

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال الله تعالى

أَفَرَأَيْتُمُ الْمَاءَ الَّذِي تَشْرَبُونَ (68) أَأَنْتُمْ
أَنْزَلْتُمُوهُ مِنَ الْمُزْنِ أَمْ نَحْنُ الْمُنْزِلُونَ (69)

صدق الله العظيم

سورة الواقعة الآيات 68-69

DEDICATION

TO MY FATHER, MOTHER AND WIFE.

ACKNOWLEDGEMENT

All thanks to **ALMIGHTLY ALLAH**, for giving me health and patience to finish this work.

I would like to express my sincerest gratitude to my supervisor, **Prof. Humodi Ahmed Saeed**, for his closed supervision and guidance throughout the study period.

Thanks are extended to all staff members of National Health Laboratory for their help. Special thanks to staff members, Department of Microbiology, College of Medical Laboratory Science, Sudan University of Science and Technology (SUST).

Thanks are also to Miss. **Suhair Ramadan** of the Research Laboratory, SUST for her help and support.

Finally, special thanks to my friends for their valuable comments.

ABSTRACT

This is a descriptive cross-sectional study carried out at Sudan University of Science and Technology (SUST), during the period April – July 2013. The aim of the study was to assess waterborne pathogens in the cafeterias in SUST.

A total of 30 water samples were collected from 18 cafeterias in SUST campuses. The samples were cultured in MacConkey's broth to calculate most probable number (MPN) and to detect total coliform bacteria. The positive tubes were subcultured on Brilliant green broth and Eosin Methylene blue agar media to detect fecal coliform bacteria. The later was identified by conventional bacteriological methods.

The results revealed that the MPN ranges from 0 to 21. Of the 30 water samples investigated only 3 (10%) samples were positive for fecal coliform bacteria, while the rest 27 (90%) were negative for fecal coliform bacteria.

This study concluded that there is a strong evidence of fecal contamination in water of three cafeterias. Hand washing, regular wearing uniform and improve health awareness of workers are highly recommended as well as further studies to investigate other source of contamination with large sample size.

ملخص الاطروحة

اجريت هذه الدراسة المقطعية الوصفية فى جامعة السودان للعلوم والتكنولوجيا خلال الفترة من ابريل الى يوليو 2013 وتهدف الدراسة لتقويم القولونيات الكلية و القولونيات البرازية لمياه كافتريات جامعة السودان. جمعت 30 عينة مياه من 18 كافتريا بمجمعات جامعة السودان الثلاثة: الشمالى والغربى والجنوبى لتحديد القولونيات الكلية والبرازية (الاشريكية القولونية). زرعت العينات فى وسط اللاكتوز وتحديد القولونيات الكلية. زرعت العينات الموجبة فى الاجار MPN السائل لحساب لتحديد القولونيات البرازية وتأكيدها. تم قياس عدد العينات مع مجموعة الكافتريات اثبتت نتائج SPSS 16.0. باستخدام حزمة الطيف الاحصائية للعلوم الاجتماعية من 0 - 21 . MPN الدراسة ان مياه 3 كافتريات ملوثة بالقولونيات البرازية ويتراوح يساوي 21 (MPN) يساوي 3) والعينة 19 MPN) وكانت النتائج كما يلي: العينة 9 كان يساوي 7) اما بقية الكافتريات (27) اثبتت الدراسة ان مياهها خالية (MPN) والعينة 20 من نوعي البكتريا القولونية.

خلصت الدراسة إلى أن هنالك مؤشرات ذات دلالة قوية على تلوث مياه الشرب في ثلاث كافتريات. اوصت الدراسة إلى غسل أيدي العاملين ' الالتزام بالزي الموحد النظيف وزيادة الوعي الصحي لدى العاملين. مزيد من الدراسات يجب أن تُجرى لتحديد مصدر التلوث بعدد أكبر من العينات

TABLE OF CONTENTS

1	آلية	6
2	Dedication	66
3	Acknowledgement	6
4	Abstract (English)	6
5	Abstract (Arabic)	6
6	Table of contents	6
7	List of tables	6
9	List of abbreviations	6

CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW

1.1	Introduction	1
1.1.1.	Importance of water	1
1.1.2.	Fresh water resources	1
1.1.3.	Microbial source tracking	1
1.1.4.	Water quality legislation and regulations for microbial contamination	2
1.1.5.	Water-related diseases	2
1.1.6.	Health and pollution	5
1.1.7.	Microbiological examination of water	5
1.1.7.1	Indicator organisms	5
1.1.7.1 .1.	Coliform bacteria	5
1.1.7.1 .2.	Thermotolerant coliform bacteria	7
1.1.7.1 .3.	Faecal streptococci	8
1.2.	Literature review	8
1.3.	Rationale	14
1.4.	Objectives	15
1.4.1.	General objective	15
1.4.2.	Specific objectives	15

CHAPTER TWO: MATERIALS AND METHODS

2.1.	Study design	16
------	--------------	----

2.1.1.	Type of study	16
2.1.2.	Study area	16
2.1.3.	Sample size	16
2.1.4.	Study duration	16
2.2.	Experimental work	16
2.2.1.	Collection of samples	16
2.2.2.	Culture media	16
2.2.2.1.	MacConkey broth	16
2.2.2.2.	Brilliant green bile broth	16
2.2.2.3.	Eosin Methylene blue	17
2.2.3.	Methods	17
2.2.3.1.	Preparation of samples	17
2.2.3.2.	Bacteriological examination	17
2.2.3.3.	Presumptive test and MPN	17
1.		
2.2.3.3.	Confirmed test	17
2.		
2.2.3.3.	Completed test	18
3.		
2.3.	Statistical analysis	18

CHAPTER THREE: RESULTS

3.	Results	19
----	---------	----

CHAPTER FOUR: DISCUSSION, CONCLUSION & RECOMMENDATIONS

4.1.	Discussion	24
4.2.	Conclusion	25
4.3.	Recommendations	26

References	27
Appendices	30

LIST OF TABLES

Table (1)	Distribution of water samples according to cafeterias	2 0
Table (2)	Frequency of positive and negative water samples after presumptive test	2 1
Table (3)	Details of samples analysis	2 2
Table (4)	Frequency of pollution among cafeterias	2 3

LIST OF ABBREVIATIONS

APHA: American public health association.

AWWA: American Water Works Association.

BMP: Best management practices.

CHTW: Connected house hold tap water

CWA: [Communications Workers of America](#)

EMB: Eosin Methylene blue

MPN: Most probable number

MST: Microbial source tracking

RHRW: Roof harvested rain water

TDML: Total Daily Maximum Load

SEQ: South east Queensland

UNESCO: United Nations education science and cultural organisation

USEPA: United States surface quality standard

WHO: World Health Organisation

WWDR: World water development report