Original Research

Socio-demographic factors and health status of adults with disability in Enugu Metropolis, Nigeria

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Abstract

Background

Disability is a major determinant of impaired health and nutritional status. This study aims to assess the health and nutritional status of adults with disability and their relationship with socio-demographic factors.

Methods

A descriptive cross-sectional study of 323 adults with disability in support-centers/schools of disability in Enugu Metropolis, Nigeria was conducted. The participants' socio-demographic factors, behavioural characteristics and 24-hour dietary recall were recorded. Blood pressure and anthropometric measurements of height, weight, waist and hip circumference were obtained. The height and weight measurements of non-ambulatory participants were estimated from knee height and mid-arm circumference. Biochemical analyses of blood samples were also performed. Multiple logistic regression was used to assess the effect of socio-demographic factors on health and nutritional status.

Results

The participants consisted of females (59.3%) within the age of 20 to 30 years (59.1%). The major area of difficulty was in physical mobility (51.1%) and this occurred mostly in females (26.9%). The participants' mean daily intakes of calorie, protein and fat were below the recommended dietary allowances. The participants were overweight (49.2%), obese (4.6%), hypertensive (29.7%) and diabetic (12.1%). Dyslipidemia (81.8%), anemia (63.6%) and zinc deficiency (51.1%) were highly prevalent among the study group. Gender difference was observed in alcohol consumption (p=0.000), smoking habit (p=0.001), waist circumference (WC)(p=0.000), waist-hip-ratio (WHR) (p=0.000), triglyceride (p=0.026) and haemoglobin concentration (p=0.007). Being boarder was a positive predictor of overweight/obesity (OR= 2.974, 95% CI=1.449–6.104), abnormal WHR (OR=2.893, 95% CI = 1.073–7.801) and hypertension (OR=8.381, 95% CI=1.598–13.959). Female gender was associated with abnormal WC (OR=7.219, 95% CI=3.116–14.228) and WHR (OR=3.590, 95% CI=2.095–6.150) whereas older age-group was associated with overweight/obesity (OR=1.908, 95% CI=1.137–3.202). Being employed was a negative predictor of hypertension.

Conclusion

Overweight/obesity, anemia, zinc deficiency and dyslipidemia were highly prevalent among persons living with disability in Enugu Metropolis.

Keywords: Vulnerable, malnutrition, hypertension, diabetes, zinc deficiency, anaemia, obesity, dyslipidemia, gender difference, Nigeria.

Introduction

The World Health Organization defined disability as an umbrella term for impairments, activity limitations, and participation restrictions. It is a complex phenomenon, reflecting the interaction between an individual and his/her contextual factors (environment and personal factors)[1]. Globally, over 1 billion people experience some forms of disability, this represents 1 in every 7 persons and half of these people cannot afford health care[2]. In Nigeria, approximately 14 million people live with one or more form of disability[3]. Disability is a major determinant of impaired health and nutritional status especially in developing countries like Nigeria where people with disability receive minimal or no support from government.

Malnutrition and disability are interrelated in that disability can cause malnutrition and vice versa. Disability results to increased nutrient needs, increased nutrient loss and reduced nutrient intake[4] consequently, leading to malnutrition. Reduced nutrient intake or even overnutrition is an important cause of disability including blindness, intellectual and physical disability. This occurs throughout lifecycle with its adverse effects which could be irreversible. In addition, malnutrition and disability share similar risk factors including poverty, diseases and risky behaviours[5-7].

People with disability are particularly vulnerable and need adequate care both nutritionally and otherwise but unfortunately their health and dietary needs are among the least explored area in public health care. Evidence suggests that people with disability face barriers in accessing the health and rehabilitation services that they need in many settings[2]. Insights on the healthcare outcomes of people with disability will lead to early detection of diseases hence improve recovery rate. Currently there is dearth of information regarding the health and nutritional status of adults living with disability in Nigeria. This may hinder their opportunity in receiving support from governmental and non-governmental organizations. In view of the above, the need to include people with disability in health care surveillance cannot be overemphasized. This study was carried out to assess the health and nutritional status of adults with disability in Enugu Metropolis, Nigeria as well as examine the relationship with socio-demographic factors. Providing such evidence is hoped to guide policy and practice in improving the health and nutritional status of adults with disability.

Methods

Study area

The study took place in Enugu between May and August,

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2019. Enugu is the capital city of Enugu State located in the South-eastern geopolitical zone of Nigeria. The Enugu metropolitan area has an estimated population of 722,664[8]. Most of the registered support-centers/schools for people with disability in Enugu Metropolis double as residential area for this group of people[9].

Study design

A descriptive cross sectional survey design was adopted for the study.

Study population and sample size

The study population of this research work consisted of adults (20-40 years) with disability in Enugu Metropolis. The minimum sample size was calculated using the Yamane[10] formula;

Where n = sample size; N = population size, and e = level of precision = 0.05

The estimated population of adults (20-40 years) in the support-centers/schools of disability in Enugu Metropolis as at 2017 was 427 [9]. When the formula was applied, a sample size of 207 was obtained. This was increased by 10% for contingencies. The minimum calculated sample size of 228 was obtained. However, a total of 358 adults with disability were approached and 323 gave consent for the study (a response rate of 90.2%). Despite the fact that the calculated minimum sample size for the study was 228, the 323 persons who gave consent were selected to increase the power of the study. Ten percent (10%) of the participants were randomly selected as sub-sample for biochemical analysis.

Sampling techniques

The sample was selected from support-centers/schools for people living with disability in Enugu Metropolis. First, a list of all registered support-centers/schools for people living with disability in Enugu Metropolis was obtained. These support-centers/schools were visited to seek approval for the study. Approval was granted by 6 out of the 9 support-centers/schools visited. The reasons for declining included busy schedule and inability to obtain parental consent. All adults with disability in the 6 centers who authorized the study were selected. This sampling technique was used because of the population of this group and the difficulty in accessing them. The first participant in each support-center/school was randomly selected and subsequent ones selected consecutively until all participants were recruited. This resulted to a total of 323 participants.

Method of data collection

Data were collected using a semi-structured validated questionnaire, anthropometric measurements, 24-hour dietary recall and biochemical analysis. The questionnaire was designed by the researchers and pretested in a pilot study consisting of 40 adults with disability in a nearby city (Nsukka). The reliability index of the questionnaire was 0.80. The questionnaire was used to collect background information of the participants. Using a 24-hour dietary recall, they were asked to state what they consumed in the last 24 hours preceding the interview, frequency of consumption and quantity consumed in household measures. The dietary intake data were provided by the participants' relatives or caregivers on behalf of participants who were unable to recall due to the disability. The daily energy and nutrient intakes were calculated using food composition tables[11,12].

Anthropometric measurements

Weight was measured using a bathroom weighing scale (Hana H-9012) graduated in kg. Each participant was weighed standing erect on the scale with arms on their sides and without foot wears, bangles and wristwatches. The readings were recorded to the nearest 0.1kg.

Height was measured with a portable stadiometer height-rod (Seca 213). With no shoes on, each participant was asked to stand erect on a flat surface with feet parallel to each other, heels, buttock and back of the head touching the height metre. The head was comfortably erect with arms hanging freely by the sides. The headpiece of the height metre was lowered until it made a firm contact with the head. Measurement was taken to the nearest 0.1cm.

The weight and height measurements of non-ambulatory participants were estimated from knee height and mid-upper arm circumference using the equations[13, 14] below.

For women:

Height (cm)= 68.1 + (1.86 ×Knee height) – (0.06× age)

Body weight (kg)=(Knee height ×1.24) + (Mid-arm circumference ×2.97) – 82.48

For men:

Height (cm)= 73.42 + (1.79× Knee height)

Body weight (kg)= (Knee height ×1.09) + (Mid-arm circumference ×3.14) – 83.72

The knee height was measured on the left leg using a sliding caliper with the participant lying supine with the angle of the left knee joint and ankle in 90 degrees. The fixed blade of the caliper was placed under the heel of the left foot, and a moveable blade on the anterior surface of the left thigh. The caliper was positioned parallel to the outside bone of the lower leg (fibula), over the most prominent bony projection on the outside of the left ankle, and just posterior to the head of the fibula. Pressure was gently applied to the blades to compress the tissues. The measurement was taken to the nearest 0.1cm.

The mid-arm circumference was measured using a flexible non-stretchable measuring tape. The tape was placed around the midpoint of the upper arm without compressing the soft tissue. The measurement was obtained and recorded to the nearest 0.1cm.

Body mass index (BMI) of the participants was calculated using the formula;

BMI = [(Weight (Kg))/(Height (m^2))]Kg/m^2

Values obtained were classified into underweight, normal, overweight and obesity as proposed by WHO[15].

Waist circumference (WC) was measured using flexible

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non-stretchable measuring tape. The tape was placed on the smallest area below the rib cage and at the level of belly button (umbilicus) round the waist with the participant standing erect, abdominal muscles relaxed, arms at the sides and feet together. The tape was held firm at this point and reading taken to the nearest 0.1cm at the end of normal expiration (breathing out).

Hip circumference was obtained using flexible non-stretchable measuring tape. The tape measure was held at the point of greatest circumference round the hip region with the participant standing erect, arms at the sides and feet together. The tape was tightened to make close contact with the body but without indenting the soft tissue. Measurement was taken at this point to the nearest 0.1 cm.

For non-ambulatory participants, waist and hip measurements were taken in supine position.

Waist-hip ratio (WHR) was calculated from waist and hip circumference using the formula;

WHR =

Abnormal WC and WHR were defined as ≥94 cm in males and ≥80 cm in females; and >0.90 in males and >0.85 in females, respectively using the classification by Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [16]. Abnormal WC and WHR are indications for metabolic and cardiovascular risk.

Blood pressure measurements

The blood pressure was measured according to standard procedure using a digital automatic blood pressure monitor (MOTECH® model: BPU500, Germany) with measuring range of 30 - 280 mmHg. Blood pressure reading was taken twice (1-3 min interval) and the average recorded. Hypertension was diagnosed as systolic blood pressure of >140 mmHg and/or diastolic blood pressure of ≥ 90 mmHg[17].

Biochemical analysis

Fasting (after 8-12 hours of overnight fasting) lipid profile (high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, triglycerides and total cholesterol) was determined using a portable testing device (Alere cholestechLDX® system). The readings were obtained following the instruction on the manufacturer's kit manual. Based on the classification proposed by Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [16], dyslipidaemia was defined as low HDL-cholesterol (<1.03 mmol/L in males and <1.30 in females), high LDL-cholesterol (>3.37 mmol/L), high triglyceride (≥1.7 mmol/L) and/or high total cholesterol (≥5.2 mmol/L) level. Fasting blood glucose was determined using an Accu-Chek glucometer according to the manufacturer's kit manual. High blood glucose was defined as fasting blood glucose ≥ 7.0 mmol/L [18].

Serum zinc was analyzed by atomic absorption spectrophotometer while haemoglobin concentration was determined colorimetrically using the cyanmethemoglobin method. Zinc deficiency (< 70 µg/dL in males and < 66 µg/dL in females) and anaemia (haemoglobin conc. ≤ 129g/l in males and ≤ 119g/l in females) were diagnosed as proposed by Hotz et al. [19] and WHO[20], respectively.

Ethical considerations

Ethical approval (NHREC/05/01/2008B) for the study was obtained from the University of Nigeria Teaching Hospital Ituku/Ozalla, Enugu State, Nigeria. Approval was also obtained from the managements of support-centers/schools of people with disability used in this study. Informed written consent was obtained from the participants, their relatives or caregivers after detailed explanation of the study objectives and what the study entails with assurance of confidentiality. This explanation was given in local dialect that they understood very well.

Statistical analysis

Data obtained were statistically analyzed using the IBM SPSS (Statistical Product for Service Solution), version 22. The chi-square test was used to analyze the proportions of categorical health and nutritional indicators in relation to gender. The relationships between participants' characteristics and their health/nutritional status were tested using multiple logistic regression analysis, calculating odds ratios with their respective confidence interval (95% CI). The independent variables (participants' characteristics) included socio-demographic (gender, age, marital status, educational attainment, employment status, monthly income, number of children and living arrangement) and behavioural (alcohol consumption and smoking habit) characteristics. The dependent variables (selected health and nutritional indicators) for the multiple regression were overweight/obesity (BMI > 24.5kg/m^2), abnormal WC, abnormal WHR and hypertension. Mean daily energy and nutrient intakes were calculated and compared with the Recommended Dietary Allowance[21].

Results

More than half of the participants were females (53.9%) within 20 – 30 years of age (59.1%). Majority of the participants had at most primary education (66.2%), were unemployed (72.1%) and earned no income (71.2%). Significantly higher proportion of males than females engaged in alcohol consumption (51.0 % vs. 12.1, p = 0.000) and cigarette smoking (10.1 vs. 1.7%; p = 0.001). Majority (80.5%) were boarders (reside in the support-centers/schools), when compared between genders no significant difference was observed in the living arrangement, p = 0.402 [Table 1].

Out of the 323 participants, 51.1% had difficulty in physical mobility; this was more in females (26.9%) than males (24.1%). Other types of difficulty were hearing impairment (46.4%), difficulty in communication (33.1%) and visual impairment (7.1%) [Figure 1].

Prevalence of overweight and obesity were 49.2% and 4.6%, respectively. More females (55.7%) than males (41.6%) were overweight whereas more male (6.0%) than females (3.4) were obese. However, this variation was not statistically significant (p = 0.072). Gender difference occurred in WC and WHR with females presenting with significantly higher risk of abnormal WC (50.0% vs. 2.7%; p = 0.000) and abnormal WHR (73.0% vs. 43.6%; p = 0.000) than males. Prevalence of hypertension was 29.7% and more females (27%) than males (21.5%) were hypertensive (p = 0.295) [Table 2].

High blood glucose was found in 12.1% of the participants. The most common lipid abnormality reported among the participants was high triglyceride level (66.7%) followed by high total cholesterol (36.4%).

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Table 1: Socio-demographic and behavioural characteristics of the participants

Variables		Male n = 149	Female n = 174	Total N = 323
Age-group (years)	20 – 30	90 (60.4)	101 (58.0)	191 (59.1)
	31 - 40	59 (39.6)	73 (42.0)	132 (40.9)
		$\chi^2 = 0.18$, df = 1, p = 0.734		
Marital status	Single	134 (89.9)	148 (85.1)	282 (87.3)
	Married	15 (10.1)	26 (14.9)	41 (12.7)
		$\chi^2 = 1.72$, df = 1, p = 0.189		
Educational attainment	No formal education	8 (5.4)	14 (8.0)	22 (6.8)
	Primary education	86 (57.7)	106 (60.9)	192 (59.4)
	Secondary education	26 (17.4)	26 (14.6)	52 (16.1)
	Tertiary education	29 (19.5)	28 (16.1)	57 (17.6)
		$\chi^2 = 1.81$, df = 3, p = 0.612		
Employment status	Unemployed	102 (68.5)	131 (75.3)	233 (72.1)
	Employed	47 (31.5)	43 (24.7)	90 (27.9)
		$\chi^2 = 1.86$, df = 1, p = 0.213		
Earn monthly income	No	101 (67.8)	129 (74.1)	230 (71.2)
	Yes	48 (32.2)	45 (25.9)	93 (28.8)
		$\chi^2 = 1.58$, df = 1, p = 0.220		
Number of children	No child	132 (88.6)	149 (85.6)	281 (87.0)
	1-3 children	12 (8.1)	21 (12.1)	33 (10.2)
	Above 3 children	5 (3.4)	4 (2.3)	9 (2.8)
		$\chi^2 = 1.67$, df = 2, p = 0.434		
Living arrangement	Family house	26 (17.4)	37 (21.3)	63 (19.5)
	Boarding	123 (82.6)	137 (78.7)	260 (80.5)
		$\chi^2 = 0.74$, df = 1, p = 0.402		
Alcohol consumption status	Abstainers	73 (49.0)	153 (87.9)	226 (70.0)
	Current drinkers	76 (51.0)	21 (12.1)	97 (30.0)
		$\chi^2 = 57.92$, df = 1, p = 0.000		
Cigarette smoking habit	Non-smokers	134 (89.9)	171 (98.3)	305 (94.4)
	Smokers	15 (10.1)	3 (1.7)	18 (5.6)
		$\chi^2 = 10.62$, df = 1, p = 0.001		

Table 2: Anthropometric and blood pressure indices of the participants

Variables		Male n = 149	Female n = 174	Total N = 323
Body Mass Index (kg/m^2)	Underweight	2 (1.3)	1 (0.6)	3 (0.9)
	Normal	76 (51.0)	70 (40.2)	146 (45.2)
	Overweight	62 (41.6)	97 (55.7)	159 (49.2)
	Obesity	9 (6.0)	6 (3.4)	15 (4.6)
		χ^2 = 6.99, df = 3, p = 0.072		
Waist circumference	Normal	145 (97.3)	87 (50.0)	232 (71.8)
	At risk	4 (2.7)	87 (50.0)	91 (28.2)
		χ^2 = 88.80, df = 1, p =0.000		
Waist-Hip-Ratio	Normal	84 (56.4)	47 (27.0)	131 (40.6)
	At risk	65 (43.6)	127 (73.0)	192 (59.4)
		χ^2 = 28.71, df = 1, p = 0.000		
Blood pressure (mmHg)	Normal	109 (73.2)	118 (67.8)	227 (70.3)
	Hypertension	40 (26.8)	56 (32.2)	96 (29.7)
		χ^2 =1.10, df = 1, p = 0.295		
	High systolic	16 (10.7)	20 (11.5)	36(11.1)
	High diastolic	32 (21.5)	47 (27.0)	79 (24.5)

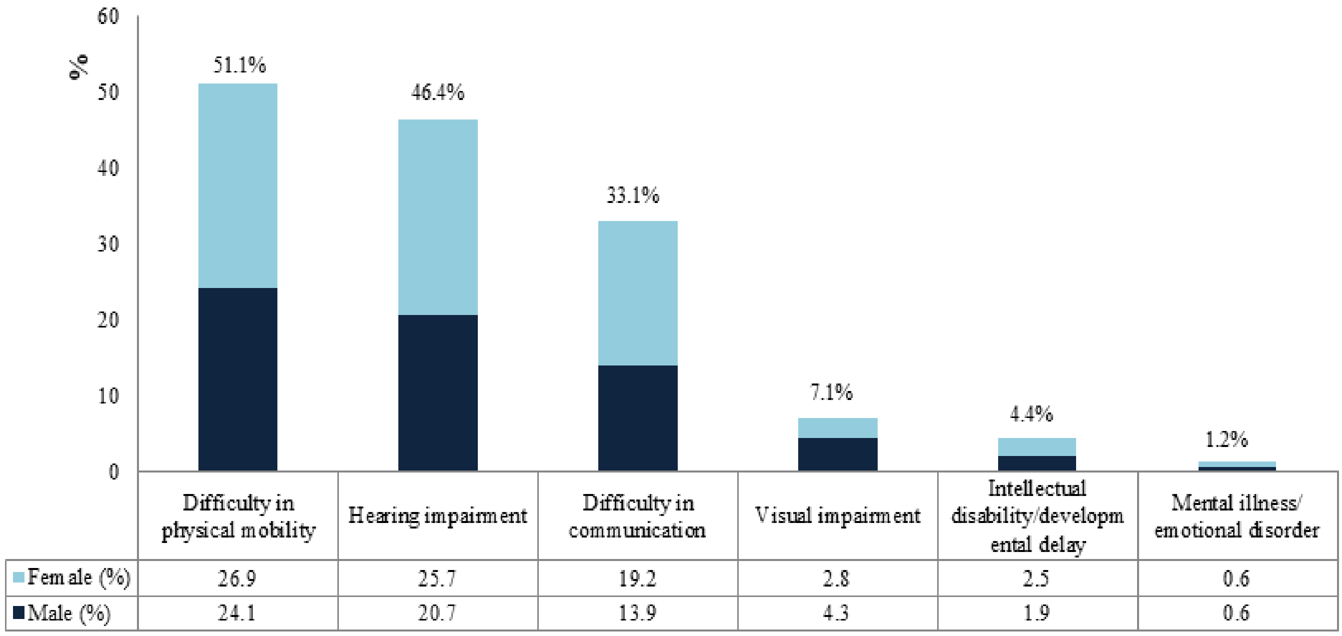

Figure 1: Types of difficulty among the participants

A high prevalence of dyslipidemia (81.8%) was observed among the study population with no significant (*p* = 0.895) variation in gender. Majority (63.6%) of the participants were anaemic with significantly (p = 0.007) more males (88.3%) than females (37.5%) having low hemoglobin concentration. More than half (51.5%) were zinc deficient and this was more prevalent among female than male participants (68.8 vs. 35.3%) [Table 3].

The participants' daily nutrient intake compared with the recommended dietary allowance (RDA) was presented in Table 4. Mean intakes of calorie, protein and fat were lower than the recommended dietary allowance for age-sex group. The average daily calorie intake was 89.3% of the RDA for males and 86.1% of the RDA for females. Protein intake was 76.73% for males and 67.78% for females, and fat intake was 92.21% for males and 83.20% for females.

Table 3: Fasting blood glucose, lipid profile and micronutrient deficiency status of participants

Biochemical variables	Biochemical variables	Male n = 17	Female n = 16	Total N = 33
Fasting blood glucose	Normal	14 (82.4)	15 (93.8)	29 (87.9)
	High	3 (17.6)	1 (8.2)	4 (12.1)
		χ^2 = 1.00 , df = 1, p = 0.601		
Triglyceride	Normal	9 (52.9)	2 (12.5)	11 (33.3)
	High	8 (47.1)	14 (87.5)	22 (66.7)
		χ^2 = 6.067, df = 1, p = 0.026		
HDL-cholesterol	Normal	17 (100.0)	16 (100.0)	33 (100.0)
	Low	-	-	-
LDL-cholesterol	Normal	17 (100.0)	15 (93.8)	32 (97.0)
	High	0	1 (6.2)	1 (3.0)
		χ^2 = 1.10 , df = 1, p = 0.485		
Total cholesterol	Normal	11 (64.7)	10 (62.5)	21 (63.6)
	High	6 (35.3)	6 (37.5)	12 (36.4)
		χ^2 = 0.17, df =1, p = 0.895		
Dyslipidemia	Absent	5 (29.4)	1 (6.2)	6 (18.2)
	Present	12 (70.6)	15 (93.8)	27 (81.8)
		χ^2 = 2.97, df =1, p = 0.085		
Zinc	Normal	11 (64.7)	5 (31.2)	16 (48.5)
	Zinc deficiency	6 (35.3)	11 (68.8)	17 (51.5)
		χ^2 = 3.69, df = 1, p = 0.084		
Hemoglobin concentration	Normal	2 (11.8)	10 (63.5)	12 (36.4)
	Mild anaemia	2 (11.8)	2 (12.5)	4 (12.1)
	Moderate anaemia	7 (41.2)	4 (25.0)	11 (33.3)
	Severe anaemia	6 (35.3)	-	6 (18.2)
		χ^2 = `12.13, df = 3, p = 0.007		

The logistic regression analysis [Table 5] showed that people with disability who were within 31-40 years of age and boarders had 1.908 (95% CI= 1.137–3.202; *p* = 0.014) and 2.974 (95% CI= 1.449–6.104; *p* = 0.003) times higher chances of being overweight/obese compared to younger age-group (20-30 years) and those who came from their homes, respectively. Females with disability had a higher chance of developing abnormal WC (OR = 7.219; 95% CI= 3.116-14.228; *p* = 0.000) and abnormal WHR (OR = 3.590; 95% CI= 2.095-6.150; *p* = 0.000) compared to their male counterpart. With regards to number of children, we observed that participants who had more than 3 children were 7.430 times (95% CI= 1.744–17.215; *p* = 0.015) more at-risk of developing abnormal WC compared to those who had no children. Risk of developing abnormal WC for boarders was 2.893 times (95% CI= 1.073–7.801; *p* = 0.036) higher than those who live at home.

Boarders were 8.381 (95% CI= 1.598-13.959; *p* = 0.012) times more likely to be hypertensive compared to those living in the family house. On the other hand, employed participants were less likely to develop hypertension (OR = 0.103; 95% CI= 0.015–0.702; *p* = 0.020) compared to unemployed participants.

Discussion

Physical immobility has been linked to several chronic diseases including obesity, diabetes, cardiovascular and kidney diseases[22].

Table 4: Percentage contribution of participants' daily nutrient intake to the Recommended Dietary Allowance (RDA)

Variable		Calorie (kcal/day)	Protein (g/day)	Fat (g/day)
RDA for age-sex group	Male	2800	49	93.33
Estimated mean daily intake		2499.21 ± 512.96	37.6 ± 16.95	86.06 ± 25.66
% of RDA		89.26	76.73	92.21
RDA for age-sex group	Female	2200	45	73.33
Estimated mean daily intake		1894.96 ± 570.54	30.50 ± 13.60	61.01 ± 30.12
% of RDA		86.13	67.78	83.20

Energy requirement: FAO/WHO/UNU (1985); Fat (recommended) = 30% of calorie

Table 5: Association of socio-demographic and behavioural characteristics with health and nutritional deficiencies of participants

Socio-demographic and behavioural characteristics	Overweight/obesity		Abnormal waist circumference		Abnormal waist-hip ratio		Hypertension	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Gender								
Male (Ref.)								
Female	1.633 (1.633 – 2.765)	0.068	7.219 (3.116 – 14.228)	0.000***	3.590 (2.095 – 6.150)	0.000***	2.331 (0.463 – 2.331)	0.927
Age-group (years)								
20 – 30 (Ref.)								
31 - 40	1.908 (1.137 – 3.202)	0.014*	1.559 (0.820 – 2.962)	0.175	1.058 (0.617 – 1.815)	0.839	1.132 (0.545 – 2.353)	0.739
Marital status								
Single (Ref.)								
Married	2.528 (0.664 – 0.174)	0.174	0.968 (0.213 – 4.401)	0.967	0.283 (0.071 – 1.120)	0.072	1.422 (0.219 9.237)	0.712
Educational attainment								
No formal education (Ref.)								
Primary education	1.268 (0.473 – 3.397)	0.637	0.344 (0.093 – 1.266)	0.108	0.804 (0.283 – 2.285)	0.682	0.428 (0.164 – 2.152)	0.594
Secondary education	1.428 (0.474 – 4.304)	0.527	0.349 (0.083 – 1.473)	0.152	1.050 (0.329 – 3.347)	0.935	0.917 (0.229 – 3.681)	0.903
Tertiary education	1.929 (0.592 – 6.282)	0.275	0.918 (0.210 – 4.017)	0.910	0.936 (0.275 – 3.185)	0.916	0.680 (0.142 – 3.263)	0.630
Employment status								
Unemployed (Ref.)								
Employed	0.735 (1.960 – 2.759)	0.648	0.402 (0.036 – 4.437)	0.457	0.959 (0.257 – 3.578)	0.951	0.103 (0.015 – 0.702)	0.020*
Earn monthly income								

Table 5 Cont...

No (Ref.)								
Yes	1.177 (0.260 – 5.322)	0.833	1.459 (0.111 – 9.149)	0.774	1.349 (0.301 – 6.054)	0.696	1.279 (0.800 – 9.884)	0.790
Number of children								
No child (Ref.)								
1-3 children	0.784 (0.211 – 2.913)	0.716	1.719 (0.385 – 7.674)	0.478	1.912 (0.478 – 7.651)	0.360	1.485 (0.240 – 9.208)	0.671
Above 3 children	0.162 (0.019 – 1.384)	0.096	7.430 (1.744 – 17.215)	0.015*	3.435 (0.491 – 9.008)	0.214	0.511 (0.024 – 10.878)	0.667
Living arrangement								
Family house (Ref.)								
Boarding	2.974 (1.449 – 6.104)	0.003**	2.893 (1.073 – 7.801)	0.036*	1.849 (0.929 – 3.680)	0.080	8.381 (1.598 – 13.959)	0.012*
Alcohol consumption status								
Abstainers (Ref.)								
Current drinkers	0.950 (0.489 – 1.847)	0.880	0.433 (0.138 – 1.368)	0.153	0.893 (0.458 – 1.741)	0.740	1.638 (0.621 – 4.319)	0.319
Cigarette smoking habit								
Non-smokers (Ref.)								
Smokers	1.241 (0.405 – 3.797)	0.705	1.458 (0.192 – 11.039)	0.715	2.233 (0.728 – 6.851)	0.160	1.362 (0.274 – 6.779)	0.706

p-value (*p < 0.05, **p < 0.01, ***p < 0.001). OR = Odds Ratio; CI = Confidence Interval

More than half of the study population had difficulty in physical mobility; this was followed closely by sensory disability including hearing impairment, communication difficulty and visual impairment. In contrast to the present study, a study conducted in 2005 found that visual impairment (37%) was the most common type of disability among people with disabilities in two northern states in Nigeria[23]. It is interesting to know that the prevalence of visual impairment (7.1%) in the present study is 5 times less than that reported in the two states in Nigeria[23]. The difference could be attributed to the improved eye care outreach programmes going on in Nigeria within the last decade with the aim to reduce preventable blindness. The regional variation in dietary pattern that exists within Nigeria could also be a contributory factor.

No gender variation was observed in the socio-demographic factors. Majority of the participants had at most primary education, were unemployed and had no income. A previous study in Nigeria also found that half (49.8%) of people with disability were illiterate and 61% were unemployed with zero income (38%)[23]. This is the situation of people with disability in many developing countries. They are socially excluded with limited access to the basic needs of life. The variation that exists in socio-demographic and economic factors between the disabled and non-disabled persons is the major reason for the exclusion experienced by people with disability[24].

The prevalence of overweight (49.2%) among the study population is relatively high compared to the range (20.3%–35.1%) reported for the general population of Nigerian adults[25]. However, the obesity prevalence in the present study is lower than that reported for different forms of disabilities in other countries such as Spain 36.8% [26], United States 24.9% [27], and Turkey 13.2% [28]. This disparity might be due to variation in environmental, genetic and dietary factors. Behavioural, environmental and biological factors such as excessive caloric intake, sedentary lifestyle, genetic disorders and use of medications have been implicated in the etiology of overweight and obesity among people with disability[29,30]. Excessive weight gain in disability can result to a vicious cycle with additional health implications due to increased activity limitations, and participation restrictions.

We observed that greater proportion of the participants had abnormal WC and WHR. Gender variation was observed in WC and WHR with females showing higher rate of abnormality. This has been consistently reported even among non-disabled adults especially in Africa[31,32] where it has been attributed to female sedentary lifestyle, accumulation of fat during pregnancy and cultural norms which associate fat with beauty and affluence. Body fat distribution is vital in considering the health implications of obesity. Evidence has shown that increased total abdominal fat is a strong indicator for morbidity and mortality even when BMI is within the desirable range[33].

Compounding evidence indicates that the variations in abdominal fat explain the relationships among obesity, insulin resistance, hypertension and dyslipidemia. The high prevalence of dyslipidemia (81.8%), hypertension (29.7%), and diabetes (12.1%) among the participants are more likely to result from the high measures of obesity (abnormal WC and WHR) as indicated in previous reports[34-36]. A close interaction was reported between abdominal obesity and multiple adverse changes to lipid profile in older adults[35]. In another study markers of insulin resistance correlated significantly with the degree of abdominal adiposity[36]. These interactions were well explained in a review that explores the pathophysiological links between abdominal obesity and elevated cardiometabolic risk[37].

Anaemia was highly prevalent among adults with disability in Enugu Metropolis. This is contrary to studies from other countries which found lower prevalence of anaemia (< 30%) in adults with disability[38]. This may be due to low consumption of iron rich foods especially the animal food sources as evident in the 24-hour dietary recall data collected from the participants. Their dietary intake is predominantly plant based which has low bioavailability of iron hence accounting for the high prevalence of anaemia. Surprisingly, we observed that more males than females were anaemic

($p = 0.007$) with greater proportion presenting with moderate and severe anaemia. This pattern is consistent with few other studies conducted among institutionalized people with intellectual and/or motor disability[39]. The reason for this finding is still not clear however, to some extent it could be attributed to the WHO serum hemoglobin threshold[20] used to diagnose anaemia in adults which placed males at higher threshold.

More than half of the study population was zinc deficient. This finding elucidates the alarming rate of anaemia recorded among the study population. The link between anaemia and zinc deficiency was explained through several mechanisms. Impaired iron absorption can occur in zinc deficiency as zinc is a vital component of enzymes that are responsible in hemoglobin synthesis and erythropoiesis stimulation[40,41]. To our knowledge, there is no reference data in the prevalence of anaemia and zinc deficiency among adults with disability in Enugu State and Nigeria as a whole. However, the high prevalence rate of these micronutrient deficiencies could largely be due to ignorance of micronutrients-rich food sources despite their availability in the State hence, the need for nutrition education.

The mean calorie intake was less than 90% of the RDA. Although this was lower than the RDA, it could be considered healthier than that reported for adults with intellectual disability living in group homes in Australia[42]. However, the mean protein intake in the present study was relatively lower than that reported among adults with intellectual disability in Spain[43]. In addition to the varying dietary pattern, the different dietary assessment methods employed by the investigators may not be unconnected with the contrasting information obtained.

The logistic regression analysis revealed that the risk of being overweight/obese was higher with advanced age-group than the younger age-group. The reason is in line with the fact that advanced age is associated with reduced physical activity. Oviedo et al. analyzed the age difference in physical activity levels and sedentary time patterns among adults and older adults with disability and found that adults were more physically active and had a higher step count than older adults[44]. Accumulation of fat which mostly starts at adulthood is exacerbated by the sedentary lifestyle and limited energy expenditure peculiar at this age.

Similarly, boarders had higher chances of being overweight/obese, having abnormal WC and being hypertensive than those living in a family house. Living in a more restrictive environment encourages sedentary lifestyle and physical inactivity[44]. In contrary to our finding, a study conducted in U.S. showed that adults with intellectual disabilities who lived in restrictive settings had lower risk of developing obesity[45]. Investigators whose results contradict our finding argued that the ability to access food independently without assistance, a practice common in family homes could be the reason for increased level of obesity recorded among adults with intellectual disability[45,46]. This might not be the case in the present study as associations may vary in different societies based on the level of household food security.

The risk of developing hypertension was higher for boarders than their peers who lived in family home. The evidence for the relationship between living arrangements and hypertension in disability is very limited. However, substantial evidence suggests association between limitations in activities and hypertension[47,48]. The finding that boarders had higher chances of having hypertension in this study may be in line with some previous studies where the health and well-being of adults with intellectual disability improved when they live with family rather than living out of home[49]. These findings suggest that further detailed investigation into the effect of living arrangements on nutrition and health status of individuals with disability especially in developing countries like Nigeria is needed as this may provide policy makers with information required to develop appropriate policies for this group of people.

Female gender and having more than three children were associated with central obesity. In consistent with other studies[50] this result confirms the association between parity and risk of central obesity which increases with higher number of parities. We found that being employed was a protective factor of hypertension. This is in line with previous report that unemployed adults had higher risk of hypertension compared to employed ones[51,52]. Having employment is associated with increased physical activity which has been linked with lower blood pressure and reduced cardiovascular risk[53].

The following limitations of the study should be considered. The physical activity level of the participants was not assessed as a result its association with dependent variables was not determined. Again, the nutrient intake data might have been over-or under-reported by the respondents due to recall bias. Limitation in study design also exists; the cross-sectional study employed could not establish causality as the independent and dependent variables were assessed at the same time. Despite these limitations, the current research provides some new evidence on the relationship between socio-demographic factors and health and nutritional status of adults living with disability in Nigeria where limited information exists.

Conclusion

There was high prevalence of overweight/obesity, dyslipidemia, anaemia and zinc deficiency among people with disability in Enugu Metropolis. Older age-group, female gender, living away from home and having more than 3 children were factors associated with measures of overweight and obesity. Being boarder was an important predictor of hypertension while being employed was a protective factor. The findings of this study indicate the need to initiate and scale up nutrition and health promotion strategies such as nutrition education and physical activity programmes for people with disability. In addition, actions such as elimination of disparity gap in employment status should be priotized. It is hoped that the findings of this study will guide policy and practice towards improving the health and nutritional status of adults with disability in Enugu Metropolis and beyond.

References

1. World Health Organization. International Classification of Functioning, Disability and Health (ICF). 2001. Geneva: WHO.

2. World Health Organization. World Report on Disability. Geneva: WHO. 2011. Available from: http://www.who.int/disabilities/world_report accessed 27/5/2020.

3. UNPD. World Population Prospects: The 2004 Revision. New York: UN Population Division. 2005.

4. Kerac M, Postels DG, Mallewa M, Alusine JA, Voskuijl WP, Groce N et al. The interaction of malnutrition and neurologic disability in Africa. Semin Pediatr Neurol. 2014; 21: 42–9.

5. Banks LM, Kuper H, Polack S. Poverty and disability in low- and middle-income countries: a systematic review. PLoS One. 2017; 12: e0189996.

6. Kuper H, Monteath-van Dok A, Wing K, Danquah L, Evans J, Zuurmond M et al . The impact of disability on the lives of children; cross-sectional data including 8,900 children with disabilities and 898,834 children without disabilities across 30 countries. PLoS One. 2014; 9: e107300.

7. Blum RW, Kelly A, Ireland M. Health-risk behaviors and protective factors among adolescents with mobility impairments and learning and emotional disabilities. J Adolesc Health. 2001; 28: 481–90.

8. National Population Commission. Official Gazette, 2006 census. The Federal Republic of Nigeria, Abuja: Nigeria, 96(2), 2009 B1-B42.

9. Enugu State Wide Disability Database, 2017.

10. Yamane T. Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row. 1967.

11. Stadlmayr B, Charrondiere UR, Enujiugha VN, Bayili RG, Fagbohoun EG, Samb B et al. West African food composition table / Table de composition des aliments d'Afrique de l'Ouest. Food and Agriculture Organization of the United Nations (FAO), Rome, (Italy); International Network of Food Data Systems (INFOODS), Rome, (Italy); West African Health Organization (WAHO), Burkina Faso; Bioversity International, Rome (Italy). 2012.

12. Platt BS. Table of representative values of foods commonly used in tropical countries. London: Her Majesty's Stationery Office, 46p. (London special report series). 1977.

13. Ross Laboratories, Columbus, OH 43210.

14. Chumlea WC, Guo SS, Steinbaugh ML. Prediction of stature from knee height for black and white adults and children with application to mobility-impaired or handicapped persons. J Acad Nutr Diet. 1994; 94: 1385-1388.

15. World Health Organization. Obesity: Preventing and managing the global epidemic, Report of a WHO Consulation on obesity. Geneva: World Health Organization. 1998.

16. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of National Cholesterol Education Program (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA. 2001; 285: 2486–97. DOI: 10.1001/jama.285.19.2486

17. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. JAMA 2003; 289(19): 2560–71. DOI: 10.1001/jama.289.19.2560

18. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2010; 33(Suppl. 1): S62– S69.

19. Hotz C, Peerson JM, Brown KH. Suggested lower cutoffs of serum zinc concentration for assessing population zinc status: A reanalysis of the second US National Health and Nutrition Examination Survey data (NHANES II: 1976–1980). Am J Clin Nutr. 2003; 78:756–64.

20. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1) Available from: http://www.who.int/vmnis/indicators/haemoglobin. pdf, accessed 6/12/2019.

21. FAO/WHO/UNU. Food and Agricultural Organization/World Health Organization Recommended intakes.1985. FAO/WHO/UNU, Report No. 724. 1985.

22. Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic disease. Compr Physiol . 2012; 2: 1143– 1211.

23. Smith N. The face of disability in Nigeria: a disability survey in Kogi and Niger States. Disability, CBR and Inclusive Development. 2011; 22:1. doi:10.5463/DCID.v22i1.11.

24. Pali L. Prevalence of disability in South Africa. Census 2001 [Internet]. Pretoria, South Africa: Statistics South Africa, Private Bag X44, Pretoria 0001 © Statistics South Africa, 2005 Users; 2005. Available from: http://www.statssa.gov.za/census/census_2001/disability/Disability.pdf

25. Chukwuonye II, Chuku A, John C, Ohagwu KA, Imoh ME, Isa SE et al. Prevalence of overweight and obesity in adult Nigerians – a systematic review. Diabetes Metab Syndr Obes. 2013; 6: 43–47.

26. Soler MA, Xandri GJ. Nutritional status of intellectual disabled person with Down syndrome. Nutr J. 2011; 26: 1059-1066.

27. Weil E, Wachterman M, McCarthy EP, Davis RB, O'Day B, Iezzoni LI et al. Obesity among adults with disabling conditions**. JAMA.** 2002; 288: 1265–1268.

28. Bozkir C, Ozer A, Pehlivan E. Prevalence of obesity and affecting factors in physically disabled adults living in the city centre of Malatya. BMJ Open. 2016; 6(9): e010289. doi: 10.1136/bmjopen-2015-010289

29. Adolfsson P, Sydner YM, Fjellström C, Lewin B, Andersson A. Observed dietary intake in adults with intellectual disability living in the community. *Food & Nutr Res.* 2008; **52.**

30. Froehlich-Grobe K, Lollar D. Obesity and Disability: Time to Act. Am J Prev Med. 2011; 41: 541–545.

31. Olamoyegun AM, Fawale MB, Oluyombo R. The relationship between measures of obesity and atherogenic lipids among Nigerians with hypertension. Malawi Med J. 2019; 31(3): 193-197. doi:10.4314/mmj.v31i3.5

32. Kabwama SN, Kirunda B, Mutungi G, Wesonga R, Bahendeka SK, Guwatudde D. Prevalence and correlates of abdominal obesity among adults in Uganda: findings from a national cross-sectional, population based survey 2014. BMC Obes. 2018: 3(5):40. doi: 10.1186/s40608-018-0217-1. PMID: 30524745; PMCID: PMC6276139.

33. National Institute of Health. The practical guide: identification, evaluation and treatment of overweight and obesity in adults. National Health, Lung and Blood Institute. NIH publication number: 00-4084. 2000.

34. Crowther NJ, Ferros WF, Ojwang PJ, Rheeder P. The effect of abdominal obesity on insulin sensitivity and serum lipid and cytokine concentrations African women. Clin Endocrinol (Oxf) 2006; 64(5):

535–541. doi: 10.1111/j.1365-2265.2006.02505.x

35. Weltman A, Despres JP, Clasey JL, Weltman JY, Wideman L, Kanaley J et al. Impact of abdominal visceral fat, growth hormone, fitness, and insulin on lipids and lipoproteins in older adults. Metabolism. 2003; 52: 73–80.

36. Faria AN, Ribeiro Filho FF, Gouveia Ferreira SR, Zanella MT. Impact of visceral fat on blood pressure and insulin sensitivity in hypertensive obese women. Obes Res. 2002; 10: 1203 –1206.

37. Després J. Abdominal obesity: the most prevalent cause of the metabolic syndrome and related cardiometabolic risk. *Eur Heart J Suppl*.2006; 8(B): B4-B12, https://doi.org/10.1093/eurheartj/sul002

38. Kim SW, Park GB, Kim HS, Shin JB, Kim JM, Bae MS. A survey on the health status of population with disability in Goyang city. J Korean Acad Rehab Med. 2011; 35: 77-83.

39. Ohwada H, Nakayama T, Nara N, Tomono Y, Yamanaka K. An epidemiological study on anemia among institutionalized people with intellectual and/or motor disability with special reference to its frequency, severity and predictors. BMC Public Health. 2006; 6: 85. https://doi.org/10.1186/1471-2458-6-85.

40. Labbaye C, Valtieri M, Barberi T, Meccia E, Masella B, Pelosi E et al. Differential expression and functional role of GATA-2, NF-E2, and GATA-1 in normal adult hematopoiesis. J Clin Invest. 1995; 95: 2346– 2358.

41. Garnica AD.Trace metals and hemoglobin metabolism. Ann Clin Lab Sci. 1981; 11: 220–8.

42. Hamzaid NH, O'Connor HT, Flood VM. Observed Dietary Intake in Adults with Intellectual Disability Living in Group Homes. Nutrients. 2020; 12: 37. doi:10.3390/nu12010037

43. Soler MA, Xandri GJ. (2011). Nutritional status of intellectual disabled persons with Down syndrome. Nutr Hosp. 2011; 26(5): 1059–1066. doi: 10.1590/S0212-16112011000500021.

44. Oviedo GR, Travier N, Guerra-Balic M. Sedentary and Physical Activity Patterns in Adults with Intellectual Disability. Int J Environ Res Public Health. 2017; 14: 1027.

45. Stancliffe RJ, Lakin K C, Larson S, Engler J, Bershadsky J, Taub et al. Overweight and obesity among adults with intellectual disabilities who use intellectual disability/developmental disability services in 20 US states. Am J Intellect Dev Disabil. 2011; 116(6): 401- 418.

46. Bhaumik S, Watson JM, Thorp CF, Tyrer F, McGrother CW. Body mass index in adults with intellectual disability: distribution, associations and service implications: a population-based prevalence study. J Intellect Disabil Res. 2008; 52 (4): 287–298.

47. Caskie GI, Sutton MC, Margrett JA. The relation of hypertension to changes in ADL/IADL limitations of Mexican american older adults. J Gerontol B Psychol Sci Soc Sci. 2010; 65B(3): 296–305.

48. de Ramirez SS, Enquobahrie DA, Nyadzi G, Magombo F, Ramirez M, Sachs S et al. Prevalence and correlates of hypertension: a cross-sectional study among rural populations in sub-Saharan Africa. J Hum Hypertens. 2010; 24(12): 786-795. doi:10.1038/jhh.2010.14

49. Grey JM, Totsika V, Hastings RP. Living with family: Perceptions of health and subjective well-being of adults with an intellectual disability. J Intellect Disabil Res. 2018; 62: 474–485. https://doi.org/10.1111/jir.12479

50. Li W, Wang Y, Shen L, Song L, Li H, Liu B et al. Association between parity and obesity patterns in a middle-aged and older Chinese population: A cross-sectional analysis in the Tongji-Dongfeng cohort study. Nutr Metab. 2016; 13(72). doi:10.1186/s12986-016-0133-7.

51. Roba HS, Beyene AS, Mengesha MM, Hawulte B. Prevalence of hypertension and associated factors in Dire Dawa City, Eastern Ethopia: A community-Based cross-sectional study. Int J Hypertens. 2019; 9.doi.org/10.1155/2019/9878437

52. Abdalla AA, Alagib ME, Balla SA. Socio-demographic Characteristics, Risk Factors and Awareness of Adults Hypertensive Population in Khartoum Locality, 2014. J adv. Med. 2019; 30(8): 1-9.

53. Hegde SM, Solomon SD . Influence of physical activity on hypertension and cardiac structure and function. Curr Hypertens Rep. 2015; 17: 77.