



WHITE NILE WATER (SUDAN – RABAK) TURBIDITY AND LEVEL OF ALUMINUM IONS TREATMENT COMPARED TO MEZON COMMERCIAL DRINKING WATER

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ABSTRACT

The aim of this study is to measure both water turbidity and Aluminum ion in drinking water in Rabak city compared to standard water turbidity (1-5NTU (Nephelometric Turbidity Unit)) and level of aluminum ions in drinking water reported by World Health Organization (WHO) 1993 Aluminum ion which is used for purification of drinking water was measured by using Atomic Absorption Spectral Photometer. The results revealed that there were high water turbidity in river White Nile and some blocks compared to Mezon soft drinking water. On the other hand the level of Aluminum ions in water treated by Alum in houses was higher than Mezon compared with River water, in addition to that Aluminum ion used by the residents to purify water from turbidity was reached 3.3 mg/l. The results showed that led to a significant increase ($P < 0.01$) in both water turbidity and Aluminum ion concentration in houses.

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INTRODUCTION

Background

Water is a vital substance and of great importance in all natural and anthropogenic activities. It regenerates shape and oceans and seas, rivers, lakes and forests, becoming part of the identity of environments and landscapes and of paramount importance for the development of ecosystems and human life (Telles and Costa, 2007). Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates also turbidity measures the “cloudiness” of water; more precisely, it measures the extent to which light is scattered and absorbed by suspended sediment, dissolved organic matter, and, to a lesser extent, plankton and other microscopic organisms (Clesceri, et al. 1994). From a technical standpoint, turbidity is a relative measurement of scattering as compared to a calibrated standard, usually a formazin suspension (Davies-Colley and Smith 2001). The more total suspended solids in the water, is higher the turbidity (Lettermann and Driscoll, 1988). Turbidity was considered as a good measure of the quality of water. There are various parameters influencing the cloudiness of the

water. The World Health Organization (WHO 1998) reported some of these as phytoplankton; sediments erosion; re-suspended sediments from the bottom (frequently stirred up by bottom feeders like carp); waste discharge; algae growth; urban runoff allowed maximum turbidity in drinking water. According to the WHO, the turbidity of drinking water should not be more than 5 NTU, (Nephelometric Turbidity Unit) and should ideally be below 1 (NTU). The suspended particles absorb heat from the sunlight, making turbid waters become warm, and so reducing the concentration of oxygen in the water (oxygen dissolves better in colder water). Some organisms also cannot survive in warmer water (WHO 1998).

Objectives

1. Determine the occurrence of White Nile water turbidity in Kosti town.
2. Assess the difference between the treated water samples (cases) and control samples (river water, Mezon soft drinking water).

MATERIAL AND METHODS

Sample collection

Drinking water samples were collected at respondents kitchen tap, pots or barrels. The tap was turned on and water was left

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to run for 1-3 minutes. Two replicates of 6 water samples were taken from each different sites in Kosti town particularly (Blocks 27, 28, 32, 41, 88, 118), samples from kitchen tap and Mezon soft drinking water. A100ml non acidified bottles, was used for water sample collection. The PH of samples was calculated, then the samples were preserved and 0.4ml 69% pure concentrated nitric acid made all contents soluble before being analyzed at the laboratory to ensure bacterial removal from samples and to lengthen the storage time of the samples (MOH 2004).

Measurement of turbidity

Aluminum method of purification of drinking water was frequently used. aturbidimeter (also called a nephelometer (Copyright C 1998-2009, Lenntech Holding B.V., Environmental Protection Agency [EPA] Calibration Standards) was used for measuring turbidity of drinking water as follows:

When particles were suspended in water and a light is passed through the sample, not all of the light will pass straight through the sample. Instead, the light will reflect off the suspended particles and some of the light will exit at a right angle to the direction of entry into the sample. Aturbidimeter uses laser pointer as a light source and two photo diodes as detectors for the intensity of the transmitted and refracted light.

Measurement of Aluminum ions

Al using Atomic Absorption Spectral Photometer nov AA 300 (A.AS). This apparatus is a flame photometer with hydride technique as accessory, when combined with an auto-sampler it could be employed as a multi element automatic device. The nov AA 300 was fitted either with the motor driver 6-position lamp turret or with manual 2-position lamp turret. Atomic absorption measurement is the amount of light at the resonant wave length which is absorbed as the light passes through a cloud of atoms, as the number of atoms in the light path increases the amount of the high absorbed Al cathode increase in the predictable way. The analyte concentration is determined from the amount of absorption. Concentration of measurements is usually determined from a working curve after calibrating the instrument with standards of known concentration.

Statistical analysis

Data were analyzed using Statistical Package for Social Science (SPSS) version 16).

RESULTS AND DISCUSSION

Analysis of the data collected from laboratory revealed that the range of aluminum concentration in drinking water treated by the residents themselves found to be between 1.1 –3.3 mg/l (Table 1 , Fig. 1)). This range is higher than the optimum accepted standards of the WHO (0.2mg/l). As has been found from the results the Aluminum ion concentration in tap accepted water from the River Nile and Mezon was 0.01 mg/l. of purification of drinking water were evaluated using the highest limit (5 NTU). The results indicate that there was significant (p<0.01) difference in water turbidity in residential area (Blocks27 ; Block 28; Block 32; Block 41 ; Block 88 and Block 118) at Kosti town(Table 3 Fig.2). The results also indicate that the turbidity of drinking water in these

residential areas was significant (p<0.01) when compared with the international highest level (5 NTU).

Table 1 Mean concentration of Aluminum ions in drinking water in different blocks compared to Mezon soft drinking water.

Water treated by Alum	
	mg/l
Block 27	2.6 mg/l
Block 28	2.8
Block 32	1.4
Block 41	3.3
Block 88	1.1
Block 118	2.7
River water	0.01
Mezon water	0.01

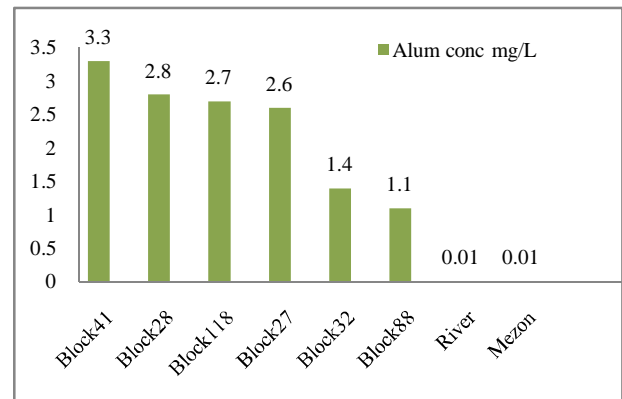


Fig 1 Mean concentration of Alum in drinking water in Different blocks compared to river and Mezon

Table 2 The World Health Organization (WHO) has established the following guideline set up in Geneva, 1993 known as whose standards for the permissible concentrations of some elements and substances

Element/ substance	Symbol/ formula	Normally found in fresh water/surface water/ground water	Health based guideline by the WHO
Aluminium	Al		0.2 mg/l

Table 3 PH and turbidity for selected drinking waters in Kosti town compared to meson soft drinking water

Blocks	pH	Turbidity(NTU)
27	7.92	15.3
28	8.07	16.5
32	7.55	18.8
41	7.98	17.8
88	7.99	15.6
118	8.09	18.9
River water	7.2	102
Mezon soft drinking water	7.2	4.2

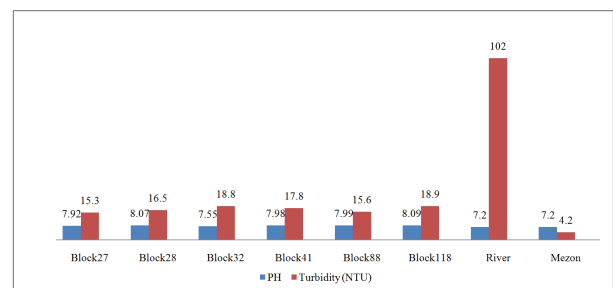


Fig 2 The pH and turbidity for selected sources of drinking water in Kosti town compared to Mezon soft drinking water

The obtained results of White Nile higher water turbidity (102 NTU) agree with Scherr, *et al.* (2011) who noted that higher turbidity was significantly correlated with decreasing abundance of sediment-sensitive macroinvertebrate taxa in the Umatilla River, Oregon. Also agree with (Uhrich and Bragg 2003), who declared that elevated turbidity in this case is likely due to the presence of a clay-rich natural debris flow). The findings of Aluminum concentration in line with (Maclachlan *et al.*, 1996) who stated that several studies were indicated that there is association between aluminum exposure and dementia as Aluminum found in water. The results obtained also were agree with those findings by Driscoll and Letterman (1988) who stated that high concentration of Al in drinking water was related to both raw water concentration and high treated-water turbidity.

CONCLUSION

We conclude that most of the residents in Kosti town are used Alum (Aluminum potassium sulphate (ALKSO₄)), mainly to treat water turbidity but without reference to least level of Aluminum ion for treated the drinking water. This might be later on caused effect of resident health particularly in residents who lived in shanty area in Kosti city. So Mezon water in our opinion is the best soft drinking water according to the above results.

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