROCEDURE

The water sampling and testing procedure is explained in these following seven sequential steps:



1. IDENTIFY ESSENTIAL WATER QUALITY TESTS

- ✓ Rapid, reliable results are necessary for operational monitoring so that timely corrective action may be taken to restore the effectiveness of the control measure.
- ✓ At a minimum, it is recommended that a basic water quality operational monitoring should test for the parameters presented in Table 1. Depending on the water quality risks identified for a particular water supply system, as well as the resources available within that setting, additional water quality parameters may be considered for inclusion in the Operational monitoring program.
- ✓ The team should be equipped with a basic understanding of various kinds of water quality tests and their importance.
- ✓ Priorities should be directed at the most important public health concerns. Control of microbiological contaminants in drinking-water is the highest priority.
- ✓ It is important to pay particular attention to the limited number of chemicals that have been found to present serious human health hazards due to exposure through drinking-water. These include fluoride, nitrate and possibly manganese.
- ✓ It must be emphasized that water quality operational monitoring is not based solely on laboratory testing, but also on regular sanitary inspections and surveys accompanied by recommendations for remedial action.

Table 31 Basic Water Quality Testing Parameters Used in Operational Monitoring

Water quality parameter	Description	Operational monitoring data indicates	Common method(s) of measurement
Turbidity (<5NTU)	Turbidity is caused by the presence of organic and inorganic particles in water (e.g. minerals, microorganisms) giving water a cloudy appearance	• Potentially hazardous events in the water supply system (e.g. poor source water quality, failure of the water treatment process, loss of distribution network integrity, such as water main leak/burst, illegal connection). • Potential for reduced effectiveness of disinfection. • Potential for consumer acceptability issues (e.g. taste, odor, appearance)	• Turbidity meter
Chlorine (0.2 and 0.5mg/L)) (if chlorination is practiced)	Chlorine is added to drinking-water to kill or inactivate harmful microorganisms and to protect the water from microbial recontamination during delivery to the consumer	• The effectiveness of disinfection. • The degree of residual protection from recontamination by microorganisms during distribution. • Potential hazardous events in the water supply system (e.g. increase in the presence of organic/inorganic material in the water, over-/under-dose of chlorine, loss of distribution network integrity). • Potential for consumer acceptability issues (e.g. chlorine taste, odour)	• Disposable chlorine test strip • Comparator test kit • Chlorine meter
pH (6.5-8.5) (if chlorination and/or chemical coagulation is practiced)	pH indicates the acidity or alkalinity of water	• Potential for reduced effectiveness of a water treatment process (e.g. coagulation/flocculation, chlorine disinfection) • Potential hazardous events in the water supply system (e.g. discharges of waste in the catchment, over-/underdose of water treatment chemical)	• Disposable pH test strip • Comparator test kit. • pH meter.

Table 32 Organoleptic, Physical and Chemical Parameters

Characteristics	Prescribed values	Undesirable Effects
Color	Colorless	
Odor	Acceptable	
Taste	Acceptable	
Dissolved solids (mg/l)	500 - 2000	Beyond this palatability decreases and may cause gastrointestinal irritation
Iron (as Fe) (mg/l)	0.3	Has adverse effect on domestic uses and water supply structures, and promotes iron bacteria
Copper (as Cu) (mg/l)	0.05 - 1.5	Astringent taste, discoloration and corrosion of pipes
Fluoride (as F) (mg/l)	1.0 - 1.5	High fluoride may cause fluorosis
Nitrate (as NO3) (mg/l)	45	Beyond this methaemoglobinamia takes place/may be indicative of pollution
Manganese (as Mn)(mg/l)	0.1-0.3	Beyond this limit taste/appearance are affected, has adverse effect on water supply structures.
Chlorides (mg/l)	250 - 1000	Beyond this limit taste, corrosion and palatability are affected
Total hardness (as CaCO3) (mg/l)	200 - 600	Encrustation in water supply structure and adverse effects on domestic use
Ammonia (as total ammonia-N) (mg/l)	0.5	Toxicological effect about 200 mg per kg of body weight

Table 33 Bacteriological Parameters of Water

Organisms	Guidelines
All water intended for drinking	
E. coli or thermotolerant coliform bacteria	Must not be detectable in any 100 ml sample.
Pseudomonas	Infectious dose 108–109 colony forming units/liter
Legionella	< 1000 colony forming units/liter.
Treated water entering the distribution system	
E. coli or thermotolerant coliform bacteria	Total coliform bacteria Must not be detectable in any 100 ml sample. Must not be detectable in any 100 ml sample.
Treated water in the distribution system	
E. coli or thermotolerant coliform bacteria	Must not be detectable in any 100 ml sample.
Total coliform bacteria	Must not be detectable in any 100 ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of samples taken throughout any 12-month period.

2. IDENTIFY SAMPLING LOCATIONS

- ✓ The number of locations from where samples for water quality testing should be collected is based on the source of water and the water supply system.
- ✓ A full description of the water supply system should be available with all the inlets and outlets (figure 2).
- ✓ Frequency should be dependent on the system level risk. Identify hazards and hazardous events and assess the risks. Examples of typical hazards, hazardous events, control measures and corresponding operational monitoring at each step within a water supply system is represented in table 2.

- ✓ It is recommended that the Water monitoring team make a sampling plan by taking into consideration the following criteria:
  - Most HCFs have multiple sources of water. Sampling points should be selected such that all different sources from which water is obtained are covered.
  - There should be at least one sampling point at the clean-water outlet of each water treatment plant (WTP). Similarly, there should be at least one sampling point at the inlet of sump in a water distribution system (WDS).
  - Sampling sites at the above mentioned locations should be fixed for comparing water quality test results over time.
  - Sampling should also be carried out at variable locations, which prove helpful in detecting local problems in the water supply system.
  - Sampling locations at consumer end should be representative and include representative outlets: showers, basins and toilets. For each outlet, samples should include first catch from cold and warm.

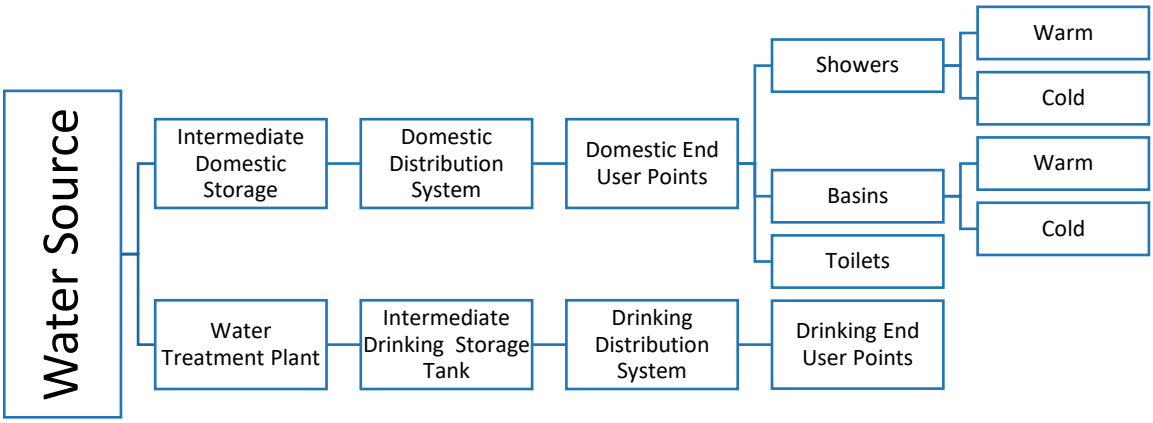


Figure 2 Description of Water Supply System in HCFs

Table 34 Examples of Typical Hazards, Hazardous Events, Control Measures and Corresponding Operational Monitoring

Process step	Hazardous event	Control measure	Operational monitoring
Source	Stock defecating in the source water (M, P)	Fencing to prevent stock access	Integrity of stock exclusion fence (V)
	Raw water turbidity spike	Water filter at raw water off-take	Water turbidity post filtratiom
Water treatment plant	Impairment of treatment process due to vandalism (M, C, P)	Security fencing	Integrity of security fence (V)
	Reduced effectiveness of disinfection due to high raw water turbidity (M)	Filtration	Filtered water turbidity (Ms)
Intermediate storage tank	Regrowth of microorganisms on tank water interface during treated water storage (M)	Maintenance of residual chlorine RC concentration	RC concentration in tank water (Ms)
	Accumulation of sediment in tank over time (M, P)	Tank cleaning programme	Tank outlet water turbidity (Ms)
Distribution system	Regrowth of microorganisms on pipe wall during distribution (M)	Readjustment	RC concentration in distribution system (Ms)
	Suspension of sediment in distribution pipes following abnormal flow event (M, P)	Water main maintenance/ cleaning Programme	Distribution system water turbidity (Ms)
End User Points	Contamination of water through insanitary treatment/ storage practices (M)	water treatment and safe storage awareness Programme	Observation of water treatment and safe storage practices (V)
	Contamination of water through the use of inappropriate plumbing materials (C)	Consumer plumbing inspection Programme	Inspection of internal plumbing (V)

M – microbial; C – chemical; P – physical; V – visual; Ms – measurable.

3. ESTABLISH SAMPLING REGIME

Establish a sampling regime for various locations identified in the water distribution network. The sampling regime should list the number of samples to be collected and frequency of sampling at each sampling location for the different water quality tests mentioned above.

Sampling sit	Frequency of Required Tests				Minimum number of Samples
	Physical	RC	Bacteriological	Chemical	
Dug well	Quarterly	Daily	Monthly	Quarterly	At each well
Outlet of WTP	Daily (Turbidity only)	Hourly during supply time	Weekly	Daily	One per source
Inlet of main sump/ Ground level Storage Reservoir/ Elevated Service Reservoir	Daily	Daily	Weekly	Monthly	Each WDS
Consumer End	Daily (Turbidity only)	Daily	Monthly	Once/year	At 5-10 locations from each WDS zone. All high-risk departments. During a disease outbreak, number of samples should be increased
Hemodialysis (post treatment during or after dialysis)	Daily (Turbidity only)	-	Monthly	Monthly	All points.

4. SAMPLE COLLECTION ON SITE

The objective of sampling is to collect a small portion of water which can be easily transported to laboratory, without contamination or deterioration and which should accurately represent the water being supplied.

1. PREPARATION AND PLANNING:

- Identify the total number of samples to be collected, the sampling locations and the parameters for which samples need to be collected.
- Make a list of equipment for sample collection and on site testing (table 3).

Table 35 List of Equipment for Sample Collection and Field-Testing

For sample collection	For onsite chemical and physical testing
Sampling Bottle	Test tube
Water Microbiology Bottle	TDS Digital METER
Gas Burner	pH Digital METER
Plastic Ice Box	Free Chlorine measuring Kit
Sticker Label	Free Chlorine test strips DPD1
Sketch Pen	
Date Collection Formats	
Labels	

2. FOLLOW PROCEDURE FOR SAMPLE COLLECTION AT DIFFERENT LOCATIONS:

1. SAMPLING FROM A TAP OR PUMP OUTLET

A. Clean the tap

Remove from the tap any attachments that may cause splashing. Using a clean cloth, wipe the outlet to remove any dirt.

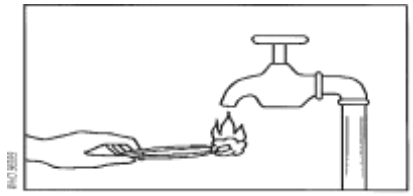
B. Open the tap

Turn on the tap at maximum flow and let the water run for

1–2 minutes.

C. Sterilize the tap

Sterilize the tap for a minute with the flame from a gas burner, cigarette lighter, or an ignited alcohol-soaked cotton-wool swab.



D. Open the tap before sampling.

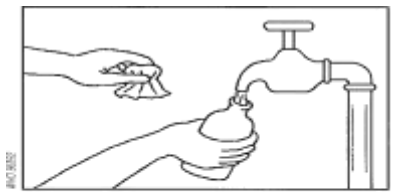
Carefully turn on the tap and allow the water to flow for 1-2 minutes, do not adjust the flow rate after it has been set.

E. Open the sterilized bottle.

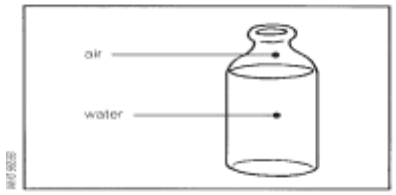
Take out a bottle and carefully unscrew the cap or pull out the stopper.

F. Fill the bottle

While holding the cap and protective cover face down- wards (to prevent entry of dust, which may contaminate the sample), immediately hold the bottle under the water jet, and fill.



A small air space should be left to make shaking before analysis easier.



G. Stopper or cap the bottle. Place the stopper in the bottle or screw on the cap and fix the brown paper protective cover in place with the string.

5. SAMPLE TESTING ON SITE OR SEND SAMPLES TO LABORATORIES

1. SAMPLES FOR PHYSICAL AND FIELD TESTING

A. Testing for chlorine residual

The most common test is the DPD (Diethyl Paraphenylene Diamine) indicator test, using a comparator or a photometer. A tablet of DPD-1 is added to a sample of water, coloring it red. The strength of color is measured against standard colors on a chart to determine the chlorine concentration. The stronger the color, the higher the concentration of chlorine in the water. The second equipment called a photometer that can be used to determine more precisely the concentration of chlorine in the water. The DPD-1 strip used for this test produces a color change if chlorine is present, and the amount by which the water changes color depends on the chlorine concentration. Several kits for analyzing the chlorine residual in water, such as the illustrated in Figure 3 (comparator) and Figure 4 (photometer), are available commercially. The kits are small and portable.

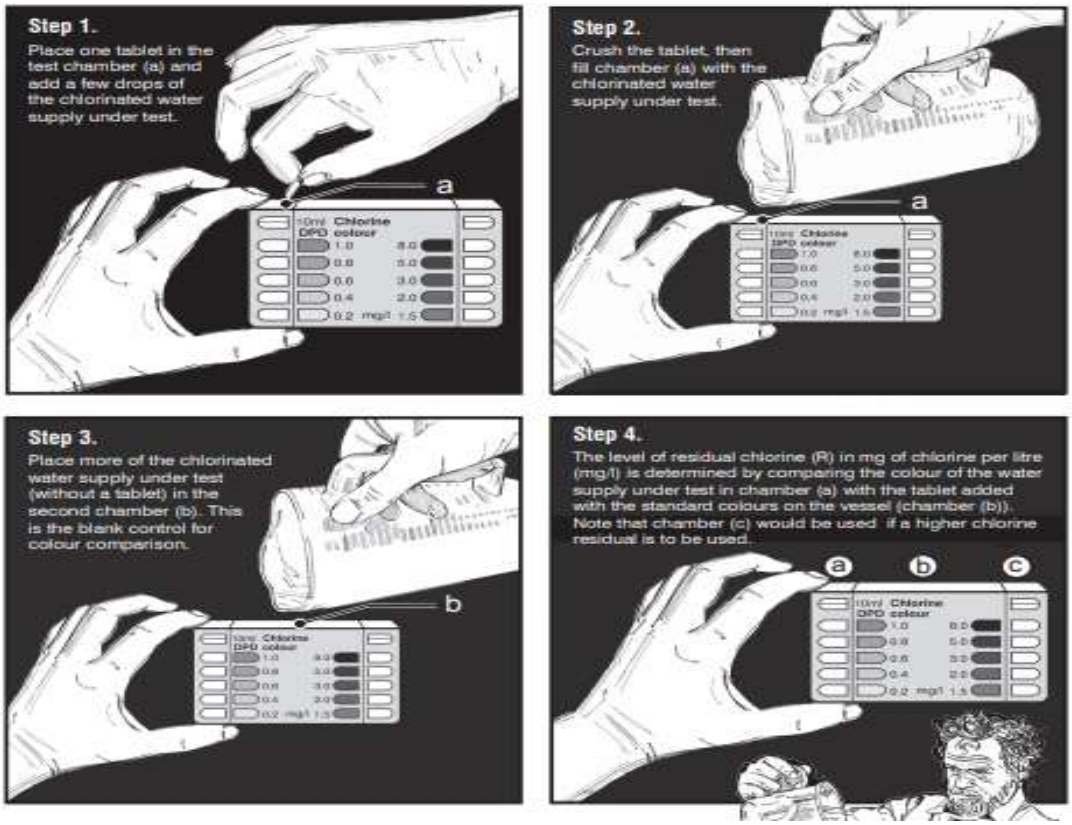


Figure 3 Steps in Determining the Chlorine Residual in Water Using a Comparator

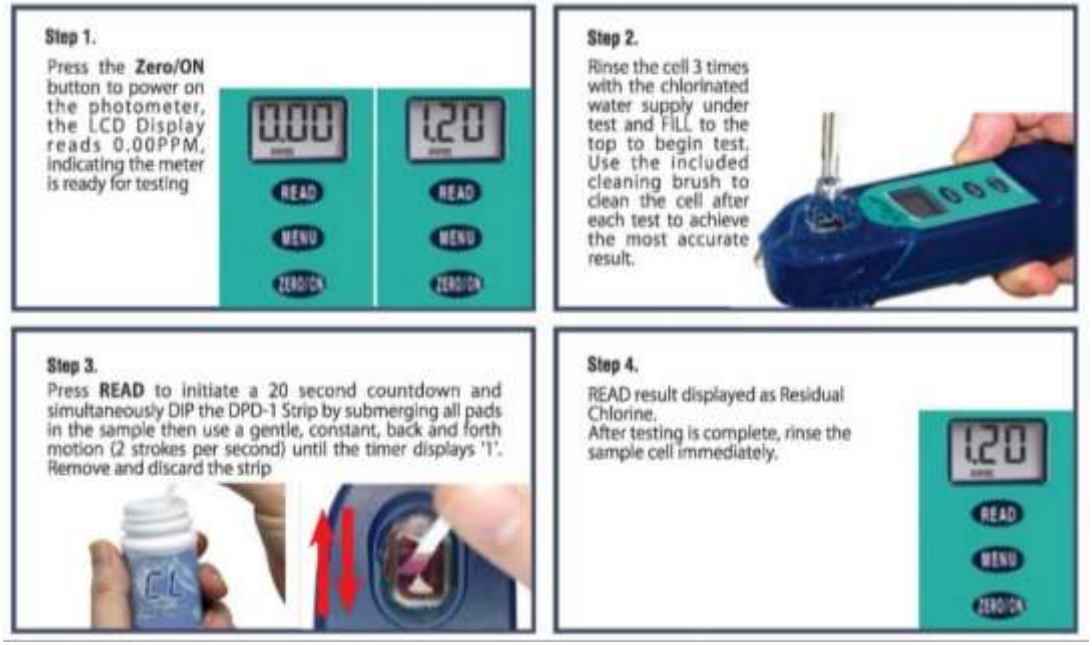


Figure 4 Steps in Determining the Chlorine Residual in Water Using a Photometer

B. Testing for pH:

Testing the pH can be done by phenol red pH indicator solution using a comparator or digital handheld pH meter or Disposable pH test strip. The most common used method is the digital handheld pH meter.

1. Remove the protective cap
2. First rinse the electrode with distilled water and rinse it with a soft piece of filter paper/cotton flannel.
3. Turn of the pH meter by pressing the "ON" button.
4. Immerse the pH meter electrode into the solution you wish to measure.
5. Stir gently and wait for the value to stabilize.
6. Once stabilized press the "HOLD" button, and the value will be kept. If you press the "HOLD" button again, the hold condition will be released.
7. After use, rinse the electrode with water and press the "OFF" key.
8. Replace the protective cap after use

C. Testing for Total dissolved solids (TDS):

Total dissolved solids (TDS) are the total amount of mobile charged ions including mineral, salts or metals dissolved in a given volume of water. TDS which is based on conductivity is expressed in parts per million (ppm). Typically expressed in NTU, turbidity is a practical parameter that can be measured using online devices, and benchtop and portable meters or turbidity tubes.

1. Remove the protective cap.
2. Turn the TDS meter on. The ON/OFF switch is located on the panel.
3. Immerse the meter into the water/solution up to the max. immersion level.
4. Lightly stir the meter to dislodge any air bubbles.
5. Wait until the display stabilizes. Once the reading stabilizes (approx. 10 seconds), press the HOLD button to view the reading out of the water.
6. After usage, shake off any excess water from your meter. Replace the cap.

D. Testing for Turbidity:

Turbidity can be measured using either an electronic turbidity meter or a turbidity tube. Both methods have advantages and disadvantages, as shown below (figure 5 and 6). Turbidity is usually measured in nephelometric turbidity units (NTU) or Jackson turbidity units (JTLJ), depending on the method used for measurement. The two units are roughly equal.

There are many different types of electronic turbidity meter available.

Advantages:

- very accurate, and especially useful for measuring very low turbidities (less than 5 NTU)

Disadvantages

- High cost
- Need power supply (mains or battery)
- Easily damaged

It is impossible to give general guidelines on their use here. You should refer to manufacturers' instructions for use and maintenance of these meters. Figure 1 shows an example of an electronic turbidity meter.

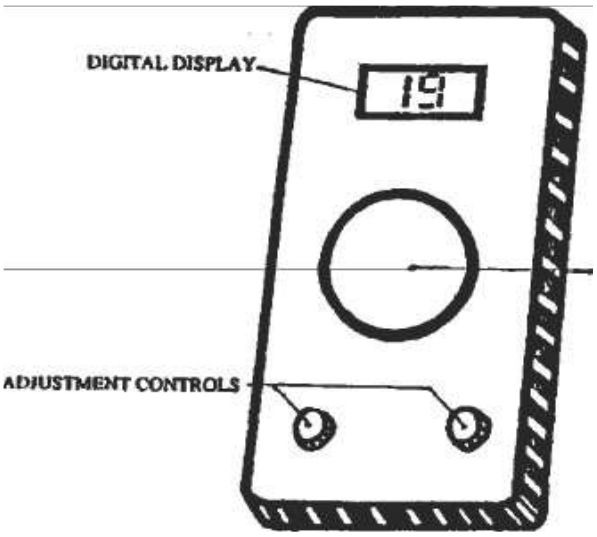


Figure 5 Turbidity Meter

Advantages

- Simple design
- Low cost
- Not easily damaged

Disadvantages

- Cannot measure very low turbidities (usual minimum is 5 NTU)
- Less precise.

To measure the turbidity of a water sample using a turbidity tube:

- Where the tube is in two parts, push the two parts together; making sure that they fit squarely.
- Hold the tube in one hand near the bottom and look into the open end with your head about 10 to 20 centimeters above the tube, so that you can clearly see the black circle,
- Cross or other murk on the bottom of the tube.
- Slowly pour the water sample into the tube, waiting for air bubbles to rise if necessary, until the mark on the bottom of the tube just disappears.
- Look at the level of water in the tube. Read the number on the nearest line to the water level. If the tube does not have a scale marked, measure the distance from the bottom of the tube to the water level with a tape measure and look up or calculate the turbidity using the instructions provided with the tube.
- After use, wash the tube in clean water and store the two parts of the tube where they cannot be damaged

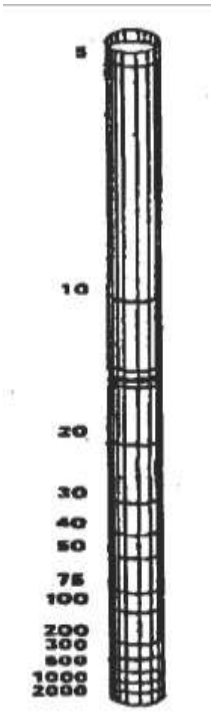


Figure 6 Turbidity Tube

2. PERFORMING BACTERIOLOGICAL TESTS

Bacteriological tests are not conducted onsite. All samples collected for bacteriological testing should be sent to accredited laboratories.

3. PERFORMING CHEMICAL TESTS

Chemical tests are not conducted on site. Some kits allow indicative tests on site such as chlorides and nitrates. In any case, samples for chemical testing should be sent to accredited laboratories.

6. REMEDIAL AND PREVENTIVE MEASURES

The presence of pollutants and impurities in drinking water can be discerned in one of the following three ways

1. Failure of water quality tests
2. Unsatisfactory findings of sanitary inspection
3. Complaints of dirty/ turbid water or a localized epidemic of HCAIs.

FAILURE OF WATER QUALITY TESTS:

The following tables are remedial and preventive measures in case of failure of water quality tests.

Table 36 Remedial Measures in Case of Failure of RC Test

Sampling Location	Immediate Remedial Measure	Preventive Action
At WTP/WDS	Add more chlorine and repeat the test till the sample clear RC test. If the sample fails consecutively three times immediately send the sample for bacteriological testing	Not applicable
At consumer end	Recommend boiling and using of chlorine tablets. Immediately send the sample for bacteriological testing	Not applicable

Table 37 Remedial Measures in Case of Failure of Bacteriological Tests

Sampling Location	Immediate Remedial Measure	Preventive Action
At source	Disinfect (chlorinate) water supply (section 2.1)	Protect the source and its catchment
	Conduct a detailed sanitary inspection and correct the short comings found	
At WTP/ WDS	Ensure 0.2 mg/l free RC at tail end. (super chlorination)	Frequent and improved supervision of the whole system is necessary, careful operations and maintenance is essential
	Conduct a detailed sanitary inspection of whole water supply system and rectify the shortcomings found	
At consumer end	Recommend boiling and use of chlorine tablets	Ensure routine sanitary inspections and feedback information

UNSATISFACTORY FINDINGS OF SANITARY INSPECTION

Table 38 Remedial Measures in Case of Unsatisfactory Sanitary Inspection

Findings	Immediate Remedial Measure
Unsatisfactory findings of the sanitary inspection around untreated piped water supply	• Immediately protect the source and its catchment area • Conduct a detailed sanitary inspection • Immediately correct the shortcomings found
Unsatisfactory findings of the sanitary inspection around WTP or WDS report	• Immediately collect samples and send for testing to confirm bacteriological quality. • Recommend boiling of water or use of disinfectant (chlorine tablets) to area residents. • Frequent and improved supervision of the whole system is necessary, careful operations and maintenance is essential especially for intermittent systems. • Ensure routine sanitary inspections and feedback information to the water supply agencies.

LOCALIZED EPIDEMIC OF ENTERIC INFECTION (HCAIS)

Table 39 Remedial Measures in Case of Localized Epidemic of Enteric Infection

Immediate Remedial Measure	Preventive Measure
• Take samples for bacteriological analysis. • Without waiting bacteriological results, immediately chlorinate water supply so that the tail end has minimum 0.5 mg/l of free RC. • Recommend boiling and use of chlorine tablets at end use. • conduct a detailed sanitary inspection of source and distribution system and rectify the shortcomings found	• Elimination of the pollution source (for example, sewage getting mixed in drinking water supply because of a broken pipeline). • Frequent and improved supervision of the whole system is necessary, • Careful operations and maintenance is essential, especially for intermittent systems. • Ensure routine sanitary inspections, especially in areas prone to water logging and flooding.

7. DATA RECORDING AND MANAGEMENT

The analysis results for all samples tested in field or sent to the laboratory should be duly recorded and compiled on a regular basis. The forms for recording these test results, should not be complicated, but must be comprehensive and provide all necessary information such as location where sample was collected, data and time and the results of the test.

The laboratory carrying out the bacteriological and chemical tests should record the results obtained in a standardized form.

Table 40 Sample Format for Recording Physical & RC Test Results

Name of hospital:										
Address:										
Name of department taking the sample:										
Date	**Time**	**Site**	**Turbidity (NTU)**		**Chlorine (ppm)**	**TDS**	**pH**	**Notes**	**Signature of operator**	**Signature of analyst**
			Total Number of samples taken in the month							

Total No. of Samples		**No. of samples passed**					**No. of Samples failed**			
		Turbidity	**Chlorine**	**TDS**		**pH**	**Turbidity**	**Chlorine**	**TDS**	**pH**

Table 41 Sample Format for Collating Monthly Records of Water Quality Tests

Name of hospital:												
Address:												
Name of department taking the sample:												
Name of department	**Residual Chlorine**			**Physical**			**Chemical**			**Bacteriological**		
	Total	**pass**	**fail**	**Total**	**pass**	**fail**	**Total**	**pass**	**fail**	**Total**	**pass**	**fail**

Table 42 Sanitary Inspection of Water Wells

Inspection of Wells		
Number of wells		
Location and/or name of well:		
Date of Visit		
Water Sample taken Y/N		
If there is more than one well accessed by the facility, fill separate sheet		
Assessment Questions	Yes/No	Comments
1. Is there a latrine or sewer within 15 – 20 m of the pump house?		
2. Is the nearest latrine a pit latrine that percolates to soil, i.e. not connected to a septic tank or sewer?		
3. Is there any other source of pollution (e.g. animal excreta, rubbish, surface water) within 10 m of the borehole?		
4. Is the drainage area around the pump house faulty? 5. Is it broken, permitting ponding and/or leakage to ground?		
6. Is the fencing around the installation damaged in any way which would permit any unauthorized entry or allow animals access?		
7. Is the floor of the pump house permeable to water?		
8. Is the well seal unsanitary?		
Total score of risks..... /10		
Contamination risk score: 7-8 = very high; 6 –5 = high; 3-4 = intermediate; 0 –2 = low		

Table 43 Sanitary Inspection of Distribution and Storage

Inspection of Distribution and Storage Conditions		
Location and/or name of storage reservoir		
Storage capacity in cubic meter		
Type of water (domestic drinking or both)		
Type/make of the storage container		
If there is more than one storage reservoir used in your facility, use one form for each reservoir		
Assessment Questions	Yes/No	Comments
1. Are there any leaks in the distribution system?		
2. Is the physical infrastructure of the storage reservoir cracked or leaking?		
3. Is there inspection cover of the storage reservoir?		
4. Is the inspection cover visibly dirty?		
5. Are screens protecting the air vents on the storage reservoir missing or damaged?		
6. If there is an overflow pipe, is the screen protecting it missing or damaged? (concrete tank)		
7. If there is a water level controller? (PE tank)		
8. Is there any scum or foreign object in the storage reservoir?		
9. Is the area around the storage reservoir unfenced or is the fence damaged, allowing animals to access the area?		
10. Is the storage reservoir not regularly cleaned and disinfected?		
Total score of risks..... /10		
Contamination risk score: 9 –10 = very high; 6 –8 = high; 3 –5 = intermediate; 0 –2 = low		

Table 44 Sanitary Inspection of WTP

Date of survey:			
Carried out by:			
Department served:			
Treatment-plant capacity	**Designed:**	**Actual:**	
Security of plant	**Fence: Y/N**	**Security guard: Y/N**	
Record keeping			
1. Chemical consumption:			
2. Process-control tests:			
3. Bacteriological examination:			
4. Residual chlorine:			
5. Others:			
Maintenance			
	Cleaning	**Calibrating/oiling/ greasing**	
1. Screen			
2. Pumping facility			
3. Chlorine-dosing unit			
4. Sodiumbisulfite dosing unit			
5. Antiscalant dosing unit			
6. Instrument (gauge, recording devices, etc			
7. General housekeeping			
8. Storage of chemicals			
Problems (if any) with:			
	Yes	**No**	**Description of problem**
1. Chlorination			
2. Dechlorination			
3. Activated carbon			
4. Antiscalant			
5. Filtration			
6. Fine Filtration			
7. High Pressure Pumping			
8. Reverse Osmosis			
9. Demineralization			
10. Neutralization			
11. Disinfection			
12. Storage			
13. Other process			
14. Process control			
15. Record keeping			
16. Maintenance			
Remedial measures recommended			

Measures to be taken immediately:
Measures to be taken later on:
Have problems identified in the previous sanitary survey been corrected?

2. CLEANING AND DISINFECTION OF WATER SYSTEM

2.1 DISINFECTION OF BOREHOLES

SAFETY PRECAUTIONS TO TAKE BEFORE STARTING

1. Turn off all electricity and clear debris from around the top of the well.
2. If the well is connected to interior plumbing, close valves to any water softener unit.
3. Wear protective goggles or a face shield when working with chlorine solutions. Chlorine solutions may cause injury to the eye, irritate skin, and damage clothing.
4. Work in well-ventilated areas and avoid breathing vapors when mixing and handling chlorine solutions.
5. Warn users not to drink or bathe in water until the well has been disinfected.
6. Always add Chlorine to water and not water to Chlorine.

DISINFECTION

The most common method of disinfection is by chlorination. Chlorine is delivered in a variety of ways but the most common is sodium hypochlorite, which is a liquid chlorine and has around 10-12% available chlorine released in the water to disinfect.

1. Calculate the volume of water to be treated.
2. Pour the chlorine liquid into the borehole (you may have to remove part of the pump to do this).
3. Replace the pump and operate it until chlorine can be smelled in the outflow.
4. Allow the water to stand in the borehole for 12 to 24 hours and then operate the pump until all the chlorinated liquid has been removed. Note that if a chlorine smell is not present in the discharge water after this contact time, the chlorination procedure should be repeated.
5. If you have a chlorine test kit you can check the chlorine concentration in the water
6. In about a week, collect a water sample for bacteriological examination. To be very safe, boil or chlorinate all drinking water until the bacteriological results are returned. Two consecutive "safe" tests will probably indicate that the treatment has been effective

Table 45 how to calculate the amount of chlorine for Disinfection

1. Calculate the volume of water in the borehole using the formula:

$$v = \frac{\pi D^2 h}{4}$$

Where

V = volume of water in the borehole (m3)

D = diameter of the borehole (m)

h = depth of water (m)

π = 3.142

2. Multiply the answer by 1000 to convert the answer to liters

3. Determine how much chlorine needs to be added to effectively disinfect the calculated volume of water using 0.5 liter chlorine to each 1000 liter water.

2.2 DISINFECTION OF WATER TANKS

SAFETY PRECAUTIONS TO TAKE BEFORE STARTING

1. Gaining access and working inside a water tank can be difficult and dangerous. There is often only a small access hatch on the top of the tanker through which to climb in and out.
2. Cleaners should be aware that some liquid held in tanks can give off hazardous gases which may remain even when the liquid has been removed. The liquids may also pose physical hazards such as slippery surfaces. Corrosive liquids can cause burns.
3. Always blow fresh air into the tank for a period before allowing a person to enter. The cleaner should wear protective clothing, including gloves, boots, a hat and glasses (Figure 1.5). Make sure someone remains outside the tank, next to the access hatch all the time in case the cleaner has an accident. The availability of gas masks and portable ventilators would be an advantage.

SELECT THE TANKS TO USE

1. Tanks should be selected based on three considerations: normal use; ease of cleaning and water storage hygiene.
2. Selected tanks should only have been used for holding food-grade liquids, for example, milk, cooking oils, fruit juices, or vinegar.
3. Tanks previously used for holding nonfood-grade liquids such as fuel and sewage should not be used.
4. Tanks that previously held water but have been out of use for some time must also be cleaned and disinfected as described below under Steps 2 and 3.
5. Tanks must be easy to clean. This means they must be accessible for cleaning and have no sharp corners that may hold dirt and so prevent the removal of food deposits.
6. Water will only remain clean if stored safely. Tanks must therefore be covered and fitted with an access point with a lockable lid.

CLEANING

1. **Empty the tank**: Open the outlet valve or tap and drain out any remaining liquid. Collect the liquids so that they can be safely disposed. Permanent storage tanks are usually fitted with a washout valve that draws liquid from the base. Use this, rather than the normal outlet valve, for emptying (figure 7).
2. **Scrub the internal surfaces of the tank:** Use a mixture of detergent and hot water (household laundry soap powder will do) to scrub and clean all internal surfaces of the tank. This can be done with a stiff brush or a high pressure jet. Attaching the brush to a long pole may make it possible to clean the tank without entering it.

DISINFECTION

The most common way of disinfecting a water tank is by chlorination. Chlorine is delivered in a variety of ways but the most common is sodium hypochlorite, which is a liquid chlorine and has around 10-12% available chlorine released in the water to disinfect.

The amount of chlorine needed to disinfect the water tank will depend on its volume. Fill the tank a quarter full with clean water. Add 0.5 liter of liquid chlorine into the tank for every 1000 liters' total capacity of the tank. Fill the tank completely with clean water, close the lid and leave to stand for 24 hours. If the tank is required for use urgently, double the quantity of chlorine added to the tank. This will reduce the time of disinfection from 24 to 8 hours.

Disinfecting the hoses and pump

If the tank is fitted with a pump, connect the hoses so that water is drawn from and returned to the tank.

With the tank full of water and disinfectant, start the pump so that the mixture passes through the hoses and pump. Run the pump for about an hour. Repeat this procedure with the tank full of clean water.

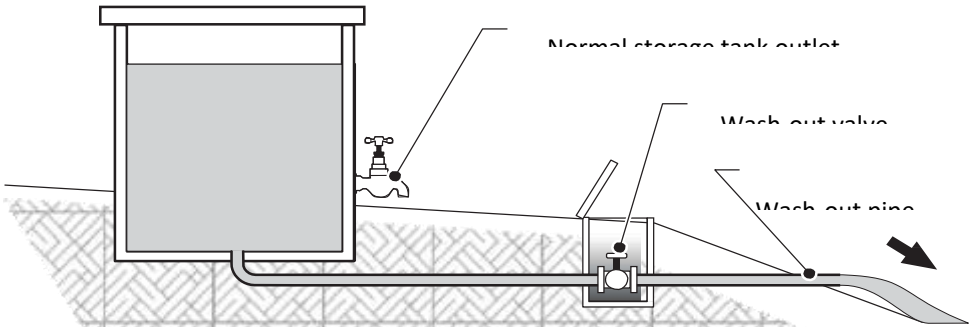


Figure 7 Discharging Liquids from Tanks

If no pump is fitted, use some of the disinfectant from the tank and gently fill the hoses to full capacity. You will have to block one end of the hose and fill it from the other end. Allow to stand for 24 hours.

Empty out the disinfectant and connect the hoses to the tank outlet so that when the clean water in the tank is discharged it passes through the hoses. The hoses are now ready for use.

Prepare for use

Completely empty the tank and carefully dispose of the disinfecting water, as it will contain a high concentration of chlorine. Fill the tank with drinking-water, allow to stand for about 30 minutes then empty the tank again. The tank is now ready for use.

SAFELY DISPOSE OF LIQUID WASTE

Care must be taken when disposing of all liquids used for cleaning and disinfecting the tanks. Sudden discharge of water will cause localized erosion or flooding.

CHLORINE TESTING

Refill the tank with clean water and allow standing for 30 minutes. Test the **RC** left in the tank. If the **RC** concentration is 0.5mg/l or less the tank is safe to use for water storage.

If the concentration is greater than 0.5mg/l, empty the tank again and refill with clean water. Re-test to check that the chlorine concentration is 0.5mg/l or less. The optimum chlorine residual in a small, communal water supply is in the range of 0.2 to 0.5mg/l.

2.3 DISINFECTION OF WATER DISTRIBUTION SYSTEM

CLEANING

1. Connect a full tanker of clean water, via a water pump, to the washout for the section of pipe you are working on. Confirm the pump can deliver the quantity of water and pressure required to flush and clean the pipe.
2. Open the valve connected to the pump and tanker. Turn on the pump gradually open the downstream washout valve until the flowrate reaches the required level (see table 16).
3. Pump until the water coming out of the washout is completely clean but not less than the time suggested in

DISINFECTION

1. Calculate the volume of water required to fill the section of pipe (table 9). Acquire tankers of volume equal to, or higher than, the calculated volume of the pipe. Add 0.5 liter of liquid chlorine into the tanker for every 1000 liters' total capacity of the tank. If the demand for water is urgent, or the repaired main cannot be isolated, the concentration of the disinfecting solution may be increased to 1 liter/1000 liter and the contact period reduced to 8 hour.
2. Connect the water tanker to the valve next to the supply line. Open the valves between the tanker and the pipe.
3. Gradually open the downstream washout so that the chlorinated water replaces the clean water in the pipe (it may be necessary to pump water into the pipe).
4. Continue feeding water into the pipeline until chlorine can be strongly smelt in the water coming out of the washout. Close the washout valve but leave the inlet valves open so that chlorinated water can still enter to replace leakage.
5. Leave the pipeline for 24 hours.
6. Disconnect the water tanker and open the upstream isolating valve
7. Gradually open the downstream washout and monitor the water coming out until it no longer smells strongly of chlorine.
8. The pipe can then be returned to service

Table 46 velocity and flow required for flushing of pipes

Pipe diameter (mm)	Approximate water volume per 1000m of pipe (liters)	Velocity required (m/s)	Flowrate required (liters/sec)	Minimum flushing time for a 1000 m pipe (mins)
50	1,960	1.3	2.7	770
75	4,420	1.6	7.2	625
100	7,850	1.8	15.0	555
150	17,670	2.2	41.0	455

2.4 DISINFECTION AT END USER POINTS

Water treatment can make drinking water that is unsafe at the source or drinking-water that becomes contaminated during handling and storage safer. There are several different methods and the preferred method

or combination of methods depends on a number of factors such as source water quality, including turbidity or number of suspended particles in the water, availability of different methods and supply chains, user preferences and cost.

FILTRATION

A filter removes contamination by physically blocking particles while letting the water pass through membrane filters, sand filters or ceramic filters.

DISINFECTION

Disinfection destroys all harmful organisms present in the water, making it safe to drink.

1. Boiling:

☑ Very effective method
☑ Bring water to a rolling boil and allow to cool.
☑ These include boiling and heating to pasteurization temperatures (typically > 63 °C for 30 minutes)
☒ Energy consuming
☒ Change the taste of water.
☒ Does not remove turbidity/cloudiness
☒ Does not provide residual chemical disinfectant to protect against contamination

2. Chemical Disinfection

☑ The most commonly-used is chlorine.
☑ Kill most viruses and Bacteria.
☑ For typical room temperature and water temperature of 25 °C, minimum contact time should be 30 min; increase contact time for colder water—e.g. Double time for each 10 °C less than 25 °C.
☑ Recommendations are to dose with free chlorine at about 2 mg/l to clear water (< 10 NTU) and twice that (4 mg/l) to turbid water (> 10 NTU).
☑ Chlorine residual level of 0.2 mg/l
☒ Some species of Protozoa (notably cryptosporidium) are resistant to chlorine

3. UV irradiation

☑ Typically, these technologies allow water in a vessel or in flow-through reactors to be exposed to the UV radiation from the UV lamps at sufficient dose (fluence) to inactivate waterborne pathogens.
☒ These may have limited application in developing countries because of the need for a reliable supply of electricity, cost and maintenance requirements.
☒ Excessive turbidity and certain dissolved species inhibit process; effectiveness depends on fluence (dose), which varies with intensity, exposure time, UV wavelength.

4. **Combined treatment systems.**

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WeWorld-GVC is an independent Italian organization emerged `from the union between GVC NGO (constituted in Bologna in 1971) and WeWorld (founded in Milan in 1999), with the aim of increasing the impact of Development Cooperation and Humanitarian Aid projects in 29 countries, including Italy.

Together, we can act more efficiently towards the achievement of the 2030 Sustainable Development Goals. We can activate synergies between diverse local and international key actors, creating integrated wide-ranging projects that link emergency to development, in the respect of human rights. United we can carry out projects that are more effective in the fight against poverty and inequalities, with the aim of providing every individual with access to water, food, shelter, health, education and work. Every single intervention is designed to increase the resilience capacities of communities, so that they may foster the resources and confidence necessary to reach self-sufficiency. We have also strengthened our capacities to promote awareness-raising campaigns in order to disseminate a culture of human rights, peace and solidarity.

In the Palestinian context, WW-GVC maintains the total continuity with the work implemented by GVC since 1992, guaranteeing its experience, historical memory and fieldwork skills. We started our interventions in the health sector by creating the first transfusion health center in the Gaza strip, operating up to this date.

Nowadays WW-GVC works in emergency and development aiming at:

1. Increasing the access to and the integrated management of water resources.

2. Increasing the protection of vulnerable communities.

3. Contributing to local socio-economic development.

WW-GVC operational approach in oPt has always been based on the reinforcement of the civil society, by building strong partnerships with local organizations and by using community-based methodologies. The increase of resilience and the support to the development of communities have always been at the center of WW-GVC programs, aimed at empowering local beneficiaries through the provision of infrastructures, capacity building and the promotion of inclusive policy decision-making.

Specific activities have included: rehabilitation and provision of WASH assets and infrastructures (cisterns, tanks, springs, reservoirs, networks and filling points), rehabilitation and provision of livelihood assets (land, agricultural inputs, livestock, access), reinforcement of health and education services (schools, clinics, access), and support to good governance (institutional capacity building, governance frameworks, institutional partnerships).

Mainstreamed and essential to the overall programmatic strategy, the awareness and internal outreach campaigns had been based on good sectorial practices (hygiene, cooperatives, food security, gender), aiming at increasing the awareness at national level over the living conditions and constraints in Area C and Gaza Strip

We strive for a better world where everyone, especially women and children, have equal opportunities and rights, access to resources, to health, to education and to dignified work. A world in which the environment is a common good to be respected and preserved; in which war, violence and exploitation are banned.

We feel called upon to increase our capabilities of providing support, in a global context characterized by economic and environmental crises, conflicts and inequalities, in which Humanitarian Aid and Development Cooperation are more linked than ever.

For more Information: communication.palestine@gvc-italia.org