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Original Research Paper

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DIETARY AND CARDIO-METABOLIC RISK FACTORS AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS ATTENDING MEDICAL OUT-PATIENT CLINIC OF A FEDERAL TEACHING HOSPITAL IN NIGERIA

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ABSTRACT The increasing prevalence of cardio-metabolic risks contributes to an increase in the prevalence of diabetes mellitus. Although the cardiovascular risk factors among type 2 diabetic patients is well known, the dietary and cardio-metabolic risk factors has not been fully investigated. This study was carried out to determine the cardio-metabolic risk factors in 45 purposively-selected adult diabetic patients attending the Medical Out-Patient Clinic, University College Hospital (UCH), Ibadan. A 24-hour dietary recall was used to determine the dietary intake of the patients. Weight and height were measured to determine body mass index (BMI) which was categorized as underweight (<18.5kg/m2), normal weight (18.5-24.9kg/m2), overweight (25-29.9kg/m2) and obese (≥30.0kg/m2) and also waist-hip ratio. Biochemical parameters (triglyceride, blood pressure, total cholesterol, fasting blood glucose, high and low density lipoprotein cholesterol) were obtained from their hospital records. Data were analyzed using descriptive statistics, Chi-square test and correlation at $p<0.05$. The mean age of the patients was 61.3±8.15 years. Their mean BMI was 30.2±6.94kg/m^2. About (37.8%) of the patients had systolic stage one hypertension, 88.9% had normal triglyceride, 55.6% had normal fasting blood glucose and 80.0% had normal total cholesterol. Less than half (44.4%) of the patients were obese, 33.3% had high waist-hip ratio. A positive and significant correlation was only observed between regular exercise and fasting blood glucose of the patients. The cardio-metabolic risk factors were slightly high among type 2 diabetic patients in UCH, Ibadan. Diabetic individuals should be educated to maintain healthy lifestyles, comply with the right diets in order to reduce complications.

KEYWORDS : Type 2 diabetes mellitus, Cardio-metabolic risk factors, Dietary factors,

Background of the study

Diabetes Mellitus, particularly Type 2 which accounts for about 90-95% of all cases in Nigeria is one of the most significant public health challenges of the 21st century (1). Type 2 DM is highly associated with a family history of diabetes, ethnicity and previous gestational diabetes combined with older age, overweight and obesity, unhealthy diet, physical inactivity and smoking (2). Patients with diabetes will develop nephropathy and many will progress to end-stage renal disease, necessitating dialysis or kidney transplantation (3,4).

The WHO Global Report (5) stated that Nigeria has the greatest number of people living with Diabetes in Africa with an estimated burden of about 1.7 million which will increase to 4.8 million by 2030. According to American Diabetes Association (6), about 18.3% (8.6 million) of Americans age 60 and older have diabetes. Diabetes mellitus prevalence increase with age and the numbers of older persons with diabetes are expected to grow as the elderly population increase in number. Also, cardio-metabolic risks refers to a high lifetime risk for cardiovascular diseases (CVD). The specific factors that can cause this increased risk include obesity, hyperglycemia, hypertension, insulin resistance and dyslipidemia (6).

Cardio-metabolic risk factor is a condition in which possibilities of developing atherosclerotic cardiovascular diseases and diabetes mellitus are significantly enhanced as a consequence of the presence of atherogenic dyslipidemia (7). Cardio-metabolic risk is particularly prevalent in patients diagnosed as having metabolic syndrome (7).

According to the International Diabetes Federation, metabolic syndrome has been defined by the presence of a waist circumference above 94 cm in males and 80 cm in females. Risk factors for diabetes often cluster, including unhealthy diet, obesity, insulin resistance and hypertension. These conditions can also occur in isolation and they are exaggerated by physical inactivity and smoking (8).

Studies have reported the prevalence of diabetes to be high in various States in Nigeria (9,10). However, limited information exists about the dietary and cardio-metabolic risk factors in the adult Nigerian diabetic population.

The study is set out to investigate the association between dietary and cardio-metabolic risk factors and diabetes mellitus in adult patients attending the Medical Out-Patient Clinic, University College Hospital, Ibadan.

Due to the identified gap in research, it is important that a study of this nature be conducted as the findings from this study will be an additional information on the dietary and cardio-metabolic risk factors of adult diabetic patients.

Methodology

Study Design

This was a descriptive cross-sectional study.

Study Population and sample size

Participants for the study were 45 adult patients who had type 2 diabetes mellitus and are attending the Medical Out-Patient Clinic, University College Hospital, Ibadan Oyo State, Nigeria.

Inclusion Criteria

Male and female patients who are diabetic and are between the ages 18 and 85 and who gave their consent to participate were included in the study.

Exclusion Criteria

Male and female patients who do not have type 2 diabetes mellitus, type 2 diabetic patients who are below 18 and those above 85 years of age and those who do not give their consent to participate in the study were excluded from the study

Ethical Consideration

Ethical approval was obtained from the University of Ibadan /University College Hospital, Ibadan (UI/UCH) research and ethical review committee at the Institute of Advanced Medical Research and Training (IAMRAT) and verbal consent was

obtained from each of the respondents before the administration of the questionnaire.

RESULTS

Adequacy of intake of the Patients

Table 1 below shows that only 12(26.7%) had adequate energy intake while 18(40.0%) had inadequate intake. More than half 24(53.3%) of the respondents had excess protein intake. The carbohydrate requirement of the respondents were almost equally distributed with 14(31.1%) adequate, 14(31.1%) excess and 17(37.8%) inadequate.Fiber intake was largely low and 38(84.4%) of the respondents did not meet the recommended requirements. Fat was also less consumed than needed with 35(77.8%) inadequate, 5(11.1%) adequate and 5(11.1%) excess.

Table 1: Adequacy of Intake of the Patients

Macronutrient Adequacy of the Patients

Variables	Female (n=45) (%)	Male (n=45) (%)	Total (n=45) (%)	X^2	p-value
Energy Adequacy					
Inadequate	15(41.7)	3(33.3)	18(40.0)	0.313	0.855
Adequate	9(25.0)	3(33.3)	12(26.7)		
Excess	12(33.3)	3(33.3)	15(33.3)		
Protein Adequacy	12(33.3)				
Inadequate	12(33.3)	1(11.1)	13(28.9)	1.731	0.421
Adequate	6(16.7)	2(22.2)	8(17.8)		
Excess	18(50.0)	6(66.7)	24(53.3)		
Carbohydrate Adequacy					
Inadequate	13(36.1)	4(44.4)	17(37.8)	0.436	0.804
Adequate	12(33.3)	2(22.2)	14(31.1)		
Excess	11(30.6)	3(33.3)	14(31.1)		
Fiber Adequacy					
Inadequate	29(80.6)	9(100.0)	38(84.4)	2.072	0.355
Adequate	1(2.8)	0(0.0)	1(2.2)		
Excess	6(16.7)	0(0.0)	6(13.3)		
Total Fat Adequacy					
Inadequate	28(77.8)	7(77.8)	35(77.8)	2.500	0.287
Adequate	5(13.9)	0(0.0)	5(11.1)		
Excess	3(8.3)	2(22.2)	5(11.1)		

Anthropometric Variables of the Patients

Table 2 shows that almost half 20(44.4%) of the respondents were obese, 13(28.9%) had normal weight while 12(26.7%) overweight at the time of data collection. For the respondent's waist to hip ratio, almost half 22(48.9%) of the respondents were at low risk, 8(17.8%) were at moderate risk while 15(33.3%) were at high risk.

Table 2: Anthropometric Variables of the Patients

Variables	Male n (%)	Female n (%)	Total n (%)	X^2	p-value
BMI					
Underweight	0(0.0)	0(0.0)	0(0.0)	4.944	0.084
Normal	2(22.2)	11(30.6)	13(28.9)		
Overweight	5(55.6)	7(19.4)	12(26.7)		
Obese	2(22.2)	18(50.0)	20(44.4)		
Waist/Hip ratio					
Low risk	9(100.0)	13(36.1)	22(48.9)	0.000	0.000
Moderate risk	0(0.0)	8(22.2)	8(17.8)	0.000	
High risk	0(0.0)	15(41.7)	15(33.3)		
Waist to hip ratio (male)	0.84	0.05			
Waist to hip ratio (female)	0.83	0.77			

Biochemical Assessment of the Patients

Table 3 shows that more than half 25(55.6%) of the respondents had normal blood glucose, 7(15.6%) had borderline while 13(28.9%) had high fasting blood glucose level at the time of the study. Majority 40(88.9%) of the respondents had normal triglycerides level. Only 4(8.9%) had normal systolic blood pressure, 16(35.5%) had pre-hypertension systolic blood pressure, about 17(37.8%) had stage 1 hypertension. About 19(42.2%) had normal diastolic blood pressure while 11(24.4%) had pre-hypertension diastolic blood pressure. A high percentage 36(80.0%) of the respondents had normal total cholesterol levels. About half 23(51.1%) had low high-density lipoprotein while 21(46.7%) had normal low density lipoprotein levels.

Table 3: Biochemical Assessment of the Patients

Variables	Male n (%)	Female n (%)	Total n (%)	X^2	p-value
Fasting blood glucose levels					
Normal	7(77.8)	18(50.0)	25(55.6)	2.374	0.305
Borderline	1(11.1)	6(16.7)	7(15.6)		
High	1(11.1)	12(33.3)	13(28.9%		
Triglycerides					
Normal	9(100.0%	31(86.1)	40(88.9)	1.406	0.236
Borderline high	0(0.0)	5(13.9)	5(11.1)		
High	0(0.0)	0(0.0)	0(0.0)		
Blood pressure Systolic					
Normal	1(11.1)	3(8.3)	4(8.9)	0.653	0.884
Pre-hypertension	4(44.4)	12(33.3)	16(35.5)		
Stage 1 hypertension	3(33.3)	14(38.9)	17(37.8)		
Stage 2 hypertension	1(11.1)	7(19.4)	8(17.8)		
Diastolic					
Normal	6(66.7)	13(36.1)	19(42.2)	3.559	0.313
Pre-hypertension	2(22.2)	9(25.0)	11(24.4)		
Stage 1 hypertension	1(11.1)	8(22.2)	9(20.0)		
Stage 2 hypertension	0(0.0)	6(16.7)	6(13.3)		
Total cholesterol					
Normal	6(66.7)	30(83.3)	36(80.0)	1.563	0.458
Borderline high	2(22.2)	3(8.3)	5(11.1)		
High	1(11.1)	3(8.3)	4(8.9)		
HDL Cholesterol					
Low risk	2(5.6)	0(0.0)	2(4.4)	0.543	0.762
Normal	16(44.4)	4(44.4)	20(44.4)		
High risk	18(50.0)	5(55.6)	23(51.1)		
LDL Cholesterol					
Optimal	1(11.1)	4(11.1)	5(11.1)	0.074	0.999
Near optimal	4(44.4)	17(47.2)	21(46.7)		
Borderline high	1(11.1)	4(11.1)	5(11.1)		
High	2(22.2)	8(22.2)	10(22.2)		
Very high	1(11.1)	3(8.3)	4(8.9)		
Total	9(100.0)	36(100.	45(100.0)		

DISCUSSION

The study showed that mean age of the patients was 61.29±8.15years. Majority of the diabetics were in age group 61-70 years. This counters a study by Rathmann & Giani (11) which stated that majority of the diabetics were in age group of 45-64 years. The age prevalence reflects that the onset of diabetes is during adulthood and it is usually after the age of forty years (12). Type 2 diabetes can strike at any age, even in infancy. However, persons who are middle-aged and older are most likely to develop type 2 diabetes. Age 45 or older, a family history of diabetes, being overweight, or being obese all increase your risk of developing type 2 diabetes.

Macronutrient adequacy of some of the subjects in this study was inadequate. Dietary non-compliance is still common among T2DM patients (13,14). Dietitians need to improve their skills and use more effective intervention approaches in providing dietary counseling to patients.

Majority of the patients were overweight and obese. The increase in the prevalence of obesity has been associated with an increase in the prevalence of type 2 diabetes (15). Overweight has been shown to be a known risk factor for type 2 diabetes (16). Although not all obese individuals develop type 2 diabetes and not all individuals with type 2 diabetes are obese (16). According to reports, children and young people who are very obese during childhood and adolescence are more likely to develop type 2 diabetes. T2DM, which typically has no symptoms, is frequently not identified until a random blood glucose reading is taken (17). About one-third of the subjects had high waist-hip ratio. Despres *et al*., (18) reported that several studies revealed that waist-hip ratio may be a better indicator of the risk of developing type 2 diabetes mellitus than BMI. Regardless of the disputed results on whether obesity indicators is more accurate, every study included in a meta-analysis demonstrated that either BMI or waist-hip ratio independently predicted or was linked with type II diabetes (19).

Majority of the patients exhibited normal total cholesterol, slightly normal fasting blood glucose, normal triglycerides, low high-density lipoprotein cholesterol and slightly high low density lipoprotein cholesterol. This was however contrary to the study by Gaede *et al*., (20) which stated that dyslipidemia occurs in diabetics as a result of metabolic derangement due to insulin resistance leading to a deficit in lipid handling which causes hypertriglyceridemia, low serum high-density lipoprotein cholesterol and occasionally high serum low-density lipoprotein cholesterol. Simone et al (21) suggested that diabetes modulates cholesterol metabolism more than obesity alone.

CONCLUSION

This study showed that there were high cardio-metabolic risk factors among type 2 diabetic patient in the University College Hospital, Ibadan. Many individuals had impaired glucose tolerance and a large number of them were undiagnosed. The dietary habits, old age and lack of exercise contributed to the progression of the disease. An increase in physical activity, healthy choice of diet and regular follow-up at the clinic is necessary to prevent complications and improve quality of life. Dietary management is an effective and cheaper approach to improve glycemic control compared to the use of drugs and insulin.

Limitations of the study

- The major limitations of this study were the low number of patients, unwillingness of some patients to participate in the study and financial constraint.

Declarations

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REFERENCES

1. Ogbera AO, Ekpebegh C. Diabetes mellitus in Nigeria: The past, present and future. World J Diabetes. 2014 Dec 15;5(6):905–11.
2. World Health Organnization. Global Report on Diabetes. Diabetes Fact Sheet [Internet]. 2018 [cited 2022 Aug 31]. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes
3. Lea JP, Nicholas SB. Diabetes mellitus and hypertension: key risk factors for kidney disease. J Natl Med Assoc. 2002 Aug;94(8 Suppl):7S-15S.
4. Fabusoro OK. Serum Albumin and Nutritional Status of Patients with Chronic Kidney Disease: A Hospital-Based Study. 2016 Oct [cited 2022 Aug 20]; Available from: https://hdl.handle.net/2142/110099
5. World Health Organnization. Global report on diabetes [Internet]. 2016 [cited 2022 Aug 31]. Available from: https://www.who.int/publications-detail-redirect/9789241565257
6. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2006 Jan;29 Suppl 1:S43-48.
7. Ruilope LM, de la Sierra A, Segura J, Garcia-Donaire JA. The Meaning of Cardiometabolic Risk in Hypertensive Patients. Eur Endocrinol. 2007;1:51–4.
8. Klonoff DC, Buse JB, Nielsen LL, Guan X, Bowlus CL, Holcombe JH, et al. Exenatide effects on diabetes, obesity, cardiovascular risk factors and hepatic biomarkers in patients with type 2 diabetes treated for at least 3 years. Curr Med Res Opin. 2008 Jan;24(1):275–86.
9. Ekpenyong CE, Akpan UP, Ibu JO, Nyebuk DE. Gender and age specific prevalence and associated risk factors of type 2 diabetes mellitus in Uyo metropolis, South Eastern Nigeria. Diabetol Croat. 2012 Mar 1;41(1):17–29.
10. Ojewale LY, Adejumo PO. Type 2 Diabetes Mellitus and Impaired Fasting Blood Glucose in Urban South Western Nigeria. Dubai Diabetes Endocrinol J. 2012;20:1–12.
11. Rathmann W, Giani G. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004 Oct;27(10):2568–9; author reply 2569.
12. International Diabetes Federation. Diabetes and cardiovascular disease [Internet]. Brussels, Belgium; 2016. Available from: www.idf.org/cvd
13. Tan SL, Juliana S, Sakinah H. Dietary compliance and its association with glycemic control among poorly controlled type 2 diabetic outpatients in Hospital Universiti Sains Malaysia. Malays J Nutr. 2011 Dec;17(3):287–99.
14. Fabusoro OK, Oladele BB. Influence of Knowledge and Dietary Compliance on the Glycemic Control and Nutritional Status of Diabetes Mellitus Patients in Ibadan, Nigeria: A Hospital Based Study. 2016 Oct [cited 2022 Aug 20]; Available from: https://hdl.handle.net/2142/110100
15. Prevalence of Obesity, Diabetes, and Obesity-Related Health Risk Factors, 2001 | Obesity | JAMA | JAMA Network [Internet]. [cited 2022 Aug 31]. Available from: https://jamanetwork.com/journals/jama/fullarticle/195663
16. Eckel RH, Kahn SE, Ferrannini E, Goldfine AB, Nathan DM, Schwartz MW, et al. Obesity and Type 2 Diabetes: What Can Be Unified and What Needs to Be Individualized? J Clin Endocrinol Metab. 2011 Jun;96(6):1654–63.
17. Malone JI, Hansen BC. Does obesity cause type 2 diabetes mellitus (T2DM)? Or is it the opposite? Pediatr Diabetes. 2019;20(1):5–9.
18. Després JP. Visceral obesity, insulin resistance, and dyslipidemia: contribution of endurance exercise training to the treatment of the plurimetabolic syndrome. Exerc Sport Sci Rev. 1997;25:271–300.
19. Qiao Q, Nyamdorj R. Is the association of type II diabetes with waist circumference or waist-to-hip ratio stronger than that with body mass index? Eur J Clin Nutr. 2010 Jan;64(1):30–4.
20. Gaede P, Vedel P, Larsen N, Jensen GVH, Parving HH, Pedersen O. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. N Engl J Med. 2003 Jan 30;348(5):383–93.
21. Simonen PP, Gylling HK, Miettinen TA. Diabetes Contributes to Cholesterol Metabolism Regardless of Obesity. Diabetes Care. 2002 Sep 1;25(9):1511–5.