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Original Article

Association of demographic and socioeconomic characteristics with body mass index of outpatient diabetic adults attending a tertiary health facility in Enugu, Nigeria

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ABSTRACT

Background/objective: Recently, demographic and socioeconomic characteristics have been emphasized in dealing with chronic diseases of which Type 2 diabetes (T2D) is one. This present study was conducted to correlate the demographic and socioeconomic characteristics of out-patient type 2 diabetic adults with their body mass index (BMI).
Methodology: This cross-sectional study was conducted in the Out-patients Diabetic clinic of University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu Nigeria. A total of 370 subjects were purposively selected from the 2888 annual average attendances and examined with questionnaire and anthropometry. Information on their demographic and socioeconomic characteristics was correlated with their body mass index.
Result: The results indicated that there were more (59%) urban diabetics than rural (25.7%) diabetics, many (65.7%) were within the age range of 41–60years, more (64.9%) females than males (35.1%), mainly (86.2%) married and of Christian religion (94.1%) and Igbo ethnicity (95.9%). The majority (91.1%) were of a monogamous family type with 55.4% from average sized (4-6persons) families. More than 1/3 (34.1%) had tertiary education, mainly (43%) civil servants, and 45.1% earning above 137.21 US Dollar per month. Most (69%) of the diabetics were over-weight, a trend of both under-nutrition (1.1%), and over-nutrition (68.7%) with mean BMI value of 27.19 kg/m^2 was also observed. BMI had slight negative association with age, sex, and occupation and positive association with religion, ethnicity, marital status and level of education.
Conclusion: There is a weak negative association of age, sex and occupation with BMI.

1. Introduction

Type 2 diabetes mellitus (T2DM) is one of the prominent [1], or most common diet related non-communicable diseases (NCDs) globally. As one of the many chronic lifestyle diseases caused by an imbalance in diet, it has serious adverse effect on human health. The recent upsurge in T2DM has necessitated the quest into non-nutrient causal factors. There are suggestions that demographic and socio-economic characteristics like are age, sex, ethnicity, occupation and others may be important predictors of nutrition status of people [2] that had attained sexual maturity - adults. BMI is one of the indices used to assess nutrition and health status of people. As a measure of weight adjusted for height, and calculated as weight in kilograms divided by the square of height in meters (kg/m2); it measures excess weight rather than excess fat, and it is often considered an indicator of body fatness [3]. Evidence suggest that it is correlated to more direct measures of body fat, future health risk, and can predict future morbidity and death as well [3]. Consequently, it is a proper measure for screening for obesity and its health risks of which diabetes is one. For centuries now, most studies on health and nutrition concentrate on the effects of nutrient consumption and food availability, while few studies focus on the relationship between nutritional status and non-nutritional factors, like demographic and socioeconomic characteristics of the subjects. More so, these few studies are usually on healthy adults,

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thus, this study aims to investigate the relationship between the nutritional status (BMI) of out-patient diabetic adults and their demographic/socioeconomic characteristics.

2. Methods and materials

The study adopted a cross-sectional survey design and was conducted in the Out-patients Diabetic Clinic of University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu Nigeria. A purposive sampling method was used to select the 370 subjects from the hospitals annual average (2,888) out-patients diabetic attendances. Consent was obtained from all subjects to participate in the study. Structured interviewer-administered questionnaire was used to obtain information on their demographic and socio-economic characteristics. Their nutritional status was assessed using anthropometry (height, weight and body mass index). Data collected was analyzed and results were presented as frequencies, percentages, means and standard deviation. Simple correlation analysis was used to determine the association of demographic and socioeconomic characteristics with the BMI of the diabetic adults.

3. Results

Table 1 shows the demographic characteristics of the respondents. More than half (59%) of the respondents resided in urban areas; 25.7% and 15.1% resided in rural and semi-urban areas respectively. Age profile of the respondents showed that many (65.7%) were within the age range of 41–60years, 29.5% were above 60years, while only 5.1% were within the age range of 20–40years. There were more female (64.9%) diabetics than males (35.1%) in the study population. An overwhelming majority (86.2%) of the respondents were married, only 2.4% were single. Monogamous family was the common (91.1%) family type in the study area. More than half (55.4%) of the respondents were of average family size (4–6 persons), although an appreciable proportion (35.7%) were of large family size (7–10 persons). Christianity (94.1%) and Igbo (95.9%) were the main religion and ethnicity in the study area.

Table 2 shows the socio-economic characteristics of the respondents. Many (34.1%) of respondents had incomplete tertiary education while as much as 10.8% had no formal education. A good number of the respondents (43%) were in civil service while 10.8% had no occupation. More than one–third (45.1%) of the respondents earned above 137.21 US Dollar per month while 11.1% earned < 27.44 US Dollar per month.

Table 1
Basic characteristic of the respondents.

Variables	Frequency (%) n = 370	Variables	Frequency (%) n = 370
Location		**Family type**	
Urban	219 (59.2)	Monogamous	337 (91.1)
Semi-urban	56 (15.1)	Polygamous	33 (8.9)
Rural	95 (25.7)	**Family size**	
Age		1to 3	26 (7.0)
20–40yrs	19 (5.1)	4 to 6	205 (55.4)
41–60yrs	242 (65.4)	7 to 10	132 (35.7)
Above 60yrs	109 (29.5)	≥11	7 (1.9)
Sex		**Religion**	
Male	130 (35.1)	Christian	348 (94.1)
Female	240 (64.9)	Muslim	4 (1.1)
Marital status		Traditionalist	5 (1.4)
Single	9 (2.4)	Nonbeliever	13 (3.5)
Married	319 (86.2)	**Ethnicity**	
Widowed	35 (9.5)	Igbo	355 (95.9)
Divorced/separated	7 (1.9)	Niger-delta	10 (2.7)
		Others	5 (1.4)

Table 2
Socio-economic characteristic of the respondents.

Variables	Frequency (%) n = 370	Variables	Frequency (%) n = 370
Educational level		**Occupation (contd)**	
No education	40 (10.8)	Civil service	159 (43)
Informal education	8 (2.2)	Business	69 (18.6)
Pre-primary education	4 (1.1)	Retired	29 (7.8)
Primary not completed	8 (2.2)	None	40 (10.8)
Primary completed	82 (22.2)	**Monthly income (USD)**	
Secondary not completed	29 (7.8)	<27.44	41 (11.1)
Secondary completed	53 (14.3)	27.44 to 54.88	26 (7.0)
Tertiary not completed	126 (34.1)	<54.88 to 82.33	23 (6.2)
Tertiary completed	20 (5.4)	<82.33 to 109.77	26 (7.0)
Occupation		<109.77 to 137.21	37 (10.0)
Farming	29 (7.8)	>137.21	167 (45.1)
Artisan	5 (1.4)	None	50 (13.5)
Trading	39 (10.5)		

Table 3 shows the respondents' weight classification. Using WHO weight classification, almost half (45.7%) of the respondents were overweight, an appreciable percentage (30.3) were of normal weight, 1.1% were underweight and 23.0% were in different degrees of obesity.

Table 4 presents the mean and standard deviation of height, weight and BMI of the respondents. The mean height of the respondents was 1.65 m, mean weight was 73.71 kg, and mean BMI was 27.11 kg.

The level of reliability of the Pearson correlation was classified using the characterizations reported by Biu et al. (2013) (Table 5). These characterizations range from 0.00 to 0.20 (Slight), 0.21 to 0.40 (Fair), 0.41 to 0.60 (moderate), 0.61 to 0.80 (substantial) 0.81 to 1.00 (almost perfect). Correlation of BMI with personal and socio-economic characteristics shows that BMI was negatively correlated with age (0.04), sex (0.13) and occupation (0.05), and positively associated with religion (0.13), marital status (0.05), ethnicity (0.11), and level of education (0.14).

4. Discussion

The demographic information of the respondents presented in Table 1 shows that more (59%) respondents resided in urban areas when compared with the minority in the rural and semi-urban areas respectively. This result disagreed with the report of [4] on diet-related non-communicable diseases in Ghana which had less respondents (46.4%) in urban and more (53.6%) in rural. The appreciable proportion of rural dwellers (25.7%) that attended the study hospital was expected as the hospital was located in the rural area. Nearness to health facility has been shown to significantly improve attendance [5,6]. Also geographical proximity is a strong catalyst for health care seeking [7]. The hospital was within the proximity of both urban and semi-urban areas like Enugu metropolis and Emene and as such justified its attendance by both sectors. More urban dwellers attended the facility. This may mean that urban dwellers had more health seeking behavior than the

Table 3
BMI categories of adult diabetics.

BMI categories	Frequency n = 370	Percentage = 100%
Underweight	4	1.08
Normal weight	112	30.27
Over weight	169	45.68
Class i obesity	60	16.22
Class ii obesity	19	5.14
Class iii obesity	6	1.62

Table 4
Mean and standard deviation of height, weight and BMI of the respondents.

Variables	Sample size (N)	Mean	Standard Deviation	Min	Max	95% Confidence Interval
Height (m)	370	1.65	0.069	1.36	1.78	(1.63883, 1.65305)
Weight (Kg)	370	73.71	16.230	61.00	173.00	(72.0481, 75.3709)
BMI	370	27.11	5.763	18.00	59.86	(26.6119, 27.7617)

Table 5
Comparison of Socio-economic characteristic and Nutritional Status using Pearson correlation coefficient.

Parameter	Pearson correlation coefficient	Level of relationship
Age/BMI	−0.04	Slight (negative)
Religion/BMI	0.13	Slight (positive)
Marital Status/BMI	0.05	Slight (positive)
Ethnicity/BMI	0.11	Slight (positive)
Sex/BMI	−0.03	Slight (negative)
Level of Education/BMI	0.14	Slight (positive)
Occupation/BMI	−0.06	Slight (negative)

other sectors. Urban districts had great influence on health utilization although availability of health facility in an area was necessary, it was not enough to promote utilization [6]. Consequently, it may also be that the urban dwellers were the worst hit by T2DM than their rural counterparts due to differences in diets as regards to the different geographic locations. Rural dwellers had more access to fresh fruits and vegetables that are very crucial in diabetes management.

Age profile of the respondents shows that many (65.7%) were within the age range of 41–60years. Several studies [4,8–12] had similar trend with the present study-more diabetics within the age range of 40–60years, only Hirbli et al. [13] reported 15.8% prevalence of T2D among adults older than 40years.This results reflected the uniqueness of adult on-set diabetes occurrence, more in older adults than in younger adults. Diabetes Epidemiological collaborative Diagnostic Analysis of Asia DECODA Study Group [14] revealed that the prevalence of diabetes increases with age. Age has also been known to impact significantly on nutritional status [15]. Diabetes in older adults has been associated with higher mortality, reduced functional status and increased risk of institutinalization [16]. Older adults with diabetes were at considerable risk for both acute and chronic microvascular and cardiovascular complications of the disease [17]. The result may also indicated that older persons utilized health care services more than younger adults and was in line with the works of Weaver et al. [18] which stated that as older persons gets closer to death, their use of health care services increases and proximity to death is one of the main drivers of long-term care use. It was therefore not surprising that there were reports that older (51–60years; 40–59years) diabetics had better knowledge than others [12,19]. This was however, at variance with Al-Nahedh, [5] report which maintained that younger generation with more education use health services more and that of Odili, Isiboge, & Eregie, [20] who found better knowledge among younger age. Older persons had less education, worse cognitive function and barriers for self-care than younger counterparts [21,22].

There were more female (64.9%) diabetics than males (35.1%) in the study population. This trend was similar to other studies on diabetics by Unyime et al. [12] 63% female and 37% males in Jos plateau, Adebisi [8] 58.9% females and 41.9% males in Ogun State; and Oladapo et al. [11] 60% females and 40% males in Ondo state but at variance with Naja et al. [23] which had more males (60.3%) than females (39.7%). Hilawe et al. [24] confirmed that the prevalence of diabetes was more in women than in men although more men were likely to have IFG and less IGT than women. Boule, Haddad, Kenny, Wells, & Sigal, [25] also revealed that women accounted for more than half of all person ≥20 years with diabetes. Centre for Disease Control and prevention [26] and Faerch, [27] explained that previously, the prevalence of T2DM was higher among women than among men but the trend has shifted recently with more men than women now diagnosed with T2DM. Kautzky-Willes et al. [28] further clarified that T2DM was more frequently diagnosed at lower age and BMI in men than in women.

An overwhelming majority (86.2%) of the respondents were married. This was also similar with several reports [8,11,12,23] that had 80.4%, 70%, 83.8% and 87.9% married diabetics respectively although the second study had no unmarried respondent. This may be because type 2 Diabetes occurred more in adult population and marriage is usually meant for the adults. Luong et al. [29] emphasized that marriage (a social relationship) is more positive with age.

The study patients were more of Christians (94.1%) and of Igbo (95.9%) ethnicity. This was justifiable since the hospital is located in south-eastern Nigeria dominated by the Igbo ethnicity, the main adherent of Christian religion. This trend was at par with the findings of Unyime et al. [12] which had more Christians (79.9%) than Muslims (20.1%). On the contrary, Awosan, Ibrahim, Essien, Yusuf, & Okolo, [30] reported more Islamic worshippers (66.1%) with diabetes in Sokoto, a state known to be dominated by Muslims. Socio-cultural and religious teaching appeared to play a major part in this distribution. Religious doctrines were known to influence decisions about health and health behaviors, and promotes better health behaviors (associated with less alcohol, cigarette smoking and drug use), more physical activity, better diet and safer sexual practices [31].

The common (91.1%) family type monogamous reflected the Christian doctrine of one man one wife. Odume, Ofoegbu, Aniwada, & Okechukwu [32] observed similar trend, more (80.7%) monogamous family type. Obirkorang et al. [4] reported more (62.5%) diabetics living in a nuclear family system while Naja et al. [23] had diabetes running in the family of 58.6% of their respondents and non in 41.1%.

More than half (55.4%) of the respondents were from average sized (4–6 persons) families, although an appreciable proportion (35.7%) were from large sized families (7–10 persons). Odume et al. [32] had similar trend where 40.9% had family size of 3–5 persons and 21.4% had family size above 7 persons. Lundborg et al. [33] revealed that there is a positive effect of family size on health outcomes. Family size of fewer persons had better health status [34]; and larger families had increased health challenges [35].

The socioeconomic characteristics of the respondents presented in Table 2 shows that many (34.1%) of respondents had incomplete tertiary education. This was consistent with Naja et al. [23] which had 74.1% respondents with > high school status and 25.9% < high school status. Unyime et al. [12] had more (41.3%) with tertiary education and as many as 15.8% had no formal education. This notwithstanding implies that many of the patients were informed because they had above secondary education. Educational level has impact on nutritional status [15]. Knowledge increases as level of education increases [36]. This assertion was at variance with the reports of Maina, [37]; Dinge, Tag & Koh, [38]; Odili et al. [20]; and Tham et al. [39] Ulvi et al. [40] that had better knowledge among

secondary education holders and even among illiterate [41]. There is a cyclic relationship between poor nutrition and educational outcome. Poor diet early in life will result in less education, fewer job opportunities and lower socio-economic status [42]. Beckles [43] revealed that attaining higher education may influence decision making ability of an individual. This however was contrary to Awosan et al. [30], findings that had more diabetics within secondary (47.8%) and primary (39.4%) education and only 1% in tertiary education cadre. Higher education has been linked with health facility usage [5,6]. Worswick et al. [44] revealed that patient education is associated with improvement in glycaemic and vascular risk factor control. Also, education is linked to cost savings in financial outcomes [45].

A good number of the respondents (43%) were in civil service. Unyime et al. [12] had similar trend – more were formally employed. This was good because there is a moderate to strong evidence that occupation has an important influence on health and well-being [46]. Uyime et al. [12] reported that civil servants/retired performed better than self-employed in diabetes management knowledge. This differed with Odili et al. [20] where occupation had no effect on knowledge. The few (10.8%) that had no response for occupation may be linked to the respondents with no occupation. This number was lower than 22.1% the unemployed in Odume et al. [32] and 22.5% in Unyime et al. [12]. These set of people were likely to have little or no income and one can imagine the effect of poverty on diabetes management. Cavelaars et al. [47] reported higher mortality levels among unskilled workers.

More than one–third (45.1%) of the respondents earned above 137.21 US Dollar per month, unlike in Adebisi's [8] study where many (59%) earned between 27.44 and 137.21 US Dollar per month. High income is necessary in diabetes management. National Centre for health Statistics [48] reported that the greater ones' income, the lower the likelihood of diseases and premature deaths. It is documented that income is a strong basis to health outcomes [49,50]. Marmot [51] reported that higher income was directly related to the material conditions essential for biological survival. Beckles [43] further substantiated that higher income translates to better access to health care, higher living standards, and other measurable that had positive impact on health. Moreso, increases in income significantly improves mental and physical health [52]. Evidence suggested that higher income is directly linked to more knowledge [38,53] although Odili et al., [20] and Ding et al. [38] held a contrary view.

Low socioeconomic status (education, occupation and income) have inadequate access to high-quality clinical and preventive care services [54] and consequently poorer health than other persons [55,56]. The average socio-economic status as observed in this study, explained why most of them were able to seek and maintain health despite the challenges posed by diabetes.

The weight classification of the respondents shown in Table 3 shows that using WHO weight classification, almost half (45.7%) of the respondents were overweight, many (23.0%) were in different degrees of obesity, some (30.3%) were with healthy weight and few (1.1%) were underweight. The percentages that were underweight may be due to protein and energy deficiency which is indicative of poor weight gain. It is of great concern that less than half of the study respondents were within the healthy range and up to 69.7% had weight issues. This value was higher than that reported by Naja et al. [23] which had 55.2% of their respondents obese. Ilo, Ikwudinma & Obiegbu, [57] had 15% obesity and Awosan et al., [30] had 28.9% overweight and 28.1% obese. The proportion of the respondents that had overweight issues suggested greater risk of obesity and its associated co-morbidities. Overweight and obesity are associated with increased risk of diabetes mellitus [58]; they are risk factors for chronic diseases (CHD, HBP, DM, HCHOL) [59–61]. Increase weight increases DM [62,63] and reduced weight improves BP, BCHOL, and TG levels [64–68]. Reduction of weight in these overweight and obese respondents will reduces BP and/or prevents hypertension, although the ideal is to maintain normal body weight [69,70].

The mean height, weight and BMI of the questionnaire respondents presented in Table 4. shows that the mean weight (73.71 kg), height (1.65 m) and BMI (27.19 kg/m^2) of the respondents were higher than that reported by Afolabi, Odebunmi, Onabanyo, Sanni, & Olonisakin, [71] which had a mean weight of 67.3 kg with a range of 32.9–118 kg, mean height of 1.59 m and BMI of 26.4 kg/m^2 (14.6–42.9 kg/m^2). Naja et al. [23] had higher BMI (30.79 km/m^2) and mean age (56.55 years) than the present study. Soyoye et al. [72] had mean BMI of 27 km/m^2, while Bakari and Onyemelukwe [9] had mean BMI of 24.93 km/m^2. BMI is strongly associated with HBP, TCHOL, Low HDL, DM [16,73]. Increase in BMI results in increased risks of diabetes, hypertension, heart disease, cardiovascular accidents, and death [3,74]. Normal BMI and physical activity decreases risk of diabetes mellitus [58]. Individuals with a higher BMI are more likely to experience obesity-related health problems [75,76].

The negative correlation with age (Table 5) although contrary to weight increases with increase in age if one is not adhering to a healthy lifestyle may be attributed to decrease in muscle mass due to increase in age of the diabetic adults. Sperrin, Marshall, Higgins, Renehan & Buchan [77] also documented an inverse relationship of BMI with age in adults especially women. The negative association of BMI with sex was dissimilar to the work of Reas et al. [78] which observed no gender differences with increase in BMI. Also, the negative association with occupation was expected as occupation involves different physical activities that can reduce weight. On the other hand, the positive association with religion was not surprising as most religion convey peace and tranquility to an individual which in most cases will translate to increase weight. Cline & Ferraro, [79] reported increase in BMI with high level of religious media practice and affiliation especially in women. The positive association of BMI with Marital status could be explained by the presence of others which makes for a more stable eating habit. Teachman [80] revealed that co-habitors and married respondents tend to weigh more. Ethnicity was positively associated with BMI in this study. Davis, Juarez & Hodges, [81] had already confirmed a positive association of BMI with ethnicity. The level of respondents' education was positively associated with BMI. This may be attributed to increased access to basic needs (especially food) with higher education. Hermann et al. [82] reported an inverse association with higher BMI and lower education level.

5. Conclusion

This study concluded that there is a high prevalence of type 2 diabetes in the urban area and showed slight negative association of BMI with age, sex and occupation and positive association with religion, marital status, ethnicity, and level of education of diabetic adults.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2019.01.026.

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