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Socio-Demographic Determinant of Yellow Fever Patient: A Retrospective Study (2020), Federal Medical Center, Asaba

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Abstract

Background: Yellow fever is transmitted primarily to humans and non-human primates through the bite of an infected female mosquito Aedes Spp. It is prevented mainly by vaccination. **Method:** This retrospective observational study at the Center for Communicable Disease Control and Research (CCDCR) Federal Medical Center Asaba (F.M.C) was conducted on all patients diagnosed and managed with yellow fever in the year 2020. We studied a total number of 57 patients' case files seen within the period. A chi-square test was done to test the null and alternative hypotheses. **Result:** About 48 (84.2%) males and female 9 (15.8%) females were mostly affected and gender was significant with a chi-squared value of 26.6 and p-value of 0.00. **Conclusion:** To eradicate this virus, vaccination and health promotions should be encouraged by the health care workers supported by the government. This is to ensure that a greater proportion of the affected community can be immunized.

Keywords

Yellow Fever, Socio-Demograpic, Determinants, Asaba

1. Introduction

Yellow fever continues to be a public health emergency; the infection is likely to have caused 200,000 cases of illness and 30,000 loss of life each year with 90% occurring in Africa. Twenty to fifty percent of infected persons who develop severe infections die, and outbreaks cause malaise which can have disruptive effects on economic and healthcare systems [1]. This is in line with the World Health Organization record, which revealed that 47 countries in Africa and 13 countries in South America are endemic to the infection [2]. An evaluation, from the early 1990s indicated that 200,000 cases with 30,000 mortalities, were expected yearly worldwide, with 90% occurring in Africa [3].

Yellow fever is caused by the prototype member of the genus Flavivirus, a family of positive-strand, single-strand RNA viruses, the majority of which are transmitted by insects such as mosquitoes or ticks resulting in viral hemorrhagic fevers [4]. Yellow fever virus is transmitted primarily to humans and non-human primates through the bite of an infected female mosquito; Aedes *spp*. which is responsible for transmission in Africa and the Americas, while *Haemagogus spp*. vectors are restricted to sub-Saharan Africa. There are three types of transmission cycle: Sylvatic or jungle yellow fever, Intermediate yellow fever, and lastly Urban yellow fever [5].

According to World Health Organization, symptoms of yellow fever include fever, headaches jaundice, muscle pain, loss of appetite, nausea, vomiting, and fatigue. A small percentage of persons affected sometimes enter a toxic phase within 24 hours of recovering from initial symptoms [6]. High fever returns and several organs in the body are involved, especially the liver and the kidney causing affected persons to develop jaundice hence the name, due to yellowness of the eyes and increase in body temperature. At this point bleeding can come out from the mouth, the nose, eyes, and stomach, sadly half of those who enter the toxic phase die within 7 - 10 days [7].

In Nigeria, the earliest outbreak was reported in Lagos in 1864, and subsequent outbreaks have been recorded. Two epidemics happened in Ogbomosho in 1946 and in Eastern Nigeria in 1951-1953 [8]. Later another outbreak in 1969 occurred in Jos, Plateau State in a 17-year-old boy at that period. The first laboratory confirmation of yellow fever was in a patient whose illness began on 7th September 1969. The diagnosis was confirmed by virus isolation and a widespread outbreak in Jos Plateau state and adjacent areas was established. This was the first recognized epidemic of Yellow fever in Nigeria since 1953 [9]. Approximately 252 patients were hospitalized between September and December 1969. The case fatality rate for hospitalized patients was approximately 40%. It was estimated that up to 100,000 cases may have occurred during the epidemic [10]. For a space of 21 years, no further confirmed cases were reported until September 2017, when Yellow fever was diagnosed in a seven-year-old child in Ifelodun Local Government Area of Kwara State. On 22 November 2018, a cluster of suspected Yellow fever cases and deaths in Edo State, Nigeria was reported to the

World Health Organization. From 2017 to 2018, 163 cases were confirmed in 17 States; Kwara (8), Kogi (12), Kano (1), Zamfara (19), Kebbi (7), Nasarawa (3), Niger (1), Katsina (2), Edo (90), Ekiti (2), Rivers (1), Anambra (1), FCT (11), Benue (1), Delta (1), Ondo (2) and Abia (1). All the States in Nigeria (including the Federal Capital Territory) reported 4,132 suspected cases in 616 LGAs. Of all suspected, probable, and confirmed cases, 90 deaths were recorded with 31 deaths among confirmed cases. The case fatality rate for all cases (suspected, probable, and confirmed) was 2.2% and 19.0% for confirmed cases.

In Africa, cases of yellow fever were documented in Togo and Angola. From late 2015 to December 2016, the biggest outbreak of this disease originated in Angola and spread to bordering countries [11]. The outbreaks started in a congested urban environment from Luanda and spread quickly to the rest of the country and beyond its borders. Cases of this illness in Angola have been exported to countries including the Democratic Republic of Congo (DRC), Kenya, Uganda, and Mainland China [12].

Vaccination has lessened worldwide epidemics of yellow fever, but the infection has re-emerged in many parts of Africa and South America. The highest rate of mortality is reported in infants and the elderly, who often have depressed immune systems. Most cases are diagnosed in unvaccinated travelers to sub-Saharan Africa or South America. Occasionally, travelers from endemic countries may carry the disease to uninfected regions. To avoid the importation of the disease, many countries require proof of yellow fever vaccination before issuing a visa, especially if travelers are going to, or have visited endemic areas [13]. Yellow fever is endemic in tropical and subtropical areas in Africa and South America [14]. From early December 2015 to late July 2016, a total of 3818 cases were reported. Among these, 3294 cases had laboratory tests and 879 were confirmed. The majority of the confirmed cases were in males aged 15 - 19 years, The Democratic Republic of Congo (DRC) is located in a geographical area known to be Yellow fever endemic, and autochthonous cases are regularly reported. On 22 March 2016, the National International Health Regulations (IHR) Focal Point of the DRC notified WHO of cases of Yellow fever in connection with the outbreak occurring in Angola. The last case in DRC was detected on 12 July 2016. In mid-February 2017, DRC declared the end of the Yellow fever outbreak [15]. A total of 2987 cases were reported from all 26 provinces of DRC during the outbreak, of which 81 cases were laboratory confirmed, with 16 deaths (case fatality rate among confirmed cases 20%).

The population at risk are people who live in low-income houses with overcrowding, poor sanitation, bad waste removal practices, and inadequate water supply which makes residents store water in open containers that serve as breeding sites for mosquitoes [16]. This encourages the breeding of the Aedes mosquito which is capable of breeding in small amounts of water that accumulates in artificial containers inside or close to dwellings or in natural reservoirs such as tree holes [17]. The incubation period after an initial infected bite is typ-

ically 3 - 6 days. Most infected individuals develop only mild non-specific symptoms in the initial phase of the disease when the virus is present in the blood, such as fever, muscle pain, loss of appetite, nausea or vomiting, or asymptomatic. An individual may serve as a source of infection for mosquitos during this time [10]. Initial symptoms, if any, usually subside after approximately 2 - 6 days. After a brief period of symptom improvement, approximately 15% - 25% of individuals progress to a more severe form of the disease ("period of intoxication") which +includes high fever, liver and kidney failure leading to jaundice, dark urine, abdominal pain with vomiting, and bleeding that can occur from the mouth, nose, eyes. During this severe phase, antibodies appear in the blood and the virus disappears [10]. Unprotected exposure of an unvaccinated individual to mosquitoes in an endemic area is the major risk factor for yellow fever. Severe or prolonged rainy seasons are associated with increased numbers of vectors and may be implicated in increased transmission [13].

Vaccination is the single most important measure for preventing yellow fever. In high-risk areas where yellow fever vaccination coverage is low, prompt recognition and control of our breakthrough vaccination are important to prevent epidemics. To prevent outbreaks throughout affected regions, vaccination coverage must reach at least 60% - 80% of the at-risk population [14]. Prevention is also by environmental sanitation, destroying breeding sites of mosquitoes, proper waste removal, and removal of stagnant water from gutters. All this will help destroy the vector, which will prevent the spread of the virus.

The treatment of yellow fever consists of supportive care; there is no specific antiviral therapy available [15]. Management of patients may be improved by modern intensive care, but this is generally not available in remote areas where yellow fever often occurs. Supportive care should include maintenance of nutrition, prevention of hypoglycemia, nasogastric suction to prevent gastric distention and aspiration, treatment of hypotension by fluid replacement and vasoactive drugs if necessary, administration of oxygen, prophylactic anticonvulsant therapy, management of metabolic acidosis, treatment of bleeding with fresh-frozen plasma, dialysis if indicated by renal failure, and treatment of secondary infections [16].

2. Justifications of Study

The yellow fever outbreak is a serious condition of public health concern. The majority of the patients with the disease present late as yellow fever has signs and symptoms similar to some known diseases like malaria, and Lassa fever. The case fatality rate for hospitalized patients was approximately 40% (WHO 2019) which is high; the severity of the disease condition most times results in death as 20% - 50% of cases die of complications caused by considerable tissue damage. This has financial, emotional, and social implications for both the family and the public at large. Managing the condition was expensive, due to its severe nature, especially as the persons most affected are of low social economic status [16].

Studies done in Congo show that most of the established cases were males, who had journeyed from the country of Angola where they have been infested and most were men [17]. Another study in Uganda also in agreement revealed that males were more affected, and they had a greater attack rate than females. The age range of the probable case patients was 3 - 64 (median: 32) years. Of all age groups, persons aged 30 - 39 years had the utmost attack rate. (19) The case fatality rate was 33%. The case fatality rate among males was 36% while for females was 22%. The age group of 20 - 30 years had the highest case fatality rate of 36% [17]. In their occupation, more than half (64%) of the cases were farmers; other occupations represented in case-persons included sand miners (5%), wood colliers (5%), small shop owners (3%), teachers (2%), and casual labor (3%). Of note, all case persons were involved in farming events to at least some extent, and the recent outbreak of yellow fever in Nigeria specifically in some communities in Delta State was observed to have affected a certain age range (14 - 35 years) and sex was more affected [17]. Due to the severity of this aliment, it is important to investigate the socio-demographic determinant of these patients to put in place targeted strategies to prevent outbreaks and disease burdens.

3. Statement of Problem

The yellow fever outbreak is a serious condition of public health concern. The severity of the disease condition most times results in death as 20% - 50% of cases die of complications caused by considerable tissue damage. This has so much effect on both the family and the public at large. Managing the condition is costly especially as the persons most affected are of low social economic status. Of concern is the severe nature of the condition. Therefore, it is imperative to assess the socio-demographic determinant of these patients to initiate early intervention to curb this malady.

4. Significance of the Study

Understanding the socio-demographic determinant of yellow fever patients will necessitate the need for the government and healthcare facilities to embark on massive sensitization and health education of the masses on yellow fever mostly in endemic communities. Furthermore, this study will help target the people who are usually affected as a result of their occupation and also after a better understanding of the need for early immunization and vaccination against yellow fever disease. There is a paucity of data on yellow fever studies in our environment. Findings from this study will contribute to the body of knowledge on yellow fever. The study can also help policymakers to make policies that will reduce overcrowding. Most of these patients were managed in the isolation center of Federal Medical Center Asaba. This study is aimed at assessing the socio-demographic determining factor of these patients, which will help the government and healthcare facilities to organize Health promotions geared at curbing the disease condition such as immunization of all age groups, especially

those within the affected age range.

5. Objectives

To examine the socio-demographic determinant of patients the yellow fever disease using data collected from Isolation Center, Federal Medical Center Asaba.

6. Research Question

What is the socio-demographic determinant of patients with yellow fever in Federal Medical Center Asaba?

7. Hypothesis

There is no significant relationship between patients' genders and yellow Fever in Federal Medical Center Asaba.

There is a significant association between gender and yellow Fever in Federal Medical Center Asaba.

8. Material and Methods

8.1. Research Design

This study is a retrospective observational study. The duration of one month was used to collect data from the case note of patients managed for yellow fever.

8.2. Research Setting

The research was conducted at the Centre for Communication Diseases Control and Research (CCDCR) from 28 August to September 2021 in Federal Medical Centre, Asaba, Delta State, Nigeria, as a single-center study, which is one of the three COVID-19 treatment center located in Delta State. The treatment center is completely upheld by the management of Federal Medical Center, Asaba in partnership with the Delta State government. The center has a laboratory and groups of qualified clinical staff who are trained and competent in the management of patients with communicable diseases.

8.3. Target Population

This was made up of established cases of yellow fever who were hospitalized and managed in the isolation unit (CCDCRC) of Federal Medical Center Asaba.

8.3.1. Inclusion Criteria

Those that were diagnosed with yellow fever were admitted and managed in the isolation ward (CCDCR) in 2020.

8.3.2. Exclusion Criteria

Those that were diagnosed and managed with yellow fever before or after 2020.

8.4. Sampling Technique

The folders of all individuals diagnosed with yellow fever and managed in isola-

tion (CCDRC) in the year 2020 were used.

8.5. Sample Size

All the yellow fever cases that were seen in the isolation center in 2020.

8.5.1. Study Period

The study period was from 27th August—24th September 2021 (one month).

8.5.2. Ethical Approval

Ethical approval was sought and gotten from the ethical committee of Federal Medical Center Asaba.

8.6. Confidentiality

The patient case note was treated in such a way as to avoid information contained therein leaking out to the public.

8.7. Method of Data Collection

Relevant information on patients' socio-demographics was gotten from their case notes.

8.8. Method of Data Collection and Analysis

Data from patients' case notes were screened for completeness by the researcher and entered and analyzed using Statistical Package for Social Sciences (SPSS V.25). With a P value set at 5% significant, a chi-square was done with the help of a statistician quantitative variables, etc. Descriptive data were presented using frequency tables and charts.

9. Results

Table 1 shows that 48 (84.2%) were male, and 9 (15.8%) were female. Based on age group, 22 (38.6%) were from <20 years, 28 (49.1%) were from 20 - 39, 5 (8.8%) were from 40 - 59, 2 (3.5%) were above 60 years. 52 (91.2%) were <40 years while 4 (7%) were >40 years. On tribe, 36 (63.2%) were Igbo, 1 (1.8%) were Hausa, 19 (33.3%) were Ika and 1 (1.8%) were TV. On religion, 56 (98.2%) were Christians while 1 (1.8%) were African religion. On marital Status, 40 (70.2%) were single, 3 (5.3%) were cohabiting, 13 (22.8%) were married, and 1 (1.8%) were separated or divorced. Based on educational status, 16 (28.1%) attended the primary level of education, 21 (36.8%) attended the secondary level of education, 7 (12.3%) attended the tertiary level of education, 1 (1.8%) had nursery education, 12 (21.1%) had no formal education. In total, while 52 (91.2%) were poorly educated, 5 (8.8%) had tertiary education.

Figure 1 shows that 18 (31.6%) were cured, 37 (64.9%) died, 1 (1.8%) were transferred out, and 1 (1.8%) defaulted.

Table 2 shows that 56 (98.2%) were domiciled in the delta state while 1 (1.8%) were domiciled in Anambra state. Also, 51 (89.5%) were from rural

Table 1. Socio-demographic data of respondents.

Variables	Frequency n = 57	Percentage (%)
Gender		
Male	48	84.2
Female	9	15.8
Total	**57**	**100**
Age group		
<20	22	38.6
20 - 39	28	49.1
40 - 59	5	8.8
60+	2	3.5
Total	**57**	**100**
<40	52	91.2
>40	4	7
missing value	1	1.8
Total	**57**	**100**
Tribe		
Igbo	36	63.2
Hausa	1	1.8
Ika	19	33.3
TV	1	1.8
Total	**57**	**100**
Religion		
Christianity	56	98.2
Islam	0	0
African religion	1	1.8
Total	**57**	**100**
Marital Status		
Single	40	70.2
Co-habiting	3	5.3
Married	13	22.8
Separated/Divorces	1	1.8
Total	**57**	**100**
Educational Status		
Nursery	1	1.8
Primary	16	28.1
Secondary	21	36.8
Tertiary	7	12.3
None	12	21.1
Total	57	100

Table 2. Residential status of yellow fever patients managed at CCDCR, FMC Asaba.

Variables	Frequency n = 57	Percentage (%)
State of domicile		
Delta	56	98.2
Anambra	1	1.8
Total	**57**	**100**
Area of domicile		
Rural	51	89.5
Urban	6	10.5
Total	**57**	**100**
Place of domicile		
Nsukwa	19	33.3
Agbor	26	45.6
Ogbe eku	7	12.3
Iwa-oyibo	2	3.5
Umutu kwale	3	5.2
Total	**57**	**100**

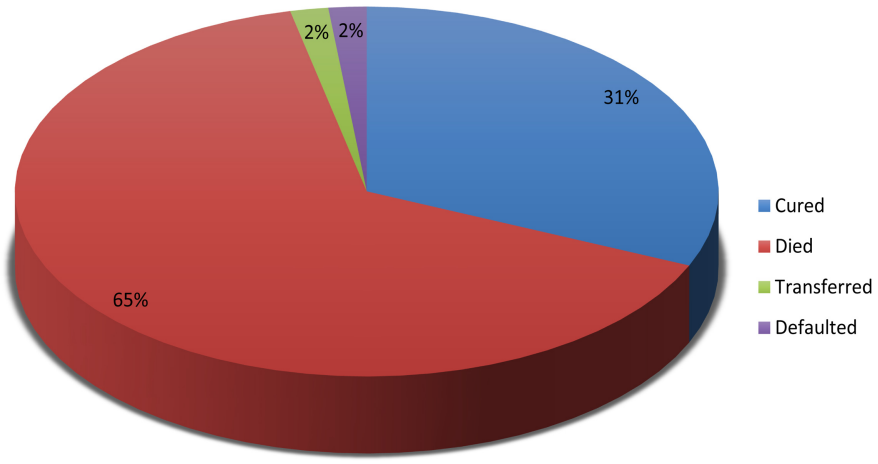

Figure 1. Clinical outcome of patients with yellow fever managed at CCDCR, FMC Asaba.

areas and 6 (10.5%) were from urban areas. Based on the place of domicile, 19 (33.3%) were from Nsukka, 26 (45.6%) were from Agbor, 7 (12.3%) were from Ogbe eku, 2 (3.5%) were from Iwa-oyibo, and 3 (5.2%) were from out kwale.

Table 3 reveals that 38 (66.7%) stayed in the hospital for <1 week, 11 (19.3%) remained in the hospital for >1 week <2 weeks, 7 (12.3%) stayed in the hospital for >2 weeks <1 month, and 1 (1.8%) stayed in the hospital for >1 month.

Table 4 shows that 18 (31.6%) take alcohol, 8 (14%) smoke, and 2 (3.5%) have

a sedentary lifestyle.

From Figure 2 it shows that the majority of yellow fever patients presented with fever 55 (96.5%), followed by jaundice 50 (87.7%) and so on; those who presented consciously were 42 (73.7%) were conscious at presentation and 15 (26.3%) were not. 15 (26.3%) were unconscious at the presentation while 42 (73.7%) were not. 50 (87.7%) had jaundice and 7 (12.3%) were not. 23 (40.4%) had convulsions while 34 (59.6%) did not. 55 (96.5%) had a fever and 2 (3.5%) did not. 33 (57.9%) were bleeding and 24 (42.1%) were not bleeding. 5 (8.8%)

Table 3. Length of stay of yellow fever patient managed at CCDCR, FMC Asaba.

Variables	Frequency n = 57	Percentage (%)
<1 week	38	66.7
>1 week <2 weeks	11	19.3
>2 weeks <1 month	7	12.3
>1 month	1	1.8
Total	57	100

Table 4. Social life status of yellow fever patient managed at CCDCR, FMC Asaba.

Variables	Present	Percentage (%)	Absent	Percentage (%)
Alcohol consumption	18	31.6	4	7
Smoking	8	14	5	8.8
Sedentary lifestyle	2	3.5	7	12.3

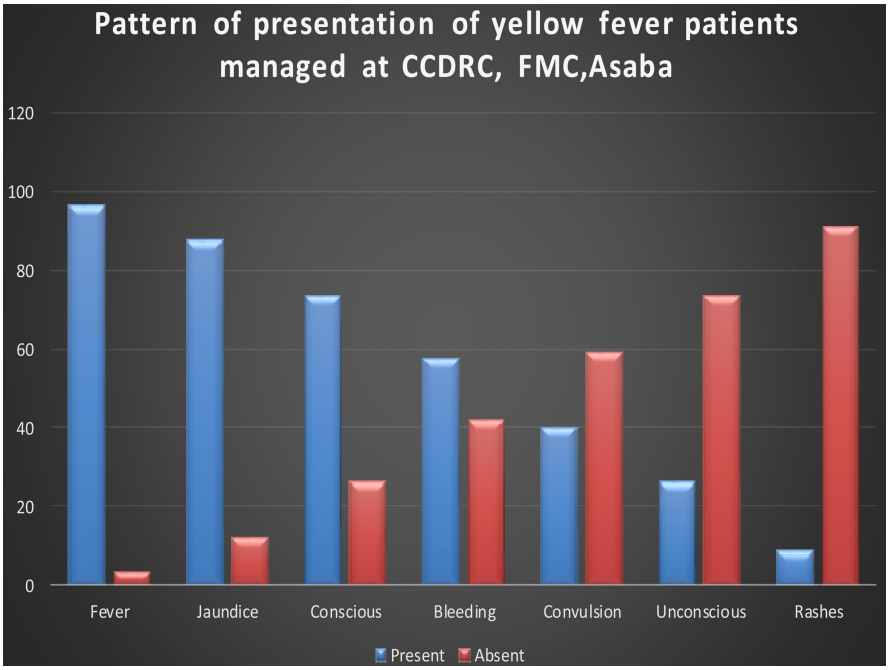

Figure 2. Pattern of presentation of yellow fever patients managed at CCDRC, FMC, Asaba.

Table 5. Bleeding sites outcome of yellow fever patients managed at CCDCR, FMC Asaba.

Variables	Frequency n = 57	Percentage (%)
Nose	2	3.5
Eyes	6	10.5
All orifice	14	24.6
Mouth	15	26.3
None	20	35.1
Total	57	100

Table 6. Rashes sites outcome of yellow fever patients managed at CCDCR, FMC Asaba.

Variables	Frequency n = 57	Percentage (%)
Face	1	1.8
Trunk	4	7
All over the body	2	3.5
None	50	87.7
Total	57	100

Table 7. Association between Yellow fever and gender (Chi-square of a single variable*Gender).

	YF patients	P value/chi-sq
MALE	48 (84.2%)	$X^2 = 26.6$
FEMALE	9 (15.78%)	P = 0.00
TOTAL	57	

had rashes and 52 (91.2%) did not. Based on other presentations, 7 (12.3%) presented with vomiting, 14 (24.6%) presented with diarrhea, 16 (28.1%) presented with abdominal pains and 20 (35.1%) had other presentations.

Table 5 shows that 2 (3.5%) were bleeding from the nose, 6 (10.5%) were bleeding from the eyes, 14 (24.6%) were bleeding from all orifices, 15 (26.3%) were bleeding from the mouth, 20 (35.1%) were not bleeding.

Table 6 illustrates that 1 (1.8%) had rashes on the face, 4 (7%) had rashes on the trunk, 2 (3.5%) had rashes all over the body, 50 (87.7%) had no rash.

There is a significant association between Yellow fever and gender, X^2=26.6, p value= 0.00, Table 7.

10. Discussion

This study on the socio-demographic determinant of Yellow fever of patients managed in CCDRC showed that most of them (49.1%) were between ages 20 - 39 followed by ages less than 20 (38.6%); this could be that men in that age range are strong and engages in such activities as farming, hunting, and fishing in areas where they could be infected. Men were more (84.2%) than women

(15.8%), buttressing the fact that men are more exposed to YF because they are more engaged in agricultural activities, which agrees with the study in Uganda and Angola. The majority of confirmed cases were in males aged 15 - 19; in the same vein a chi-square test of a single variable to test the hypothesis showed that gender was statistically relevant with x^2 26.6 and p value 0.00, showing that an association exists between gender and YF transmission probably due to above-mentioned reasons. On educational status, the majority of the patients (36.8%) had secondary education, but then 21.1% had no formal education. Most of the individuals affected were single 40 (70.2%), and the numbers of married affected were 13 (22.8%). The majority of the affected individuals were Igbo 36 (63.2%), and ika 19 (33.3%) were of the minority. Almost all the patients were from Delta state 56 (98.2%), mainly from rural areas 51 (89.5%) in which most of them reside in Nsukwa 19 (33.3%) and agbor (45.6%). The major occupation of residents in this area is farming and hunting where young people below the age of 40 years go to the forest and jungle area. Where they encounter the vector (mosquitoes Aedes) constituting the jungle cycle of transmission (24), where there may be transmission from monkeys and small mammals by mosquitoes Aedes Africans.

However, the findings of the research also revealed that the length of hospital stay of the patients was less than one week to greater than one month whereby the majority of the patients 38 (66.7%) stayed in the hospital less than a week. This is directly related to the severity of the presentation. The case fatality rate for hospitalized patients was approximately 40% (5) which is high. This agrees with our study that a majority of 37 (64.9%) and 18 (31.6%) were managed and recovered. The clinical findings revealed that most of the patients 42 (73.7%) presented as conscious, with 55 (96.5%) presenting with fever, followed by jaundice 50 (87.7%) then bleeding 33 (53.9%) mostly from all orifices followed by convulsion 23 (40.4%) then rashes 5 (8.8%). This study agrees with the study done in Brazil by Surly Hiromi, which shows that 234 (94.4%) presented with fever and 150 (69.1%) presented with jaundice. However, the limitation of this study is the fact that the sample size of patients managed with YF is small, however, one case of Yellow fever is reportable and requires immediate action from public health leadership and authority.

11. Recommendation

This study recommends broad sensitization of the general public most especially, the affected areas on the cause, mode of transmission, sign, and symptoms, and prevention of yellow fever. Educating the public will raise the sense of awareness which will lead to early presentation to the health care facilities. In addition, routine vaccination campaigns should be elaborated by the health care workers such that a greater proportion of the affected community can be immunized. Lastly, genome sequencing research should be carried out on affected persons to know if there is a cellular reason for males being more affected than

women.

12. Conclusions

Socio-demographic factors play a great role in the prevention and control of yellow fever outbreaks. Population or areas of an outbreak should be given high priority in health promotion and sensitization, so therefore, people in the rural community, especially in the agricultural industry like farmers, hunters, fishermen, and palm wine tappers should be targeted for those promotion/as they are at high risk of transmission; also vaccination must be given high priority and in case of vaccine unavailability, research has shown that as little as 0.5 mls can prevent from YF. Personal protective garments should be given to those who work in the forest and jungle. In other to minimize the outbreak, there is a need for wider coverage of immunization and sensitization of the public on the route of transmission, signs, and symptoms of the disease condition. These will help to curb the spread, reduce the severity and minimize the outbreak of the disease condition.

In addition, the breading site of the vector (aedes aegypti), usually the forest where hunting and farming take play, needs to be destroyed or fumigated. Environmental sanitation will go a long way to reduce community spread.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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