



## Diabetic retinopathy and associated risk factors among the diabetic population in Anambra state

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### Abstract

This study was designed to study the prevalence of diabetic retinopathy and other associated risk factors among the diabetic population in Anambra state. Ex- post facto research design was adopted for the study. The objective of the study was to determine the prevalence of diabetic retinopathy with other associated risk factors among the diabetic population in Anambra state. Five research questions were purposively developed for the study and five research hypotheses were postulated for the study. The data for the study was collected from the folders of 5,358 diabetic patients among whom 2,515 diagnosed with diabetic retinopathy from the selected hospital were used for the study. Research questions postulated were answered using simple percentages, and tables. Hypotheses stated were tested using the chi-square statistics at 0.05 level of significance. The result showed that there was prevalence of diabetic retinopathy at a calculated value of 11.7 percent. The highest value among the age bracket of 62.79 years was 17.6 percent in 2009, 14.7 percent in 2010, 17.6 percent in 2011, 17.6 percent in 2012, 18.3 percent in 2013, 15.9 percent with the lowest of 13.9 percent in 2014. Among the male and female diabetics, 66.6 percent of the women showed a prevalence while their male counterpart showed a prevalence of 41.08 percent. Based on the findings the following recommendations were made. Government to equip the health facilities meaningfully by putting adequate referral mechanism in place, carry out intensive client counseling on strict compliance of patients so as to address early intervention in clients' diseases by health care providers.

**Keywords:** retinopathy, diabetic, population

### Introduction

Diabetes mellitus is a metabolic disorder in which a person has high blood sugar as a result of poor secretion of insulin by the islet of Langerhans or poor absorption of insulin by the cells and being resistant to allow for glucose transport across the cell membrane. This type of poor insulin metabolism is classified as type 1 or type 2 diabetes mellitus. The accumulation of sugar in the blood causes problems in different organs in the body and also the retina of the eye leading to diabetic retinopathy. (International Diabetic Federation 2012) The high sugar level exudates blocks the blood vessels in the retina of the eye leading to diabetic retinopathy. However, there are grades of the retinopathy and classified as non-proliferative diabetic retinopathy, the proliferative retinopathy and the severe proliferative retinopathy. These grades of retinopathy can cause severe irreversible damage to the eye leading to blindness. The prevalence of diabetes and late presentation of diabetics at the clinic have caused a rise in diabetic retinopathy among the diabetics including poor health care access among others.

Nigeria has about 3.85 million diabetics as cited by the Federal Ministry of Health (FMOH) (2006) [2]. Approximately 3.4 percent of the population is estimated to be blind as a result of diabetic retinopathy and as a result of this effect of diabetes on the citizenry, the health care cost burden expenditure is expected to be high. The IDF (2012) highlighted that future projections about the development of diabetic retinopathy are significant and will be of public health importance since the population may live longer with diabetes and as such

can develop diabetic retinopathy if there is no proper intervention to stop disease progression to retinopathy.

Diabetes is the fourth most leading cause of death in most developed countries as cited by (IDF 2010) as each year over 3 million people with diabetes worldwide die and their death is attributed to diabetic-related complications. More so, it is reaching an epidemic proportion as 194 million people around the world have diabetes. The prevalence of diabetic retinopathy will rise due to an increase in life expectancy of the populace, obesity, hypertension, hyperlipidemia, and other associated risk factors which can cause disease progression to retinopathy. These risk factors have significant contributions towards retinopathy development. The African continent alone counts approximately 13.6 million diabetics. (IDF 2008) and they mainly include Sub-Saharan Africa which has about 7 million diabetics. Estimates for the region are likely to double and reach 15 million because of this increase in the number of people affected with the disease, the prevalence of diabetic retinopathy will rise where there is no proper awareness created to manage disease and stop progression of diabetes to diabetic retinopathy, although the actual percentage of cases of blindness is not known as the prevalence is high and causes a public health concern. However, diabetic retinopathy is a recognized complication of diabetes that occurs as a result of long-term accumulated damage to the small blood vessels in the retina and occurs in those of age bracket of 20-79 years as seen more in developing countries and the emerging cause of blindness in developing countries including Nigeria. More so, diabetic retinopathy can be classified as mild, moderate and severe

proliferative diabetic retinopathy. All these classes of retinopathy can cause vision loss and irreversible damage to the eye leading to blindness. Severe proliferative type of retinopathy of retinopathy can appear in mild and moderate non-proliferative stages and can be symptomless. Leaking retina is the major characteristics of this impairment which is as result of new blood vessels which are weak to maintain adequate blood supply to the retina as they are fragile. The blood clots in the eye as sequel of the leakage causing vision loss and if it progresses lead to irreversible damage which is blindness. Control of the disease progression by proper intervention reduces the disease progress and subsequently reduces the development of diabetic retinopathy.

Prevalence of a disease refers to the number of candidates affected by disease at a particular point in time over a specified period. It is a statistical concept used to measure the prevalence of a disease in a given population especially chronic diseases. Diabetic mellitus as a chronic condition is the fourth most leading cause of diabetic complication like diabetic retinopathy in countries like china, America United kingdom. The disease have also risen in African countries like Tanzania, Cameroon among others including Nigeria which have about 3.85 million people according to (IDF2006). The disease have affected both the adolescents and adults mainly due to life style changes and urbanization. The adolescent type occurs between the age of 13-30yrs. This invariably leads to incidence of diabetic retinopathy. The age, gender, health literacy/education, obesity, hypertension, glucose control and hyperlipidamia are other associated risk factors which influences disease progression to retinopathy.

The development of diabetic retinopathy seen in obesity and hyperlipidaemia leads to excess of fat deposit in the retina of the eye while hypertension have risen parallel to the development of diabetes mellitus with ocular changes affecting the retina of the eye thus diabetic retinopathy become evident. According to IDF after 20 years, more than 75 percent of patients will have some degree of retinopathy. Diabetic retinopathy is a well recognized complication of diabetes mellitus that occurs as a result of long term accumulated damage to the small vessels in the retina and it is one of the leading causes in age 20- 79 years and more in developing countries including Nigeria Diabetic retinopathy can be classified into mild proliferative diabetic retinopathy, moderate proliferative and severe proliferative diabetic retinopathy. All these classes of retinoopathy cause vision loss and irreversible damage to the eye leading to blindness. Diabetic retinopathy is the leading cause of blindness in adults between the ages of 20- 79 years in industrialised contries (Rotimi 2013) and the disease has accounted for 12 percent of new cases of blindness in USA and 11.9 percent of all blind registration on those aged 16- 79 years in the United Kingdom. Over thirty years ago, diabetic retinopathy was reported to be rare in Nigerians according to (Abiose 1978) but more recent studies have shown that the occurrence of diabetic retinopathy in Nigeria is on the increase and that accounts for 16.7 percent of all retinal disease (Nwosu, 2009) The prevalence of diabetes type2 has also increased worldwide (Lim 2014) According to Park(2011) data showed that during the last few years, the prevalence of diabetes has doubled in the USA and multiplied by three to five persons in India, Indonesia, China, Korea and Thailand. Consequently diabetic retinopathy a major ocular complication of diabetes is the

leading cause of visual impairment and blindness in the Asia Pacific region. According to Kim (2011) diabetic retinopathy contribution to vision impairment in clients with diabetes is of great interest because micro vascular complications seen in diabetics are directly related to the increase in blood sugar at the time of clinical diagnosis According to IDF (2010) “ Everyone who develops diabetes is at risk over the subsequent five to twenty years of developing diabetic retinopathy”. Across the world changes in diet and inactive lifestyle contributed to the increasing number of people who develop diabetic retinopathy. IDF further highlighted that half of the people who have diabetes are undiagnosed that is they do not know they have diabetes. This poses a public health threat to the diabetic population in Anambra State especially where there is already limited access to health care. Vision loss from diabetic retinopathy will invariably put a huge strain on already stretched and under resourced health care system.

Majority of diabetics seen at clinic presentation in Anambra State are not aware of the disease process and can always attribute the appearance of diabetic retinopathy to other conditions. Obi (2015) in his advocacy visit to health ministry in Awka highlighted that considering the national census survey 2005-2008, that 42 persons out of every 1000 persons seen at clinic presentation in the area of study came from the rural areas and presents with vision impairment as a result of diabetes. Therefore, the study population in this study will comprise of diabetics with type2 diabetes mellitus, The population of diabetics with diabetic retinopathy seen in urban hospitals is quite significant in the area of study. Various diabetic self care management programmes have been initiated in the area of study but no data have been documented in the area of study to determine the prevalence of diabetic retinopathy and other associated risk factors which can lead to the development of diabetic retinopathy. This study is therefore designed to determine the prevalence of diabetic retinopathy and other risk factors leading to the development in Anambra State from 2009-2014.

### **Purpose of the Study**

The major purpose of this study was to determine the prevalence of diabetic retinopathy and associated risk factors among the diabetic population in Anambra state from 2009-2014.

Specifically the study

1. Was to determined the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra State
2. Was to determine the prevalence of diabetic retinopathy and Associated Risk factors among the Diabetic population in Anambra state from 2009-2014 based on age.
3. Was to determine the prevalence diabetic retinopathy and Associated Risk factors among the Diabetic population in Anambra state from 2009-2014 based on gender.
4. Was to determine the prevalence of diabetic retinopathy and Associated Risk factors among the Diabetic population based on level of education.
5. Was to determine the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014 based on

some specific health conditions like (hypertension, hyperlipidaemia, obesity and glucose control).

**Research Questions**

The following research questions guided the study;

- 1 What was the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014?
- 2 What was the prevalence of diabetic retinopathy and Associated Risk factors among diabetic population in Anambra state from 2009-2014 with reference to age.?
- 3 What was the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra from 2009-2014 with reference to gender.?
- 4 What was prevalence of diabetic retinopathy of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014 with reference level of education.?
- 5 What was the influence of other health conditions (hypertension, hyperlipidaemia, obesity, glucose control) of the patients on the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014.?

**Research Hypotheses**

Five (5) null hypothesis were formulated to guide the study and was tested at 0.05 level of significance

1. There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk factors among diabetic population in Anambra state from 2009-2014.
2. There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014 with reference to age.
3. There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014 with reference to gender.
4. There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra state from 2009-2014 with reference to level of education.
5. There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk factors among the diabetic population in Anambra with reference to specific health conditions such as (hypertension, hyperlipidaemia, obesity, glucose control)

**Method**

An Ex-post-facto research design was adopted for the study. The study area of this research is Anambra state. Population of this study comprised of all the case files or folders of all the diabetic patients aged 15-79 years who have attended diabetic clinic in the selected hospitals in the urban centers from 2009-2014 and diagnosed as having diabetic retinopathy. The source of data collection for this study was

the diabetic retinopathy patients case files. The data collected was analysed using descriptive and inferential statistics. Frequencies and percentages based on yearly prevalence was used to answer the research questions, while chi-square was used to test the hypothesis at 0.05 level of significance. Tables and figures were constructed using the Microsoft office word software. Analysis of the result was by using statistical package for social science version 16(SPSS).

**Results and Discussion**

The findings of the study are presented in the tables that follow according to the research questions and hypothesis which guided the study.

**Research Question 1:** What was the prevalence of diabetic retinopathy and associated risk factors among the diabetic population in Anambra state.

**Hypothesis 1:** There was no significant difference in the prevalence of DR and associated risk factors among diabetic population in Anambra state’.

The data on table 1 were used to answer research question 1 and hypothesis 1.

**Table 1:** Prevalence of Diabetic Retinopathy and associated risk factors among the diabetic population in Anambra State

2009		2010		2011		2012		2013		2014		Total	%
f	%	f	%	f	%	f	%	f	%	f	%		
350	13.0	460	18.3	465	18.5	420	16.7	350	15.9	470	18.7	2515	100

Table 1 shows

Note:  $X^2 = 10, df 5, t \text{ value } 11.07, p < 0.05$

Table 1 presents the prevalence of DR and associated risk factors among diabetic population in Anambra state. The table shows that in 2014 there was prevalence of 18.7 percent of the patients with DR. this was followed by 18.5 percent, 18.3 percent, 16.7 percent, 15.9 percent, 13.0 percent in 2010, 2011, 2012, 2013, 2009 respectively. When the data was analysed with  $\chi^2$  statistics as in Appendix C, it gave a calculated value of  $\chi^2 = 10$  df 5 t value of 11.07,  $p < 0.05$  level of significance. The hypothesis was accepted.

**Research Question 2:** What was the prevalence of diabetic retinopathy and Associated Risk Factors among the diabetic population in Anambra state with reference to age?

**Hypothesis 2** There was no significant difference in the prevalence of diabetic retinopathy and Associated Risk Factors among the diabetic population in Anambra state with reference to age

The data on table 2 was used to answer research question 2 and hypothesis 2.

**Table 2:** Prevalence of Diabetic Retinopathy and associated risk factors among the Diabetic population Anambra State with reference to Age

	2009		2010		2011		2012		2013		2014		Total %	
	f	%	f	%	f	%	f	%	f	%	f	%		
15-30yrs	60	13	55	14.9	55	12.4	58	11.9	42	10.4	45	12.04	315	12.6
31-45yrs	120	26.0	80	20.2	120	26.9	170	14.3	60	14.9	60	17.9	510	20.3

46-61yrs	120	26.0	100	27.0	150	33.7	180	36.8	170	42.2	130	37.1	850	33.9
62-79yrs	160	34.7	140	37.8	120	26.9	180	36.8	130	32.3	110	31.8	840	33.4
<b>total</b>	<b>460</b>	<b>18.3</b>	<b>370</b>	<b>14.7</b>	<b>445</b>	<b>17.6</b>	<b>488</b>	<b>19.6</b>	<b>402</b>	<b>15.9</b>	<b>350</b>	<b>13.9</b>	<b>2515</b>	<b>100</b>

Notex2= 175.6, df 15,t value 25.08, p,<0.05.

Table 2 presents DR and associated risk factors with reference to the age of the patients from 2009-2014. The table shows that in 2012 there was prevalence Of 19.6 percent of the patients with DR. This was followed by 18.3 percent, 17.6 percent and 15.9 percent in 2009,2011 and 2013 respectively. The least prevalence was 13.9 percent in 2014. In 2012 patient within the ages of 46-61 years and 62-79 years has the highest prevalence of 36.8 percent. For the ages put together patients within the ages 41-61 and 62-79 years had the highest prevalence of 33.9 percent respectively. The total prevalence for the years in their descending order of magnitude include 19.6 percent,18.3 percent, 17.6 percent, 15.9 percent 14.7 percent and 13.9 percent respectively 2012,2009,2011,2013,2010,2014.

When the data was analysed x2 statistics as in Appendix D, it gave a calculated of 175.6 df;+15 and t value of 25.00. This was significant at 0.05 level of significance. The hypothesis was rejected.

**Research Question 3:** What was the prevalence of diabetic retinopathy among the diabetic population. in Anambra state from 2009-2014 with reference to gender?

**Hypothesis 3:** There was no significant difference in the prevalence of diabetic retinopathy and associated risk factors among diabetic population in Anambra state with reference to gender.

The data on table 3 were used to answer research question 3 and hypothesis 3.

**Table 3:** Prevalence of Diabetic Retinopathy and associated risk factors among the diabetic population in Anambra state from 2009-2014 with reference to Gender

	2009		2010		2011		2012		2013		2014		Total	Num
	f	%	f	%	F	%	f	%	f	%	f	%		
Male	85	41.8	190	40.4	150	34.0	200	43.1	190	39.7	155	36.9	965	38.3
Female	118	59.5	280	59.5	290	65.9	264	56.8	188	66	264	63	1550	61.7
<b>total</b>	<b>203</b>	<b>12</b>	<b>470</b>	<b>22.1</b>	<b>440</b>	<b>19.4</b>	<b>464</b>	<b>18.4</b>	<b>478</b>	<b>17.3</b>	<b>419</b>	<b>16.5</b>	<b>2515</b>	<b>100</b>

Note:X2=15.93 df5, t value. 11.07.p<0.05

Table 3 presents the prevalence of DR among diabetic population with reference to the male and female DR patients from 2009-2014

The lowest prevalence of 34 percent was seen in the male population in 2011 while a higher prevalence of 43.1 percent was seen among them in 2012. The lowest prevalence seen among the male and female population was 56 percent and 34 percent respectively.

The total prevalence for the years in their descending order of magnitude include 22.1 percent, 18.4 percent,17.3 percent, 16.6 percent and 12 percent respectively for the years 2010, 2011, 2012, 2013, 2014 and 2009.

The total prevalence from 2009-2014 put together was 61.7 percent for the female and 38.3 percent for the male.

When the data was analysed with X2 statistics, asin Appendix E it gave a calculated value of 15.93, df 5, t value 11.07 This was significant at 0.05 level of significance. The hypothesis was rejected.

**Research Question 4:** What was the prevalence of diabetic retinopathy and associated risk factors among the diabetic population in Anambra state from 2009-2014 with reference to level of education?

**Hypothesis 4:** There was no significant difference in the prevalence of diabetic retjnopathy associated risk factors among the diabetic population in Anambra state with reference to level of education.

The data on table 4 were used to answer research question 4 and hypothesis 4.

**Table 4:** Prevalence of Diabetic Retinopathy and associated risk factor among the diabetic population in Anambra state from 2009-2014 with reference to Level of Education

	2009		2010		2011		2012		2013		2014		Total	Num
	F	%	F	%	F	%	f	%	f	%	f	%		
Primary education	180	45	160	48.7	180	48.3	208	46.4	152	353	267	49.	1147	
Secondary education	160	40	120	36.6	120	32.2	180	40.1	200	4.6.	190	35.3	970	38.
Tertiary education	60	15	48	14.7	72	19.3	60	13.3	78	18.	80	14.	398	15.8
<b>total</b>	<b>400</b>	<b>15.9</b>	<b>328</b>	<b>13.0</b>	<b>372</b>	<b>14.9</b>	<b>448</b>	<b>17.9</b>	<b>430</b>	<b>17.</b>	<b>537</b>	<b>21.</b>	<b>2515</b>	<b>100</b>

Note:X2=102.23 df 10, t value 18.31 p<0.05

Table 4, present the prevalence of DR among diabetic population in Anambra State with reference to level of education from 2009-2014.

The table shows that in 2014 for patients with primary education, there was the highest prevalence of 49 percent. This was followed by 48.7 percent, 48.3 percent, 46.4

percent, 45 percent, and 35 percent in 2010,2011,2012,2009 and 2013 respectively. Among those with secondary education, the highest prevalence was 46.5 percent in 2013. This was followed by 40.1 percent, 40 percent, 36.6 percent, 35.3 percent, and 32.2 percent in 2012, 2009,2010,2009,2014, and 2011 respectively. The

prevalence among this group put together was 38.6 percent. Among those with tertiary education, the highest prevalence was 19.3 percent in 2011, followed by 18.1 percent, 15 percent, 14.8 percent, 14.7 percent, and 13.3 percent in 2009, 2013, 2010 and 2012 respectively. The total prevalence for the year in their descending order of magnitude are 17.9 percent, 17.05 percent, 15.9 percent, 14.9 percent, 13.05 percent respectively in 2014, 2012, 2013, 2009, 2011, 2010. When the data was analysed with X<sup>2</sup> statistics it gave a calculated X<sup>2</sup> of 102.23, df 10 t value of 18.31 p<0.05. as in Appendix F. The hypothesis was therefore rejected.

**Table 5:** Prevalence of Diabetic Retinopathy and associated risk among the diabetic population in Anambra state from 2009-2014 with reference to some specific health conditions

	2009		2010		2011		2012		2013		2014		Total %	
	f	%	f	%	f	%	f	%	f	%	f	%		
hypertension	80	24.2	170	45.9	150	48.4	200	40.9	180	45.5	285	76	1065	44
hyperlipidaemia	-		-		-		80	19.8	60	4.6	60	16	200	6.9
obesity	-		-		-		70	9.8	60	8.8	4	8	175	4.9
Glucose control	250	79.80	200	54	160	51.6	140	31.8	125	31.6	200	47.05	1075	42.9
Total	330	13.1	370	14.7	310	12.3	490	17.4	425	15.7	590	23.5	2515	100

Note: X<sup>2</sup> = 182.05 df 15 t value 25.08 p<0.05

Table 5, shows the prevalence of DR among diabetic population with reference to their specific health conditions from 2009-2014. The table shows that in 2014 there was prevalence of 76 percent of the patient with DR in the hypertensive group this was followed by 48.4 percent, 45.9 percent, 40.9 percent, 2 percent in 2011, 2013, 2010, 2012 and 2009 respectively.

The entire prevalence in this specific health condition (hypertension) put together was 44.3 percent. Among those patients with DR and those who had hyperlipidaemia, the highest prevalence was 19.8 percent in 2012 followed by 16 and 4.6. percent respectively.

Total number of DR patients with hyperlipidaemia put together showed the prevalence of 6.9 percent. Obese patients with DR showed the highest prevalence in 2012 as 9.8 percent was seen in 2013 and 8 percent in 2014 respectively. Put together the total number of DR patients with obesity was 4.9 percent, prevalence was 75.8 percent as seen in 2009. 54 percent, 51.6 percent, 47.05 percent, 31.8 percent was seen in 2010, 2011, 2014, 2012, and 2013 respectively for patients with glucose control. The total DR patients with glucose control put together was 42.9 percent. The total prevalence for the year in their descending order of magnitude includes 23.5 percent, 17.4 percent, 15.7 percent, 14.7 percent, 13.1 percent, and 12.3 percent respectively in 2014, 2012, 2013, 2010, 2009, 2011.

When the data was analysed with x<sup>2</sup> statistics as in Appendix F, it gave a calculated value of x<sup>2</sup> 102.23 df 10 t value 18.31 p<0.05 level of significance. The hypothesis was rejected.

### Conclusion

Findings of this study revealed the prevalence of diabetic retinopathy and other associated risk factors. Diabetic retinopathy has become prevalent because of the world wide incidence of diabetes and poor disease progress awareness especially in developing countries like Nigeria. Various literature were cited in developed countries regarding the prevalence

**Research Question 5:** What was the prevalence of diabetic retinopathy and associated risk factors among the diabetic population with reference to some specific health conditions of the patients?

**Hypothesis 5:** There was no significant difference in the prevalence of diabetic retinopathy and associated risk factors among the diabetic population in Anambra state with reference to some specific health condition.

The data in table 5 were used to answer research question 5 and hypothesis 5

Other associated risk factors studied were age, gender, level of education, hypertension, obesity and overweight, and glucose control among the diabetic population in Anambra state and all the results indicated a prevalence except hyperlipidaemia and obesity as a result of paucity of data which showed no significant difference.

Government at various times initiated diabetic self-care programmes in the area of study but that notwithstanding, Anambra state is experiencing a prevalence of the disease especially in urban hospitals. With this it is very necessary and important to create more awareness about disease progression to diabetic retinopathy through public enlightenment programmes in remote hospitals in the state for prompt referral of the diabetics, and to supply the necessary equipments for diagnosis, the policy makers to develop a working schedule to attend to the need of this programme, more so to reduce the cost of management encountered by diabetic patients.

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