

**FLUORIDE CONTENT AND PHYSIOCHEMICAL PROPERTIES OF BOREHOLE
WATER FROM BUGOBERO SUB-COUNTY, MANAFWA DISTRICT**

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BU/UP/2018/3480

**A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF CHEMISTRY IN
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE
DEGREE OF BACHELOR OF SCIENCE EDUCATION OF BUSITEMA
UNIVERSITY**

MAY 2022

DECLARATION

I, Nabwana Esther, declare that this project report titled, “*Fluoride Content in Borehole Water in Bugobero Sub-County, Manafwa District*” is my original work and has never been submitted for any award of the mark in any institution of higher level of learning.

Signature.....

Date...../...../.....

APPROVAL

This research project report titled “*Fluoride Content in Borehole Water in Bugobero Sub-County, Manafwa District*” has been written under my supervision and is submitted for the examination by my research supervisor.

Signature..... Date...../...../.....

Supervisor. Mr. Egor Moses

DEDICATION

To my beloved parents who gave me a golden financial support, encouragement, inspiration dynamism, vision, sincerity, motivation and invaluable guidance which have enabled me carry out a promising project. I am very grateful for what you have offered to me, may the Lord reward you.

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my colleagues like Peke Joel, Engwenyu Michael and Chamita charity who supported me in providing knowledge and equipment, my parents who supported me financially during research progress and as well as my supervisor (Mr. Egor Moses) and head of department (Dr. Kamoga) who gave me the golden opportunity to do this wonderful project on the fluoride content in borehole water in Bugobero sub-county, Manafwa District, Uganda which also helped me in doing a lot of research and I came to know about so many things.

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LIST OF ACRONYMS

F-Fluoride

CDC-Center of Disease Control

WHO-World Health Organization

EPA-Environmental Protection Agency

TSAB-Total Ionic Strength Adjustment Buffer

FISE-Faculty of Information Science Engineering

ATC-American Tower Company

COND-Conductivity

SAL-Salinity

TDS-Total dissolved solids

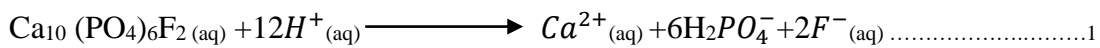
ABSTRACT

This study was carried out to assess fluoride content and to determine physicochemical parameters of drinking water of Bugobero area, Manafwa, Uganda where borehole water is the main source of drinking water. Water samples were collected from boreholes, the physicochemical parameters and fluoride concentrations were measured. Fluoride concentrations were analyzed using ion selective electrode method. The water samples collected had a pH range of (6.4–6.8), electrical conductivity ranged (287-743) $\mu\text{S}/\text{cm}$, salinity ranged from (23-30) mg/L, Total hardness ranged from (400-575) mg/L and TDS Values of (156.7–387) mg/L and some of these parameters were within the WHO normal range for drinking water. Fluoride concentration in groundwater from boreholes ranged from (0.5 to 1.7) mg/L. High fluoride levels corresponded with higher electrical conductivity total dissolved solids and salinity values at near-neutral pH. The WHO set standard limit of 1.5 mg/L and Uganda National Bureau of Standards (UNBS) guideline value of 0.4 mg/L fluoride and this showed that some of the water of Bugobero the limit values. All water sources studied contained average fluoride levels higher than 0.4 mg/L which was the limit value of Uganda National Bureau of Standards (UNBS). These findings imply a possible risk to the local population which depends on this water being exposed to dangers of high fluoride intake.

CHAPTER ONE: INTRODUCTION

1.1 Background

Fluoride is a naturally occurring substance and is present in virtually all water, usually at very low levels. Higher concentrations of naturally occurring fluoride often are associated with groundwater, where fluoride has dissolved from the rock formations into the groundwater (Olalekan et al., 2015). During fluoride dissociation under acidic conditions as given in the equation below



The released fluoride ions may remain as free ions in water, adsorb on particulates or combine with cationic organic and inorganic species in water or soil. Ingestion of such water is the main direct route through which fluoride ions enters the food chain. Fluorapatite ($\text{Ca}_{10}(\text{PO}_4)_6\text{F}_2$) and have been the most source of fluoride particulates in Bugobero (Singh et al., 2011).

In 2010, the CDC (center of disease control) reported that more than 204.2 million (73.9%) of the people in the United States who received their water from public water systems received fluoridated water of the total U.S population, 66.2% received fluoridated water.

In 2004, more than 170 million (67%) people Served by public water system received fluoridated water (Egor & Birungi, 2020).

The concentration of fluoride in ground drinking water greater than the world health organization standard value imposes a serious health, social and economic problem in developing countries (Jimenez-farfan, 2011).

In the Ethiopian Rift Valley where deep wells are the major source of drinking water, high fluoride level is expected. Though many epidemiological studies on fluoride concentration and its adverse effects have been conducted in the region (Egor & Birungi, 2020).

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