Health Implication of Dam in Some Parts of Tafa Local Government Area of Niger State, Nigeria

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Abstract
Although dams have beneficial effects, they are also acknowledged as having serious environmental repercussions if they are not properly managed. The aim of this research was to examine the impact of Kofa dam in Niger State on the health status of a riparian community downstream (Kofa) against a control community (Karfe). The objectives of the study are to assess the health implications of proximity to Kofa dam and to investigate the perception of the community members located near the dam on its health implication. A convenient 3% sample size was adopted resulting to 130 respondents and questionnaires, focus group discussion and personal observation were used to elicit data. The result unveiled that communicable water-related diseases are more common in the catchment area, which were identified as malaria, water related diseases (bilharzias, diarrhea, rashes measles) and cholera among others which are mostly associated with water. Case-control study was then conducted in one community (Karfe) which is about 5km away from the experimental community in other to ascertain the health status of the communities with regards to the function of the dam. Most of the diseases identified in the control community are conventional diseases in Nigeria such as: Malaria, Ulcer, Diabetes, which invariably signifies that the diseases identified there has no correlation what so ever with the waterborne diseases found in the experimental community. The study therefore shows some degree of association between the presence of the dam and poor health status of the downstream community in close proximity to it. However, it was recommended that Government should assist in providing the community with safe drinking water so as to prevent the community from using the untreated dam water for their domestic use and provide the community with health education, mosquito netting, medical facilities and drugs to promptly diagnose and treat infected persons in the communities particularly Kofa as it is the community located in close proximity to the dam and is mostly affected by waterborne disease.

Keywords: dam, health, waterborne disease, conventional disease, riparian

1. Introduction

Throughout the world, especially the developing world, dams and related water infrastructure projects continue to be planned, constructed and operated to meet human needs through energy generation, agricultural production and the supply of drinking water. For most countries, dams are a crucial part of economic and social development and, as such, they aim to achieve important socio-economic development objectives. Through their potential to alleviate poverty, they can contribute significantly to the enhancement of human health. Large dams became a prominent instrument for economic development in the past century. Worldwide, the number of large dams stood at 5000 in 1950 (International Commission on Large Dams, 1998); three quarters of these were in North America, Europe, and other industrial regions. By 2000, the number of large dams had climbed to over 45,000, and these were spread among more than 140 countries (ICOLD, 1998). On average, two large dams were built per day for half a century (World Commission on Dam, 2000). Today, the number of large dams exceeds 50,000 (WCD, 2006).

A dam, as the name implies, is the structural damming, locking, or controlling the flow of river water through the construction of barrier across the river channel (Ahmed, 2002). Dams provide water storage that has enabled large cities like Phoenix, Arizona, to grow in desert regions. About

half of the world's large dams were built primarily for irrigation, many of them in Asia as the Green Revolution spread (WCD, 2000). Undeniably, large dams have played an important role in economic development. However, large dams have also brought serious environmental and social consequences. Whereas the benefits have generally been delivered to urban centre's or industrial-scale agricultural developments, river-dependent populations located downstream of dams have commonly experienced a difficult upheaval of their livelihoods, health problems, loss of food security, and other impacts to their physical, cultural and spiritual well-being. While downstream river-dependent communities may benefit from some degree of flood protection and enhanced irrigation opportunities provided by dams, adverse impacts are far more common and usually outweigh the benefits to downstream people, resulting in reduction of their incomes, livelihood and increase in environmental problem (Anul *et al.*, 2007). Today, 200 million people are affected, the equivalent of the entire population of the United States of America. Disease is widespread in Africa, Japan, the Philippines, Thailand, Laos and other parts of Asia, the Middle East, the West Indies and parts of South America. In all, 71 countries are affected (WCD, 2000).

Empirically researches unveiled that dams are associated with socio-economic and health consequences. For example Yamana (2004) noticed that tropical diseases such as malaria, schistosomiasis, river blindness and rift valley fever are mostly cause as a result of consuming water contaminated by human, animal, or chemical wastes, and parasites that spend at least part of their life cycles in water. Epidemic of malaria disease is more prevalent around dams. River blindness found in the river basins of central and South America and Tropical Africa bring untold hardship to the people. In the same vein, Hunter (2009) also found out that there was a strong relationship between dam construction and health status of riparian community within the dam vicinity. Goldsmith *et al*. (1984) in the book "Dam and Disease" talk about the Social and Environmental Effect of Large Dams, in which they identified Malaria, Schistosomiasis, Filariasis, and Onchorcerciasis (River blindness) as some of the major disease found in dam situated areas. Malaria, schistosomiasis, lymphatic filariasis and onchorcerciasis were found but not limited to diseases concern in water resource projects. Water resource projects lead to the aggregation of people; the ensuing health consequences include sexually transmitted diseases, accidental injuries, acute respiratory infections, diarrhea and tuberculosis. In 1977, prior to the construction of Jebba dam (which was completed in 1982, creating a reservoir about 100km long), it was predicted that onchocerciasis, trypasonomiasis would be important public health problems around this impoundment. Nigeria is not left out in terms of dam construction; several dams have been constructed all over the states in an attempt to generate hydropower e.g. Kainji dam which is the largest hydroelectricity project in the country, Jebba (on the Niger) and Shiroro (on the Kaduna tributary). In Kano state for example, we have Saint Thomas dam, Tiga dam, Kusalla dam, Challawa dam and the Bakolori dam in Zamfara state among others, all constructed for the purpose of generating hydroelectricity, supply of water for domestic use and for Agricultural purposes (irrigation).

The problems related to Dam are numerous based on their nature and magnitude. For the purpose of this study, the research concentrate more on the problems related to the health implication of the people. The health issue associated with Dams can be represented into two categories depending on the nature of the problem involved, namely;

1. **Communicable diseases** e.g. Vector borne (Malaria), water-born (Diarrhea, cholera, Typhoid, Schistosomiasis or Bilharzias, Guinea worm, River blindness or (Onchocerciasis), sexually transmitted, and zoo nose
2. **Non - communicable disease** e.g. poisoning by minerals, biological toxins, pesticide residues and industrial effluent

The aim of the study was to ascertain the health implication of dam in some part of Tafa L.G.A, in Niger State. To achieve this aim, the study assess the health implication of proximity to Kofa dam

and also investigate the perception of the community members located near the dam on its health implication.

2. Methodology

2.1 Study Area

Kofa and Karfe which are the two study areas are located between Lat 9°14'35" N and Lon 7°14'15" E, and between Lat 9°13'2" N and Lon 7°12'58" E respectively. The two communities are located in Tafa Local Government Area of Niger State, Nigeria. Tafa has an area of 222 km² and a population of 83,544 according to the 2006 census. The inhabitants of the village live in mud-brick houses with thatched roofs, although there are some few modern houses. The most common occupation is farming and other menial economic activities. Most of the inhabitants come into contact with the Kofa dam at least once a day for various reasons, including fishing, bathing, washing, and collecting water for domestic use as there is no supply of tap water in the village. Children also play barefoot along the dam-shore and in the water. A common problem in this village is the lack of basic health and sanitary amenities, such as a clean water supply, combined with a low economic level. The dam is located in between the two communities with the closest to it been the experimental communities (Kofa) with a distance of about 0.43km to the dam. The source of the river is river Iku and it direction of flow is from East to West, the company that construct the dam are CIBAS (Imperisit Bakolori). The construction started in 1990 and was commission in 1997 by General Sani Abacha. The sole purpose of the dam was to supply water for domestic use in the catchment areas which is about 144 square kilometers and has a capacity of about 30 million cubic meter of water.

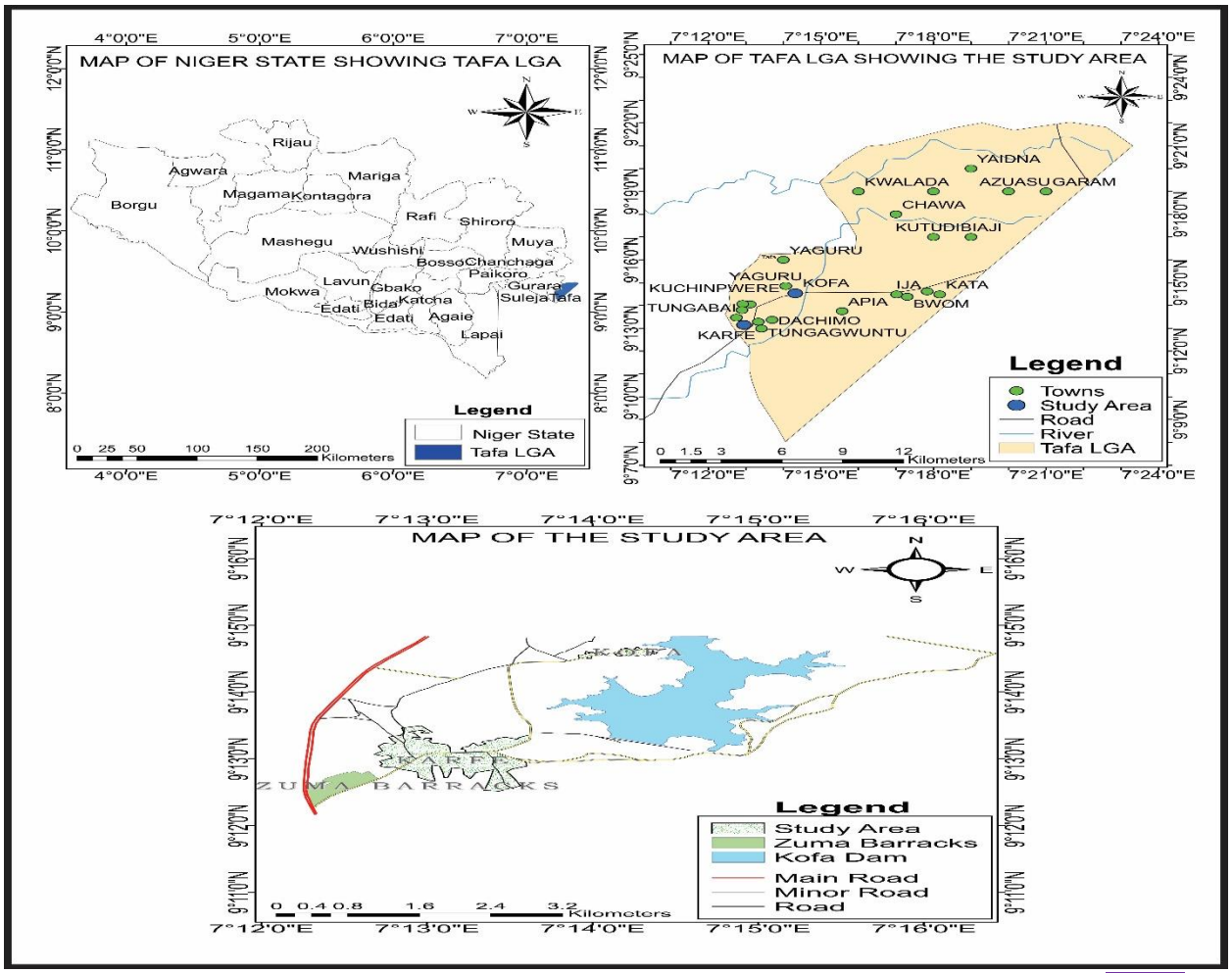

Figure 1: Map of Niger State Showing Study Area
Source: Department of Geography, Federal University of Technology, Minna

2:2 Method of Data Collection and Analysis

This study was conducted using descriptive survey research design. Probability sampling method served as the techniques in which random sampling were used to administered the questionnaires to the respondents. Primary data were acquired with the use of questionnaires, Focus Group Discussion and personal observation. Data for this study were collected using both closed and open ended questionnaire to generate information for the study. The sampling population for the two study areas was 4324. A convenient 3% sample size for the two study areas totaling 130 respondents participated in the study. 65 questionnaires each were administered to the study areas of Kofa and Karfe respectively. Focus Group Discussion was also conducted in the two study areas in four phases; two groups for each area were used with a population of twelve persons per group. Educational background and Age of the respondents were employed as the criteria to determine the sample size of the Focus Group Discussion. The secondary data used were from both publish and unpublished information obtain from books, journals, seminar papers, encyclopedias, student's project, magazines and online materials among others.

Data for this study were analyzed using descriptive statistical analysis. Data gathered were edited, coded and analyzed using SPSS and presented in charts and tables.

3 Data Analysis and Presentation

3.1 Demographic characteristics of Respondents

Sex of Respondents
The result presented in table 1 below indicates that the male respondents are more than the female respondent in the proportion of 78.2% to 21.8% respectively. This is because the male respondents are more readily available than the females who are mostly housewives and are usually indoors except for the few who were seen coincidentally working outside their household.

Table 1: Sex of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
male	97	78.2	78.2	78.2
female	27	21.8	21.8	100.0
Total	124	100.0	100.0	

Source: Field work, (2018)

Age of Respondents

The result in figure 2 indicates that respondents from age 26-30 for Kofa and Karfe have the highest percentage with 12. 1% and 9.9%, followed by 31-35 with 8.1% and 8.9%, 36-40 with 5.6% and 7.3%, 21-25 with 5.6% and 4.8%, 41-45 with 4.0% and 1.6%, 46-50 with 4.0% and 2.4%, 51-55 with 2.4% and 8.1%, 56-60 with 2.4% and 5.6%, 16-20 with 2.4% and 1.6%, 61-65 with 1.6% and 2.0%, and lastly 66-70 with 1.6% and 2.4% respectively.

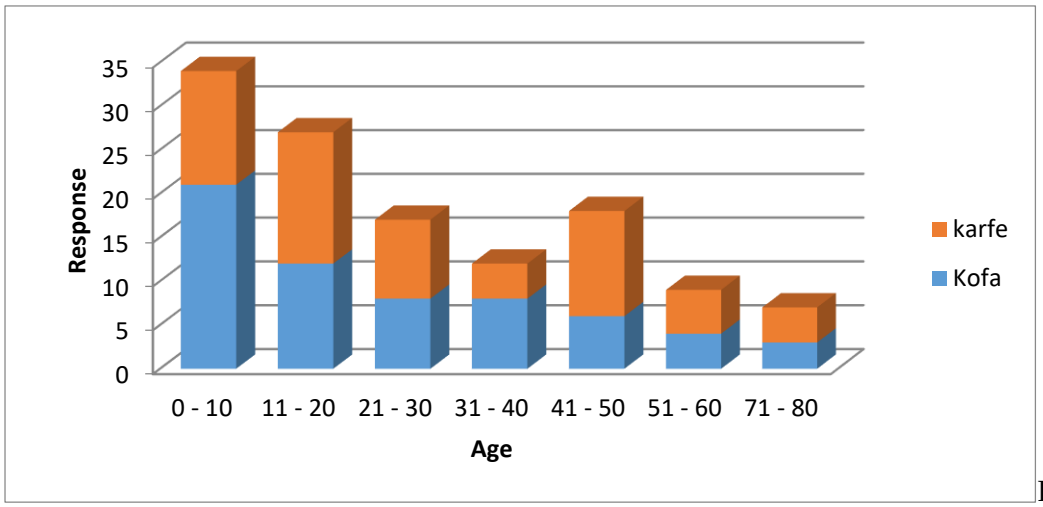

Figure 2. Age of Respondents

3.2 Sources of Water in the Study Areas

The Source of water plays a major role in determining the health status of the study areas. The research identified three sources of water as indicated in Table 2.

Table 2: Table Showing Different Sources of Water

	Kofa		Karfe	
	No.	%	No.	%
Dam	10	8.1	0	0.0
Borehole	3	2.4	0	0.0
both dam and borehole	49	39.5	0	0.0
Tap	0	0.0	62	0.0

Source: Field Work (2018)

3.3 Common Diseases in the Study Areas

Another factor that was considered to be important in determining the health status of the study areas is the type of diseases prevalent in the area. This research identified that there is an overlap between the diseases found in both communities. Thus, some diseases are more common in one community than the other. Some of the diseases identified are water-related, airborne while some are vector borne (Malaria fever) and other conventional diseases found irrespective of the environment. The results of the common diseases for the two communities are shown in the Table 3.

Table 3. Common Disease in the Study Area

		Kofa		Karfe	
		NO.	%	NO.	%
Malaria	Yes	60	48.4	62	50.0
	No	2	1.6	0	0.0
Bilharzia	Yes	30	24.2	8	6.5
	No	32	25.8	54	43.5

Typhoid	Yes	49	39.5	17	13.7
	No	13	10.5	45	36.3
Diarrhea	Yes	29	23.4	15	12.1
	No	33	26.6	47	37.9
Measles	Yes	13	10.5	0	0.0
	No	49	39.5	62	50.0
Rashes	Yes	16	12.9	0	0.0
	No	46	37.1	62	50.0
Pile	Yes	18	14.5	29	23.4
	No	44	35.5	33	26.6
Swollen Stomach	Yes	21	16.9	0	0.0
	No	41	33.1	62	50.0
Eye Problem	Yes	20	16.1	0	0.0
	No	42	33.9	62	50.0
Cholera	Yes	15	12.1	3	2.4
	No	47	37.9	59	47.6
Hypertensive	Yes	0	0.0	10	8.1
	No	62	50.0	52	41.9
Ulcer	Yes	0	0.0	9	7.3
	No	62	50.0	53	42.7
Diabetes	Yes	0	0.0	7	5.6
	No	62	50.0	55	44.4
Others	Yes	44	35.5	13	10.5
	No	18	14.5	49	39.5

Source: Field Work (2018)

On the health implication of proximity to kofa dam, the result in Table 3 show a high rate of disease occurrence in kofa against Karfe. Waterborne diseases are the major diseases prevalent in Kofa except for Malaria fever which is more frequent in Karfe than in the former. Proximity to Kofa dam has a serious health implication to the inhabitants as illustrated from the research findings. Prior to the construction of the dam, disease occurrence and most especially disease outbreak are very limited in Kofa, this is because the dam was initially a flowing river which make it difficult for new breed of mosquito, snail and other disease carriers to reproduce younger breeds. However, after the construction of the dam the pattern of disease occurrence change as the community began to notice few disease outbreaks such as bilharzias, typhoid, cholera and other water related diseases. Human contact with the river also increases exponentially as the dam became their major source of water for domestic and agricultural use. The only alternative source of water in the community is a single borehole which was not functional at the time of carrying out this research. This however exposes the inhabitant to have direct physical contact with the dam water frequently which makes them vulnerable to most of the waterborne diseases. Apart from the diseases, several death cases were also recorded. These results are similar to those of Yamana (2004) and Anul *et al.* (2007) who also found out that waterborne and malaria are more frequent in areas with dams and water body.

However the situation in Karfe is the opposite in terms of disease occurrence, this can be explained as shown Table 3 that most of the disease in Karfe are more of conventional diseases that is more attributed to lifestyle habit than the environment except for malaria fever which is one of the predominant disease in Karfe. These disparities may be attributed to the fact that malaria fever is a vector borne disease that travel long distance by it host (mosquito) before receding in a particular area depending on some factors such as cleanliness of the environment and the type of water people use for their day to day activities. It should be noted that unlike in Kofa, Karfe has a good water supply system (tap) which the inhabitant use for all their domestic activities. This may explain to some extent the minimal presence of waterborne disease.

3.4 Perception of Community Members Located near the Dam on its Health Implication

The people of Kofa community are fully aware of the health implication of the dam. Most of the respondents from the Focus Group Discussion argue that prior to the construction of the dam there were little presence of diseases, most especially waterborne diseases. However, after the construction of the dam in 1997 there was a change in the pattern of disease occurrence as some diseases such as bilharzias, cholera, diarrhea, eye problem and rashes become more frequent in the area. Within this time frame some few disease outbreak occurred most especially cholera and bilharzias. The dam also poses a great danger to the life of the people as about 95 deaths were recorded since the construction of the dam to date, this causes so much psychological problem as their love ones are lost while trying to cross the dam to their farm land and neighboring villages. Injury became more prominent in the community as several children are drowned on a day to day basis while swimming in the river. The water became a breeding ground for mosquito and other host and agent of diseases as the water became polluted and stagnant, children are mostly affected with the diseases as they are one of the group that come in contact with the contaminated water most often. Adult are not left out as some of them are affected with various eye problem and rashes. Swollen stomach is another major disease that surface mostly on children after the construction of the dam. In terms of the culture of the people, they try as much as possible to purify the water by boiling it before use as prescribe by medical health practitioners after preliminary lap test of the water. In general, the health status of the inhabitant living in Kofa community is on a positive note compare to when the dam was constructed, this is because many type of health educational program have been conducted to the people on how to use the water and take precautionary measures. Government have also been supportive on their part by providing them with some drugs most especially for bilharzias and cholera.

4. Conclusion

Health implications of dam are influence by numerous factors including the environment, culture and source of water among others. Source of water is the most influential factor in determining the types of diseases found in the two communities. However, there are differences between the type of diseases found in both the study areas as waterborne and malaria fever are prevalent in Kofa, there is minimum presence of waterborne disease in the other community without the dam (Karfe). There is also an overlap between some of the diseases in both areas as malaria and conventional diseases (typhoid, hypertensive, ulcer etc), whereas cultural and environmental factor plays more prominent role in their occurrence than the presence of dam and water body. The control community (Karfe) consistently had a much better health status than the riparian community which is closer to the dam. However, the study therefore showed that there was a strong association between the presence of the dam and poorer health status of the downstream community in close proximity to it and more specifically waterborne diseases.

4.1 Recommendations

Water development projects should only be undertaken if they can be shown to benefit large sectors of the population instead of the urban elite. Dam should not be built if they displace indigenous peoples from their homes and destroy their culture unless compensation is provided to ensure that the affected people are made no worse off, and preferably better off than before the project. However, this research recommends the followings:

1. Government should assist in providing the community with safe drinking water so as to prevent the community from using the untreated dam water for their domestic use.

2. Government should also assist in providing the community with health education, mosquito netting, medical facilities and drugs to promptly diagnose and treat infected persons in the communities particularly Kofa as it is the community located in close proximity to the dam and is mostly affected by waterborne disease.

Although, no one solution will solve all of the health problems associated with dam, however well-integrated strategies chosen according to local characteristics and requirement can reduce the health problem to a minimal level.

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