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The Prevalence of Type 2 Diabetes in the 27 Local Government Areas (LGAs) of Imo State

Nwaokoro Joakin Chidozie[1, *], Onwuliri Viola Adaku[2], Onyeocha Ignatius[3], Onwuliri Daniel Chinemerem[4], Nnodim Johnkennedy[5], Ede Okorie Alison[6]

[1]Department of Public Health, Federal University of Technology, Owerri, Nigeria

[2]Department of Biochemistry, Federal University of Technology, Owerri, Nigeria

[3]Department of Biotechnology Federal University of Technology, Owerri, Nigeria

[4]Department of Community Medicine, University of Nigeria Teaching Hospital Ituku Ozalla Enugu, Enugu, Nigeria

[5]Department of Medical Laboratory Science, Imo State University, Owerri Nigeria

[6]Department of Environmental Health, Nnamdi Azikiwe University, Awka Anambra State, Nigeria

Email address:

nwaokorojc@hotmail.com (N. J. Chidozie)

*Corresponding author

Abstract: Diabetes is a homeostasis imbalance in which insulin is deficient. It poses a great public problem and economic cost. This study investigated prevalence of type 2 diabetes in Imo State, Southeastern Nigeria. Sample size consisted 3690 persons from across the state. Research instrument for data collection were questionnaires and test kits for blood sugar, blood pressure and body mass index determination (physical examination). Out of 2700 persons that responded to the question on whether they know about type 2 diabetes, 68% of them representing 1761±8.3 said "Yes", while 32% representing 830±8.2 said "No"; a chi-square contingency analysis on the respondents' knowledge of type 2 diabetes yielded a value of 83.26 (p<0.001). On whether they know if they are living with type 2 diabetes, 830 out of 2700 respondents which represent 11% of the responses said "Yes", while 2340 which accounted for 89% of the responses said "No". This puts the prevalence rate at 11%, but blood sugar screening results puts the prevalence rate at 21.1%. On the distribution of type 2 diabetes, 843±17.2 out 2700 respondents representing 34% said urban dwellers are more prone to type 2 diabetes than rural dwellers, 806±19.0 and 841±18.9 representing 32% and 35% said "No" and "No idea", respectively; with a chi-square value of 831.44 and p-value of <0.001, there was very high significant difference on whether there is more type 2 diabetes on urban than rural On gender, 547±7.2 out 2700 respondents accounting for 21% of the responses said type 2 diabetes is more in men than women, while 656±10.4 respondents out 2700 noted that type 2 diabetes is more in women than men, 1334±10.3 out 2700 said they do not have any idea. This study revealed 11.0% prevalence rate of type 2 diabetes in Imo State. Type 2 diabetes is fast ravaging the health of the people of Imo state with many persons living with the diseases and yet are unaware of it.

Keywords: Prevalence, Type 2 Diabetes, 27 Local Government Areas, Imo State

1. Introduction

Diabetes mellitus is a significant and growing global health problem [1]. It is a global pandemic posing a serious threat to global health, and it is a chronic, debilitating, and costly disease associated with major complications [2].

Diabetes reduces the quality of life. It can generate multi-system morbidities and premature death, which consequently leads to increased healthcare cost [3]. Currently, in many countries, people with diabetes have a significantly decreased life expectancy [4].

Similarly, diabetes has become a global health and development crisis. The human and financial costs of

diabetes threaten to overwhelm health systems and adversely affect national economic progress. This makes the situation very grave coupled with the social stigma that is associated with the disease [5].

Some 382 million people worldwide, or 8.3% of adults, are estimated to have diabetes in which type 2 diabetes accounts for about 90%. About 80% live in low- and middle-income countries. If these trends continue, some 592 million people, or one adult in 10, will have diabetes by 2035. This equates to approximately three new cases every 10 seconds or almost 10 million per year [6]. Furthermore, type 2 diabetes imposes heavy financial burden on afflicted families in its management [7]. It is important to note that, diabetes of which type 2 accounts for about 90% of all cases caused 5.1 million death in 2013.

However, there is paucity of information on the prevalence of type 2 diabetes in Imo State, Nigeria, where unpublished medical reports indicate a high prevalence. This occurs against a background of rapidly changing socio-cultural, economic and biological indices including aging population, reduced physical activities, overall lack of information on healthy lifestyle and wellness behavior and changing dietary patterns [8].

The lack of reliable statistical data makes itifficult to create a detailed prevalence picture of this debilitating disease in Nigeria. It is believed that the results of this study will help put into place appropriate interventions for type 2 diabetes management and overall prevention in Imo State, Nigeria.

2. Materials and Methods

2.1. Study Area

The study area is Imo State. Imo State is one of the 36 States of Nigeria, it is located in the Southeast geopolitical zone. Imo State lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E with an area of around 5,100 sq km.

2.2. Study Design

Descriptive and analytical study designs were used in this study. This included epidemiological. Descriptive design was used to investigate the distribution of type 2 diabetes, while analytical design was used to analyse the determinants of the disease distribution in senatorial zones of Imo State, namely; Imo North (Okigwe Zone), Imo Central (Owerri Zone) and Imo West (Orlu Zone).

2.3. Survey Methods and Sampling Technique

Random, target and stratified sampling survey methods were employed in this study. Random sampling was used in collecting data from the LGAs, target was used in collecting data from the hospitals, while stratified will be used for the entire state, in which case each LGA will be used as a stratum.

2.4. Sample Size

Questionnaire 1: 2700 (100 from each LGA) respondents for the general populace.

Questionnaire 2: 540 (20 from each LGA) respondents for the category of patients.

Clinical examination: 450 persons (150 from each senatorial zone).

Therefore, the whole sample size was 3690.

2.5. Method of Data Collection

Research instrument for data collection were questionnaires and materials such as test stripes, lancets, alcohol pads and glucometers.

2.6. Questionnaires

Well structured questionnaires were used to obtain data from respondents.

2.7. Ethical Consideration

Letters of approval/permission to administer questionnaires on respondents were presented to management of health institutions for approval before they were administered to respondents. Also, the consent of those living with type 2 diabetes was sought for before they were presented with questionnaires. Similar consent was sought from the general public before the questionnaires were administered on them.

2.8. Data Presentation and Statistical Analysis

Generated data were put into Tables and Charts. Descriptive Statistics: mean, relative standard error and standard deviation were used to measure the level of skewness among data that were obtained in relation to various parameters using SPSS statistical software version 17.0.

3. Results

The results are presented in tables.

3.1. Distribution of Type 2 Diabetes (1)

The distribution of type 2 diabetes (1) is shown in Table 1 below.

On whether urbanization contributes to type 2 diabetes, 960 (40%) respondents answered positively, 876 (36%) responded negatively while 573 (24%) had no idea. A chi-square test of significance gave a value of 576.19 which is highly significant at p<0.001.

The results showed that 841 (34%) of respondents had no idea if urban dwellers were more prone to type 2 diabetes than rural dwellers, 834 (34%) responded positively while 806 (32%) responded negatively. A chi-square statistical test gave a value of 831.44 which was very highly significant at p<0.001.

The result on if type 2 diabetes is more in men than

women shows that greater number of respondents have no idea. 1334 (53%) had no idea, 656 (26%) responded negatively and 547 (21%) responded positively. A chi-square test of significance yielded a value of 223.56 which was very highly significant at $p<0.001$.

***Table 1.** Distribution of type 2 diabetes (1).*

Local Govt. Area	Do you think urbanization contributes to type 2 diabetes?			Are urban dwellers more prone to type 2 diabetes than rural dwellers?			Is type 2 diabetes more in men or women?		
	Yes	No	No idea	Yes	No	No idea	Yes	No	No idea
Aboh Mbaise	21	23	45	14	17	61	31	14	45
Ahiazu Mbaise	11	14	28	14	15	27	10	24	65
Ehime Mbano	22	60	18	33	46	12	14	42	38
Ezinihitte Mbaise	21	53	18	49	13	18	21	35	40
Ideato North	48	17	21	13	54	21	19	32	49
Ideato South	17	60	22	53	21	19	25	20	54
Ihitte/Uboma	49	19	21	59	13	14	10	40	50
Ikeduru	28	50	16	48	14	24	16	28	40
IsialaMbano	48	25	17	19	60	19	15	22	48
Isu	57	19	17	21	62	13	35	21	44
Mbaitoli	15	40	20	45	30	25	20	24	40
NgorOkpala	58	13	19	59	19	21	21	23	45
Njaba	49	20	14	16	58	19	20	12	65
Nkwerre	21	58	15	60	21	14	12	13	70
Nwangele	54	19	13	14	52	17	20	21	55
Obowo	51	14	19	16	21	61	24	48	31
Oguta	19	62	12	59	20	17	13	21	53
Ohaji/Egbema	50	21	18	15	60	19	14	22	59
Okigwe	48	22	16	21	25	49	23	24	49
Onuimo	49	17	21	18	63	21	21	19	47
Orlu	12	49	25	49	38	12	39	13	41
Orsu	60	21	23	28	12	51	22	17	53
Oru East	58	22	16	29	11	54	22	49	28
Oru West	17	61	13	27	13	60	29	14	50
Owerri Municipal	35	55	12	19	21	54	20	23	52
Owerri North	12	24	45	16	12	67	12	14	65
Owerri West	30	18	49	20	15	52	19	21	58
Total	960 (40%)	876 (36%)	573 (24%)	834 (34%)	806 (32%)	841 (34%)	547 (21%)	656 (26%)	1334 (35%)
Mean	36	32	21	31	20	31	20	24	49
St. D	±17.4	±18.2	±9.9	±17.2	±19.0	±18.9	±7.2	±10.4	±10.3
X^2-value (p-value)	576.19 (p<0.001)*** DF=52			831.44 (p<0.001)*** DF=52			223.56 (p<0.001)*** DF=52		

***=Very highly significant at $p<0.001$

3.2. Distribution of Type 2 Diabetes (2)

The Distribution of type 2 diabetes (2) is presented in Table 2 below.

Three hundred and forty three (13%) of the respondents had no idea if type 2 diabetes is more in the older population than the younger population, 504 (20%) responded negative while 1730 (67%) responded positively. A chi-square test of significance with degree of freedom at 52 gave a value of 118.84 which was very highly significant at $p<0.001$.

The result showed that 921 (38%) respondents had no idea if type 2 diabetes is more among the rich than the poor while 871 (35%) responded positively and 671 (27%) responded negatively. A chi-square statistical test yielded a value of 868.97 which was very highly significant at $p<0.001$.

***Table 2.** Distribution of type 2 diabetes (2).*

Local Govt. Area	Is type 2 diabetes more in older than in young population?			Is type 2 diabetes more among the rich than among the poor?		
	Yes	No	No idea	Yes	No	No idea
Aboh Mbaise	61	11	13	21	14	48
Ahiazu Mbaise	72	15	07	13	25	38
Ehime Mbano	68	20	13	22	46	20
Ezinihitte Mbaise	65	25	10	18	50	35
Ideato North	63	23	14	60	25	10
Ideato South	61	25	14	19	71	7
Ihitte/Uboma	58	19	17	18	70	9
Ikeduru	64	14	16	74	10	22
IsialaMbano	71	13	12	65	21	8
Isu	58	17	11	50	30	18
Mbaitoli	75	5	20	25	15	30

Local Govt. Area	Is type 2 diabetes more in older than in young population?			Is type 2 diabetes more among the rich than among the poor?		
	Yes	No	No idea	Yes	No	No idea
Ngor Okpala	62	19	12	11	25	60
Njaba	69	17	8	21	28	58
Nkwerre	71	19	7	11	17	51
Nwangele	49	32	14	13	21	61
Obowo	52	30	12	17	19	49
Oguta	55	25	26	20	15	48
Ohaji/Egbema	58	21	14	21	1	53
Okigwe	59	12	13	19	7	64
Onuimo	60	20	11	20	10	65
Orlu	85	2	9	39	24	25
Orsu	62	17	16	49	21	19
Oru East	68	19	11	55	25	18
Oru West	67	21	10	56	20	17
Owerri Municipal	70	20	9	63	19	13
Owerri North	72	13	08	23	14	60
Owerri West	55	30	16	48	28	15
Total	1730 (67%)	504 (20%)	343 (13%)	871 (35%)	671 (27%)	921 (38%)
Mean	64	19	13	32	25	34
St. D	±7.8	±6.9	±4.1	±19.7	±16.7	±20.3
X^2-value (p-value)	118.84 (p<0.001)*** DF=52			868.97 (p<0.001)*** DF=52		

***=Very highly significant at p<0.001

3.3. Distribution of Type 2 Diabetes (3)

The distribution of type 2 diabetes (3) is shown in Table 3 below. Out of all the responses, 981 (39%) of the respondents answered no to type 2 diabetes being more in the educated than in the uneducated, 886 (36%) said they had no idea while 631 (25%) answered yes. A chi-square test gave a value of 640.99 which was very highly significant at p<0.001.

Table 3. *Distribution of type 2 diabetes (3).*

Local Govt. Area	Is type 2 diabetes more in the educated than the uneducated?		
	Yes	No	No idea
Aboh Mbaise	53	17	15
Ahiazu Mbaise	25	17	59
Ehime Mbano	14	24	58
Ezinihitte Mbaise	20	60	17
Ideato North	23	51	21
Ideato South	19	49	18
Ihitte/Uboma	22	48	17
Ikeduru	28	28	30
IsialaMbano	7	20	70
Isu	21	9	65
Mbaitoli	45	30	25
NgorOkpala	19	61	14
Njaba	22	55	21
Nkwerre	28	45	14
Nwangele	23	48	16
Obowo	21	42	17
Oguta	20	52	18
Ohaji/Egbema	21	58	15
Okigwe	14	60	16
Onuimo	25	42	28
Orlu	21	38	25
Orsu	20	19	61
Oru East	22	21	55
Oru West	14	20	63
Owerri Municipal	19	15	58
Owerri North	12	23	55
Owerri West	53	29	15
Total	631 (25%)	981 (39%)	886 (36%)
Mean	23	36	33
St. D	10.8	16.5	20.5
X^2-value (p-value)	640.99 (p<0.001)*** DF=52		

***=Very highly significant at p<0.001

3.4. Distribution of Type 2 Diabetes (4)

Table 4 below shows the distribution of type 2 diabetes (4). The results show that type 2 diabetes is most among upper -level white collar (Managers, Directors, and above) with 41% of all responses while middle-level white collar (Administrative office staff, etc) had 31%, Lower white-collar (Messengers, clerical staff, drivers, etc) had 18% and Blue-collar (Labourers or workmen) had the lowest with 10%. A chi-square test yielded a value of 754.48 which was very highly significant at p<0.001.

Table 4. *Distribution of type 2 diabetes (4).*

| Local Govt. Area | Which among the following have type 2 diabetes most? | | | | Area you have lived more in your entire life | |
	Blue-collar (Labourers or workmen)	Lower white-collar (Messengers, clerical staff, drivers, etc)	Middle–level white-collar (Administrative office staff, etc)	Upper-level white-collar (Managers, Directors and above)	Urban area	Rural area
Aboh Mbaise	8	10	32	41	5	15
Ahiazu Mbaise	4	5	53	32	6	14
Ehime Mbano	4	14	35	42	2	10
Ezinihitte Mbaise	12	10	25	49	7	13
Ideato North	18	9	23	46	6	14
Ideato South	10	10	27	50	8	12
Ihitte/Uboma	9	12	49	22	9	11
Ikeduru	8	12	38	40	2	18
IsialaMbano	11	10	28	44	3	17
Isu	7	13	20	53	4	16
Mbaitoli	15	10	10	55	12	8
NgorOkpala	9	11	18	53	5	15
Njaba	8	13	17	49	6	14
Nkwerre	13	10	12	51	7	13
Nwangele	11	8	28	47	9	11
Obowo	12	10	48	22	7	13
Oguta	11	9	47	30	5	15
Ohaji/Egbema	7	12	51	27	6	14
Okigwe	10	13	21	47	13	7
Onuimo	9	10	52	24	10	10
Orlu	10	13	29	38	16	3
Orsu	6	141	51	23	7	13
Oru East	7	48	14	23	9	11
Oru West	4	5	45	39	8	12
Owerri Municipal	6	42	10	38	14	6
Owerri North	15	11	24	43	11	9
Owerri West	14	12	12	39	12	8
Total	249 (10%)	483 (18%)	819 (31%)	1067 (41%)	8	12
Mean	10	18	30	40	±3.57	±3.49
St. D	±3.1	±26.4	±14.6	±10.6	209 (39%)	322 (61%)
X^2-value (p-value)	754.48 (p<0.001)*** DF=78				67.02 (p<0.001)*** DF=26	

***=Very highly significant at p<0.001

4. Discussion

The knowledge of the existence of diabetes mellitus in the world has become commonplace [9]. Because of its polyuric nature, people easily identify it as, 'disease of urine [10]. In the local parlance of the study area, Igbo being the tribal language; diabetes mellitus is generally referred to as, 'oria mamiri' or 'disease of urine' in English language as noted earlier. In the course of this study, almost every person that was interviewed or screened referred to the disease upon which was investigated as 'oria mamiri'. This indicates that the generality of the populace of Imo State were already abreast with the disease [11]. When asked whether they know what type 2 diabetes was, 7 persons in 10 said yes in the entire state, though very many of them did not know the existence of other forms of diabetes mellitus. In contrast their being aware of the disease, 7 persons in 10 did not know their blood sugar level. This shows that many people have not been diagnosed of type 2 diabetes or do not care to know what their blood sugar level is, whether they are living with the disease or not.

Diabetes mellitus is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating fasting plasma glucose level of ≥ 7.0 mmol/l (126 mg/dl) [12]. Among the study population, 11.0% of them admitted to be living with type 2 diabetes. This therefore accords type 2 diabetes 11.0% prevalence rate in the state. Globally, the prevalence rate of type 2 diabetes is 8.3%, while in Africa it is 5.7% being the least on the regional category, with MENA having the highest prevalence rate of 10.9% [13]. Comparing the prevalence rate in Imo State, Nigeria, with what it is in the world, Africa and MENA that of Imo State is higher than all of them, almost double of what it is in the entire continent of Africa and with a small margin lower than what it is in MENA. It is reported that with 8.3 prevalence rate, there is

approximately three new cases every 10 seconds or almost 10 million per year [14]. That means with 11.0% prevalence rate in Imo State, there would be four new cases every 10 seconds. It has been observed that the largest increases will take place in the regions where development economies are predominant [15]. Imo State being in Nigeria, development economies is highly predominant. This makes the situation worse for Imo State.

The prevalence rate of 11.0% in Imo State calls for serious concern as it would definitely rise above this in few years to come; unless some concerted efforts are geared towards nipping it in the bud [16]. In the course of the study, some people had fasting blood sugar up to 362 mg/dl for the first time. They only knew they had fasting blood sugar as high as this (362 mg/dl) for the first time because of free screening that was administered on them [17]. This implied that greater percentage of the populace in Imo State do not know their diabetes status. They only realize they are diabetic when they are rushed to the hospital or when their health situation has become chronic [18].

In the 27 Local Government Areas (LGAs) that were studied, some LGAs had very high cases of type 2 diabetes. For instance, Ngor Okpala LGA had the highest prevalence rate of 23%, this was followed by Ikeduru LGA with 17% prevalence rate. Next to Ikeduru LGA is Aboh Mbaise LGA with 16% prevalence rate. These are the first three highest LGAs. The last three with least prevalence rates include: Ehime Mbano LGA with 4% prevalence rate, Ideato North, Ihitte/Uboma and Nkwerre, respectively, had 7% as the prevalence rate; the third is Ezinihitte Mbaise and Obowo LGAs, respectively, with 8% prevalence rate.

These variations appear to show differences in the prevalence of type 2 diabetes across the 27 LGAs in the state. But statistically, they did not vary [19]. This suggests that within 95% confidence limit, there is uniformity in the prevalence of type 2 diabetes across the 27 LGAs of Imo State.

In this study, the distribution of type 2 diabetes was considered with respect to age, gender, urban/rural area and with respect to occupation. It has been reported that about 382 million people worldwide, or 8.3% of adults, are estimated to have diabetes [19]. About 80% live in low- and middle-income countries. In Africa an estimated number of 19.8 million persons distributed according to age, sex and rural/urban centres are living with diabetes [20]. In Nigeria, about 5.1 million people are living with the disease. The following below is the distribution of type 2 diabetes in Imo State.

Among the age bracket, those in the age group of 51 to 61 years of age had the highest number of persons living with type 2 diabetes with 39% of all those living with diabetes in the State. This was followed by those with the age bracket of 41 to 50 years of age with 32% of all those living with the disease in Imo State. Combining these two age brackets we will have a percentage of 71% for people with the age range of 41 to 61 years [21]. Almost half of all adults with diabetes are between the ages of 40 and 59 years. More than 80% of the 184 million people with diabetes in this age group live in low-

and middle-income countries [22]. This study found 71% occurrence of type 2 diabetes; while IDF found 80% occurrence within similar age group [22]. In a similar vein, the age of the patients at the time the disease was first diagnosed in the patients was found to be highest at the age range of 41 to 50 years of age. The age bracket accounted for 37%, followed by 51 to 60 years of age with 30% at the time of first diagnoses. Again, combining these age brackets (40 to 60 years), we will have 67%. This is not too far from what was obtained in section A (General Population) of this study as was earlier reported above, in which 71% of persons in this same age bracket were living with type 2 diabetes. Section B (Patients) of this study recorded 67% of all those that were studied in the same age bracket (of 41 to 60 years) at the first time of diagnosis [23].

This calls for serious concern as IDF study included all cases of diabetes while this study was limited to type 2 diabetes. In addition, the International Diabetes Federation noted that this age group will continue to comprise the greatest number of people with diabetes in the coming years [24]. By 2035, it is expected that the number will increase to 264 million. Again, more than 86% will be living in low- and middle-income countries.

In this study, there was an increasing occurrence of type 2 diabetes among the various age groups which peaked at 61 years before it began to decline. A regression analysis showed that increasing age, there was corresponding increase in the blood sugar level of the persons that were studied. This implies that age is a critical factor in determining the manifestation of type 2 diabetes in the populace. Also, the number of persons living with diabetes according to the various age groups is unrelated [25]. That is to say that the number vary significantly at p<0.001.

The distribution of type 2 diabetes in this study with respect to gender indicated that more female had type 2 diabetes than their male counterpart. Though, the difference is not much as 46% of the male population had type 2 diabetes against 54% of the female. Statistically, there was no significant difference between the two sexes at 95% confidence limit. The international Diabetes Federation observed that there is little gender difference in the global numbers of people with diabetes for 2013 or 2035. There are about 14 million more men than women with diabetes (198 million men versus 184 million women). However, this difference is expected to increase to 15 million (303 million men versus 288 million women) by 2035. This therefore makes it unequivocally clear that gender does not have impact in the occurrence of type 2 diabetes [26].

This study observed that more persons living with type 2 diabetes live in the rural areas of Imo State, than those living in the urban centres. This does not corroborate the report of International Diabetes Federation in which it was reported that there are more people with diabetes living in urban (246 million) than in rural (136 million) areas although the numbers for rural areas are on the increase. In low- and middle-income countries, the number of people with diabetes in urban areas is 181 million, while 122 million live in rural

areas. By 2035, the difference is expected to widen, with 347 million people living in urban areas and 145 million in rural areas. The differences between those with type 2 diabetes living in the rural area when compared to those living in the urban areas vary significantly at p<0.001. This implies that the percentage or number of those living with diabetes in the urban area and that of rural area are largely unrelated with rural having 61% against 39% for the urban centres.

In the area of occupation, none skilled labourers were found to be living with diabetes more than skilled labourers. This finding is consistent with that of [27] in which they noted that diabetes is more common among blue-collar workers (describes people who do work needing strength or physical skill rather than office work) and lower in white-collar workers of both genders than among middle-level and upper white-collar workers [28]. Male blue-collar workers' risk of developing diabetes is double that of female white-collar workers at intermediate and upper levels. So, in Imo State the number of skilled labourers living with type 2 diabetes are fewer in number when compared to the number of unskilled labourers [29].

5. Conclusion

Types 2 diabetes is fast affecting the health of the people of Imo State with many persons living with the diseases, yet are unaware of it. The distribution of diabetes varied with respect to age, gender, urban/rural area and occupation across the state.

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