Socio-economic and Environmental Risk Factors of Allergic Conjunctivitis in Lokoja, Kogi State, Nigeria

*[1]IBOR, UW; [2]BASSEY, TI; [3]SEUN, A

[1]Department of Geography, Federal University Lokoja, Nigeria
[2]Department of Environmental Health, College of Health Technology, Calabar, Nigeria
[3]Department of Geography, Federal University Lokoja, Kogi State, Nigeria
*Corresponding Author Email: Uguru.ibor@fulokoja.edu.ng

ABSTRACT: The study examined the socioeconomic and environmental risk factors of Allergic Conjunctivitis in Lokoja, Kogi State, Nigeria by collecting primary and secondary data of allergic conjunctivitis from the Specialist Hospital from 2011-2015 and through the use of questionnaire. A total of 1742 cases of allergic conjunctivitis were reported within the period under review. The number of cases declined to 403 in 2012 and later to 207 in 2015. Females (948) in the age of 0-10 years (409) were more infected. Dry season was the main time of the year for the increased transmission of allergic conjunctivitis. Multiple Regression Analysis showed that 15.5% of the prevalence of conjunctivitis was explained by income, education, occupation and residential quality. However, occupation was the main predisposing factor (0.346, p<0.05). Dusty weather was the major environmental risk factor (60%). Redness of the eyes and itching were identified as the main symptoms of allergic conjunctivitis across the three residential zones. The study concludes that susceptibility to Allergic Conjunctivitis varies across residential zone in different seasons of the year. Therefore, adequate public health practices and health education is required in the study area.

Human behaviour affects the incidence of Allergic conjunctivitis whose transmission is associated with overcrowding and dust pollution. Allergic Conjunctivitis is one of the most prevalent diseases in the tropics. It is frequently referred to as "pink eye" and is the most common acute eye disorder (Brazil, *et al*., 2015) seen among the poor and slum dwellers. It is estimated that 20 percent of the population is affected with conjunctivitis globally and approximately one-half of these people are infected as a result of exposure (World Health Organization, 2006). However, allergic conjunctivitis is more prevalent in warm climatic condition and among Afro Caribbeans, Arabs, Asians, Africa and less among the white populations. In Lokoja, Allergic Conjuctivitis occurs in particular seasons, giving rise to seasonal form, and in some cases throughout the year as in perennial conjunctivitis. It is commonly referred to as Apollo. Allergic conjunctivitis occurs very seasonally and tends to affect the people as a result of the hot, dry and dusty climate of the area. There is the likelihood of increased transmission during the harmattan season due to the emergence of dust in the atmosphere. Indoor activities such as playing with pets such as cat, dog, teddy bears, domestic works such as sweeping and dusting, including use of perfume, cosmetic (make up), contact lens, preparation of food such as sieving yam flour, sieving of cassava flour put women at even greater risk (McMinn *et al*., 1991). Chiang *et al*., (2012) conducted a population study on chronic and acute conjunctivitis associated with the ambient environment in urban and rural areas and reported that increment of the daily average temperature increased the risk of acute conjunctivitis and chronic conjunctivitis. Residents in rural counties, females, the elderly, and children have higher risk of conjunctivitis. In 2008, Tong et al wrote that patients with allergic rhinitis often present with various symptoms of conjunctivitis including sneezing, watery rhino rhea and nasal congestion; itchy, red, watery eyes, and Jeffrey *et al*., (2014) feared that patients who are not treated appropriately are at risk for permanent visual complications. The human factor is also important as humans act as a disease reservoir and helps to expand the range of the disease. Broadly speaking, all populations are susceptible to conjunctivitis, but Jeffrey *et al*., (2014) noted that many patients with allergic eye disease are young, and they may not be able to provide a full clinical history. The disease is highly contagious and is associated with close contact between patients, a situation common in kindergartens and children (Garibaldi, *et al*., 1981). The major

known risk factors are a history of asthma or multiple allergies, smoking, contact lenses and environmental pollution. However, the factors predisposing people to conjunctivitis in Nigeria have received scanty attention in the literature. This study therefore seeks to investigate factors of vulnerability to conjunctivitis in lokoja, Nigeria. This study is critical given the delay in reporting the disease by infected individuals. This is because many infected persons prefer home therapy to visiting a hospital. Consequently, it is likely that not all cases of conjunctivitis are reported, and severe infections may constitute a serious public health problem. However, relatively few studies have been documented to show the prevalence of conjunctivitis in Nigeria (Okesola; Salako, 2010). Epidemiological studies on allergic conjunctivitis have been carried out in Europe (Garibaldi, Brodine and Matsumiya, 1981) and the United States of America (Brennen and Muder, 1990), but relatively few studies have yet been conducted to show the spatial dimension of Allergic Conjunctivitis in Nigeria and elsewhere. The objective of this study is to examine variations in the prevalence of allergic conjunctivitis in relation to the associated socioeconomic and environmental risk factors in Lokoja, Nigeria.

MATERIALS AND METHODS

Study Area: The study was conducted in Lokoja, the capital city of Kogi State, Nigeria. Lokoja lies between latitude 7 degree 45 minutes North and longitude 6 degree 45 minutes east. The climate of Lokoja is classified as tropical climate. The region has its minimum rainfall of 1190mm and maximum rainfall of 1500mm annually, the humidity is about 60 percent and the climate factors include: wind, pressure, humidity which are optimum and does not cause any dampness, hurricane and high amount of air release in the atmosphere. Lokoja is drained by Niger and Benue rivers (Ukoje and Ibor, 2018). The city has an area of about 3,180 km square and has a population of 195,261 in 2006 census (NPC 2006). The population of Lokoja is made up of number tribes such as Bunu, Kakanda, Nupe, Awari, Ibira, Yoruba, Igbo, Bssange, and Igala, according to CMO (1849 – 1999). Settlement pattern in Lokoja are dominated by linear-compact type where built up environments are heavily concentrated along the major roads that transverse the city. Some of the linear and clustered areas include Kabawa, Adankolo, Lokongoma, Zangodaji, and Sirkin numa. The main economic activities of Lokoja people are mainly farming, fishing, trading, while some are civil servants. So many people migrate into the state capital from various neighboring village in search of employment opportunities, educational services, business, trading activities. This however, also contributes to unplanned settlement and environmental pollution in the area.

Methodology: The survey research design was adopted to collect data on both conjunctivitis prevalence and questionnaire data for the study. Conjunctivitis prevalence data included annual demographic case registry of conjunctivitis for a period of five years (2011-2015). The case registry data was collected from the record unit of Specialist Hospital Lokoja, Kogi State. However, the questionnaire data included socio-economic characteristics of respondents as well as the environmental and behavioural risk factors of conjunctivitis in the study area. However, for easy administration of the questionnaire, the area was divided into three residential zones after which, the data collected was statistically analyzed. The residential area was divided into low, medium and high density residential areas. This categorization is necessary in order to attribute the incidence of allergic conjunctivitis to the type of dwelling arrangement and residential quality. The sampling frame comprised households in three residential zones: the high zone, medium and low residential zone. From each of the zones, 60, 40 and 20 households were sampled respectively, bringing the total sampled population to 120 households. Heads of Households were then selected in a systematic way along road transact for questionnaire administration. The systematic sampling technique was adopted in the administration of questionnaire. The sampling interval was 4 and starting from the first household along each road transects, one in every 4th household was sampled.

Both descriptive and inferential statistics were used in analyzing the collected data. The descriptive methods used included frequencies, simple percentages, mean and bar graph. In the analyses, attempt was made to find out if the prevalence of conjunctivitis was influenced by income, education, occupation and residential quality. The difference between male and female affected with conjunctivitis as well as the seasonal variation in the prevalence of allergic conjunctivitis were also analyzed using inferential statistics. Independent Samples Test was used to compare the difference between male and female affected with conjunctivitis in the study area. Also, Multiple Regression Analysis (MRA) was used to find out if age, income, education, household size and occupation significantly influence the incidence of conjunctivitis. One-Way Analysis of Variance Test (ANOVA) was used to test if there is significant variation in the prevalence of conjunctivitis among residential zones.

RESULTS AND DISCUSSION

Demographic and socio-economic characteristics: To a large extent, respondents' demographic and socioeconomic characteristics have influence on their level of knowledge of diseases, access to facilities and health seeking behaviour. It also determines people's lifestyle which may or may not expose them to various health challenges (WHO, 2006). Information on the demographic and socioeconomic characteristics of respondents is shown in Table 1. The sex distribution showed that males dominated the survey as they constituted 61 respondents representing 50.8%, while female constituted 59 respondents representing 49.2%. Similar result was reported by Okesola and Salako (2010) with male dominance of 59.2%. A look at the respective communities revealed that females dominated the survey in New Layout, Lokongoma Phase 1, and GRA, while in Gadumo and Kabawa males were dominant. On the age of respondents (Table 1 and Figure 1), the study indicated that in the sampled communities, respondents within the ages of 21 – 30yrs dominated the survey, followed closely by those within the ages of 31 – 40yrs, while those between the ages of 11 – 20yrs had the lowest representation.
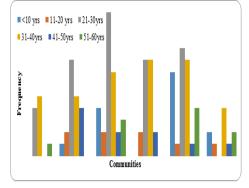

Fig 1: Age distribution of respondents across the selected communities

It could therefore be deduced that majority (65%) of the people surveyed were within the ages of 21 – 40yrs; implying that young adults constituted the survey. In addition, the educational status revealed that the respondents had different qualifications with a good number of the respondents precisely 80.8 per cent with primary and post-primary education (Figure 2). It showed that across the 6 communities, those with primary education had the highest proportion, followed by those with secondary education and then tertiary education, while individuals with additional qualification such as masters had the lowest

proportion. The implication of this result is the literacy level of respondents in the studied communities is high and this is expected to have some influence on the people's level of knowledge of allergic conjunctivitis (AC). Information on occupation showed that the occupational pattern was dominated by people whose occupations was not included in the options provided such as bankers, engineers, fishers, drivers and teachers.
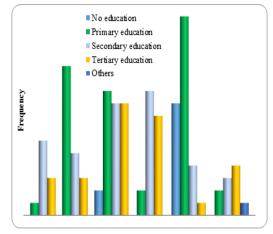

Fig 2: Educational distribution of respondents across the selected communities

These individuals constituted 45.8% of the entire percentage followed closely by students with 25%, while those involved in farming were the least with 3.3%. From the result it implies that people in the study area are involved in different occupations as a source of livelihood (Figure 2). The monthly income of respondents showed a varied pattern. It showed that across the selected communities, very few respondents earned N40, 000 and above monthly. A good number of the respondents (31.7%) earned nothing monthly (unemployed), while 28.3 and 18.3% earned between <N10, 000 and N10, 000 – N20, 000 monthly. The differences in income may be attributed to the variation in the nature of occupation engaged by the people in the communities. In summary, the study shows that across the communities, people earn <N10, 000 and above with a good number earning no income. In addition, information on the household size of respondents revealed that across the communities, 48.3% of households had 1 – 3 persons, followed closely with households with 4 – 6 persons (47.5%). This pattern simply means that majority (95.8%) of the households in the area has 1 to 6 persons. The result indicated that households with 7 – 10 persons were found in Kabawa and GRA only; those with 1 – 3 and 4 – 6 persons were found in all the communities.

Table 1: Distribution of respondents by demographic and socio-economic characteristics

Communities	Communities											
	New layout		Gadumo		Adankolo		Lokongoma Phase 1		Kabawa		GRA	
	F	%	F	%	F	%	F	%	F	%	F	%
Sex												
Male	4	40.0	13	65.0	15	50.0	9	45.0	17	56.7	3	30.0
Female	6	60.0	7	35.0	15	50.0	11	55.0	13	43.3	7	70.0
Age												
<10 yrs	-	-	1	5.0	4	13.3	-	-	7	23.3	2	20.0
11-20 yrs	-	-	2	10.0	2	6.7	2	10.0	1	3.3	1	10.0
21-30yrs	4	40.0	8	40.0	12	40.0	8	40.0	9	30.0	-	-
31-40yrs	5	50.0	5	25.0	7	23.3	8	40.0	8	26.7	4	40.0
41-50yrs	-	-	4	20.0	2	6.7	2	10.0	1	3.3	1	10.0
51-60yrs	1	10.0	-	-	3	10.0	-	-	4	13.3	2	20.0
>60yrs	-	-	-	-	-	-	-	-	-	-	-	-
Occupation												
Farming	-	-	1	5.0	1	3.3	-	-	2	6.7	-	-
Civil service	3	30.0	2	10.0	4	13.3	3	15.0	-	-	-	-
Student	1	10.0	3	15.0	10	33.3	4	20.0	8	26.7	-	-
Trading/business	1	10.0	-	-	5	16.7	3	15.0	8	26.7	4	40.0
Applicant	-	-	-	-	-	-	-	-	-	-	2	20.0
Others	5	50.0	14	70.0	10	33.3	10	50.0	12	40.0	4	40.0
Education												
No formal education	-	-	-	-	2	6.7	-	-	9	30.0	-	-
Pry education	1	10.0	12	60.0	10	33.3	2	10.0	16	53.3	2	20.0
Sec education	6	60.0	5	25.0	9	30.0	10	50.0	4	13.3	3	30.0
Tertiary education	3	30.0	3	15.0	9	30.0	8	40.0	1	3.3	4	40.0
Others	-	-	-	-	-	-	-	-	-	-	1	10.0
Income												
<N10,000	1	10.0	7	35.0	7	23.3	5	25.0	13	43.3	1	10.0
N10,000 – N20,000	1	10.0	3	15.0	7	23.3	5	25.0	6	20.0	-	-
N21,000 – N30,000	5	50.0	3	15.0	3	10.0	2	10.0	2	6.7	2	20.0
N40,000 and above	2	20.0	2	10.0	3	10.0	2	10.0	-	-	-	-
Others	1	10.0	5	25.0	10	33.3	6	30.0	9	30.0	7	70.0
Household size												
None	-	-	-	-	-	-	-	-	-	-	-	-
1 – 3	4	40.0	4	20.0	16	53.3	15	75.0	12	40.0	1	10.0
4 – 6	6	60.0	16	80.0	13	43.3	5	25.0	15	50.0	7	70.0
7 – 10	-	-	-	-	1	3.3	-	-	3	10.0	2	20.0
Others	-	-	-	-	-	-	-	-	-	-	-	-

Source: researcher's fieldwork, 2017

*Residential history***:** Figure 3 provides information on the dwelling arrangements found in the residential areas. An assessment of the pattern of dwelling arrangement showed that non-clustered dwelling arrangement dominated the area with 52.8% of the dwellings non-clustered, while 47.5% of the dwellings were clustered in arrangement. This means that a good number of dwellings in the study are well arranged and not clustered. Looking at the respective residential types, in the high residential areas, clustered dwelling arrangement was paramount with Kabawa having high number of clustered houses, while in Adankolo, both dwelling housing arrangements were found with non-clustered being a little more than the clustered. This pattern of dwelling arrangement is common in other residential types. For instance, in the low residential areas, clustered and non-clustered housing arrangements were common, with clustered housing type outweighing the non-clustered. Also, in the medium residential area, both dwelling arrangements were seen with the non-clustered housing being the highest. Looking at the pattern of housing arrangement, it can be deduced that the medium residential area has a well arranged housing structured or pattern. In all, the residential areas in the study locations are made up of clustered and non-clustered housing structure or arrangement. Residential areas with non-clustered arrangement are believed to be more hygienic and environmentally safer than areas with clustered arrangement.
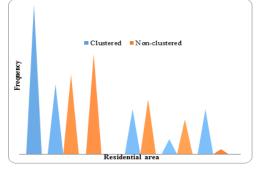

Fig 3: Housing arrangements among residential areas

IBOR, U. W; BASSEY, T. I; SEUN, A

The spread of disease in non-clustered housing structure is likely to be low compared to the clustered where the transmission rate could be high as a result of close contact.

The quality of residential houses is one of the numerous factors responsible for the outbreak of diseases. Houses built with good housing materials are less likely to attract diseases compared to those with bad housing materials. The quality of residential houses found in the three residential areas is shown in Table 3. It revealed that a good number (78.3%) of housings in the studied area was bungalow, while 7.5% of the houses were made of zinc-mud and duplex respectively. The housing quality among the residential types showed a varied pattern. In the high residential area, bungalow was most common,

followed by zinc-mud and duplex. In Kabawa, bungalow and zinc-mud houses were common, while in Adankolo, different housing quality existed with bungalow being the most common, followed by duplex. In the medium residential housing, zinc-mud and duplex were not found; the area had more of bungalows. Whereas, in the low residential housing, apart from zinc-mud that were not common, bungalow and duplex were very common. In the entire housing types, bungalow is the obvious seen or observed type of housing built by the people. The type of housing in these areas can be attributed to peoples' source of income. Since, the high number of bungalow and zinc-mud with less of duplex can be ascribed to the income of the people in the area where a good number of the respondents are low –medium income earners.

Table 3: residential types and residential quality

Residential types	Residential quality							
	Zinc-mud		Bungalow		Duplex		Others	
	F	%	F	%	F	%	F	%
High								
Kabawa	8	26.7	22	73.3	-	-	-	-
Adankolo	1	3.3	25	83.3	2	6.7	2	6.7
Medium								
Lokongoma Phase 1	-	-	20	100.0	-	-	-	-
Gadumo	-	-	20	100.0	-	-	-	-
Low								
GRA	-	-	-	-	7	70.0	3	30.0
New layout	-	-	7	70.0	-	-	3	30.0

Source: researcher's fieldwork, 2017

Predisposing risk factors of allergic conjunctivitis: Information on the history of infection, age and causes of infection of allergic conjunctivitis shows that 73.3% representing 88 respondents affirmed to be infected by allergic conjunctivitis in the past, while only 26.7% representing 32 respondents had not had allergic conjunctivitis infection. Across the selected communities and residential types, a good number of the respondents held the opinion that they were infected in the past. However, among those that affirmed to have the infection, majority of them had the infection when they were young, with very few infected above the age of 20yrs. The result showed that allergic conjunctivitis infection was most pronounced with the ages of 11 – 20yrs, followed by the age interval of <10yrs. Invariably, the result obtained implied that <10yr to 20yrs were most vulnerable to allergic conjunctivitis (Figure 4). This result corroborates the findings of Trottier *et al*., (1991) who reported severe infections among school-aged children. This perhaps calls for preventive measures for this age group who happens to be highly susceptible to the infection. Among the causes of allergic conjunctivitis infection, contact with infected persons (peers, classmate and people) and dust were

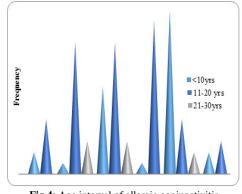identified as the most predisposing risk factors of the disease.

Fig 4: Age interval of allergic conjunctivitis

This is apparent as the disease is seemingly contagious and it is most possible to develop in a dusty environment resulting in the itching of the eyes. Persistent itching of the eyelids makes it easier for allergic conjunctivitis to manifest. On the frequency of allergic conjunctivitis, the result showed that people infected experienced it once and some more than once; with once being the highest number of allergic

conjunctivitis infection followed by twice, while very few people were infected thrice. Nevertheless, between the two common causes of allergic conjunctivitis, the result of this study identified contact with infected persons as the most mode of transmission. In all the residential areas, contact with infected persons was the main risk factor. The result also indicates that a good number of the respondents have had allergic conjunctivitis when they were <10yrs to 20yrs and that contact with infected persons is the direct cause of infection. It also revealed that a good number of people who were infected only experienced it once in their life time and others twice.

Environmental risk factors of allergic conjunctivitis: The environmental risk factors of allergic conjunctivitis are shown in Figure 5. Among the climatic risk factors, the result identified dusty weather usually experienced during the dry season mostly in the northern part of Nigeria as the main climatic risk factor of allergic conjunctivitis. As partly explained above, this factor enables dust to find its way into the eyes causing unease and subsequent itching. Depending on the intensity of itching, the eyes become reddish which may create way for the occurrence of allergic conjunctivitis. Other likely climatic risk factors included smoky and dry weather. In all the communities, dusty weather condition was recognized as the principal climatic risk factor of allergic conjunctivitis. Information on the environmental risk factors of allergic conjunctivitis recognized cooking with fuelwood/charcoal, working at quarry site and living/working in crowded area as prominent risk factors of allergic conjunctivitis (Figure 5).
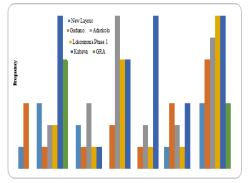

Fig 5: Environmental risk factors of allergic conjunctivitis

Cooking with fuelwood/charcoal for instance makes the immediate environment smoky and this reacts negatively with the eyes resulting in sudden tears. Continuous exposure makes the eyes reddish and swollen with the likelihood of being infected by allergic conjunctivitis. This finding corresponds with

the known epidemiology of Allergic Conjunctivitis as reported by Wilhelmus (2005). Similar circumstance is surrounded with working at quarry site as a result of the large quantities of dust particles released into the atmosphere. Workers in such area as well as people living within such environment are exposed to allergic conjunctivitis infection. More so, living/working in crowded areas makes the spread of allergic conjunctivitis easier because it is contagious. Swimming in unsafe (dirty) water also predisposes water users to allergic conjunctivitis. This indeed is common among children and adolescents who are usually attracted to surface water bodies within or around their domain. Season of infection of allergic conjunctivitis identified the dry season as the main time of the year for the increased incidence of allergic conjunctivitis. This perhaps is expected considering the weather condition during this time. This result corroborates the findings of King et al., (1988) who noted that during this period or time of the year, the atmosphere is dry and windy resulting in the movement of dusty particles from the Sahara Desert. This affects the eyes and makes it susceptible to allergic conjunctivitis infection if preventive measures are not taken.

Symptoms and consequences of allergic conjunctivitis: The respondents cited several symptoms of allergic conjunctivitis infection. From the result redness of the eyes and itching are recognized as the main symptoms of allergic conjunctivitis. As mentioned earlier, these symptoms are associated with dusty and smoky environment which favour the development of allergic conjunctivitis. These two identified symptoms of allergic conjunctivitis were upheld by a significant proportion of respondents across the 6 communities. Indeed, an apparent sight of persons suffering or infected with allergic conjunctivitis is redness of the eyes. This remains a well-known physical symptom of allergic conjunctivitis. On the consequences of allergic conjunctivitis, the result based on the responses of respondents in the 6 communities identified acute eye disorder, eyelash matting and loss of work hour as well as tearing as the principal consequences of allergic conjunctivitis. Loss of work hour is the economic consequence of allergic conjunctivitis because if it occurs, the people infected cannot work with the condition. Vision as a result of eyelash matting in such a situation becomes completely blurred which could increase occupational hazards. Workers become unproductive and uncreative.

Duration, prevention and treatment of allergic conjunctivitis: The result in Table 7 indicated that allergic conjunctivitis usually lasted for a week with very few cases lasting more than a week. This means

that when proper care and attention is given to allergic conjunctivitis, its infection would not last beyond a week. On the ways of prevention of allergic conjunctivitis, the study recognised the avoidance of pollutants such as smoke and dust particles etc, contact isolation and use of sun shade as main ways of preventing allergic conjunctivitis. The use of sun shade is imperative to reduce eyes distress as well as passing it to other people. It reduces the possibility of transmission. On treatment, the result showed that three categories of treatments are available to people

infected by allergic conjunctivitis. It is either patients visit pharmacy stores to buy medicine, visit the hospital for proper treatment or make use of traditional medicine involving roots and liquid squeezed from plant leaves and other parts. However, among the treatments available, getting medicine from the store and visiting the hospital are the widely used treatments across the communities. Only people in New Layout, Gadumo and Adankolo do get medicine from the store, visit the hospital and use traditional medicine in the treatment of allergic conjunctivitis.

Table 7: Duration, prevention and treatment of allergic conjunctivitis

Variables	Communities											
	New layout		Gadumo		Adankolo		Lokongoma Phase 1		Kabawa		GRA	
	F	%	F	%	F	%	F	%	F	%	F	%
Duration of infection												
One week	10	100.0	20	100.0	27	90.0	20	100.0	26	86.6	10	100.0
More than a week	-	-	-	-	3	10.0	-	-	4	13.3	-	-
Prevention												
Use of personal protective measure	-	-	2	10.0	11	36.7	4	20.0	4	13.3	-	-
Avoid exposure to pollutants	6	60.0	10	50.0	9	30	9	45.0	4	13.3	5	50.0
Use of sun shade	1	10.0	4	20.0	6	20.0	1	5.0	3	10.0	-	-
Contact isolation	2	20.0	3	15.0	4	13.3	6	30.0	12	40.0	4	40.0
Careful hand washing	1	10.0	1	5.0	23	76.7	-	-	7	23.3	1	10.0
Treatment												
Buy drugs from a medicine store	5	50.0	13	65.0	15	50.0	11	55.0	20	66.6	5	50.0
Visit a hospital	2	20.0	2	10.0	8	26.7	9	45.0	10	33.3	5	50.0
Use traditional medicine	3	30.0	5	25.0	7	23.3	-	-	-	-	-	-

Source: researcher's fieldwork, 2017

Temporal Prevalence of allergic conjunctivitis by sex and age from 2011-2015: Table 8 gives information on the temporal and demographic prevalence of conjunctivitis from 2011 to 2015. The table shows that a total of 1742 cases were reported. In 2011, 475 cases were recorded. The numbers of reported cases of conjunctivitis declined to 403 in 2012 and later drop to 366 cases in 2013. A total of 291 and 207 cases of allergic conjunctivitis were recorded in 2014 and 2015 respectively. The analysis shows that there is a steady decline in the prevalence of reported cases of allergic conjunctivitis in the area. There are variations in the sex prevalence of the disease. The table further depicts that out of the 794 male populations affected within the period under consideration, 222 reported the disease in 2011. In 2012, a total of 187 males were infected and 162 cases were recorded in 2013. Only 128 and 95 men were infected in 2014 and 2015 respectively. Concerning female prevalence, a total of 948 cases were reported. In 2011, there were 253 cases of allergic conjunctivitis in females, 216 cases in 2012; 204 and 163 cases were reported in females in 2013 and 2014 respectively, while only 163 cases of allergic conjunctivitis in females were reported in 2015. As regards the age prevalence of the disease, there were 409 cases in the 0-10 years old. Out of these, 182 were

males and 227 were females. In the 11-20 years old, 181 cases were recorded. However, 181 and 214 cases were reported by males and females respectively. Also, 429 cases of allergic conjunctivitis were recorded in the 21-30 years old; 201 cases were recorded in males and 228 in females. Similarly, the 31-40 age old prevalence shows 108 and 128 male and female infections respectively. In the 41-50 age old, there were 198 cases; of these, 86 and 112 cases were reported in male and females respectively. Only 86 cases were reported in age 50 and above. However, 38 cases were recorded in males and 48 cases in females. The demographic prevalence of the disease shows that females less than 10 years are more infected and this calls for concern. The hypothesis that ''there is no statistical difference between male and female affected with conjunctivitis'' was formulated for the study. This hypothesis was tested using Independent Samples Test.

The result obtained is shown in Table 9. The t-test result showed that the probability value of 0.076 is greater than 5% (0.05) significance level which therefore implied that there is no statistical difference between male and female affected with conjunctivitis ($t = 0.1.77$, $p>0.05$). This is obvious as both male and

female are infected by allergic conjunctivitis. It further means that both sexes can be susceptible to allergic conjunctivitis if they predispose themselves to the risk factors associated with the disease.

Also, One-Way Analysis of Variance Test (ANOVA) was used to test if there is significant variation in the prevalence of conjunctivitis among residential zones. The result obtained is shown in Table 10 and it showed that the probability value (p-Value) of 0.980 is greater than 5% (0.05) significance level. This means that there is no seasonal variation in the prevalence of conjunctivitis among residential zones (F = 0.020, p>0.05). This result implies that the prevalence of allergic conjunctivitis does not vary by season among the three residential zones, as it can take place at any season across the residential areas. It also means that it seasonal occurrence in the high residential area does not vary significantly from others.

The hypothesis that ''Prevalence of conjunctivitis is influenced by income, education, occupation and residential quality'' was tested using multiple regression analysis. Multiple regression analysis was used to find out the effect of a set of independent variables (income, education, occupation and residential quality) on a single dependent variable (prevalence of conjunctivitis). However, before this was carried out, items used for descriptive analysis was transformed or recoded to make them suitable for parametric statistics. Results obtained are summarized Table 11.

The result indicates that 15.5% of the prevalence of conjunctivitis was explained by income, education, occupation and residential quality. The ANOVA result further revealed that income, education, occupation and residential quality have significant influence on the prevalence of conjunctivitis (F = 5.147, p<0.05).

The signs of the regression coefficients indicated that monthly income, education and residential quality were negatively related to prevalence of conjunctivitis, while occupation was positively related to prevalence of conjunctivitis. The negative sign implies decrease in prevalence of conjunctivitis with the increase in income, education, and residential quality, while the positive sign suggests increase in prevalence of conjunctivitis. However, considering the standardized regression coefficients of the predictors, occupation received the strongest weight in the model followed by education, income and residential quality.

Table: 8 Statistical Analysis of patients with conjunctivitis from 2011 – 2015 in Lokoja

	Ages 0-10		Ages 11-20		Ages 21-30		Ages 31-40		Ages 41-50		Age >50				
Years	M	F	M	F	M	F	M	F	M	F	M	F	Total	Total Male	Total Female
2011	58	66	47	52	53	59	31	35	22	27	11	14	475	222	253
2012	47	59	39	44	46	51	28	32	19	21	8	9	403	187	216
2013	32	41	36	46	47	55	21	25	17	25	9	12	366	162	204
2014	28	33	31	41	33	38	15	22	15	21	6	8	291	128	163
2015	17	19	28	31	22	25	11	14	13	18	4	5	207	95	112
Total	182	227	181	241	201	228	108	128	86	112	38	48			

Table 9: Independent samples test of the gender difference between male and female affected with conjunctivitis

Gender	N	Mean	SD	t-cal	Sig (2-tailed)
Male	61	1.20	0.401	1.77*	0.079
Female	59	1.34	0.477		

*Difference between means is insignificant at 5% alpha level; df =118; Source: researcher's fieldwork, 2017

Table 10: ANOVA result of the seasonal variation in the prevalence of conjunctivitis among residential zones

Source of variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.014	2	0.007	0.020*	0.980
Within Groups	30.368	86	0.353		
Total	30.382	88			

*Insignificant at 5% alpha level; Source: researcher's fieldwork, 2017

The t-value results indicated that among the four predictors considered in this model, monthly income and occupation exerted significant effect on the prevalence of conjunctivitis.

From the analysis, it could be adjudged that monthly income and occupation were the foremost factors of the prevalence of conjunctivitis. This is apparent as these factors individually have significant effect on the prevalence of conjunctivitis.

Table 11: Summary of regression result

Predictor variables	Coefficients		
	B	**B**	**t-value**
Education	-0.089	-0.060	0.635
Residential quality	- 0.064	-0.051	0.536
Monthly income	-0.065	-0.245	2.737*
Occupation	0.315	0.346	3.880*
Test results			
F- value	5.147*		
R	0.394		
R^2	0.155		
Constant	1.189		7.788*

*Significant at 0.05 significance level; Source: researcher's fieldwork, 2017

*Conclusion***:** The study has established the fact that socioeconomic factors are more important in the incidence of Allergic Conjunctivitis than environmental factors. This finding serves to highlight the role of population-environment interaction in disease prevalence. The study discovered that though environmental factors like dust, smoke and harmattan season may favour the occurrence of disease, prevalence is significantly and largely influenced by the socioeconomic environment. Therefore, improvement in the socioeconomic conditions of people and health education is required. Also, people should avoid crowded residential places and uninfected population should prevent themselves from infection.

REFERENCES

Brazil, R D; Pinto, P I; Rodrigo, L; Alves, B (2015). The Prevalence of Adenoviral Conjunctivitis at the Clinical Hospital of the State University of Campinas. Clinics 70(11):748-750

Brennen, C; Muder R. R (1990). Conjunctivitis Associated With Methicillin Resistant Staphylococcus Aureus in a Long-Term-Care Facility. American Journal of Medicine 88: 14–17

Garibaldi, RA; Brodine, S; Matsumiya, S (1981). Infections among patients in nursing homes. N Engl J Med 305: 731–735

Ukoje, JE; Ibor, U W (2017). Temporal variations in network coverage and mobile telephone usage in Lokoja, Kogi State. International Journal of Social Sciences vol. 11, No. 2: pp.55-67

Jeffrey, C F; Pong, F R; Jimmy S. M (2014). Allergic Conjunctivitis: Presentation, Diagnosis, and Management. *HKJ Ophthalmology* 12 (1) 111-117

King, S; Devi, S P; Mindorff, C; Patrick, M L; Gold, R; Ford-Jones, E L (1988). Nosocomial Pseudomonas Aeruginosa Conjunctivitis in a Pediatric Hospital. Infection Control Hospital Epidemiology 9: 77–80

McMinn, P C; Stewart, J; Burrell, C J (1991). A Community Outbreak of Epidemic Kerato- Conjunctivitis in Central Australia due to Adenovirus Type 8. *Journal of Infectious Diseases* 164: 1113– 1118

Okesola, A O; Salako, A O (2010) Microbiological Profile of Bacterial Conjunctivitis in Ibadan, Nigeria. *Annals of Ibadan Postgraduate Medicine*, 8 (1): 20 – 24

Richardson, M; Elliman, D; Maguire, H; Simpson, J; Nicoll A (2001). Evidence Base of Incubation Periods, Periods of Infectiousness and Exclusion Policies for the Control of Communicable Diseases in Schools and Preschools. Pediatric Infectious Diseases Journal 20: 380– 391

Tong, Q; Yizhen, H and Zhinan, W (2008). Pediatric Allergic Conjunctivitis and Allergic Rhinitis: Journal of Nanjing Medical University (3):183-187

Trottier, S; Stenberg, K.; Rosen, I. A; Svanborg C (1991). Haemophilus Influenzae Causing Conjunctivitis in Daycare Children. Pediatric Infectious Diseases Journal 10: 578–584

Wilhelmus, K. R (2005). Epidemiology of Ocular infections. In: Tasman M and Jaeger EA (eds) Duane's clinical ophthalmology, vol. 2. Town: Lippincott, Williams & Wilkins, 1–64

World Health Organization (2006) Demographic and Socioeconomic Statistics. Available at: http://www.who.int/whosis/whostat/EN_WHS09_Table9.pdf