Journal of the Medical Sciences
(Berkala Ilmu Kedokteran)

The impact of glucose control index on erectile hardness score among type 2 diabetes mellitus patients

Sakti Ronggowardhana Brodjonegoro[1*], Andy Zulfiqqar[1,2], Franky Renato Anthonius[2], Amanda Cyko[3], Pandu Ishaq Nandana[4]

[1]Division of Urology, Department of Surgery, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada/Dr. Sardjito General Hospital, Yogyakarta, [2]Departement of Internal Medicine, HL Manambai Abdulkadir General Hospital, Sumbawa,[3] Department of Internal Medicine, Dompu General Hospital, Dompu, [4]Division of Urology, Department of Surgery, Faculty of Medicine, Universitas Mataram, Mataram, Indonesia.

ABSTRACT

The prevalence of erectile dysfunction (ED) was reported to vary from 37.5 to 52% in men above 40. Type 2 diabetes mellitus (T2DM) maycause the nerves and blood vessels damages that worsened the ED. This study aimed to evaluate the correlation between the glucose control index and the erection hardness score (EHS) among T2DM patients. The cross-sectional observational study was conducted in two district hospitals i.e. Manambai Abdulkadir District Hospital, Sumbawa, and Dompu District Hospital, Dompu, West Nusa Tenggara, Indonesia. Forty-five patients with T2DM were involved in this study. Data were collected using structural questioners during the period from June 1st to August 1st, 2017 and were analyzed using SPSS 24.0. Pearson correlation and logistic regression analysis were used to determine the odds ratio (OR). Among 45 patients having age 57.38± 7.22 years involved in this study, 38 (84.4%) patients had ED, 26 (57.8%) uncontrolled DM, 5 (11.1%) congestive heart failure (CHF), 4 (8.9%) chronic kidney diseases (CKD), and 7 (15.6%) neuropathy diabetic. A strong correlation between random glucose level and IIEF-5 score (r=0.91; p=0.01) was observed. The overall odds ratio of ED in this study was 4.3 (95% CI: 0.73 to 25.1) for uncontrolled DM, 2.5 (95% CI: 0.1 to 51.1) for CHF, 2 (95% CI: 0.01 to 41.6) for CKD, and 1.2 (95% CI: 0.1 to 11.5) for neuropathy diabetics. In conclusion, there is a strong correlation between random glucose level, duration of diagnosed DM and EHS. Active screening is recommended for this population.

ABSTRAK

Prevalensi disfungsi ereksi (DE) dilaporkan bervariasi antara 37.5 hingga 52 % pada laki laki berusia diatas usia 40. Diabetes melitus tipe 2 (DMT2) dapat menyebabkan kerusakan jaringan syaraf dan pembuluh darah yang dapat memperburuk kondisi DE. Penelitian ini bertujuan mengkaji hubungan antara indeks control glukosa dan skor kekerasan ereksi (SKE) pada penderita DMT2. Penelitian ini merupakan penelitian potong lintang dilakukan di RSUD Manambai Abdulkadir, Sumbawa dan RSUD Dompu, Dompu, Nusa Tenggara Barat, Indonesia. Empat puluh lima pasien DMT2 diikutkan dalam penelitian ini. Data diperoleh menggunakan kuisioner terstruktur periode 1 Juni sampai 1 Agustus 2017 dan dianalisis menggunakan SPSS 24.0. Analisis regresi analitik dan korelasi Pearson digunakan untuk menentukan *odds ratio* (OR). Di antara 45 pasien yang berumur 57,38 ± 7,22 tahun yang terlibat dalam penelitian ini, 38 (84,4%) pasien mengalami DE, 26 (57,8%) DMT2 tidak terkontrol, 5 (11,1%) gagal jantung kongestif (GJK), 4 (8,9%) penyakit ginjal kronik, (PGK), and 7 (15,6%) diabetes neuropati. Ada hubungan yang kuat antara kadar gula darah acak dengan skor IIEF-5 (r=0,91; p=0,01). *Odd ratio* keseluruhan dari DE pasien ini adalah 4,3 (95% CI: 0,73 - 25,1) untuk DM tidak terkontrol, 2,5 (95% CI: 0,1–51,1) untuk GJK, 2 (95% CU: 0,01 – 41,6) untuk PGK, dan 1,2 (95% CI: 0,1 – 11,5) untuk diabetes neuropati. Dapat disimpulkan, terdapat hubungan kuat antara kadar gula darah acak, durasi terdiagnosis DM dengan SKE. Skrining aktif direkomendasikan pada populasi pasien ini.

---

*corresponding author: drsakti.brodjonegoro@gmail.com

INTRODUCTION

Erectile dysfunction (ED) is defined as a failure to achieve or maintain the erection of the penis for sufficient sexual intercourse.[1] The ED mostly affects elderly men with the number of cases approximately 30 up to 50% in the population. The data of ED remain as an iceberg due to the majority of cases are undiagnosed.[2,3]

Type 2 diabetes mellitus (DM) is one of major risk factors for ED. Inadequate glycemic control is known as one of the major factors that lead to an abnormality of neurovascular inducing the ED. A cross-sectional study reported that the ED cases are commonly found in patients with particular conditions, such as DM, the advancement of age, and chronicity of diseases.[4]

Increasing age is positively correlated to the prevalence and degree of ED. Data showed that moderate and complete ED among age was different, among men in the forties there was 8%, meanwhile, there was 40% in men aged 60-69. Massachusetts Male Aging Study (MMAS) estimated the possibility of the increasing number of ED worldwide between 1995 and 2025. This estimation is based on the age-adjusted data of the recent men population which is increased from 152 million to 322 million.[2] The International Diabetes Federation (IDF) also estimates that there are 425 million people worldwide who have diabetes and approximately 20 up to 85% of them have ED. Among the ED patients, those with diabetes are likely to have experienced the symptoms 10-15 years earlier than men without diabetes.[5] Thus increasing age is positively correlated to the prevalence of T2DM and the degree of ED.

Although the ED is not a life-threatening condition, it is strongly associated with physical health, psychosocial health, the outcome of therapy, and hence it determines the quality of life. This study was aimed to investigate the impact of ED among T2DM patients and the impact of glucose control in the erection hardness domain.

MATERIALSAND METHODS

Design and subjects

The cross-sectional observational study was performed at Manambai Abdulkadir District Hospital, Sumbawa, and Dompu District Hospital, Dompu, West Nusa Tenggara, Indonesia. The male out patients diagnosed with T2DM were enrolled in this study. All samples were collected from the outpatients in the Department of Internal Medicine. All patients with histories of spinal cord injury, stroke, Parkinson's disease, prostate surgery, cancer, and major psychiatric problem were excluded. The blood samples were taken from both hospital laboratories and their classification was carried out using a national algorithm adopted from the American Diabetes Association (ADA) guidelines.

Protocol of study

In this study, we used the Indonesian version IIEF-5 (international index of erectile function) questioners and erectile hardness score (EHS) to evaluate the ED of patients. The patients were interviewed to avoid bias in answering questioner. The current mental condition was assessed using the patient's health questionnaire 9 (PHQ9). The patients were interviewed by the general practitioner (GP) to avoiding bias in the patient perspective to answering the PHQ9. Patients with a score of more than 5 that indicate patients with mild or worse depression condition were

excluded. This study received approval from the Manambai Abdulkadir District Hospital Ethical Review Board (800/892/ RSMA/VII).

Forty-five consecutive males whom favorable inclusion and exclusion criteria were enrolled in this study. The blood venous samples were taken in the outpatient department after interviews were completed. The cut point of regulated DM was used ADA guidelines and current national guidelines that indicated 200 mg/dL as regulated DM.

Statistical analysis

Data were presented as mean ± standard deviation (SD) or frequency and analyzed using SPSS 24.0. Pearson correlation and logistic regression analysis were used to find the odds ratio (OR).

RESULTS

A total of 45 men completed the questionnaire and their clinical characteristics are presented in TABLE-1.

TABLE 1. Data of demographics

Variable	Sum
Age (mean ± SD years)	57.38 ± 7.22
ED Defined by IIEF-5 [n (%)]	39 (83)
• Mild	15 (33)
• Mild-moderate	9 (20)
• Moderate	8 (18)
• Severe	7 (16)
ED Defined by EHS [n (%)]	38 (80.9)
Duration of DM(mean ± SD years)	3.89 (3.6)
Status of DM [n (%)]	
• Controlled	19 (42.2)
• Uncontrolled	26 (57.8)
CKD [n (%)]	4 (8.9)
CHF[n (%)]	5 (11.1)
Neuropathy [n (%)]	7 (15.6)
Hypertension [n (%)]	15 (33.3)
• Regulated	8 (17.7)
• Unregulated	7 (15.6)

Overall, 39 (84.4%) and 38 (80.9%) of T2DM patients had ED that defined by IIEF-5 and EHS respectively, and the majority of patients had mild ED (15) (TABLE 1). The duration of DM was approximately 3.89 years. Among 45 patients who had T2DM, 26 (57.8%) of them was an uncontrolled glucose index.

The overall odds ratio of ED in this study were 4.3 (95% CI: 0.73 to 25.1) for uncontrolled diabetes, 2.5 (95% CI: 0.1 to 51.1) for CHF, 2 (95% CI: 0.01 to 41.6) for CKD, and 1.2 (95% CI: 0.1 to 11.5) for neuropathy diabetics (TABLE 2). In this study, we found that EHS and IIEF-5 also demonstrated similar results on diagnosed ED patients which both of them exhibited a medium inverse correlation to ED severities (Spearman rho 0.91; p<0.001) as presented in FIGURE 1.In addition, the duration of DM also has a medium inverse correlation (Spearman rho 0.349, p = 0.016).

TABLE 2. Univariate analysis risk of ED

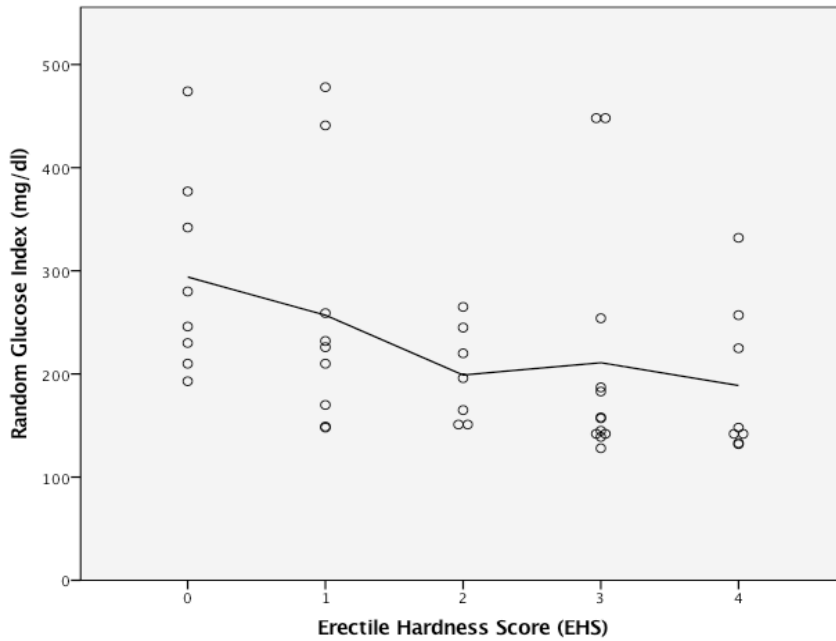| Variables	OR	95% CI
Uncontrolled DM	4.3	0.73 -25.1
Congestive heart failure	2.5	0.1 -51.1
Chronic kidney diseases	2	0.01 - 41.6
Neuropathy	1.2	0.1 - 11.5

Fisher exact test; Chi-square analysis

FIGURE 1. Correlation between EHS and random glucose index (Spearman rho – 0.35; p = 0.020).
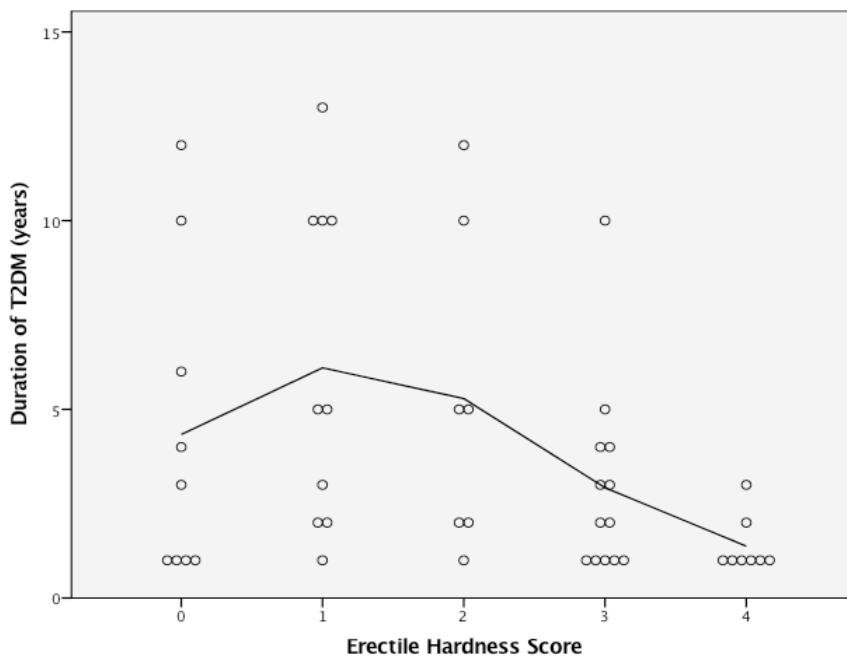

FIGURE 2. Correlation between EHS and Random glucose Index (Spearman rho – 0.349; p=0.016).

DISCUSSION

Sexual dysfunction is reported mostly in patients with T2DM. It can be caused by physical abnormality, psychological condition, or both of them. In terms of management of ED, the management of underlying diabetic condition hypothetically improves sexual quality. Currently, the glucose control impact on the erection hardness is still less reported. In this study, 39 of the 45 patients had ED in all degree categories. Mostly, the ED patients had a multi-burden disease. Ahmed *et al.*[6] also found a similar pattern. Approximately 97.2% T2DM patients had ED in term all severity of ED were included. Erectile dysfunction has been known as one of the negative predictors of poor quality of life in patients with T2DM due to its negative effect on male self-esteem, depression, and anxiety.[7-9] Hence, actively screening ED among T2DM patients is needed for diagnosis purposes and to improve the quality of life T2DM patients.

Glycemic control correlates with the development of ED and furthers complications of T2DM; tight glycemic control has been advocated for decades. Despite being campaigned poor glycemic control remains found in a wide population, on this study we found that the majority of patients (57.8%) still have unregulated glycemic blood levels. A significant inverse correlation between blood glycemic level and severity of ED was demonstrated in this study. This data suggests that poor glycemic controls worsen the severity of ED. Several studies support our finding,[10-15] whereas other studies did not report any correlation.[16,17] The result from each study may vary due to the chronicity of T2DM, time of diagnosis, hypertension, hyperlipidemia, overweight, obesity, metabolic syndrome, smoking, sedentary lifestyles, and autonomic neuropathy, which are recognized as risk factors for ED that found different on the baseline of each studies.[18-20]

Erectile hardness score is known as a tool for an evaluation of the management of ED that focusing on assessing dimensions of erection hardness. This study illustrating that the glucose index has an inverse correlation with erectile hardness. High glucose index is known as a scavenger that slowing nerve conduction and altered vascular reactivity that may result in a worsened erectile hardness score.[21] To the best of our knowledge, our study is the first data that evaluate the glucose index and erectile hardness score. The nature of random glucose index may present as cross-sectional data is one of the limitations of this study. Further, the duration of diabetes was also found as a confounding factor in this study. The longer duration of T2DM indicated the worsened erection hardness score. Besides, most patients in this study did not seek medical advice for their current condition, this condition makes the patient could be considered as silent suffers. The active screening of ED on the patient with the duration of T2DM and unregulated blood glucose index is advisable. The future direction of this study is to evaluate the reversibility of low EHS scores among T2DM after tight regulation of the blood glucose index.

In the term of limitation, our cross-sectional study conducted in a relatively small number of subjects. The major obstacle was the large proportion patient with T2DM patients were have moderate-severe depression while screened with PHQ9 questioner, several patients also reported underwent TURP and others procedure that may affect the quality of erection. The major strength of our study is to perform strong data with strict exclusion criteria. However, Studies in larger subjects are needed.

Despite the aforementioned limitation, this study indicated the early screening of ED among T2DM, and regulate underlying diseases may

pivotal role to improve the management outcome in a specific condition and the specific therapy addressed the sexual concerns is needed.

CONCLUSION

The poor glycemic control and the long duration of T2DM are poor predictors of erection hardness score (EHS). Healthcare Professionals should be encouraged to initiate an open dialogue of sexual issues to identify patients with ED who may not otherwise volunteer their sexual concerns.

ACKNOWLEDGMENTS

REFERENCES

1. Giuliano F, Droupy S. Erectile dysfunction. Prog Urol 2013; 23(9):629-37.
   http://doi.org/10.1016/j.purol.2013.01.010
2. Malavige LS, Levy JC. Erectile dysfunction in diabetes mellitus. J Sex Med 2009; 6(5):1232-47.
   https://doi.org/10.1111/j.1743-6109.2008.01168.x
3. Feldman HA, Goldstein I, Hatzichristou DG, Krane RJ, McKinlay JB. Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. J Urol 1994; 151(1):54-61.
   https://doi.org/10.1016/S0022-5347(17)34871-1
4. Kimura M, Shimura S, Tai T, Kobayashi H, Baba S, Kano M, *et al*. A web-based survey of erection hardness score and its relationship to aging, sexual behavior, confidence, and risk factors in Japan. Sex Med 2013; 1(2):76-86.
   https://doi.org/10.1002/sm2.15
5. Jumani DK, Patil O. Erectile dysfunction in diabetes mellitus :

6. Ahmed I, Aamir AH, Anwar E, Ali SS, Ali A, Ali A. Erectile dysfunction and type 2 diabetes mellitus in northern Pakistan. J Pak Med Assoc 2013; 63(12):1486-90.
7. Tamler R, Deveney T. Hypogonadism, erectile dysfunction, and type 2 diabetes mellitus: what the clinician needs to know. Postgrad Med 2010; 122(6):165-75.
   https://doi.org/10.3810/pgm.2010.11.2234
8. Malavige LS, Jayaratne SD, Kathriarachchi ST, Sivayogan S, Ranasinghe P, Levy JC. Erectile dysfunction is a strong predictor of poor quality of life in men with Type 2 diabetes mellitus. Diabet Med 2014;31(6):699-706.
   https://doi.org/10.1111/dme.12412
9. Phé V, Rouprêt M. Erectile dysfunction and diabetes: A review of the current evidence-based medicine and a synthesis of the main available therapies. Diabetes Metab 2012; 38(1):1–13.
   https://doi.org/10.1016/j.diabet.2011.09.003
10. Penson DF, Latini DM, Lubeck DP, Wallace KL, Henning JM, Lue TF. Do impotent men with diabetes have more severe erectile dysfunction and worse quality of life than the general population of impotent patients? Results from the exploratory comprehensive evaluation of erectile dysfunction (ExCEED) database. Diabetes Care 2003; 26(4):1093-9.
    https://doi.org/10.2337/diacare.26.4.1093
11. Lu CC, Jiann BP, Sun CC, Lam HC, Chu CH, Lee JK. Association of glycemic control with risk of erectile dysfunction in men with type 2 diabetes. J Sex Med 2009; 6(6):1719-28.
    https://doi.org/10.1111/j.1743-6109.2009.01219.x
12. Enzlin P, Rosen R, Wiegel M, Brown J, Wessells H, Gatcomb P, *et al*. Sexual dysfunction in women with

areview. 2020; 1-7.

type 1 diabetes: long-term findings from the DCCT/ EDIC study cohort. Diabetes Care 2009;32(5):780-5.
https://doi.org/10.2337/dc08-1164

13. Ali RMA, Al Hajeri RM, Khader YS, Shegem NS, Ajlouni KM. Sexual dysfunction in Jordanian diabetic women. Diabetes Care 2008; 31(8):1580-1.
https://doi.org/10.2337/dc08-0081

14. Olarinoye J, Olarinoye A. Determinants of sexual function among women with type 2 diabetes in a Nigerian population. J Sex Med 2008;5(4):878-86.
https://doi.org/10.1111/j.1743-6109.2007.00649.x

15. Giugliano F, Maiorino M, Bellastella G, Gicchino M, Giugliano D, Esposito K. Determinants of erectile dysfunction in type 2 diabetes. Int J Impot Res 2010; 22(3):204-9.
https://doi.org/10.1038/ijir.2010.1

16. Siu SC, Lo SK, Wong KW, Ip KM, Wong YS. Prevalence of and risk factors for erectile dysfunction in Hong Kong diabetic patients. Diabet Med 2001; 18(9):732-8.
https://doi.org/10.1046/j.0742-3071.2001.00557.x

17. Shiferaw WS, Akalu TY, Aynalem YA. Prevalence of erectile dysfunction in patients with diabetes mellitus and its association with body mass index and glycated hemoglobin in Africa : A systematic review and meta-analysis. Int J Endocrinol 2020; 2020:5148370.
https://doi.org/10.1155/2020/5148370

18. Chao JK, Kuo WH, Chiang HS, Hwang TIS, Chao IC, Chiang SK. Association of metabolic syndrome, atherosclerosis risk factors, sex hormones in ED in aboriginal Taiwanese. Int J Impot Res 2012; 24(4):141-6.
https://doi.org/10.1038/ijir.2012.5

19. Al-Hunayan A, Al-Mutar M, Kehinde EO, Thalib L, Al-Ghorory M. The prevalence and predictors of erectile dysfunction in men with newly diagnosed with type 2 diabetes mellitus. BJU Int 2007;99(1):130-4.
https://doi.org/10.1111/j.1464-410X.2006.06550.x

20. Giuliano FA, Leriche A, Jaudinot EO, de Gendre AS. Prevalence of erectile dysfunction among 7689 patients with diabetes or hypertension, or both. Urology 2004; 64(6):1196-201.
https://doi.org/10.1016/j.urology.2004.08.059

21. Cellek S, Cameron NE, Cotter MA, Muneer A. Pathophysiology of diabetic erectile dysfunction: potential contribution of vasa nervorum and advanced glycation endproducts. Int J Impot Res 2013; 25(1):1-6.
https://doi.org/10.1038/ijir.2012.30