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BACTERIOLOGICAL ANALYSIS OF DRINKING WATER FROM WATER COOLERS

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Abstract: *Water is said to be contaminated when it contains infective and parasitic agents. Faecal coli forms are the most commonly used bacterial indicator of faecal pollution and hence used to assess the microbiological quality of drinking water. As per WHO standards, any microorganisms known to be pathogenic or any bacteria indicative of faecal pollution should not be present in drinking water (2)*

Factors affecting microbiological quality of surface waters are discharges from sewage works and runoff from informal settlements. Indicator organisms are commonly used to assess the microbiological quality of surface waters and facial coli forms are the most commonly used bacterial indicator of fecal pollution. [3]In order to prevent them from transmission. The most important way of controlling water contamination includes monitoring its microbial quality. On the other hand, this parameter is influenced by some factor such as water turbidity, residual chlorine and also its pH. As a result if these factors are monitored, it can be said that the quality of water health condition is assessed. [4]

Key Word: cfu coliforms , surgical site infection, pathogens

Method: Heat sterilized screw capped bottles should be used for collection of water having capacity of 200ml. Care should be taken to avoid contamination of the bottle with the bacteria present in the surrounding environment or hands of the collecting person. At least 150 ml of water should be collected.

• Sodium thiosulfate is added to neutralize the bactericidal effect of residual chlorine present in water if any.

caracteristics were examined including colony morphology on culture media After incubation, the colonies were counted and identification of isolates was performed by gram staining and standard biochemical tests.

Results: the inoculated tubes are incubated al 37◦ C for 48 hours. Positive test is indicated by (1) a color change in the medium from purple to yellow due to lactose fermentation and gas collected in the Durham's tube. **Presumptive coliform count** (Most probable number): An estimate of coliform count per 100 mL of water is calculated from the tubes showing acid and gas production using the McCrady's probability table.

Quality of water supply is determined by the presumptive coliform count. The most probable numbers of:

0, 1-3, 4-9 and 10 per 100 mL are interpreted as excellent, satisfactory, intermediate and unsatisfactory respectively

• Detection of coliform bacteria does not always indicate fecal contamination; as some of them may be found in environment. Hence, it is further tested by differential coliform count to detect the fecal E.coli.

Differential Coliform Count (Eijkman Test)

It is done to confirm that thecoliform bacilli detected in the presumptive test are fecal E. coli. This is done by:

• Sub culturing the positive tubes (of the previously done presumptive coliform test) on lactose containing medium for detection of lactose fermentation with production of acid and gas at 44◦ C and.

• Demonstrating positive indole test at 44◦C.

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Conclusion: The study shows that the microbiological quality of water of our hospital is satisfactory with very low bacterial contamination rate.

Introduction:

Water is one of the main constituent to support the living life on earth .It is the essential component required to body. It has a great potential of transmitting a variety of enteric diseases. The most common danger connected with drinking water is contamination by sewage wastes or human and animal excrement. WHO estimate that 80% of all human illnesses in the developing world are caused by biological contamination? The pipelines carrying water and sewage are usually placed in closeness to each other, there is a higher probability that the drinking water gets contaminated with the pathogenic microorganisms which are present in fecal matter Faecal contamination of drinking water may give rise to various intestinal pathogens .Presence of pathogenic organisms related to microbial diseases in the water may cause diseases from mild gastroenteritis to severe and sometimes fatal dysentery, cholera or typhoid. Some organisms which are not naturally present in the environment regarded as pathogens which can also cause opportunistic diseases Drinking water should not contain any type of microorganisms known to be pathogenic. It should be free from all microorganisms indicative of pollution with excreta. The majority of the population in the developing countries supplied with potable water and thus obliged to use unsafe water for domestic and drinking purposes. [1]

Water is said to be contaminated when it contains infective and parasitic agents. Faecal coliforms are the most commonly used bacterial indicator of faecal pollution and hence used to assess the microbiological quality of drinking water. As per WHO standards, any microorganisms known to be pathogenic or any bacteria indicative of faecal pollution should not be present in drinking water (2)

Factors affecting microbiological quality of surface waters are discharges from sewage works and runoff from informal settlements. Indicator organisms are commonly used to assess the microbiological quality of surface waters and fecal coliforms are the most commonly used bacterial indicator of fecal pollution. [3]In order to prevent them from transmission. The most important way of controlling water contamination includes monitoring its microbial quality. On the other hand, this parameter is influenced by some factor such as water turbidity,

residual chlorine and also its pH. As a result if these factors are monitored, it can be said that the quality of water health condition is assessed. [4]

One of the most important parameters of coolers water quality assessment is to find level of coliforms and fecal coliform in the water. The main goal of this study was to evaluate the effect of coolers on the microbial quality of drinking water. At the same time, a number of physical and chemical properties such as temperature, pH and residual chlorine which affect the growth of bacteria are studied. [5] Water may become contaminated at any point between collection, storage, serving or handling in houses. [6]

The human pathogens that present serious risk of disease whenever present in drinking water include Salmonella species, Shigella species, pathogenic Escherichia coli, Vibrio cholera, Campylobacter species, various viruses such as Hepatitis A, Hepatitis E, and parasites such as Entamoeba histolytic a and Giardia species and so on [7] . The present study was conducted to evaluate the bacteriological quality of drinking water from water coolers installed in MMIMSR, Mullana.

1.

Materials and Methods

Study Design: Cross section study

Study Setting: Department of microbiology, Maharishi Markandeshwars Institute of Medical Sciences and Research

Study population: Water samples from water coolers installed in the campus of MaharishiMarkandeshwar Institute of medical science and research received in the department of Microbiology

Inclusion criteria: Water samples from working water coolers of MMIMSR

Exclusion criteria:

1. water samples from non working water coolers
2. Water samples other than water coolers

Study duration. Three months

This study will be conducted in the Department of Microbiology, MMIMSR, Mullana, and District Ambala. Water samples from all the water coolers of MMIMSR campus will be collected and would be subjected to this study. The samples would be collected by method recommended by WHO.[12]One sample from each source would be analyzed. Each sample will be tested as follows:

Bacteriological Examination of water

Collection and transport of water samples

Heat sterilized screw capped bottles should be used for collection of water having capacity of 200ml. Care should be taken to avoid contamination of the bottle with the bacteria present in the surrounding environment or hands of the collecting person. At least 150 ml of water should be collected.

• Sodium thiosulfate is added to neutralize the bactericidal effect of residual chlorine present in water if any.

• **Water from tap**: Water should be collected only after running it from the tap for 2-3 minutes

• **Transport:** The bottle should be properly labeled and sent to the laboratory as quickly as possible at least within 6 hours. If delay is anticipated, the bottles should be kept in an ice box and protected from light

Methods of Analysis

The standard test usually employed for bacteriological analysis of water are, (1) Presumptive coliform count, (2) Differential coliform count

Presumptive Coliform Count (Multiple Tube Method) multiple tube method is used for the estimation of presumptive coliform count, which is expressed as the most probable number (MPN) of coliform organisms in 100 ml of water

• **Mediumused:** MacConkey purple broth (double strength and single strength) in bottles or tubes is the standard medium of choice.

• Durham's tube is used to detect gas production.

• Bromocresol purple is used as indicator.

• **Procedure**: Measured amount of water samples are added to tubes containing MacConkey purple broth by sterile graduated pipettes as under:

• 50 mLofwater- added to one bottle of 50 mLdouble strength medium.

• 10 mL of water each- added to 5 tubes of 10 mL double strength medium. 1 mL of water each- added to 5 tubes of5 mLsingle strength medium.

• **Result:** the inoculated tubes are incubated al 37◦ C for 48 hours. Positive test is indicated by (1) a color change in the medium from purple to yellow due to lactose fermentation and (2) gas collected in the Durham's tube.

• **Interpretation:** The interpretation of presumptive coliform count is as follows:

Presumptive coliform count (Most probable number): An estimate of coliform count per 100 mL of water is calculated from the tubes showing acid and gas production using the McCrady's probability table.

Quality of water supply is determined by the presumptive coliform count. The most probable numbers of:

0, 1-3, 4-9 and 10 per 100 mL are interpreted as excellent, satisfactory, intermediate and unsatisfactory respectively

• Detection of coliform bacteria does not always indicate fecal contamination; as some of them may be found in environment. Hence, it is further tested by differential coliform count to detect the fecal E.coli.

Differential Coliform Count (Eijkman Test)

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• Demonstrating positive indole test at 44◦C.

Fecal Streptococci Detection

When presumptive coliforms are present but fecal E. coli are absent, detection of fecal streptococci would confirm the fecal origin of coliform bacilli.

Subcultures are made from positive tubes obtained from the presumptive coliform test into tubes containing 5 mL of glucose azide broth and incubated at 45°C for 48 hours. Presence of acid in the medium indicates fecal streptococci.

Further confirmation can be done by plating onto bile esculin azide agar which shows black colonies.

Classification of quality of drinking water supply according to bacteriological test

Quality of drinking water supply	Most probable number(MPN)/10	
	Coliform count/100ml	E.coli count /100ml
Excellent	0	0
Satisfactory	1-3	0
Intermediate	4-9	0
Unsatisfactory	≥10	≥1

Inclusion criteria:

1. Water samples from working water coolers of MMIMSR

Exclusion criteria:

1. water samples from non working water coolers
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2. DISCUSSION

The microbiological quality of water is the reflection of the hygienic conditions of the hospital . culture plates are supposed to be more sensitive in detecting the increase of microbial water contamination related to conditions that could compromise the quality of the water in operating theatres as weel as other hospital sites .[8]] The highly variable results in different studies can be ascribed to various factors like method of surveillance (active water sampling or passive water sampling), time of sampling, i.e. at rest or operational, ventilation of OTs and last but not the least the disinfectants being used and the methods of sterilization employed.

2. Conclusion

The study shows that the microbiological quality of water our hospital is satisfactory with very low bacterial contamination rate on surface swabbing and a cfu count per m^3 of well within permissible limits. Settle plate method for air and swabbing technique for surfaces are very useful, convenient and cost effective methods for surveillance of OTs even in resource limited settings.

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Conflicts of interest

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