Assessment of Water Quality among Water Vendors and Storage Facilities within Gombe Metropolis

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Abstract

The issue of water shortage and lack of water sanitation remain the topic of discussion as a result of illness and diseases caused by pathogenic aquatic microorganism and parasitic health myths. Water quality and treatments occurred at different source of water which include well, dam, borehole, aquifer and springs among others, but little is being done in assessing the water storage facilities and water vendors particularly in Gombe metropolis. The main aims and objectives of this research work are to ascertain as well as to determine the overall quality of the water sources. Systematic random sampling was used in sampling fifty (50) samples of water from water storage facilities and water vendors, respectively. The findings show that 30% the tested water samples is suitable for consumption, while 70% was found not suitable for human consumption and other domestic activities due to nutrients level. Only 20% of the water analyzed is found suitable for drinking in terms of feacal coliforms criteria while 80% of the water is unfit for drinking and other domestic activities In terms of water physical qualities, 22% is suitable for drinking and other domestic activities, but 78% is not suitable for drinking and other domestic activities. Finally, 20% of the sample analyzed is suitable for drinking and other domestic activities chemically, but 80% is not suitable for drinking and other domestic activities. the researcher therefore advise the house hold and water vendors to carry out regular, proper and effective washing and cleaning of their water storage facilities.

Introduction

Water remains one among the most essential elements that determine the survival of mankind. The issue of inadequate and lack of water sanitation is one among the factors that contribute in high rate of morbidity and mortality. Water shortage is the leading factors in causing dead worldwide. Water covers 70% of our planet, and it is easy to think that it will always be plentiful. However, freshwater that we drink, baths in, irrigates our farm fields with-is incredibly rare. Only 3% of the world's water is fresh water, and two-thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use.

As a result, some 1.1 billion people worldwide lack access to water, and a total of 2.7 billion find water scarce for at least one month of the year. Inadequate sanitation is also a problem for 2.4 billion people—they are exposed to diseases, such as cholera and typhoid fever, and other water-borne illnesses. Two million people, mostly children, die each year from diarrheal diseases alone.

Many of the water systems that keep ecosystems thriving and feed a growing human population have become stressed. Rivers, lakes and aquifers are drying up or becoming too polluted to use. More than half the world's wetlands have disappeared. Agriculture consumes more water than any other source and wastes much of that through inefficiencies. Climate change is altering patterns of weather and water around the world, causing shortages and droughts in some areas and floods in others.

At the current consumption rate, this situation will only get worse. By 2025, two-thirds of the world's population may face water shortages. And ecosystems around the world will suffer even more. Presence of microbial organism, feacal and total coliforms, water nutrients and other substances in our water contribute in diseases and illness particularly water from water vendors and storage facilities. A times water from water source such as borehole, well, stream, and aquifer are clean and wholesome for drinking and other domestic activities.

Water storage facilities and water vendors favour a lots

of microbial and feacal coliforms due to lack of cleaning and proper sanitation of such containers and facilities. Microbial feacal coliforms and other healthmiths are major source of diseases and illness. Water pollution caused by fecal contamination is a serious problem due to the potential for contracting diseases from pathogens (disease causing organisms). Frequently, concentrations of pathogens from fecal contamination are small, and the number of different possible pathogens is large. Such harmful micro pathogenic microorganism may growth and reproduces in our water storage facilities and water vendors over long period of time.

Significant amount of research is been done in the area of water shortage and water born related diseases due to lack of proper water sanitation. However, little or no any work is been done in assessment of water storage facilities as well as water vendors in determine how clean in terms of sanitary condition of such facilities and free from water born related pathogenic microorganism such as feacal coliforms, helminthes, fungi, bacteria and viruses among others which give births to this research work'

The objectives of the study are:

1. To assess the physical quality of water sample from water storage facilities and water vendors within Gombe metropolis.
2. To assess the chemical quality of water sample from water storage facilities and water vendors within Gombe metropolis.
3. To assess microbial total/feacal coliforms of water sample from water storage facilities and water vendors within Gombe metropolis.
4. To assess water nutrients from water sample from water storage facilities and water vendors within Gombe metropolis.

Material and Methods

The experimental design involved collecting 50 water samples using a systematic sampling approach. The water samples were analyzed in terms of physical, chemical, microbial and water nutrients. The results are as follow (Table 1).

Table 1: Water quality analysis and suitability

turbidity	Suitable	11	22
	Not Suitable	39	78
colour	Not Suitable	06	12
	Suitable	44	88
Odour	Not Suitable	10	20
	Suitable	40	80
taste	Not Suitable	11	22
	Suitable	39	78
Temperature	Not Suitable	12	24
	Suitable	38	76
pH	Not Suitable	10	20
	Suitable	40	80
conductivity	Not Suitable	11	22
	Suitable	39	78
chloride content	Not Suitable	10	20
	suitable	40	80
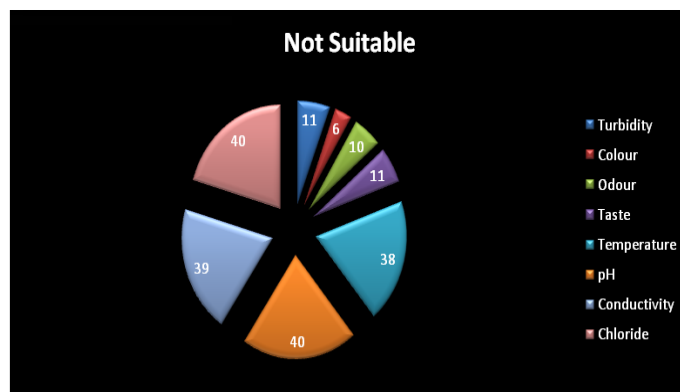
Figure 1: Graphical presentation of physical water quality analysis from water vendors
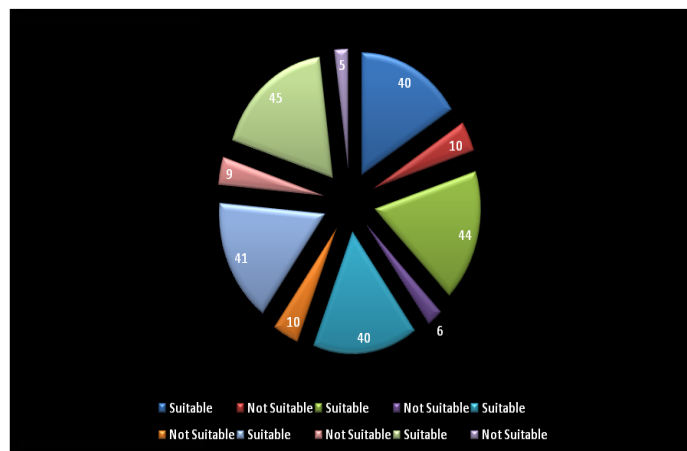
Based on Table 1 and Figure 1 shown above, in terms of turbidity, 11 among the sample collected which is equivalent to 22% of the sample collected is not suitable for drinking and other domestic activities due to the turbidity of the water, while 39 among the sample collected which is equivalent to 82% is suitable for drinking and other domestic activities. In terms of water colour, 06 among the sample collected which is equivalent to 12% is not suitable for drinking, while 44 among the sample collected which is equivalent to 98% is suitable for drinking.

In terms of water odour, 10 among the samples collected which is equivalent to 20% is not suitable for drinking, while 40 among the sample collected which is equivalent to 80% are suitable for drinking., while 11 among the sample collected which is equivalent to 22% is not suitable for drinking. 39 among the sample collected which is equivalent to 78% are suitable for drinking in terms of Odour. In terms of water temperature 12 which is equivalent to 24% of the sample collected are not suitable for drinking and other domestic activities, while 38 among the sample collected which is equivalent 76% of the water sample is suitable for drinking and other domestic activities.

Ph is also one among the water physical water quality that is been analyzed. And based on the sample collected 10 samples which is equivalent to 20% is not suitable for drinking but 40 among the sample collected which is equivalent to 80% of the sample are suitable for drinking. 11 sample of water analyzed which is equivalent to 22% are not suitable for drinking in terms of water conductivity while 78% among the sample is suitable for drinking and domestic activities. While for the issue of water chloride content 10 among the sample collected which is equivalent to 20% is not suitable for drinking, while 40 among the sample collected which is equivalent to 80% is suitable for drinking and other domestic activities.

Table 2: Chemical water Quality Analysis of water vendors

	Scale	Frequency	Percentage
TDS	Suitable	40	80%
	Not suitable	10	20%
Cl-	Suitable	44	88%
	Not suitable	06	12%
Alkalinity	Suitable	40	80%
	Not suitable	10	20%
Hardness	Suitable	41	82%
	Not suitable	9	18%
Fe	Suitable	45	90%
	Not suitable	05	10%

Table 3: Analysis of water chemistry from water vendors

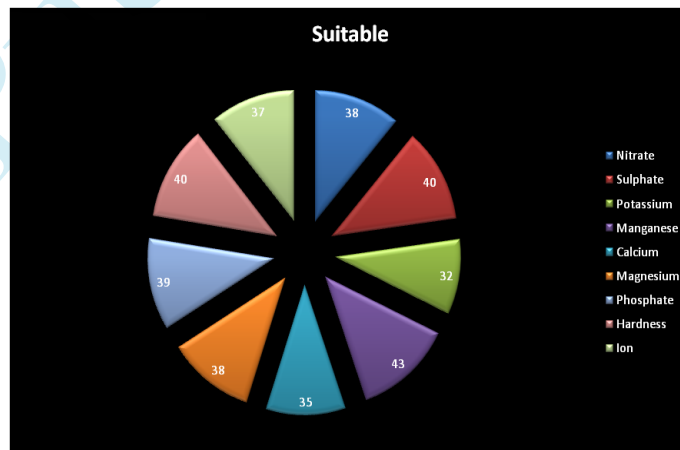| Nitrate	Suitable	38	76
	Not Suitable	12	24
sulphate	Suitable	40	80
	Not Suitable	10	20
potassium	Suitable	32	64
	Not Suitable	18	36
manganese	Suitable	43	86
	Not Suitable	07	14
calcium	Suitable	35	70
	Not Suitable	15	30
magnesium	Suitable	38	76
	Not Suitable	12	14
Phosphate	Suitable	39	78
	Not Suitable	11	22
hardness	Suitable	40	80
	Not Suitable	10	20
Ion(meaning what?)	Suitable	37	74
	Not Suitable	13	26

Figure 2: Chemical water quality analysis from water vendors

The water quality analysis in terms of total dissolved solute shows that 40 out of total of 50 samples which is equivalent to 80% indicate that the water is suitable for drinking and other domestic activities, while 10 out 50 samples analyzed which is equivalent to 20% shows that the water is unfit for drinking and other domestic activities. Chloride shows that out of 50 samples analyzed, 44 out of 50 samples which is equivalent to 88% is suitable for drinking and other domestic activities, while 6 out of 50 samples which is equivalent to 8% shows that the water is unfit for drinking and other domestic activities. Water alkalinity shows that out of 50 samples only 40 samples which is equivalent to 80% proved that the water is fit for drinking and other religious activity, but 10 out of 50 samples which is equivalent to 20% shows that the water is unfit for drinking and other domestic activities.

Water hardness indicates that out of 50 samples collected 41 samples which is equivalent to 82% indicate that the water is fit/suitable for drinking and other domestic activities while 9 out of 50 sample which is equivalent to 18% is not suitable for drinking and other domestic activity. And finally, the result of iron shows that only 45 sample which is equivalent to 90% is suitable for drinking, while 5 among the samples which is equivalent to 10% shows that the water is not suitable for domestic cooking drinking and other activities.

Figure 3: Graphical presentation of nutrient water quality analysis from water vendors

Based on the water collected from water vendors and analyzed (Table 3) (Table 4), out of 50 sample, 34 out of 50 sample analyzed which is equivalent to 76% shows that the water is suitable for drinking and other domestic activities in respect to nitrate, while 12 out of 50 sample which is equivalent to 24% shows that the water is not suitable for drinking and other domestic activities. Sulphate shows that out of 50 samples analyzed, 40 samples which is equivalent to 80% is suitable for drinking but 10 out of 50 sample which is equivalent to 20% shows that the water is not fit for drinking and other domestic activities.

Potassium shows that out of 50 samples analyzed, only 32 which is equivalent to 64% is suitable for drinking and other domestic activities, while 18 of the sample analyzed which is equivalent to 36% shows that the water is not fit for drinking and other domestic activities. 43 out of 50 samples analyzed in terms of magnesium which is equivalent to 86% shows that the water is suitable for drinking and other domestic activities, while 07 out of 50 samples analyzed which is equivalent to 14% shows
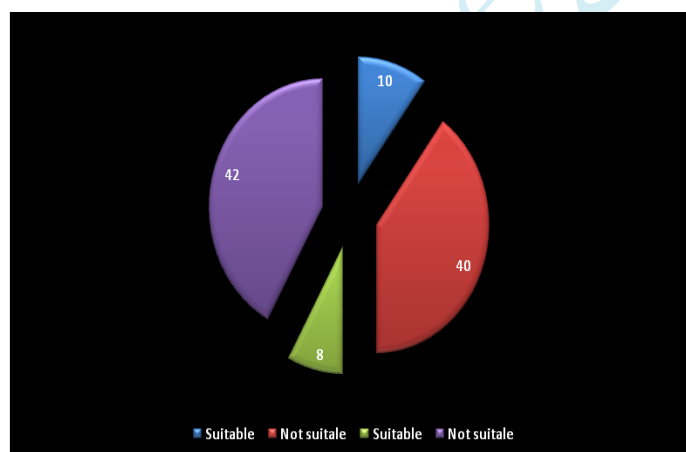
that the water is not suitable for drinking and other domestic activities.

Calcium shows that out of 50 samples analyzed 35 which is equivalent to 70% indicate that the water is suitable for drinking and other domestic activities, while 15 out of 50 samples analyzed which is equivalent to 30% shows that the water is not suitable for drinking and other domestic activities. Manganese indicate that out of 50 sample analyzed, 38 which is equivalent to 76% indicate that the water is suitable for drinking and other domestic activities, while 12 out of 50 sample which is equivalent 24% shows that the water is not suitable for drinking and other domestic activities.

Phosphate shows that out of 50 sample analyzed only 39 samples which is equivalent to 78% is suitable for drinking, while 11 out 50 samples analyzed which is equivalent to 12% shows that the water is unfit for drinking and other domestic activities. But hardness shows that out of 50 sample analyzed, 40 which is equivalent to 80% shows that the water is suitable for drinking and other domestic activities, while 10 among the sample analyzed which is equivalent to 20% indicate that the water is not unfit for drinking and other domestic activities, and finally iron shows that 37 out of 50 samples analyzed which is equivalent to 74% indicate that the water is suitable for drinking and other domestic activities, but 13 out of 50 sample which is equivalent to 26% indicate that the water is unfit for drinking and other domestic activity.

Table 4: Results for microbial water quality analysis

Coliforms	Scale	Frequency	Percentage
Fecal coliform	Suitable	10	20
	Not Suitable	40	80
Total coliform	Suitable	08	16
	Not Suitable	42	84

Figure 4: Graphical presentation of microbial water quality analyses from water vendors

Based on the sample of water analyzed from the water vendors, out of the 50 samples 10 which is equivalent to 20% shows that the water is suitable for drinking and other domestic activities, while 40 of the samples analyzed out of 50 samples from the water vendors which is equivalent to 80% shows that the water is unfit for drinking and other domestic activities in terms of feacal coliforms. In terms of total coliforms, out of 50 samples collected and analyzed from the water vendors, 9 sample which

is equivalents to 18%, shows that the water is fit for drinking and other activities, but 41 of the sample which is equivalent to 82% indicate that the water is unfit for drinking and other domestic activities.

Findings

The finding of this research works shows that in terms of physical analysis out of fifty (50) sample of water analyzed only 22% are fit for drinking and other domestic activities, but 78% of the water are unfit for drinking and other domestic activities. Microbial water quality analysis shows that ten (10) among the sample out of fifty (50) are fit for drinking which is equivalent to 20%, but the remaining 80% are not fit for drinking and other domestic activities. Chemical analysis shows that only ten (10) among the sample which is equivalent to 20%, but the remaining 80% is unfit for drinking and other domestic activities. And finally, the water nutrients shows that fifteen (15) samples which is equivalent to 30% is fit for drinking, but 35 out of fifty (50) analyzed which is equivalent to 70% is unfit for drinking and other domestic activities.

Conclusion

Although water remains the key determinant of human survival, water that is generally use for drinking and other domestic activities is generally unfit based on the finding of this research work. Only limited sources that are fit for drinking and other domestic activities. As such, there is need by governmental and nongovernmental organization to formulate laws and policies that will ensure that all the sources of water is tested for their potential use. If not the rate of morbidity and mortality will keep on increasing due to water born related diseases and illness.

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