

Amplification of Environmental Appraisal Coordination at General Hospital Lahore and its Implications to Evaluate Management Review

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Abstract: Quality standards have been a significant achievement for organizations worldwide. Environmental standards should be established in hospitals by coding ISO14001. Hospital water pollution can cause health issues in nearby urban areas and settlements. The study was aimed to estimate, characterize, use, and response to water quality parameters on amplification of environmental coordination at General Hospital Lahore (GHL), and their implications for evaluation in management reviewing. For these purposes, the drinking water samples were collected from different locations in the study area. All these samples were analyzed for different water quality parameters namely, pH, TDS, turbidity, and chloride, and compared with national environmental quality standards (NEQS). All the results and management processes were also compared with ISO 14001:2015, which indicated the weakness in the general administration framework and Environmental Management System (EMS). The results show that pH 8.6, TDS 1100 mg/l, turbidity 5.5 NTU, and chloride 260 mg/l were exceeding the maximum permissible limits. The present study recommended that GHL water should be treated before its use/ disposal. In the end, an EMS (a policy with protocol) manual was developed for continual improvement of water use. Drinking water quality assessment and EMS framework offer assistance to oversee the water quality and environment in health centers. Drinking water quality management under the guidelines of the environment management system manual developed in this study will greatly help to manage the environment, particularly water pollution in local hospitals of Pakistan.

Keywords: General hospital, environmental management system, national environmental quality standards, drinking water.

Introduction

The adjustment between the economy, environment, and human society is an effective way to maintain the natural environment. These fundamental units can balance the national economy and improve society's needs (Tomislav, 2018). These three units are considered fundamental to sustainable development, where humans can balance the current environment and support the future community (Purvis et al., 2019). However, the human expectation toward sustainable development, improving the natural aestheticity, food security, water conservation, and green revolution need the advancement of human culture, pollution reduction, climate change, stopping biodiversity violations, and resource conversation (Crişu and Răducă, 2018). This has driven organizations to embrace an orderly approach to natural administration by executing natural administration frameworks to contribute to the natural columns of maintainability. Additionally, it can also lead and manage the system to implement an effective EMS system to sustain the natural resources and improve sustainability (Todaro et al., 2019). The International Organization for Standards (ISO) has distributed 23004 (Universal Guidelines) and related archives to move forward the natural quality framework, covering nearly every industry (i.e., innovation, nourishment security, agribusiness, and health care). However, these standards develop and

improve the technology, and human culture, save the natural resources, improve the agricultural products, health facilities, and ecosystem that improves the human life, alternatively (Karwowski et al., 2021; ISO, 2015).

ISO 14001:2015 suggests the development of an ordinary administrative framework for sustainable development, improving natural resources, balancing the natural environment, and conservation of natural resources. Furthermore, the ISO 14001-2015 indicates the establishment of an EMS system for improving the natural system performance (Mazzi et al., 2016; Salim et al., 2018). It moreover makes a difference for an organization to achieve long-standing time outcomes from the ordinary natural administrative framework, which proved the essential information about natural resources, water conservation, pollution reduction, and environmental management (Martín-de Castro et al., 2016). Steady with the organization's natural arrangement, the arranged results of a natural administration framework incorporate: 1) Upgrade the natural execution, 2) execution of compliance commitments and 3) application of ISO guidelines in GHL. However, the possible outcome of the organizational policy are; 1) improvement of the environmental performance, 2) implementation of policy and 3) application of ISO standards in the GHL.

The ISO standard i.e., 14001-2015- is an effective policy for various organizations because it can improve the life cycle and life standard of ordinary people, but it does not base on environmental factors (Procházková and Rusko, 2017). These standards can be applied to improve the EMS in any organization, but some of the postulates need to eliminate for a specific organization, and some need to be added (Malinauskaite et al., 2017). This policy can maintain the EMS system for the long term without advancing the economical funds. By maintaining the EMS policy, it can conserve and improve sustainable development, protecting the natural environment from deleterious impacts (Welford, 2016). Similarly, mitigating the possible adverse effects on the environment or organization, helping the organization in implementing the policy, and improving performance by controlling organization products, manufacturing, consumption, and distribution services are the basic lifecycle perspective (Rawashdeh, 2018). This life cycle can predict the natural impacts of the organizational framework, achieving financial resources, and operational management, which leads to the improvement of ecological resources. However, this life-cycle can limit the involuntary environmental impacts within the life cycle, operational and financial benefits, and provide alternative policies to strengthen the organization, markets, and environmental data to the stakeholders (Sánchez-Silva and Klutke, 2016). The focal purpose of this study was to develop an EMS ISO14001:2015 for GH. This study will help improve the hospital's environmental conditions, patients, and surroundings.

Most stages in creating a natural methodology are as takes after:

- Scoping- "Environmental Management Strategy"
- Preparing- "Environmental Management Strategy"
- Writing- "Environmental Management Strategy"
- Writing- "Action Plan"
- Implementation Report (ISO, 2004)

Study Area

In this study, GH was selected for the collection of data and application of ISO 14001:2015. The GH is one of Pakistan's largest hospitals covering an area of about 256 Kanals situated on Ferozepur, Road, Lahore (Groote et al., 1989) (Fig. 1). The drinking water samples were collected and analyzed for different variables like pH, TDS, turbidity, and chloride and compared with NEQs for estimation of their quality for drinking purposes. All the results were also compared to ISO 14001:2015 indicating the needs and usefulness of the effective administration agenda/ framework, where the organization balanced and improve the ordinary implementation. Hospital facilities are normally comprised of large and composite buildings having large-scale mechanical and electrical services and devices. Apart from these, there are sophisticated backup systems, a substantial medical system, and

complete infrastructure, which are very rare and unique facilities (Janius et al., 2017).

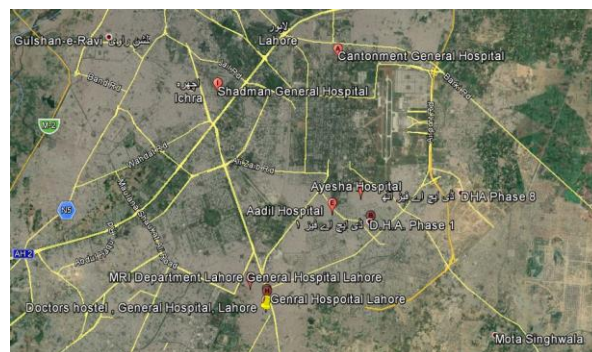


Fig. 1 Map showing the study and location of General Hospital Lahore.

GHL is providing health facilities to people from all over Pakistan. GHL is a large health care unit which is situated in Lahore with all the comprehensive medical facilities. The hospital has a daily admission of patients of more than 2000. To boost the environmental process and practices, a successful EMS was created on the "Plan, Do, Check, Act" (PDCA), which show epitomizes the perception of persistent advancement (Fig. 2).

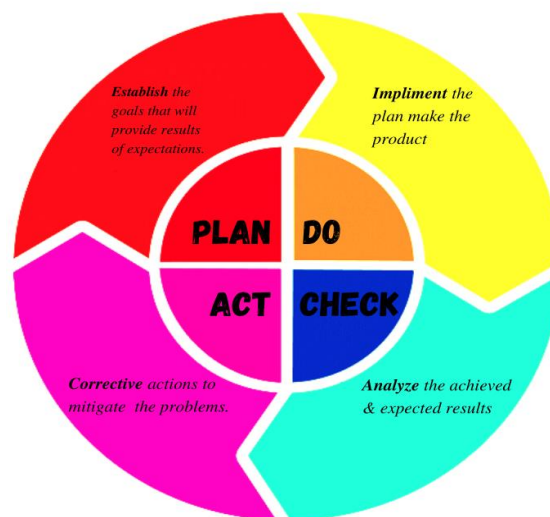


Fig. 3 Establishment of PDCA model and their role in hospital management (modified from Poh et al., 2000).

Material and Methods

Methodology for this study and data collection was derived with the help of interviews, Desktop study, meetings and discussions, checklists, walkthrough surveys, location and surroundings, a physical survey of the hospital, questionnaires, surveys, hospital documents, and published documents to develop ISO 14001:2015 (ISO, 2015). For monitoring environmental resources, water samples were collected and tested for quality, and the results with standards were checked. Specially, designed instruments, plans, devices, and international procedures were used. In the wastewater

sample, different parameters were measured like pH, total dissolved solids (TDS), turbidity, and chloride. Floors of Lahore GHl were observed after a walk-through survey and a desk study was carried out in different departments on the basement, ground floor, first floor, second and third floor. For measuring, pH levels in freshwater, a digital pH meter was used. The pH value of each sample was determined three times and then calculated their mean values for minimize the error. For measuring turbidity, a Nephelometric turbidity meter (HI88713, HINNA) was used. It works based on photodetector and light to measure light scatter, and read out in units of turbidity. For all sorts of analysis, a standard book of water and wastewater analysis was followed (Hussain et al., 2014a; Arnold et al., 1992). HANNA chloride meter was used for measuring chloride content in drinking water. By using this meter, the concentration of chloride was determined. TDS meter was used to measure dissolved solids in drinking water.

Results and Discussion

GHL is not considered an icon of appropriate health and sustainable safety in the context of the provision of safe potable water to the patients, visitors, and medical staff in the perspective of overall healthy environmental conditions. For medical workers, Personal Protection Equipment (PPEs), health and safety, pertinent knowledge, and adequate training should be imparted to them, but, unfortunately, it is not being practiced and applied appropriately. Now they are looking ahead to opt and implement EMS 14001: 2004. EMS could be a nonstop trade cycle of arranging, actualizing, checking on, and progressing the forms and activities that your company attempts to meet its “Environmental Obligations” and ceaselessly make strides its Natural Performance” (Fig. 3). A distillation unit is installed to treat the tap water before use for the high-quality water demand of laboratories.

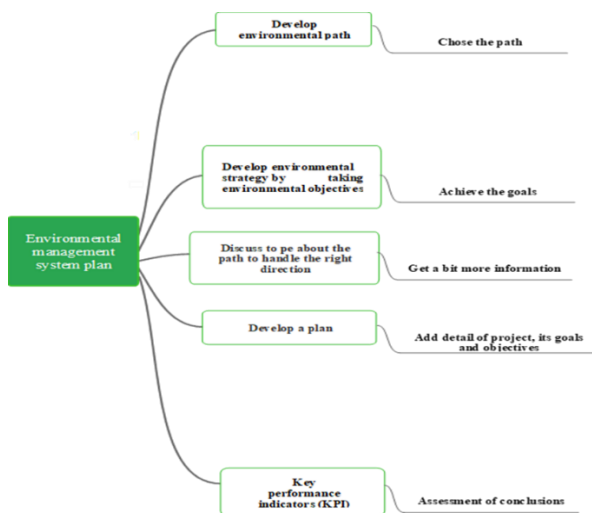


Fig. 3 Environmental Management System (EMS) Plan and their suitability with the big hospital (Taken from: <http://www.ea.gov.au/industry/eecp/case-studies/myer.html>).

The higher concentration and differences in the pH

among the different sources revealed the presence of carbonate and bicarbonate in the hospital water bodies, which was comparably higher than the WHO (World Health organization) permissible level as well as Pak EPA, and PCRWR. The pH concentration is from 8.6 to 8.7 from the basement, ground floor, and 1-3 floors. Overall pH concentration is falling within the range of National Environmental Quality Standards set by the Pakistan Environmental Protection Agency (Pak-NEQs) standards for drinking water (Rasheed et al., 2015).

The results show that the water samples collected from various floors and basement of LGHs were given in Table 1. The present study shows that the pH of wastewater was 8.6 to 8.7 from the basement to the 3rd floor which was higher than the standard permissible level of Pak-NEQs i.e., 6.5 to 8.5 (Pak-EPA, 2000) (Fig. 4).

The range of turbidity was 5.2-5.5 from the third floor to the basement which exceeds the limits of NEQs by EPA i.e., 5NTU (Fig. 4, Table 1). The result of turbidity in the GHL region is not suitable for potable water. The TDS varies within 1050-1085, which were above the WHO and Pak-NEQs drinking water permissible level. It was reported that the TDS >1200 is considered unacceptable, 900 to 1200 poor, 600 to 900 fair, 300 to 600 Good, and lower than 300 is considered excellent. The presence of high turbidity shows the lower transparency of water due to the availability of suspended solids and color. The availability of the color and suspended solids in water indicate turbidity, which may affect various physical and chemical processes in water bodies. Lower the suspended solids and color, the lower will be turbidity, which is the indicator of clean and good water quality (Hussain et al., 2016).

Table 1 Hospital Drinking Water Characteristics compared with NEQs.

Parameter	Basement	Ground floor	1 st floor	2 nd floor	3 rd floor	Units	NEQs by EPA*	Remarks
pH	8.7	8.6	8.6	8.6	8.6	-	6.5-8.5	Just above normal
Turbidity	5.5	5.5	5.4	5.3	5.2	NTU	5	Out of limits
TDS	1050	1100	1050	1066	1085	mg/l	1000	Out of limits
Chloride	259	260	256	250	240	mg/l	250	Out of limits

A mixture of the metal with gas chlorine generates salts known as chlorides (Cl). The most common chlorides are magnesium chloride (MgCl₂) and sodium chloride (NaCl). Chlorine itself as Cl₂ is extremely toxic and can be taken as an effective disinfectant. It becomes essential for life when it gets mixed with a metal such as sodium. Smaller quantities of chlorides are significant for the normal functioning of cells in animals and plants (Manasfi et al., 2017).

It was reported that chloride/ chloride compounds erode the metals and steel materials, which may affect the taste of food materials and food crops. However, chloride can also affect the beneficial organisms surrounding the environment (Kumar and Singh, 2015). Sometimes the water used for drinking and household purpose need to treat with chlorine, but its concentration must be lower than the respective permissible standard. However, it was suggested that the high-water chlorine level is best for industrial processes. It might erode the metals' materials, but it can limit bacterial growth and metallic degradation. Before the flushing industrially contaminated water especially chloride water, it is suggested to treat the chlorine contaminated water. The treated water will support the biological organisms. (Szklarek et al., 2022). The chloride concentration was 240-260 mg/L, which was beyond the standard permissible limit of NEQs i.e., 250 mg/L (Table 1, Fig. 4). Drinking water requires chloride concentrations ought to not surpass 250 mg/L. For drinking, the chloride concentration in water must be lower than the respective standard i.e., 250 mg/L (Radford et al., 2018; Hussain et al., 2014b). The criterion for shielding the aquatic life needs levels less than 600 mg/L for the long term, while 1200 mg/L for the short term. However, for chronic exposure, the chlorine concentration must need to be higher than 600 mg/L, and for cute effects, the chloride needs to be higher than 1200 mg/L (Boyd, 2015).

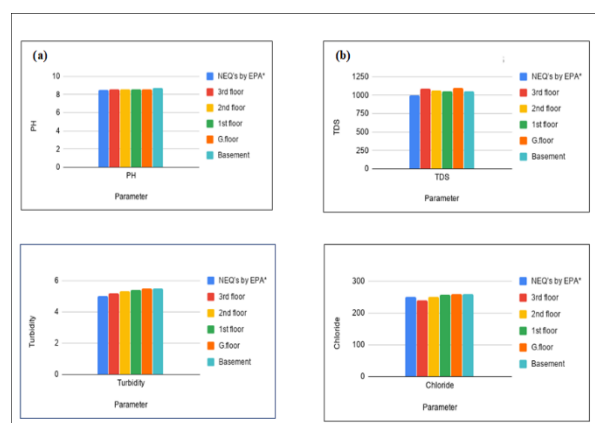


Fig. 4 The results of pH (a), TDS (b), Turbidity (c), and chloride (d) and their comparison with Pak-NEQs.

Conclusion

A general hospital is the largest health care unit which is situated in Lahore and tries to make strides in the well-being status of the community through comprehensive beneficial improvement for the health status of the community through comprehensive and extensive medical facilities. In the general hospital, drinking water which is provided by the hospital administration has higher concentrations of pH, turbidity, TDS, and chloride levels, which are not good in the context of patients, medical and para-medical staff for potable uses. Water coolers must be placed in different places in the hospital. The personal hygiene of the workers needs to be improved as for the drinking water standards are concerned.

The hygienic situation in terms of drinking water of LGH was deprived and negligible. The distances between toilets and tube wells are far from each other and open hanging toilets are there as well. For this reason, both tube wells and tank water may be polluted with chemicals. People having contaminated water for drinking or cooking can become infected with a variety of water-borne epidemics such as liver diseases, typhoid, cholera, (cancer), skin-related disease, etc. It is concluded that TDS and turbidity concentrations should be reduced within permitted limits before drinking water, and chloride concentrations should be reduced within allowable limits through water filtration media before drinking water. The government of Pakistan with help of EPA applies strict standards and should take the necessary measures to develop effective water quality provisions and sanitation in LGH.

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