ORIGINAL ARTICLE

Lifestyle habits of offspring of patients with type 2 diabetes mellitus

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Abstract

Background: To determine the lifestyle habits of offspring of patients with type 2 diabetes mellitus (T2DM) and the practice of diabetes mellitus (DM) screening among them.

Materials and Methods: This was a hospital based descriptive cross-sectional study conducted at the Jos University Teaching Hospital (JUTH). Participants were offspring of patients with T2DM who accompanied their parents to the DM clinic or took care of their parents while on admission in the hospital. They were recruited consecutively after obtaining consent. A questionnaire was used to obtain socio-demographic and clinical data from the participants. Anthropometric measurements were taken to determine Body Mass Index (BMI) and Waist Hip Ratio (WHR).

Results: A total of 100 offspring were recruited, males being 53 (53%) with a female: male ratio of 1:1.13. The mean age ± SD of the study population was 33±10 years. Less than half 49 (49%) of the participants engaged in some form of exercise. Twenty-four (24%) and 18 (18%) participants consumed fruits and vegetables daily respectively. Less than half 40 (40%) of the participants had been screened for DM at some point in their lives. Daily intake of fruits (OR 3.45, 95% CI 1.11-10.70) and vegetables (OR 4.19, CI 1.13-15.52) were found to be independently associated with DM screening.

Key words: Type 2 diabetes mellitus, offspring, lifestyle habits, screening, diet

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Introduction

Diabetes mellitus (DM), a major public health problem, is a chronic metabolic disorder of carbohydrate, protein and fat metabolism caused by absolute or relative insulin deficiency.[1] Type 2 diabetes mellitus (T2DM) which accounts for about 90% of the global population of patients with DM can be prevented or delayed by lifestyle changes including increased physical activity and healthy eating.[1,2] An estimated 536.6 million adults aged 20-79 years had diabetes in 2021 and this is expected to rise to 783.2 million by 2045.[1] Among Africans, the prevalence of diabetes is projected to rise from 4.7% in 2019 to 5.2 % by 2045 with 59.7% being undiagnosed.[1] According to a meta-analysis,[3] the prevalence of DM has increased from 1.7% in 2017 to 5.8% in 2018 in Nigeria. To reverse this trend, increase in awareness of the risk factors and education on prevention of T2DM are essential. Aside from obesity, old age, physical inactivity, unhealthy diet and prediabetes, family history of T2DM is also an important risk factor for the development of T2DM and serves as a target for prevention. T2DM which occurs insidiously, is more common in individuals with a family history of the disease and in members of certain racial/ethnic groups.[4] A study conducted in the United states of America (USA) reported that parental history of diabetes was associated with an almost threefold increase in diabetes risk.[5] Valdez et al reported that family history of diabetes has a significant, independent, and graded association with the prevalence of DM.[6] In yet another study conducted in the USA, Baptiste-Roberts and colleagues reported that having a family history of diabetes is associated with better awareness of diabetes risk factors, more daily consumption of fruits and vegetables, and participation in diabetes screening.[7] Physical inactivity, inadequate intake of fruits and vegetables were reported to be common among university employees in a study conducted in Jos, Nigeria.[8]

Prevention of T2DM through lifestyle changes (diet and physical activity) is of public health importance. Increased physical activity and healthy diet have been associated with lower prevalence of T2DM.[9, 10] It is recommended that increased physical activity of moderate intensity such as walking at least 150 minutes per week and intake of high amounts of fruits and vegetables as well as reduced fatty foods lead to reduced prevalence of T2DM.[4,11] Obesity and overweight have been reported to be seen in offspring of patients with T2DM.[12]

Other lifestyle habits that can be targeted in T2DM prevention include cigarette smoking and excessive alcohol use which are risk factors for T2DM.[13,14] Cigarette use is associated with a 30-40% increase risk of developing T2DM with insulin resistance and inflammatory markers being the pathogenic mechanisms.[13] Insulin resistance is also seen in excessive alcohol use with its deleterious effects seen when consumption is 60g/d and 50g/d in men and women respectively.[14,15]

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Screening of offspring of patients with T2DM is therefore important in the prevention of the disease and its complications and should be considered at 3-year intervals beginning at age 45, particularly in those with Body Mass Index (BMI) of ≥ 25 kg/m^2. It should be considered at a younger age or performed more frequently in individuals who are overweight and have one or more risk factors of T2DM.[4]

In this study, we examined the lifestyle habits of offspring of patients with T2DM as well as the practice of DM screening among them.

Methods

Study design and setting

This was a descriptive study conducted among offspring of patients with T2DM attending the diabetes clinic of the Jos University Teaching Hospital (JUTH) and those admitted in the hospital for medical care. JUTH is a tertiary institution located in Plateau State, North central zone of Nigeria.

Data collection

One hundred offspring of patients with T2DM attending the diabetes clinic of JUTH were recruited over a period of 7 months beginning from 21st February 2021. The participants were offspring of patients with T2DM who accompanied their parents to the DM clinic or took care of their parents while on admission in the hospital. They were recruited using the convenience sampling method where consecutive subjects satisfying the inclusion criteria (offspring of patients with T2DM, age ≥ 18years and not known to have DM) were enrolled. Offspring known to have DM were excluded from the study. Also excluded were offspring of patients whose diagnosis of DM was less than 1 year. A questionnaire was used to obtain data in an interview format. Data obtained included socio-demographic and clinical data. Information about diet (including intake of fruits, vegetables and fatty foods like butter, margarine, ice cream, unskimmed yoghurt), exercise, participants' awareness of his/her risk of DM, presence of hypertension, level of education and DM screening were collected. Information about the parent with DM was also collected. Weight in kilogramme and height in metres of the individuals were measured using a weighing scale and a stadiometer respectively with the participants standing upright and wearing light clothes with no head gear and foot wears. BMI was calculated using this formula

$$\frac{\text{Weight (kilogramme)}}{\text{Height}^2\text{(metres)}}$$

Waist circumference (WC) was measured in centimetres (cm) with a non -stretch metric tape on bare skin horizontally around the waist, at the level of the midpoint between the iliac crest and the lower costal margin.[16] It was measured to the nearest cm. Hip circumference (HC) was measured in cm with a non - stretch metric tape with the patient wearing light clothes at the level of maximum circumference around the buttocks (posteriorly) and the pubic symphysis (anteriorly).[17] It was measured to the nearest cm. Waist Hip Ratio (WHR) was calculated by dividing the WC by the HC.[17]

BMI, WC and WHR were used to assess obesity. A BMI of <18.5kg/m^2 was considered underweight, BMI of 18.8-24.9kg/m^2 was considered normal, a BMI of 25-29.9kg/m^2 was considered overweight while 30kg/m^2 and above was considered obese.[16] Also considered as obesity were WC of ≥80cm in females, WC of ≥94cm in males, WHR of ≥ 0.90 in males and WHR of ≥ 0.85 in females.[17]

Ethical Considerations

The study was approved by the Health Research Ethics Committee of JUTH. A verbal and written consent was also obtained from every participant before enrollment into the study. All information obtained was treated with confidentiality

Data analysis

The EPI- Info version 7.2.2.6 (CDC Atlanta, Georgia USA) statistical software was used for data analysis. Quantitative variables were summarised using mean and standard deviation (SD). Categorical variables were expressed using frequencies and percentages. To compare means, the student t –test was used. Where the expected frequency of a cell was <5, Fisher's exact test was used. To determine the significance of association between categorical variables, chi Square (X^2) test was used. Variables with P values ≥ 0.25 on univariate analysis were entered into a multiple logistic regression model to determine their independent association with DM screening. In all cases, p- value of <0.05 was considered statistically significant.

Results

One hundred offspring of patients with T2DM were recruited. The age range was 18 to 67years with the mean ± SD being 33 ± 10 years. There were more males (53; 53%) with the female to male ratio of 1:1.13. Majority 60 (60%) of the offspring had a mother only with T2DM, 32 (32%) had a father only with T2DM and 8 (8%) had both parents with T2DM. The knowledge of being at risk of DM was reported in 62 (62%) participants. Only 49 (49%) engaged in any form of exercise with 68 (68%) knowing that exercise can delay or prevent T2DM; 17 (17%) and 3 (3%) took alcohol and smoked cigarette respectively. More than half 58 (58%) of the participants'

Table1; Characteristics and univariate analysis of the study population

Variables	Total n(%)	DM screening; Yes (40), n(%)	DM screening, No (60), n (%)	P value
Age range	18- 67 years			
Age, years, mean±SD	33±10	37± 12	31± 8	0.002*
Age, years, ≥35	43(43)	22(51.2)	21(48.8)	0.05*
Females	47(47)	21(52.5)	26(55.3)	0.37
Exercise	49(49)	22(44.9)	27(55.1)	0.33
Exercising for ≥ 150 minutes per week	20 (20)	8 (40)	12 (60)	1.0
Alcohol use	17(17)	8(47.1)	9(52.9)	0.52
Cigarette use	3(3)	2(66.7)	1(33.3)	0.35#
Duration of parents' DM ≥10 years	58(58)	24 (41.4)	34(58.6)	0.72
Parent with DM, mother	60(60)	29(48.3)	31(51.7)	0.04*
Level of education > 6 years	90(90)	34(37.8)	56(62.2)	0.15*
Parent's level of education >6 years	43(43)	15(34.9)	28(65.1)	0.37
Presence of DM complications	81(81)	33(40.7)	48(59.3)	0.76
Knowledge of being at risk of DM	62(62)	29(46.8)	33(53.2)	0.08*
Knowing that exercise can prevent/delay DM	68(68)	31(45.6)	37(54.4)	0.05*
Presence of hypertension	11(11)	8(72.7)	3(27.3)	0.02*
Intake of high fatty food	58 (58)	23 (39.7)	35 (60.3)	0.93
Intake of fruits	99 (99)	39 (39.4)	60 (60.6)	0.4#
Intake of vegetables	100 (100)	40 (40	60 (60)	1.0
Daily intake high fatty food	10(10)	9(90)	1(10)	0.05#*
Daily fruit intake	24(24)	14(58.3)	10(41.7)	0.04*
Daily vegetable intake	18(18)	10(55.6)	8(44.4)	0.14*
BMI mean ± SD	25.2±5.5	26±6.7	24.3±4.4	0.06*
BMI kg/m^2 ≥25	46(46)	22(47.8)	24(52.2)	0.14*
WC, mean±SD, Females	86.8±15.4	90.7±17.8	83.6±16.6	0.12*
WC females ≥80cm	30(30)	16(53.3)	14(46.7)	0.08*
WC, males, mean±SD	82.4±10	86.9±10.9	79.9±8.6	0.01*
WC males ≥94cm	8(8)	5(62.5)	3(37.5)	0.16#*
WHR, females, mean±SD	0.84±0.06	0.86±0.07	0.83±0.62	0.14*
WHR ≥0.85, females	21(21)	12(57.1)	9(42.9)	0.07*
WHR, mean, males±SD	0.88±0.06	0.89±0.05	0.87±0.07	0.22*
WHR, ≥0.9, males	19(19)	8(42.1)	11(57.9)	0.83

-Fisher exact, * -p value ≤ 0.25, BMI- Body Mass Index, DM- Diabetes Mellitus, WC- waist circumference, WHR- waist-hip ratio, level of education > 6 years- secondary school education and above

Table 2; Independent correlates of DM screening

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Age (≥35/<35years)	1.6266	0.5771	4.5846	0.4865	0.5287	0.9203	0.3574
BMI (≥25/<25kg/m2)	0.5281	0.1242	2.2450	-0.6384	0.7383	-0.8647	0.3872
Daily high fatty food intake(Yes/No)	0.1476	0.0144	1.5111	-1.9135	1.1869	-1.6122	0.1069
Daily fruit intake(Yes/No)	3.4511	1.1132	10.6996	1.2387	0.5773	2.1457	0.0319*
Daily vegetable intake(Yes/No)	4.1929	1.1325	15.5242	1.4334	0.6679	2.1462	0.0319*
Education level(> 6/≤6 years)	0.8470	0.1229	5.8372	-0.1661	0.9849	-0.1686	0.8661
Knowledge of being at risk of DM(Yes/No)	3.0444	0.9910	9.3523	1.1133	0.5726	1.9442	0.0519
Knowing that exercise can prevent/ delay DM(Yes/No)	1.3986	0.4640	4.2159	0.3355	0.5630	0.5959	0.5512
Presence of hypertension(Yes/No)	1.7514	0.3093	9.9157	0.5604	0.8846	0.6335	0.5264
Parent with DM(mother/father)	1.7187	0.7205	4.0997	0.5416	0.4436	1.2209	0.2221
WC-females (≥80/<80cm)	0.7309	0.1015	5.2647	-0.3135	1.0074	-0.3112	0.7557
WC-males (≥94/<94cm)	0.2286	0.0289	1.8094	-1.4756	1.0554	-1.3981	0.1621
WHRfemales (≥0.85/<0.85)	0.4556	0.0724	2.8678	-0.7861	0.9386	-0.8375	0.4023
CONSTANT	*	*	*	-0.4331	2.0740	-0.2088	0.8346

*Statistical significance, BMI- body mass index, DM- diabetes mellitus, WC- waist circumference, WHR- waist hip ratio, level of education > 6 years - secondary school education and above, level of education < 6 years- no formal education or primary school education

parents had DM for at least 10 years. Almost all 90 (90%) of the participants had more than 6 years of education (at least secondary school education). Less than half 46 (46%) of the offspring were overweight or obese using BMI with 30 (30%) and 8 (8%) of females and males respectively being obese using WC. Twenty-one (21%) of females and 19(19%) of males were obese using WHR. Though all the participants took vegetables, less than a quarter 17 (17) took it daily. Almost all 99 (99%) took fruits but only 24 (24)) took it daily. Among the participants that took fatty foods 58 (58%), 10(10%) took it daily. See Table 1

DM screening was performed by 40 (40%) of the offspring at some point in their lives, majority of whom were females 21 (52.5%). Participants who had DM screening were older with a mean age ± SD of 37±12 years compared to 31±8 years in those who did not. More than half 22(51.2%) of those who screened for DM were aged 35 years and above and 34 (37.8%) had more than 6 years of education (at least secondary school education). Twenty-four (41.4%) of the participants who screened for DM had a parent with T2DM for at least 10 years with 29(48.3%) having a mother with DM. See Table 1.

Univariate analysis revealed that age ≥ 35 years (P= 0.05), having a mother with T2DM (P=0.04), higher level of education (P= 0.15), knowledge of being at risk of T2DM (P= 0.08), knowing that exercise can prevent/ delay T2DM (P= 0.05), presence of hypertension (P= 0.02), abnormal BMI of ≥25kg/m^2 (P= 0.14) abnormal WC of ≥ 80cm in females (P= 0.08), abnormal WC of ≥ 94cm in males (P= 0.16), abnormal WHR of ≥ 0.85 in females (P= 0.07), daily intake of fatty food (P= 0.05), daily intake of fruits (P= 0.04) and daily intake of vegetables (P= 0.14) were associated with DM screening. See Table 1

On multivariate analysis, daily intake of fruits (OR 3.45, 95% CI 1.11-10.70) and daily intake of vegetables (OR 4.19, CI 1.13-15.52) were found to be independently associated with DM screening. See Table 2

Discussion

Family history of DM as a risk factor for T2DM has a significant, independent, and graded association with the prevalence of diabetes.[6] We found that majority (62%) of the participants were aware of their risk of T2DM due to the presence of T2DM in a parent. A study conducted among young healthy male offspring of patients with T2DM aged 19 to 28 years with a median age of 22 years in Seoul, South Korea, reported that 9.9% of the participants thought that they might develop DM in the future.[18] Our finding in this study is higher than what was reported in the study in South Korea. The difference in the age group studied could explain the disparity. The population in our study was older (mean age of 33 ± 10 years with a range of 18 to 67 years) which may have impacted on the consciousness of their health leading to the higher awareness of their increased risk of DM.

Our findings also revealed that though offspring of

patients with T2DM consumed fruits and vegetables, only a few took it daily. This was corroborated in a study in the USA.[7] It has been established that consumption of high amount of fruits and vegetables (at least 2 servings per day) can modify the development of T2DM.[11]

Although 68 (68%) participants had the knowledge that exercise can delay or prevent T2DM, only 49 (49%) participated in any form of exercise with less than half (20%) exercising for at least one hundred and fifty minutes per week. This was also reported in a study in the USA where 34% of descendants of T2DM patients were found to be sedentary.[7] In the general population, studies in Nigeria reported a high prevalence of physical inactivity.[8,19]

In this study, 46 (46%) participants were overweight or obese. This is similar to the prevalence of overweight/ obesity in a study conducted in Jos, Nigeria, where the prevalence was reported to be 44.9%[20]. This however, was the prevalence in the general population. Among offspring of patients with T2DM, studies in the USA and Mexico reported higher overweight and obesity prevalence rates of 85% and 87.2% respectively.[7,12] This may be because the countries rank higher in the World Health Organisation global ranking for obesity than Nigeria where this study was conducted.[21]

The use of alcohol and cigarette use in this study was reported to be 17% and 3% respectively. This is similar to prevalence rates reported in a study conducted in Nigeria where a prevalence of 24.0% and 2.9 % were reported for alcohol use and cigarette smoking respectively.[8,] However, this study was conducted among university employees and not offspring of patients with T2DM.

In this study, though 62 (62%) of the participants were aware of their risk of developing T2DM in the future, less than half 40 (40%) of the participants had screened for DM at least once in their lifetime. In a study in the USA, Baptiste-Roberts and colleagues reported that 76.4% of the participants had screened for DM; 36% of this population were older than 50 years.[7] The lower rate of screening in our study could be attributed to the younger age group recruited as only 15 (15%) of the participants were aged $\geq$ 45 years which is the recommended age at which screening for T2DM should be conducted.[4] Another reason may be that 38 (38%) of the study participants in this study were unaware of their risk of developing DM which may have affected the screening rate. DM screening in the general population is also low which may impact on screening among high risk individuals such as those with first degree relatives with DM. In another study conducted in the USA among the general population, less than half (46.2%)of the study population self- reported screening for DM.[22]

On multivariate analysis, daily intake of fruits and vegetables were found to be independently associated with DM screening. Healthy eating habits and screening for DM are all preventive measures for the development of T2DM indicating that consciousness of one's health can lead to healthy eating habits and screening for DM.

One of the limitations of this study is that data was self-reported and so may not reflect the actual practice of the participants as some may report what they think is acceptable. Additionally, this was a hospital based study and so findings cannot be generalized to the public.

In conclusion, the offspring of patients with T2DM had poor healthy habits reflecting in the low screening for DM. This calls for concerted efforts in educating these people and other at risk individuals of the preventive measures of T2DM in order to reduce the burden of this disorder.

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