British Journal of Medicine & Medical Research
17(11): 1-10, 2016, Article no.BJMMR.28186
ISSN: 2231-0614, NLM ID: 101570965

SCIENCEDOMAIN *international*
www.sciencedomain.org

Prevalence, Risk Factors and Predictors of Diabetes-related Sexual Dysfunction

Ambrose Atosona[1,2], Christopher Larbie[1*], Marina A. Tandoh[1] and Kwabena Nsiah[1]

[1]Department of Biochemistry and Biotechnology, KNUST, Kumasi, Ghana.
[2]Department of Community Nutrition, University of Development Studies, Tamale, Ghana.

Authors' contributions

This work was carried out in collaboration between all authors. Authors AA, CL and MAT designed the study, wrote the protocol and wrote the first draft of the manuscript. Author AA performed field data collection. Authors AA and CL performed the biochemical analyses and analyzed the study results. Authors AA and KN managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/28186
Editor(s):
(1) Shatrah Binti Othman, Department of Molecular Medicine, University of Malaya, Kuala Lumpur, Malaysia.
(2) Sinan INCE, Department of Pharmacology and Toxicology, University of Afyon Kocatepe, Turkey.
(3) Philippe E. Spiess, Department of Genitourinary Oncology, Moffitt Cancer Center, USA AND Department of Urology and Department of Oncologic Sciences (Joint Appointment), College of Medicine, University of South Florida, Tampa, FL, USA.
Reviewers:
(1) Oseremen I. Aisuodionoe-Shadrach, University of Abuja, Abuja, Nigeria.
(2) Geraldo Munguba Macedo, Santa Casa Da Misericórdia Teaching Hospital and Unichristus, University Center, Fortaleza, Ceará, Brazil.
(3) Anonymous, Universidade do Estado do Rio de Janeiro, Brazil.
(4) Patrick Chinedu Obi, Federal Medical Centre, Owerri, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/16228

Original Research Article

Received 7th July 2016
Accepted 8th September 2016
Published 18th September 2016

ABSTRACT

Background: The prevalence and complications of diabetes are currently on the rise, so this study investigated the prevalence, risk factors and predictors of diabetic sexual dysfunction (SD).
Methods: The study was cross-sectional multicentred. Patients were randomly selected from the Korle Bu Teaching Hospital, Komfo Anokye Teaching Hospital and Tamale Teaching Hospital. Socio-demographic, medical history, lifestyle and physical characteristics of subjects, as well as sexual dysfunction (SD) characteristics were investigated, using a structured questionnaire. Blood samples were also taken from subjects and analyzed for total cholesterol (TC), triglycerides (TG), high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C), serum

**Corresponding author: E-mail: clarbie.cos@knust.edu.gh, ekowlarbie@gmail.com;*

creatinine and serum urea. Estimated glomerular filtration rate (eGFR) was also determined, using the serum creatinine. Statistics were performed using SPSS version 22.
Results: Of the 100 people with diabetes, 31% were males and 69% were females. The mean age was 53.82±13.754 years. It was found that 54.8% of the males and 68.1% of females had diabetic SD. The prevalence of severely abnormal SD was 6.5% and 4.3% in males and females, respectively. In a univariate analysis, none of the independent variables was associated with SD in both men and women.
Conclusion: This study has shown that the prevalence of SD is high among diabetics.

Keywords: Diabetes; sexual dysfunction; risk factors; GRISS.

ABBREVIATIONS

SD : Sexual Dysfunction
TC : Total Cholesterol
HDL-C : High Density Lipoprotein Cholesterol
LDL-C : Low Density Lipoprotein Cholesterol
BMI : Body Mass Index

1. BACKGROUND

The prevalence of diabetes is increasing in every country; by 2035 the global prevalence is projected to rise from 8.3% to 10.1% [1]. The prevalence in Africa is projected to rise from 5.1% to 5.3% [1], whilst the prevalence in Ghana which is 3.3% [2] is also expected to rise. As the prevalence of diabetes increases, so does the prevalence of diabetic SD, as more than a third of women with diabetes experience sexual dysfunction [3] and men with diabetes are more likely to have sexual dysfunction than men without diabetes [4].

Diabetes complications lead to disability and death. As the prevalence of diabetes grows in low- and middle-income countries, so too does the impact on both human and economic terms [5]. For instance, sexual dysfunction is associated with poorer quality of life [6]. It also results in loss of physical and emotional intimacy and sometimes leads to divorce. The prevalence of diabetic sexual dysfunction in men stands at 69.3% in Ghana [7], in a study that was limited to men and was conducted only in one site, Tema General Hospital, in the Greater Accra Region of Ghana. Thus, there was the need for a multicenter study for both sexes, on the prevalence, risk factors and predictors of diabetic sexual dysfunction in Ghana to help delineate preventive strategies to lessen the burden of the complications.

2. SUBJECTS AND METHODS

The study was a cross-sectional multicenter study conducted from 15th June to 30th July, 2015 and included 100 people with diabetes randomly selected from the outpatient diabetes clinics of the Korle Bu Teaching hospital (KBTH, Accra), Komfo Anokye Teaching Hospital (KATH, Kumasi) and Tamale Teaching Hospital (TTH, Tamale) representing the southern, middle and northern part of Ghana, respectively.

Diabetics who were booked and attended the diabetes clinics on particular clinic days were eligible for the study. The eligible subjects who were diagnosed diabetics, in accordance with international standards (WHO) (fasting plasma glucose (FPG) ≥ 7.0 mmol/L and/or 2 hours postprandial plasma glucose (PPG) or random plasma glucose ≥ 11.1 mmol/L), or persons who had been under diabetes treatment for at least 1 year, ≥ 18 years old and consented to participate in the study, were enrolled. Patients who were very ill (unstable vital signs/mental status) and pregnant women were excluded from the study.

The sample size for the study was calculated using Cochrane formula:

$$n= \frac{Z^2 p(1-p)}{e^2}$$

where, n is the sample size, z is the confidence level (usually 1.96 for 95% confidence level), e is the desired level of precision, p is the estimated proportion of an attribute present in the population (prevalence). Prevalence of diabetes in adults in Ghana stands at 3.3% [2]. With a desired confidence level of 95% and $\pm 5\%$ precision, the sample size

$$n=\frac{1.96^2 X 0.033(1-0.033)}{0.05^2}=\frac{0.1267 X 0.967}{0.0025}=49$$

Because large sample size provides a better estimate of the population and reduces the effect of outliers or extreme observations, the sample size was increased to 100. This sample size was divided by the number of hospitals; thus 33 diabetics were selected from KATH, 33 from TTH and 34 from KBTH, since it is the leading national referral hospital in Ghana.

Data was collected from diabetics with the aid of a pre-tested structured questionnaire to document information on socio-demographic characteristics (sex, age, ethnicity, marital status, religion, level of education and occupation), medical history (duration of diabetes, diet, medications and history of poor vision), lifestyle variables (smoking and alcohol intake) and physical characteristics (BMI and blood pressure). Three milliliters of venous blood sample was taken from each subject into gel separator tubes in the morning after an overnight fast of 8-10 hours. The gel separator tubes were centrifuged at 3000 rpm for 10 minutes and the serum separated and stored in plain separator tubes at a temperature of -20℃ until it was time for analysis. Biochemical indices (TC, TG, HDL-C, LDL-C, serum urea and serum creatinine), were assessed using the Automated Flexor Junior Chemistry Analyzer. The estimated glomerular filtration (eGFR) rate was determined, using the serum creatinine in Modification of Diet in Renal Disease (MDRD) equation. eGFR < 60 mL/min/1.73m^2 indicates renal dysfunction (Chronic Kidney Disease) [8].

During the physical examination, findings were confirmed with the medical records of the patients or the consultant physician on duty and were reported as present or absent, without further description or grading. The body mass index (BMI) was used to assess the nutritional status of the patients. Height (m) was measured without shoes, using a microtoise (Seca, Germany) and weight (kg) was measured in light clothing, using a uniscale (Seca, Germany). The body mass index (BMI) was determined by dividing the weight (kg) by the square of the height (m^2) and was classified as underweight (<18.5 kg/m^2), normal (18.5-24.99 kg/m^2), overweight (25-29.99 kg/m^2) and obese (≥30 kg/m^2). Blood pressure was measured using a digital sphygmomanometer (Omron, Japan). Before blood pressure measurements, every patient rested for at least 10 minutes. High blood pressure was defined as systolic blood pressure (mmHg) ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or known hypertensive on treatment.

Sexual dysfunction was measured, using the Golombok Rust Inventory of Sexual Satisfaction (GRISS) questionnaire. The GRISS questionnaire is for the assessment of the existence and severity of sexual problems. The GRISS is a standardized questionnaire and also easy to administer. The reliability of the scales is 0.94 for males and 0.87 for females [9]. Its validity has also been proven [9]. All the questions were answered using a five-point scale (always, usually, occasionally, hardly ever and never).

The male version of the questionnaire gives a total male score, as well as subscales of impotence, non-communication, premature ejaculation, avoidance, infrequency, non-sensuality, and dissatisfaction. The female version also gives a total female score, as well as subscales of anorgasmia, vaginismus, non-communication, infrequency, female non-sensuality, female avoidance, and female dissatisfaction. Responses were added up to give a total score. The total scores were transformed, using a standard nine point scale. Scores of five or more are considered to indicate sexual dysfunction and scores of eight or more are considered to indicate severe sexual dysfunction [9]. Findings were reported as present or absent.

2.1 Statistical Analysis

Data entry and analysis were done using SPSS 22 software (IBM, USA). For the univariate analysis, the Pearson correlation (chi-square) or Fisher's exact test was used for categorical variables, whilst student t-test was used for continuous variables. The independent variables that were significant in the univariate analysis were considered for multivariate binary logistic regression analysis so as to control for confounder risk factors. P< 0.05 was considered significant at two tailed tests. Percentages and cross tabulations were used to show respondents' responses.

2.2 Ethical Considerations

Permission to conduct the study was obtained from the Committee on Human Research, Publications and Ethics of the Kwame Nkrumah University of Science and Technology (CHRPE/AP/228/15). The consent of respondents was sought and they were assured of the confidentiality of the information provided.

3. RESULTS

A total of 100 diabetics attending three teaching hospitals in Ghana were enrolled into the study. The sex distribution of the study participants was 31% males and 69% females. The overall mean age of the diabetics was 53.8±13.8 years.

Difference in prevalence of SD in males and females was not significant (p= 0.257). Socio-demographic characteristics of the subjects are shown in Table 1.

3.1 Prevalence and Severity of Sexual Dysfunction in Male Diabetics

Of the 31 male diabetics who completed the sexual dysfunction questionnaire, 17 (54.8%) had sexual dysfunction, out of which 2 (6.5%) had severe sexual dysfunction. Regarding the sexual dysfunction domains, it was observed that premature ejaculation (p= 0.036), non-communication (p= 0.008), non-sensuality (p=0.049) and dissatisfaction (p=0.011) were significantly correlated with sexual dysfunction, whilst impotence (p=0.092), infrequency (p= 0.124) and avoidance (p= 0.224) were insignificantly correlated with sexual dysfunction (Table 2). Impotence (12.9%), premature ejaculation (12.9%) and non-communication (12.9%) had higher level of severity than the other four domains of sexual dysfunctions as shown in Table 3. In the univariate analysis, none of the potential risk factor was associated with SD in male diabetics (Table 4).

3.2 Prevalence and Severity of Sexual Dysfunction in Females

The female participants were assessed using the seven domains for measuring sexual dysfunction which included anorgasmia, vaginismus, non-communication, infrequency, female avoidance, female non-sensuality and female dissatisfaction, to determine sexual dysfunction prevalence. The prevalence of sexual dysfunction among the female diabetics was 68.1%, out of which 4.3% had severely abnormal sexual dysfunction.

As shown in Table 5, Anorgasmia (p= 0.001), vaginismus (p=0.000), non-communication (p=0.000), female avoidance (p=0.000), female non-sensuality (p=0.032) and female dissatisfaction (p=0.000) were significantly associated with sexual dysfunction whilst infrequency (p=0.089) was insignificantly associated with sexual dysfunction. Non-communication (13%) had a higher level of severity than the other six domains of sexual dysfunctions as shown in Table 6. In the univariate analysis, none of the potential risk factor was associated with SD in female diabetics (Table 7).

Table 1. Socio-demographic characteristics of study subjects

Characteristics		Frequency (%/Mean±SD)
Age (years):		53.82±13.754
Age groups:	18-27	5 (5)
	28-37	9 (9)
	38-47	19 (19)
	≥48	67 (67)
Sex	Male	31 (31)
	Female	69 (69)
Ethnicity	Northerner	36 (36)
	Ga/Adangbe	9 (9)
	Ewe	5 (5)
	Akan	50 (50)
Marital status	Single	9 (9)
	Married	83 (83)
	Divorced	6 (6)
	Widowed	2 (2)
Religion	Muslim	36 (36)
	Christian	64 (64)
Level of education	Primary	3 (3)
	JHS	26 (26)
	SHS	14 (14)
	Tertiary	14 (14)
	Informal	2 (2)
	None	41 (41)
Employment status	Employed	20 (20)
	Self-employed	62 (62)
	Not employed	18 (18)

Table 2. Association between sexual dysfunction domains and sexual dysfunction in male diabetics

Domain		N(%)	SD	No SD	p
			N=17(%)	N=14(%)	
Impotence	Present	14 (100)	10 (71.4)	4 (28.6)	0.092
	Absent	17 (100)	7 (41.2)	10 (58.8)	
Premature ejaculation	Present	25 (100)	16 (64)	9 (36)	0.036
	Absent	6 (100)	1 (16.7)	5 (83.3)	
Infrequency	Present	22 (100)	14 (63.6)	8 (36.4)	0.124
	Absent	9 (100)	3 (33.3)	6(66.7)	
Non-communication	Present	19 (100)	14 (73.7)	5 (26.3)	0.008
	Absent	12 (100)	3 (25)	9 (75)	
Non-sensuality	Present	23 (100)	15 (65.2)	8 (34.8)	0.049
	Absent	8 (100)	2 (25)	6 (75)	
Avoidance	Present	17 (100)	11 (64.7)	6 (35.3)	0.224
	Absent	14 (100)	6 (42.9)	8 (57.1)	
Dissatisfaction	Present	12 (100)	10 (83.3)	2(16.7)	0.011
	Absent	19 (100)	7 (36.8)	12 (63.2)	

Table 3. Severity of sexual dysfunction domains in male diabetics

Domain	Severely abnormal	Abnormal	Normal
Impotence	4 (12.9%)	10 (31.3%)	17 (54.8%)
Premature ejaculation	4 (12.9%)	21 (67.7%)	6 (19.4%)
Infrequency	3 (9.7%)	19 (61%)	9 (29%)
Non-sensuality	3 (9.7%)	20 (64.5%)	8 (25.8%)
Non-communication	4 (12.9%)	14 (48.4%)	12 (38.7%)
Avoidance	2 (6.5%)	15 (48.4%)	14 (45.2%)
Dissatisfaction	4 (12.9%)	8 (25.8%)	19 (61.3%)

4. DISCUSSION

Sexual dysfunction prevalence among male diabetics was found to be 54.8% in the present study, which is lower than that observed from studies done in Ghana by Owiredu et al. [7] where the prevalence was found to be 69.3%. This could be as a result of the fact that the present study was a multicenter study and also investigated a small sample size, as compared to that of Owiredu et al. [7]. However, the prevalence observed in the present study is comparable to that of Unadike et al. [10] in Nigeria, where the prevalence was reported to be 58% among diabetic males. In the present study, 6.5% of the male diabetics had severe sexual dysfunction, as compared to 4.7% in the study by Owiredu et al. [7]. Regarding severity (severely abnormal) of the sexual dysfunction domains, impotence (12.9%), premature ejaculation (12.9%), non-communication (12.9%) and dissatisfaction (12.9%) recorded the highest in the present study (Table 3) as compared to 15.8% recorded for impotence in the study by Owiredu et al. [7]. Furthermore, premature ejaculation, non-sensuality, avoidance and dissatisfaction were significantly related to sexual dysfunction in the present study as compared to infrequency, non-communication, non-sensuality, dissatisfaction, and impotence in the study by Owiredu et al. [7]. Despite having a high prevalence, impotence did not significantly relate to sexual dysfunction in this study. This is due to the fact that the difference in sexual dysfunction prevalence between diabetics with and without impotence was not significant (Table 2). It is worth emphasizing that despite the smaller sample size of our study, its multicentre design makes the results reliable, as the data was derived from different hospitals in Ghana, making it unlikely for a coincidental factor in one hospital affecting the results.

With regard to female sexual dysfunction in diabetics, the present study is the first to investigate the problem among female diabetics in Ghana. Our observed prevalence of 68.1% is comparable to a prevalence of 73.2%, reported by Singh et al. [11] in India. However, the prevalence reported in the present study is higher than prevalence obtained from other countries.

Table 4. Univariate analysis of characteristics associated with sexual dysfunction in male diabetics

Characteristics		N=100 (%)	SD	No SD	p
			N=17(%)	N=14(%)	
Age (mean±S.D)		54.7±12.8	55.4±13.5	53.9±12.3	0.752
Diabetes duration (mean±S.D)		13.91±5.82	8.06±6.54	5.85±4.53	0.302
Smoking	Yes	1 (100)	0 (0.0)	1(100)	0.263
	No	30 (100)	17 (56.7)	13(43.3)	
Alcohol intake	Yes	6 (100)	4 (66.7)	2 (33.3)	0.517
	No	25 (100)	13 (52)	12 (48)	
BMI	Underweight	29 (100)	0 (0.0)	2 (100)	0.417
	Normal	13 (100)	6 (46.2)	7 (53.8)	
	Overweight	13 (100)	8 (61.5)	5 (38.5)	
	Obese	3 (100)	1 (33.3)	2 (66.7)	
Impaired vision	Present	11 (100)	8 (72.7)	8 (72.7)	0.138
	Absent	20 (100)	9 (45)	9 (45)	
Hypertension	Present	18 (100)	10 (55.6)	8 (44.4)	0.925
	Absent	13 (100)	7 (53.8)	6 (46.2)	
Serum Cr. (µmol/l)	Abnormal (>120)	8 (100)	5 (62.5)	3 (37.5)	0.613
	Normal (≤ 120)	23 (100)	12 (52.2)	11 (47.8)	
eGFR (mL/min/1.73m^2)	Abnormal (<60)	9 (100)	7 (77.8)	2 (22.2)	0.101
	Normal (≥60)	22 (100)	10 (45.5)	12 (54.5)	
Serum Urea (mmol/l)	Abnormal (>8.3)	2 (100)	1 (50)	1 (50)	0.887
	Normal (≤8.3)	29 (100)	16 (55.2)	13 (44.8)	
Triglycerides (mmol/l)	Abnormal (> 1.7)	7 (100)	3 (42.9)	4 (57.1)	0.469
	Normal (≤1.7)	24 (100)	14 (58.3)	10 (41.7)	
HDL Chol. (mmol/l)	Abnormal (<1.03)	6 (100)	4 (66.7)	2 (33.3)	0.517
	Normal (≥1.03)	25 (100)	13 (52)	12 (48)	

Table 5. Association between sexual dysfunction domains and sexual dysfunction in female diabetics

Domain		N=100(%)	SD	No SD	p
			N=47(%)	N=22(%)	
Anorgasmia	Present	45 (100)	37 (82.2)	8 (17.8)	0.001
	Absent	24 (100)	10 (41.7)	14 (58.3)	
Vaginismus	Present	50 (100)	43 (86)	7 (14)	0.000
	Absent	19 (100)	4 (21.1)	15 (78.9)	
Non-communication	Present	54 (100)	43 (79.6)	11 (20.4)	0.000
	Absent	15 (100)	4 (26.7.4)	11 (73.3)	
Infrequency	Present	50 (100)	37 (74)	13 (26)	0.089
	Absent	19 (100)	10 (52.6)	9 (47.4)	
Non-sensuality	Present	50 (100)	41 (82)	9 (18)	0.000
	Absent	19 (100)	6 (31.6)	13 (68.4)	
Avoidance	Present	35(100)	28 (80)	7 (20)	0.032
	Absent	34(100)	19 (55.9)	15 (44.1)	
Dissatisfaction	Present	41(100)	38 (92.7)	3 (7.3)	0.000
	Absent	28(100)	9 (32.1)	19 (67.9)	

For instance, studies in Jordan, Italy and Kenya reported prevalences of 59.6%, 53.4% and 36% respectively [12,13,14]. The variation in prevalence observed above could probably be due to differences in methodological and population characteristics. Regarding the female sexual dysfunction domains, the most prevalent areas of difficulty were dissatisfaction (92.7%), vaginismus (86%), anorgasmia (82.2%), avoidance (82%), non-sensuality (80%), non-communication (79.6%) and infrequency (74%). In terms of severity of sexual dysfunction, 4.3% had severe dysfunction and the most severe area was non-communication (13%). The high prevalence of sexual dysfunction in the female diabetics observed in the present study was

expected, in that the hospitals of study were referral centres hence receive all serious and chronic illnesses, including diabetes complications. In our setting, sexual issues are treated discreetly and confidentially, so it is serious cases that will compel people to open up to disclose their pent-up sexual frustrations, as seen in referral hospitals.

Among the subjects, BMI did not relate to sexual dysfunction. Similar to the finding of the present study, Vafaeimanesh et al. [15] had shown that obesity is not correlated with sexual dysfunction in women. Vafaeimanesh et al. [15] had also reported there was no link between obesity and sexual dysfunction in men. In contrast, Owiredu et al. [7] reported that greater body weight (obesity) is a predictor of sexual dysfunction in diabetic men. Obesity has been known to cause sexual dysfunction because of its association with dyslipidemia, the main cause of ischemia, but this is not conclusive [16], hence the finding of the present study. The effect of hypertension on sexual dysfunction was not significant in the current study. This finding is consistent with other studies [13,17]. On the contrary, Sharifi et al. [18] and Peter et al. [19] showed an association between hypertension and sexual dysfunction in diabetics, possibly because of different population characteristics [20].

Table 6. Severity of sexual dysfunction domains in female diabetics

Domain	Severely abnormal	Abnormal	Normal
Anorgasmia	4 (5.8%)	41 (59.4%)	24 (34.8%)
Vaginismus	6 (8.7%)	44 (63.8%)	19 (27.5%)
Non-communication	9 (13%)	45 (65.2%)	15 (21.7%)
Infrequency	5 (7.2%)	45 (65.2%)	19 (27.5%)
Avoidance	4 (5.8%)	31 (44.9%)	34 (69.3%)
Non-sensuality	5(7.2%)	45 (65.2%)	19 (27.5%)
Dissatisfaction	4 (5.8%)	37 (53.6%)	28 (40.6%)

Table 7. Univariate analysis of characteristics associated with sexual dysfunction in female diabetics

Characteristics		N=100 (%)	SD	No SD	p
			N=47(%)	N=22(%)	
Age (mean±S.D)		53.4±14.2	54.5±13	51.1±16.7	0.403
Diabetes duration (mean±S.D)		15.6± 6.04	7.55±6.12	8.04±5.97	0.753
Alcohol intake	Yes	3 (100)	2 (66.7)	1 (33.3)	0.956
	No	66 (100)	45 (68.2)	21 (31.8)	
BMI	Underweight	7 (100)	5 (71.4)	2 (28.6)	0.548
	Normal	15 (100)	9 (60)	6 (40)	
	Overweight	27 (100)	17 (63)	10 (37)	
	Obese	20 (100)	16 (80)	4 (20)	
Impaired vision	Present	33 (100)	24 (72.7)	9 (27.3)	0.431
	Absent	36 (100)	23 (63.9)	13 (36.1)	
Hypertension	Present	42 (100)	28 (66.7)	14 (33.3)	0.747
	Absent	27 (100)	19 (70.4)	8 (29.6)	
Serum Cr. (µmol/l)	Abnormal (>120)	6 (100)	5 (83.3)	1 (16.7)	0.403
	Normal (≤ 120)	63 (100)	42 (66.7)	21(33.3)	
eGFR (mL/min/1.73m^2)	Abnormal (<60)	18 (100)	12 (66.7)	6 (33.3)	0.787
	Normal (≥60)	51 (100)	35 (68.6)	16 (31.4)	
Serum Urea (mmol/l)	Abnormal (>8.3)	1 (100)	0 (0.0)	1 (100)	0.491
	Normal (≤8.3)	68 (100)	46 (67.6)	22 (32.4)	
Total Chol. (mmol/l)	Abnormal (>6.5)	7 (100)	4 (57.1)	3 (42.9)	0.511
	Normal (≤6.5)	62 (100)	43(69.4)	19 (30.6)	
Triglycerides (mmol/l)	Abnormal (> 1.7)	25 (100)	18 (72)	7 (28)	0.602
	Normal (≤1.7)	44 (100)	29 (65.9)	15 (34.1)	
HDL Chol. (mmol/l)	Abnormal (<1.03)	16 (100)	10 (62.5)	6 (37.5)	0.582
	Normal (≥1.03)	53 (100)	37 (69.8)	15 (30.2)	
LDL Chol. (mmol/l)	Abnormal (>4.9)	3 (100)	2 (66.7)	1 (33.3)	0.956
	Normal (≤ 4.9)	66 (100)	45(68.2)	21 (31.8)	

The effect of longer diabetes duration on nerve damage (neuropathy) has been proposed theoretically to be responsible for sexual dysfunction in diabetics as it disrupts blood flow to the genital area [3]. On the other hand, the association between duration of diabetes and neuropathy has been reported to be very negligible [20] and thus justifies the finding of the present study. In line with the current study, Ziaei-Rad et al. [17] found no relation between duration of diabetes and sexual dysfunction in both genders. This finding was also supported by Esposito et al. [13] and Omidvar et al. [21] who found that duration of diabetes has no correlation with sexual dysfunction in women.

Poor vision was not correlated with diabetic sexual dysfunction in this study. In contrast, Henis et al. [22] identified impaired vision as a predictor of sexual dysfunction in men. Similarly, Ali et al. [12] identified poor vision as a significant risk factor for sexual dysfunction in diabetic women. The diagnostic criteria for poor vision in the previous studies differed from the current study, hence the difference in outcome [23]. For example, poor vision is relative and can vary in duration and extent; this can produce varying effects on sexuality.

Studies by Chernyshova et al. [24] and Copeland et al. [25] showed a relationship between renal dysfunction and sexual dysfunction in diabetics. On the other hand, renal dysfunction was not associated with sexual dysfunction in both men and women in the present study, possibly because of the different methodology employed [26,27].

Our study has shown that smoking is not a significant risk factor for sexual dysfunction. This finding agrees with a previous study among diabetic men by Mutagaywa et al. [28]. Similarly, Ali et al. [12] and Esposito et al. [13] also found no relationship between smoking and sexual dysfunction in diabetic women. Smoking is known to cause sexual dysfunction via its nicotine content [29], but a study by Premalatha et al. [16] proved otherwise, hence the finding of the present study.

The effect of high lipids concentration in the development of atherosclerosis which often results in sexual dysfunction is yet to be fully justified [16]. This may explain why there was no difference between diabetics with sexual dysfunction and diabetics without sexual dysfunction in terms of dyslipidemia in the present study. This finding has been confirmed by Sharifi et al. [18] and Mutagaywa et al. [28] who revealed that dyslipidemia is not a significant risk factor for sexual dysfunction in diabetic men. Similarly, Ali et al. [12] showed no correlation between dyslipidemia and sexual dysfunction in women. Alcohol intake and sexual dysfunction in diabetics were not found to be correlated in this study. A similar finding was reported by Mutagaywa et al. [28] in a study of diabetic men. Peter et al. [19] also reported no correlation between alcoholism and sexual dysfunction in men. In women, alcohol has been shown to cause sexual dysfunction [30] but no clinical study has been identified linking alcoholism to sexual dysfunction in women. Theoretically, alcohol is said to be linked to the development of neuropathy, a major cause of sexual dysfunction in diabetics, but this is inconclusive [31], hence the finding of the present study.

The present study found no link between age and sexual dysfunction in both genders. This finding was supported by Ziaei-Rad et al. [11] who found no relation between age and sexual dysfunction in both genders. Similar to the present study, Omidvar et al. [21] showed no relationship between age and sexual dysfunction in diabetics. In contrast, it was revealed in a study by Esposito et al. [13] that age and female sexual dysfunction are correlated, possibly because of the different methodology employed [20].

5. CONCLUSION

The study showed that the prevalence and severity of sexual dysfunction is high among diabetes patients. None of the independent variables is predictive of sexual dysfunction in diabetics.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. International Diabetes Federation. Key Findings; 2014.
Available:http://www.idf.org/
[Online] 2014.
(Accessed: February 12, 2015.)
Available:http://www.idf.org/diabetesatlas/update-2014

2. International Diabetes Federation. Diabetes in Ghana; 2014. Available:www.IDF.org [Online] 2014. (Accessed: February 12, 2015.) Available:http://www.idf.org/membership/afr/ghana
3. Josylin Diabetes Center. Sexual Dysfunction - Causes and Symptoms. Available:www.joslin.org [Online] 2015. (Cited: February 26, 2015.) Available:http://www.joslin.org/info/sexual_dysfunction_causes_and_symptoms.html
4. National Institute of Diabetes and Digestive and Kidney Diseases. Sexual and Urological Problems. Available:http://www.diabetes.niddk.nih.gov. [Online] June 29, 2012. [Cited: February 26, 2015.] Available:http://www.diabetes.niddk.nih.gov/dm/pubs/sup/
5. International Diabetes Federation. *Complications.* IDF Diabetes Atlas I Sixth Edition. 2013;32.
6. Berardis GD, Franciosi M, Belfiglio M, Nardo BD, Greenfield S, et al. Erectile dysfunction and quality of life in type 2 diabetic patients. Diabetes Care. 2002; 25:284–291.
7. Owiredu WKBA, Amidu N, Alidu H. Sarpong C, Gyasi-Sarpong CK. Determinants of sexual dysfunction among clinically diagnosed diabetic patients. Reproductive Biology and Endocrinology. 2011;7:1-11.
8. National Kidney Disease Education Program. Estimating GFR. [Online] April 24, 2015. [Cited: September 13, 2015.] Available:http://nkdep.nih.gov/lab-evaluation/gfr/estimating.shtml.
9. Rust J, Golombok S. The GRISS: A psychometric instrument for the assessment of sexual dysfunction. 1986, Archives of Sexual Behavior. 1986;15:157-165.
10. Unadike BC, Eregie A, Ohwovoriole AE. Prevalence and types of sexual dysfunction among males with diabetes in Nigeria. Diabetes International. 2008;1:18-20.
11. Singh J, Tharyan P, Kekre N, Singh G, Gopalakrishnan G. Prevalence and risk factors for female sexual dysfunction in women attending a medical clinic in South India. Journal of Postgraduate Medicine. 2009;55:113-120.
12. Ali ARM, Hajeri AM, Khader YS, Shegem NS, Ajlouni KM. Sexual dysfunction in Jordanian diabetic women. Diabetes Care. 2008;31:1580–1581.
13. Esposito K, Maiorino MI, Bellastella G, Giugliano F, Romano M, Giugliano D. Determinants of female sexual dysfunction in type 2 diabetes. International Journal of Impotence Research. 2010;22:179–184.
14. Owiti FR, Olando Y, Kuria MW, Likata GUM. Sexual dysfunction among patients with diabetes mellitus. Greener Journal of Medical Sciences. 2012;2:138-145.
15. Vafaeimanesh J, Raei M, Hosseinzadeh F, Parham M. Evaluation of sexual dysfunction in women with type 2 diabetes. Indian Journal of Endocrinology and Metabolism. 2014;18:175–179.
16. Premalatha G, Shanthirani S, Deepa R, Jerome M, Mohan V. Prevalence and risk factors of peripheral vascular disease in a selected South Indian population: The Chennai Urban Population Study. Diabetes Care. 2000;23:1295–1300.
17. Ziaei-Rad M, Vahdaninia M, Montazeri A. Sexual dysfunctions in patients with diabetes: A study from Iran. Reproductive Biology and Endocrinology. 2010;8:1-8.
18. Sharifi F, Asghari M, Jaberi Y, Salehi O, Mirzamohammadi F. Independent predictors of erectile dysfunction in type 2 diabetes mellitus: Is it true what they say about risk factors? Endocrinology. 2012; 1:1-6.
19. Peter J, Riley CK, Layne B, Miller K, Walker L. Prevalence and risk factors associated with erectile dysfunction in diabetic men attending clinics in Kingston, Jamaica. Journal of Diabetology. 2012; 2:1-10.
20. Bergqvist, Kersti Y, Monica Å, Lundberg O. Understanding the role of welfare state characteristics for health and inequalities – an analytical review. BMC Public Health. 2013;13:1-20.
21. Omidvar S, Niaki MT, Amiri FN, Kheyrkhah F. Sexual dysfunction among women with diabetes mellitus in a diabetic center in Amol. Journal of Natural Science, Biology and Medicine. 2013;4:321-324.
22. Henis O, Shahar Y, Steinvil A, Finn T, Heruti R, Loewenstein A, Justo D. Erectile dysfunction is associated with severe retinopathy in diabetic men. Urology. 2011; 77:1133-1136.

23. Vellakkal S, Subramanian SV, Millett C, Basu S, Stuckler D, Ebrahim S. Socioeconomic inequalities in non-communicable diseases prevalence in India: Disparities between self-reported diagnoses and standardized measures. PloS One. 2013;8:1-12.
24. Chernyshova TE, Sitnikov VA, Martirosov L. The effect of diabetic nephropathy on the function of the hypophyseal-gonadal system in men. Urologiiia I Nefrologiia. 1991;1:54-57.
25. Copeland KL, Brown JS, Creasman JM, Eeden Van Den SK, Subak LL, Thom DHFA, Huang AJ. Diabetes mellitus and sexual function in middle-aged and older women. Obstetrics & Gynecology. 2012; 120:331–340.
26. Patel MX, Doku V, Tennakoon L. Challenges in recruitment of research participants. Advances in Psychiatric Treatment. 2003;9:229-238.
27. Devillé WL, Buntinx F, Bouter LM, Montori VM, Henrica CW, Wind AWM, Bezemer P. Conducting systematic reviews of diagnostic studies: Didactic guidelines. BMC Medical Research Methodology. 2002;2:1-6.
28. Mutagaywa RK, Lutale J, Aboud M, Kamala BA. Prevalence of erectile dysfunction and associated risk factors among diabetic men attending diabetic clinic at Muhimbili National Hospital in Dar-Es-Salaam, Tanzania. Pan African Medical Journal. 2014;17:1-8.
29. Tostes RC, Carneiro FS, Lee AJ, Giachini FRC, Leite R, Osawa Y, Webb RC. Cigarette smoking and erectile dysfunction: Focus on no bioavailability and ROS generation. Journal of Sexual Medicine. 2008;5:1284–1295 .
30. American Health Network. Alcoholic Neuropathy.
Available:www.ahni.com
[Online] 2015. [Cited: September 6, 2015.]
Available:http://www.ahni.com/Specialties/Foot+and+Ankle/Articles/Common+Disorders/Alcoholic+Neuropathy.html
31. Mimi O, Teng CL, Chia YC. The prevalence of diabetic peripheral neuropathy in an outpatient setting. Medical Journal of Malaysia. 2003;48:533-538.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/16228