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Relationship between dyslipidemia and sexual dysfunction among type 2 diabetics in Tema Metropolis of Ghana

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ABSTRACT

Background: The prevalence of diabetes is high and still rising worldwide. This study sought to investigate the influence of dyslipidemia on the risk of sexual dysfunction among type 2 diabetics in Tema Metropolis of Ghana.

Methods: An analytical cross-sectional study design was employed and involved 246 type 2 diabetics selected through consecutive sampling from Tema General Hospital. Sexual dysfunction was evaluated using the Golombok Rust Inventory of Sexual Satisfaction questionnaire. Lipid profile of subjects was determined and dyslipidemia diagnosed according to the National Cholesterol Education Program-Adult Treatment Panel III criteria. Regression analysis was performed to determine the association between dyslipidemia and sexual dysfunction.

Results: About 64.9% and 66.4% of male and female diabetics had sexual dysfunction respectively. The prevalence of combined/mixed dyslipidemia were 46.2% and 48.3% among male and female diabetics respectively. In male diabetics, hypercholesterolemia was significantly associated with sexual dysfunction. Male diabetics that had hypercholesterolemia were 3.2 times more likely to suffer from sexual dysfunction as compared to those without hypercholesterolemia (Adjusted Odds Ratio = 3.18; 95% Confidence Interval: 1.30-7.79; P=0.011). In female diabetics, dyslipidemia was not found to be associated with sexual dysfunction.

Conclusion: Study concluded that dyslipidemia (hypercholesterolemia) is an independent predictor of sexual dysfunction in male but not in female type 2 diabetics.

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Keywords: Dyslipidemia, sexual dysfunction, diabetes, Ghana

INTRODUCTION

Diabetes is a major public health problem worldwide as its prevalence rate has reached epidemic proportions (World Health Organisation, 2016). The prevalence rates in the world, Africa and Ghana stand at 9.3%, 8.4% and 3.9% respectively and still on the rise (International Diabetes Federation, 2019). Type 2 diabetes is the commonest kind of diabetes, representing about 90% of all diabetes cases (International Diabetes Federation, 2020). Its major determinants are overweight/obesity and physical inactivity (International Diabetes Federation, 2020). In type 2 diabetes, the body is unable to produce or use enough insulin, resulting in a build-up of blood glucose (hyperglycemia) (International Diabetes Federation, 2019). Over time, the hyperglycemia ends up damaging blood vessels and nerves resulting in sexual dysfunction (World Health Organisation, 2020). Epidemiological studies have confirmed sexual dysfunction as a major complication of type 2 diabetes in both men (Lu *et al.*, 2009) and women (Olarinoye and Olarinoye, 2008).

Sexual dysfunction is defined as any struggle a person is facing with the various aspects of

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sexuality such as arousal, attraction, orgasm and pleasure (Bancroft, 2008). In male diabetics, the commonest sexual dysfunctions include: erectile dysfunction, ejaculatory problems and disorders of libido (Penson and Wessells, 2004).

In female diabetics, reduced vaginal lubrication, diminished or no desire for sex and diminished or absent sexual response are the most prevalent sexual problems (Bancroft, 2008). Sexual dysfunction results in poorer quality of life (De Berardis *et al.*, 2002), loss of physical and emotional intimacy and sometimes divorce (Owiredu *et al.*, 2011). Prevalence of diabetic sexual dysfunction is high and still rising following the continual increase in diabetes prevalence. Studies done in Nigeria (Unadike *et al.*, 2008) and India (Singh *et al.*, 2009) reported diabetic sexual dysfunction prevalence rates of 58% and 73.2% in males and females respectively. In Ghana, prevalence rates of 54.8 (Atosona *et al.*, 2016), 69.3% (Amidu *et al.*, 2010) and 70% (Owiredu *et al.*, 2011) have been reported in diabetic males whiles a prevalence rate of 68.1% has been reported in diabetic females (Atosona *et al.*, 2016).

Dyslipidemia, characterized by abnormal lipid levels in the blood (National Cholesterol Education Program, 2002) has been suggested to be associated with increased risk of sexual dysfunction in type 2 diabetics, because of its role in atherosclerosis (Dokken, 2008). Despite the high prevalence of sexual dysfunction among type 2 diabetics, epidemiological studies showing the effect of dyslipidemia on sexual dysfunction among type 2 diabetics are limited. Moreover, none of these studies was conducted in Ghana. Thus, this study sought to ascertain the relationship between dyslipidemia and sexual dysfunction among type 2 diabetics in Tema Metropolis of Ghana.

MATERIALS AND METHODS

Ethical considerations

Ethical approval for this study was obtained from the Committee on Human Research Publication and Ethics (CHRPE) of the School of Medical Science and the Komfo Anokye Teaching Hospital (KATH), Kumasi. The consent of diabetics was also obtained and they were guaranteed of the confidentiality of the information provided. Approval to carry-out the study was also sought from management of the study hospital.

Study design

An analytical cross-sectional study design, involving 246 type 2 diabetics selected from the Tema General Hospital in the Tema Metropolis, was employed. The study was conducted from September, 2012 to October, 2013.

Study population and sample size

The study population included type 2 diabetes patients visiting the Tema General Hospital during the study period. Patients that were eligible for the study comprised all sexually active type 2 diabetic subjects engaged in a heterosexual relationship for at least 2 years, ≥18 years of age and consented to participate in the study. Participants who were pregnant or not of sound mind were excluded from the study. Consecutive sampling method was employed in the selection of respondents for the study. The sample size was calculated based on the statistical test employed which was mainly regression analysis. The sample size (N) for performing a regression analysis according to Tabachnick *et al.* (2007) is N> 50+8m, where m is number of independent variables. With 15 independent variables in the present study, the sample size had to be greater than 170. Thus, the sample size was increased to 246 to provide a better estimate of the population and reduce the effect of outliers.

Data collection

A semi-structured questionnaire was used to document participants' socio-demographic characteristics such as gender, age, educational level, occupation, marital status, alcohol consumption and smoking. Regarding the anthropometric data, height (m) was measured without shoes using a wall-mounted ruler. Weight (kg) was measured in light clothing using a bathroom scale. Body Mass Index (BMI) was computed by dividing weight (kg) by square of the height (m^2). Waist to hip ratio (WHR) was

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computed by dividing waist circumference (cm) by hip circumference (cm). A Gulick II spring-loaded measuring tape was used to measure waist circumference halfway amid the inferior angle of the ribs and the suprailiac crest. Also, hip circumference (cm) was measured as the highest circumference over the buttocks. Blood pressure was measured three times in sitting position using a digital sphygmomanometer (Omron, Japan). Prior to the blood pressure measurements, every patient rested for at least 15 minutes.

Sexual dysfunction was assessed using the Golombok Rust Inventory of Sexual Satisfaction questionnaire (GRISS). The GRISS questionnaire is used for measuring the presence and severity of sexual dysfunction. The 28 questionnaire items are answered on a 5-point scale (never, hardly ever, occasionally, usually and always). It provides sub-scale scores and a total score on impotence (vaginismus), premature ejaculation (anorgasmia), dissatisfaction infrequency, non-sensuality, avoidance and non-communication. The scores are converted using a standard nine-point scale. Scores ≥5 are deemed to show sexual dysfunction and scores of ≥8 indicate severe sexual dysfunction. The questionnaire has been proven to be reliable and valid (Rust and Golombok, 1986).

Concerning the lipid profile parameters, 5mls of blood (venous) was taken from the fasting patients early morning. The blood samples were put in evacuated gel tubes and centrifuged at 3000 rpm for 5 minutes. The separated serum was stored in cryovials at -80°C. The lipid parameters were determined with BT 5000® Random Access Chemistry Analyzer (Biotecnica, Italy). The methods used by the automated instruments for the determination of lipid parameters were done in accordance with the reagent manufacturer's guidelines.

The lipids that were determined included triglycerides (TG), high density lipoprotein cholesterol (HDL-C), total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C). Dyslipidemia was diagnosed according to Third Report of National Cholesterol Education Program -Adult Treatment Panel (NCEP ATP III) standards (National Cholesterol Education Program Expert Panel, 2002): Hypertriglyceridemia–TG level ≥ 1.7 mmol/L, Low HDL–HDL level ≤ 1.0 mmol/L for both males and females, Hypercholesterolemia-TC ≥5.2 mmol/L, High LDL–LDL level ≥ 2.6 mmol/L and High TC/HDL ratio ≥5. Diabetics were diagnosed of combined/mixed dyslipidemia when they had at least two of the dyslipidemias mentioned above.

Statistical analysis

Data analysis was done using Statistical Package for Social Sciences (SPSS) (IBM, version 21). Chi-square/Fisher's exact test and Student t-test were used for bivariate analysis to determine the association between socio-demographic and anthropometric factors and sexual dysfunction. The socio-demographic and anthropometric factors (potential confounders) that were found to be associated with sexual dysfunction in the bivariate analysis were controlled for in the assessment of the effect of dyslipidemia on diabetic sexual dysfunction using binary logistic regression analysis. $P< 0.05$ was deemed significant at two tailed tests. Percentages and cross tabulations were used to show patient's responses.

RESULTS

Socio-demographic and anthropometric factors of study subjects

As depicted in Table 1, the average age of the diabetics was 60.18 ±10.63 years with the minimum and maximum ages of 29 and 89 years respectively. Also, the mean diabetes duration was 7.29+6.08 years. More than half (52.8%) of the diabetics were males. Regarding employment status, most (41.1%) of the diabetics were retirees. It was also observed that diabetics who were educated to the basic level formed the majority (70.7%). Only 4.1% of them had tertiary education. None of the diabetics was a smoker and 14.2% were alcohol drinkers.

The mean systolic blood pressure was 159.08±25.29mmHg with the minimum and maximum pressures of 87 mmHg and 241 mmHg

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Table 1: Socio-demographic and anthropometric factors of study subjects

Variable	Frequency (%)
Age (Mean±SD)	60.18±10.63
Diabetes duration (Mean±SD)	7.29±6.08
Gender	
Male	130(52.8)
Female	116 (47.2)
Marital status	
Cohabiting	1(0.4)
Divorced	1(0.4)
Married	231(93.9)
Single	11(4.5)
Widowed	2 (0.8)
Occupation	
Employed	34(13.8)
Unemployed	22(8.9)
Self-employed	89(36.2)
Retired	101(41.1)
Educational level	
Basic	174(70.7)
Secondary	62(25.2)
Tertiary	10(4.1)
Smoking	
Yes	0 (0.0)
No	246(100)
Alcoholism	
Yes	35(14.2)
No	211(85.8)
BMI (mean±S.D)	30.69 ±13.93
HC (mean±S.D)	104.99±13.41
WC (mean±S.D)	99.65 ±13.12
WHR (mean±S.D)	0.97± 0.52
SBP (mean±S.D)	159.08±25.29
DBP (mean±S.D)	101.92 ±16.41

Data presented as frequency (percent) and mean ± SD (standard deviation)

respectively whilst the mean diastolic pressure was 101.92 ±16.41 mmHg with the minimum and maximum pressures of 58 mmHg and 201 mmHg respectively. Regarding the anthropometric factors, the mean BMI, HC, WC and WHR were 30.69 ±13.93Kg/m^2, 104.99±13.41cm, 99.65 ±13.12cm and 0.97± 0.52 respectively.

Prevalence of sexual dysfunction

Of the 130 male diabetics enrolled in the study, 64.6% of them had sexual dysfunction. Out of those with sexual dysfunction, 7.1% had severe sexual dysfunction. Relating to the sexual dysfunction domains, it was observed that impotence (p≤0.0001), premature ejaculation (p= 0.002), non-sensuality (p=0.001), dissatisfaction (p≤0.0001) and non-communication (p= 0.008) were significantly associated with sexual dysfunction among male diabetics (Table 2). Among the female diabetics, the prevalence of sexual dysfunction was 66.4%, of which 7.8% had severe sexual dysfunction. Vaginismus (p=0.016), Anorgasmia (p= 0.002), non-sensuality (p=0.001), avoidance (p=0.002), dissatisfaction (p=0.015) and non-communication (p=0.008), were also found to be significantly linked with sexual dysfunction among the female diabetics (Table 2).

Prevalence of dyslipidemia among study subjects

It was revealed in the present study that the prevalence rates of combined dyslipidemia, hypercholesterolemia, hypertriglyceridemia, low HDL-C, high LDL-C and high TC/HDL-C ratio were 46.2%, 30.8%, 9.2%, 26.9%, 48.2% and 21.5% respectively among the male diabetics. Regarding the female diabetics, 48.3% had combined dyslipidemia, 25.9% had hypercholesterolemia, 6.9% had hypertriglyceridemia, 61.2% had low HDL-C, 45.7% had high LDL-C and 9.5% had high TC/HDL-C ratio (Figure 1).

Socio-demographic and anthropometric factors associated with sexual dysfunction

Regarding the socio-demographic characteristics, only age (p=0.004) and occupation (p≤0.0001) were significantly associated with prevalence of sexual dysfunction in male diabetics. It was seen that diabetics without sexual dysfunction had higher mean age as compared to those with sexual dysfunction. As regards occupation, the prevalence of sexual dysfunction was highest (86.7%) among diabetics that were employed. Also, the difference in mean WHR between respondents with sexual dysfunction and respondent without sexual dysfunction was found to be statistically significant (p=0.017) (Table 3). In the case of the female

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Table 2: Sexual dysfunction stratified by sexual dysfunction domains

	Male				Female		
Variable	SD, N=84(%)	No SD, N=46(%)	P-Value	**Variable**	SD, N=77(%)	No SD, N=39(%)	P-Value
Impotence				**Vaginismus**			
Yes	54(81.8)	12(18.2)	<0.0001	Yes	55(74.3)	19(25.7)	0.016
No	30(46.9)	34(53.1)		No	22(52.4)	20(47.6)	
Premature ejaculation				**Anorgasmia**			
Yes	50(78.1)	14(21.9)	0.002	Yes	58(76.3)	18(23.7)	0.002
No	34(51.6)	32(48.5)		No	19(47.5)	21(52.5)	
Non sensuality				**Non sensuality**			
Yes	70(72.9)	26(27.1)	0.001	Yes	57(77)	17(23)	0.001
No	14(41.2)	20(58.8)		No	20(47.6)	22(52.4)	
Avoidance				**Avoidance**			
Yes	36(58.1)	26(41.9)	0.136	Yes	61(75.3)	20(24.7)	0.002
No	48(70.6)	20(29.4)		No	16(45.7)	19(54.3)	
Dissatisfaction				**Dissatisfaction**			
Yes	68(85)	12(15)	<0.0001	Yes	40(78.4)	11(21.6)	0.015
No	16(32)	34(68)		No	37(56.9)	28(43.1)	
Non-communication				**Non-communication**			
Yes	74(71.2)	30(28.8)	0.002	Yes	63(73.3)	23(26.7)	0.008
No	10(38.5)	16(61.5)		No	14(46.7)	16(53.3)	
Infrequency				**Infrequency**			
Yes	66(68.8)	30(31.2)	0.098	Yes	71(67.6)	34(32.4)	0.504
No	18(52.9)	16(47.1)		No	6(54.5)	5(45.5)	

Data presented as frequency (percent) and mean ± standard deviation; p<0.05 considered significant

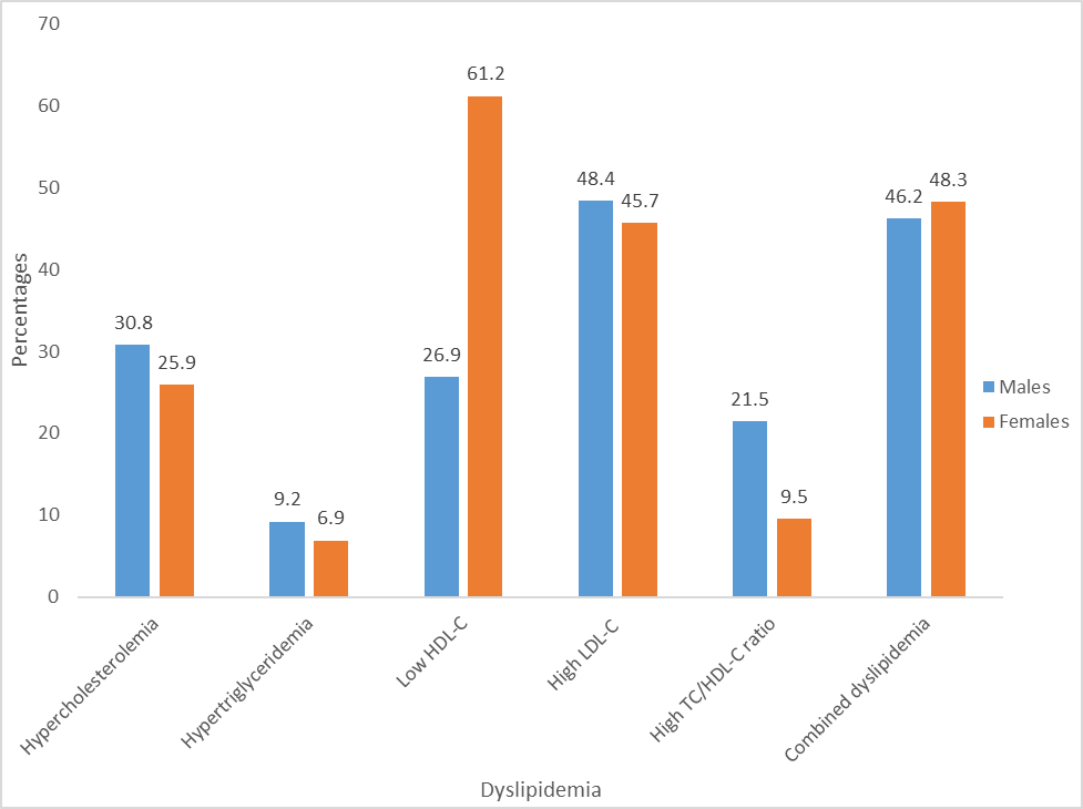

Figure 1: Prevalence of dyslipidemia among study subjects

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Table 3: Bivariate analysis of demographic and anthropometric factors associated with sexual dysfunction among male diabetic subjects

Variable	Total, N=130	Sexual dysfunction, N=84	No sexual dysfunction, N=46	p-value
Age (years)	63.04±10.85	61.05±9.79	66.67±11.84	0.004
Diabetes duration (years)	8.38±6.53	7.52±5.632	10±7.794	0.066
Marital status				
Married	124(100)	78(62.9)	46(37.1)	0.089
Single	6 (100)	6(100)	0(0.0)	
Occupation				
Employed	30(100)	26(86.7)	4(13.30)	<0.0001
Unemployed	10(100)	6(60)	4(40)	
Self-employed	28(100)	24(85.7)	4(14.3)	
Retired	62(100)	28(45.2)	34(54.8)	
Educational level				
Basic	68(100)	46(67.6)	22(32.4)	0.653
Secondary	53(100)	33(62.3)	20(37.7)	
Tertiary	9(100)	5(55.6)	4(44.4)	
Alcoholism				
Yes	28(100)	18(64.3)	10(35.7)	0.967
No	102(100)	66(64.7)	36(35.30)	
BMI (kg/m²)	28.91±11.33	28.29±11.38	30.04±11.27	0.4
SBP (mmHg)	157.53±25.17	157.49±23.94	157.61±27.55	0.979
DBP (mmHg)	101.60±14.91	103.17±15.24	98.74±13.97	0.106
HC (cm)	101.35±8.64	101.50± 9.06	101.05± 7.92	0.769
WC (cm)	95.23±10.09	94.71±10.42	96.17±9.50	0.432
WHR (ratio)	0.938±0.043	0.93±0.04	0.95± 0.04	0.017

Data presented as frequency (percent) and mean ± standard deviation; Categorical variable compared using Chi-square test, continuous data compared using student t-test; p<0.05 considered significant

diabetics, none of the socio-demographic and anthropometric factors were associated with prevalence of sexual dysfunction (Table 4).

Relationship between dyslipidemia and diabetic sexual dysfunction

The socio-demographic and anthropometric factors that were identified as possible confounders in the bivariate analysis (Tables 3 and 4) were controlled for in the assessment of the influence of dyslipidemia on diabetic sexual dysfunction. Hence age (p=0.004), occupation (p≤0.0001) and WHR (P=0.017) were controlled for in the logistic regression model for all the dyslipidemias in male diabetics. Since none of the socio-demographic and anthropometric factors were associated with sexual dysfunction in female diabetics in the bivariate analysis (Table 4), none of these factors were controlled for in the assessment of the effect of dyslipidemia on sexual dysfunction in female diabetics.

In the male diabetics, hypercholesterolemia was found to be predictive of diabetic sexual dysfunction. Diabetics that had hypercholesterolemia were 3.2 times more likely to suffer from sexual dysfunction as compared to those without hypercholesterolemia [Adjusted Odds Ratio (AOR) = 3.18; 95% Confidence Interval (CI): 1.30-7.79; P=0.011] (Table 5). However, none of the dyslipidemias was found to be associated with sexual dysfunction in female diabetics (Table 6).

DISCUSSION

Prevalence of diabetic sexual dysfunction is high and still escalating following the continual increase in type 2 diabetics. This study aimed to investigate the influence of dyslipidemia on the risk of sexual

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Table 4: Bivariate analysis of demographic and anthropometric factors associated with sexual dysfunction among female diabetic subjects

Variable	Total, N=116	Sexual dysfunction, N=77	No sexual dysfunction, N=39	p-value
Age (years)	56.98±9.42	56.00±9.38	58.92±9.32	0.114
Diabetes duration (years)	6.11±5.31	5.62±4.95	7.08±5.91	0.16
Marital status				
Married	107(100)	71(66.4)	36(33.6)	0.743
Single	5(100)	4(80)	1(20)	
Divorced	1(100)	1(100)	0(0.0)	
Widowed	2(100)	1(50)	1(50)	
Co-habitating	1(100)	0(0.0)	1(100)	
Occupation				
Employed	4(100)	2(50)	2(50)	0.06
Unemployed	12(100)	9(75)	3(25)	
Self-employed	61(100)	46(75.4)	15(24.6)	
Retired	39 (100)	20(51.3)	19(48.7)	
Educational level				
Basic	106(100)	68(64.2)	38(35.8)	0.057
Secondary	8(100)	8(100)	0(0.0)	
Tertiary	2(100)	1(50)	1(50)	
Alcoholism				
Yes	7(100)	4(54.1)	3(42.9)	0.686
No	109(100)	73(67)	36(33)	
BMI (kg/m2)	32.69±16.17	31.48±10.06	35.07±24.10	0.262
SBP (mmHg)	160.81±25.41	159.23±25.42	163±25.45	0.35
DBP (mmHg)	102.28±18.04	102.04±18.25	102.77±17.77	0.838
HC (cm)	109.08±16.34	107.78± 18.66	111.64± 10.10	0.231
WC (cm)	104.60±14.35	103.29±16.15	107.21±9.51	0.165
WHR (ratio)	01.02±0.75	01.05±0.93	0.96± 0.05	0.546

Data presented as frequency (percent) and mean ± standard deviation; Categorical variable compared using Chi-square test, continuous data compared using student t-test; p<0.05 considered significant

dysfunction among type 2 diabetics to improve preventive strategies and care for type 2 diabetes patients.

In the present study, prevalence of sexual dysfunction was 64.9% in the male diabetics. This finding is comparable to findings of previous studies in Ghana, where the prevalence rates were 70% (Amidu *et al.*, 2010) and 69.3% (Owiredu *et al.*, 2011). Likewise, a prevalence of 63.6% is also reported among Chinese diabetic men (Siu et al., 2001). In contrast, a previous study (Atosona *et al.*, 2016) recorded a prevalence of 54.8% in Ghana, which is lower than the prevalence reported in the present study. In the diabetic females, sexual dysfunction was reported to be 66.4%. This finding is also comparable to the findings of studies by Atosona *et al.* (2016) (68.1%) and Singh *et al.* (2009) (73.2%). Conversely, the prevalence observed in the current study is higher than prevalence (53.4%) recorded in a study in Italy (Esposito *et al.*, 2010). The variations in findings may be linked to difference in sampling techniques, tools used in assessing sexual dysfunction, type of diabetes, population characteristics and geographic and ethnic variations.

The high prevalence of sexual dysfunction reported in the present study signifies a poor glycemic control among the study subjects. When blood sugar level remains high for a longtime, it causes injury to blood vessels and nerves in both diabetic males and females. In males, this injury in

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Table 5: Relationship between dyslipidemia and sexual dysfunction in male diabetics

Variable	Unadjusted OR (95% CI)	P- value	Adjusted OR (95% CI)	P- value
Hypercholesterolemia				
No	1.0		1.0	
Yes	3.36(1.54-7.32)	0.002	3.18(1.30-7.79)	0.011
Hypertriglyceridemia				
No	1.0		1.0	
Yes	2.97 (0.62-14.19)	0.172	1.82(0.35-9.84)	0.454
Low HDL-C				
No	1.0		1.0	
Yes	2.25(0.925-5.48)	0.074	2.29(0.80-6.56)	0.121
High LDL-C				
No	1.0		1.0	
Yes	0.52(0.25-1.09)	0.083	0.59(0.0.251-1.403)	0.235
High TC/HDL-C ratio				
No	1.0		1.0	
Yes	1.02(0.425-2.439)	0.967	1.25(0.463-3.39)	0.657
Combined dyslipidemia				
No	1.0		1.0	
Yes	1.66(0.808-3.439)	0.167	1.57(0.703-3.524)	0.27

Data presented as frequency (percent); Univariate and multivariate logistic regression analysis conducted to determine associated factors; p<0.05 considered significant

Table 6: Relationship between dyslipidaemia and sexual dysfunction in female diabetics

Variable	Unadjusted OR (95% CI)	P- value
Hypercholesterolemia		
No	1.0	
Yes	0.980(0.407-2.372)	0.969
Hypertriglyceridemia		
No	1.0	
Yes	0.479 (0.113-2.03)	0.319
Low HDL-C		
No	1.0	
Yes	0.703(0.314-1.573)	0.391
High LDL-C		
No	1.0	
Yes	1.33(0.610-2.898)	0.473
High TC/HDL-C ratio		
No	1.0	
Yes	0575(0.164-2.016)	0.387
Combined dyslipidemia		
No	1.0	
Yes	1.027(0.475-2.220)	0.946

Data presented as frequency (percent); Univariate and multivariate logistic regression analysis conducted to determine associated factors; p<0.05 considered significant

the genital area results in artery constriction, disrupting blood flow necessary for erection (Leung *et al.*, 2004). In female diabetics, this injury results in reduced blood flow to the clitoris causing vaginal dryness and loss of sensation in the genital area making intercourse painful and orgasm hard or impossible to reach (Gupta *et al.*, 2018).

Atherosclerosis causes decreased blood flow in blood vessels which can affect erection in men and a lower libido in women (Leung *et al.*, 2004). This may partly explain why hypercholesterolemia was found to be associated with increased risk of sexual dysfunction in men in the present study. Patients with hypercholesterolemia were 3.2 times more likely to develop sexual dysfunction as compared to those without hypercholesterolemia. However, the other forms of dyslipidemias were not identified as risk factors for sexual dysfunction among male diabetics in the present study. In consonance with the finding of the present study, Azad *et al.* (2019) identified hypercholesterolemia as a risk factor for sexual dysfunction in type 2 diabetic men. Contrarily, a study by Sharifi *et al.* (2012) did not show a correlation between dyslipidemia and sexual

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dysfunction in type 2 diabetic men. The mixed findings may be attributed to difference in population characteristics and methodologies employed (Bergqvist *et al.*, 2013).

In female diabetics, dyslipidemia was not found to be associated with sexual dysfunction in the present study. In contrast, Esposito *et al.* (2010) revealed a link between dyslipidemia and sexual dysfunction in type 2 diabetic women. The large sample size in addition to the different methodology used in the previous study may partly justify the difference in findings (Devillé *et al.*, 2002; Patel *et al.*, 2003).

Lastly, our inability to conduct a longitudinal study could be a limitation to the present study as a cross-sectional study does not provide a good basis for establishing causality. Contrarily, the strength of our study is in the use of a validated tool for the measurement of sexual dysfunction.

CONCLUSION

Hypercholesterolemia is an independent predictor of sexual dysfunction in male type 2 diabetes patients. Dyslipidemia is not associated with sexual dysfunction in female type 2 diabetes patients.

COMPETING INTEREST

Authors declare that they have no competing interests

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