Prevalence of Non-Communicable Diseases in Patients with Type 2 Diabetes Mellitus in Egypt; A Retrospective Survey

Mohamed Mashahit[1*], Eman Ezzat[1] and Eman Hanafy[2]

[1]*Department of Internal Medicine, Faculty of Medicine, Fayoum University, Egypt.*
[2]*Department of Public Health, Faculty of Medicine, Fayoum University, Egypt.*

Authors' contributions

Article Information

Original Research Article

ABSTRACT

Background: Non communicable diseases (NCDs) have been a difficult group to define. However, four common behavioral risk factors (tobacco use, excessive alcohol consumption, poor diet, and lack of physical activity) are associated with four disease clusters (cardiovascular diseases, cancers, chronic pulmonary diseases, and diabetes) that account for about 80% of deaths from non communicable diseases. There is progressive increase in number of patients developing type 2 diabetes mellitus (T2DM), worldwide. Egypt is present in top ten countries for number of adults with diabetes in the 8th place. We aimed in this work to study the prevalence of non communicable diseases among T2DM patients.
Materials and Methods: This retrospective study involved data of 2468 T2DM patients collected from three Egyptian Governess; Cairo, Giza and Fayoum, for two years duration. These data included patient age, sex, body mass index (BMI), waist circumference, education level, duration of DM, degree of diabetes control (assessed by HbA1c), presence or absence of smoking,

Corresponding author: E-mail: mam22@fayoum.edu.eg;

hypertension, dyslipidaemia, diabetic complications, cardiovascular diseases, chronic lung diseases, chronic liver diseases, thyroid diseases and malignancy.

Results: Of the studied group we found that 797 patients (32.3%) had well controlled DM, 1999 (81%) with BMI ≥ 25, 1333 (54%) were hypertensive, 1876 (76%) had diabetes complications, 31% (765) of patients developed cardiovascular diseases 568 (23%) had chronic pulmonary diseases, 1530 (62%) had chronic liver diseases, 444 patients (18%) had thyroid diseases and 34 cases (1.33%) had malignancy.

Conclusion: There is high prevalence of non communicable diseases in patients with type 2 diabetes mellitus in Egypt, which mandates more organized efforts to face them.

1. INTRODUCTION

Non communicable diseases (NCDs) are a difficult group of diseases to define [1]. Even the term "non communicable diseases" is a misnomer, because it includes some diseases (cancers of the liver, stomach, and cervix) that are partly caused by infectious organisms, and it usually excludes mental illnesses, despite their large contribution to long-term disability [1]. However, four common behavioral risk factors (tobacco use, excessive alcohol consumption, poor diet, and lack of physical activity) are associated with four disease clusters (cardiovascular diseases, cancers, chronic pulmonary diseases, and diabetes) that account for about 80% of deaths from these diseases [1].

WHO estimated deaths due to non communicable diseases globally in 2008 to account for 63% of the total deaths (57 million total deaths) [2], it also projects that non communicable diseases will account for an increasing absolute number and proportion of worldwide deaths, rising to about 70% of deaths in 2030 [3]. According to Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) estimates, mortality attributed to non communicable diseases increased from 57% of total mortality in 1990 to 65% in 2010 [1,4], 80% of them occurred in low and middle income countries and in these countries 90% of these non communicable disease–related deaths occur before the age of 60 years [5].

Cardiovascular diseases (CVD) contribute to the largest portion of deaths related to non communicable diseases, followed by cancer, chronic obstructive pulmonary disease (COPD), and diabetes [6].

The GBD 2010 also estimated that 54% of disability- adjusted life-years (DALYs) worldwide in 2010 (increased from 43% in 1990) were due to non communicable diseases. In addition, DALYs between 1990 and 2010, due to cardiovascular diseases, cancer, and diabetes mellitus increased by 22.6%, 27.3%, and 69.0%, respectively [6].

Furthermore, the economic consequences of non communicable diseases are huge, because of the combined burden of health care costs and lost economic productivity due to illness and premature deaths [7].

Egypt is present in top ten countries for number of adults with diabetes in the 8th place [1]. Therefore, we aimed to study the prevalence of non communicable diseases and other co-morbid conditions among T2DM patients in Egypt.

2. MATERIALS AND METHODS

This retrospective study was conducted using data collected from files of 2468 patients with type 2 DM on anti diabetic medications, aged 18-75 years, from three Egyptian Governess; Cairo, Giza and Fayoum, for two years duration in the period from January 2015 to January 2017, after obtaining the approval of the local ethics committee. Written informed consent was obtained from the participants. Patients with type1 DM and pregnant females, current or past history of tuberculosis were excluded from this study.

All patients underwent full history taking with especial emphasis on age, sex, duration of diabetes, smoking, though clinical examination including weight, height, body mass index (BMI) and waist circumference. [Reference values are that of metabolic syndrome: in men ≥102 cm (40 in) and in women ≥88 cm (35 in)] [8]and fundus examination , laboratory investigation included (CBC, ESR, liver profile including (AST,ALT,s albumin, bilirubin, INR) viral makers including (HB s AG, HB c AB, HCV ab, HBV DNA PCR,

HCV PCR when needed), FBS. 2hPP, HB A1C, a patient was considered well controlled if HbA1c < 7.5% and poorly controlled DM if HbA1c > 7.5%, (c-peptide, fasting insulin were done when need), lipid profile, renal functions tests (creatinine, blood urea nitrogen), urine analysis. S uric acid, thyroid function tests (TSH. FT4. Ft3), liver biopsy was done when indicated.

Radiological investigations included: Electrocardiogram. Echocardiography, Chest x ray, abdominal U/S, neck U / S, breast U/S, and mammogram, CT chest, abdomen and pelvis when needed.

2.1 Statistical Analysis

Continuous data are presented as means ± standard deviations. Categorical variables are presented as numbers and percentages. All collected data were analyzed by using SPSS version 12

3. RESULTS

Of the 2468 type 2 diabetes patients included in this study: 1123 (45.5%) females and 1345 (54.5%) males, their ages ranged from 18-75 years old with 395 (16%) ranged from 18-40 years, 1580 (64%) ranged from 40-55 years, 345 (14%) ranged from 55-70 years and 148 (6%) above 70 years old. 247 patients (10%) diagnosed to be diabetic for less than one year, 839 (34%) diagnosed for 1-5 years duration, 1037 (42%) diagnosed for 5-10 years, 346 (14%) diagnosed for more than 10 years. 1357 patients (55%) were cigarette smokers [1316 males (97%) and 41 females (3%)] and 1111(45%) were non-smokers.

As regard level of education; 567 patients (23%) were highly educated, 888 (36%) of medium education level, 297 (12%) attained primary education and 716 (29%) were non-educated.

Of the studied group 797 patients (32.3%) were well controlled (HbA1c < 7.5%) and 1671 (67.7%) were poorly controlled DM (HbA1c > 7.5%).

Patients with BMI < 25 were 469 patients (19%), from 25-30 were 938 (38%), from 30-35 were 691 (28%) and > 35 were 370 (15%). Waist circumference measures were increased in 2142 patients (87%) and were normal in 326 (13%).

Hypertensive patients were 1333 (54%), 240 (18%) of them were newly diagnosed at time of examination while the rest 1093 (82%) were known to be hypertensive, 62% of hypertensive patients (826) their blood pressures were well controlled while 38% (507) were uncontrolled.

Regarding diabetes complications: 1876 patients (76%) had peripheral neuropathy, 518 (21%) had diabetic retinopathy, 1185 (48%) had diabetic nephropathy, 765 (31%) had ischemic heart diseases, 197 (8%) had diabetic foot, and 123 (5%) had cerebrovascular stroke (Fig. 1).
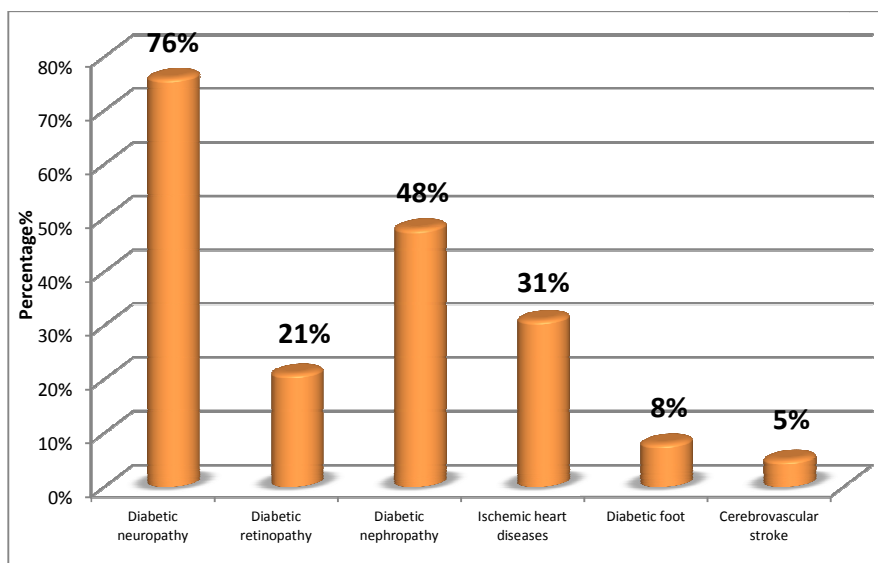

Fig. 1. Prevalence of diabetic complications among participants

Our data also revealed that 1134 patients (46%) had abnormal lipid profile (whether on no or irregular treatment) and 1334 (54%) had normal lipid profile. 31% (765) of patients developed cardiovascular diseases in the form of acute myocardial infarction, the need of coronary stent insertion, heart failure and arrhythmias (28%, 45%, 31% and 20% of cardiac patients respectively) (Fig. 2).

Our analyses showed that 568 patients (23%) had chronic pulmonary diseases as chronic obstructive pulmonary disease, bronchial asthma or other lung diseases including bronchogenic

carcinoma, interstitial lung diseases, were 477, 63 & 28 patients respectively (84%, 11%, & 5% respectively) (Fig. 3).

Patients with chronic liver diseases were 1530 (62%), 214 patients (14%) had hepatitis C virus infection, six patients (0.4%) had hepatitis B virus infection, 1001 (66%) had fatty liver disease (NAFLD) or non -alcoholic stea-ohepatitis (NASH) [some overlap was present], 306 (20%) had cirrhotic liver, 16 cases (1%) had periportal fibrosis and 13 cases (0.9%) had hepatocellular carcinoma.
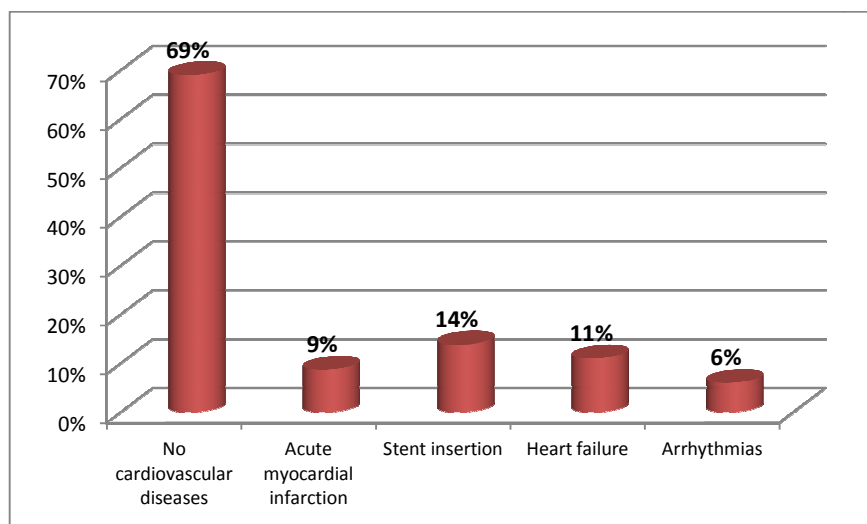

Fig. 2. Prevalence of cardiovascular disease among participants
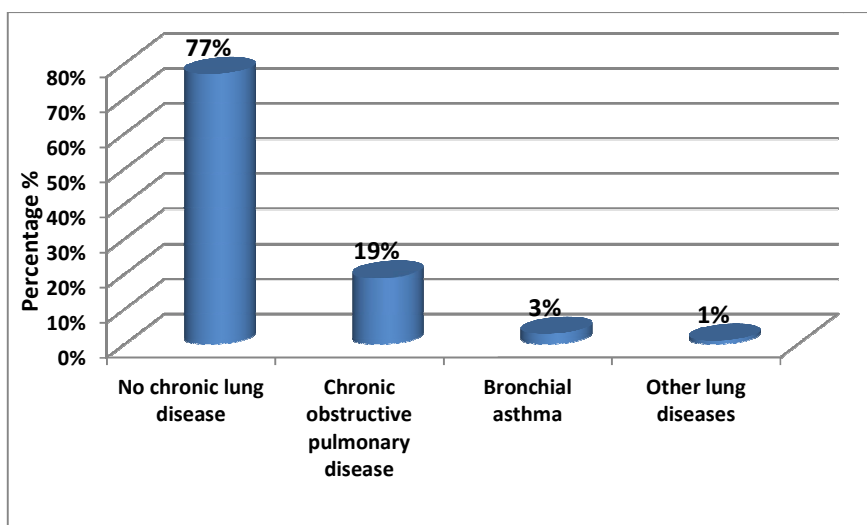

Fig. 3. Prevalence chronic pulmonary disease among participants

As regard thyroid diseases 444 patients (18%) had thyroid diseases in the form hypothyroidism, hyperthyroidism, goiter, thyroiditis and thyroid cancer (258, 108, 40, 37 & 1 case respectively).

Patients with malignancy were 34 cases (1.33%) of which 13 cases (38.3%) hepatocellular, 9 cases (26.5%) breasts, 4 cases (11.8%) pancreatic, 3 cases (8.8%) hematological, 2 (5.9%) prostatic, 2 (5.9%) bronchial, and 1 case (2.9%) thyroid malignancies.

Frequencies of non-communicable disease and co-morbid conditions among participants are shown in (Fig. 4).

4. DISCUSSION

In this retrospective survey, we found the majority of participants had obesity, and dyslipidaemia. Our results were consistent with Musaiger; [9] who estimated obesity in Middle East adults to be 50 -80% and Kilpi et al. [10] who warned about increasing obesity in the Middle East region. Worldwide, by 2025, global obesity prevalence is suspected to reach 18% in males and to exceed 21% in females [11]. Although in our survey we could not obtain a full dietary data including the amount of salt intake from our patients files which was a potential limitation of our study, and although diabetes mellitus prevalence has a regional variability due to genetic susceptibility, but Egypt is one of the low income countries and carbohydrates represent a main component of meals of the majority of populations due to their relative low prices here which may contribute to this increase in obesity in addition to sedentary life especially in urban areas.

In this study, we observed more than half of the participants were hypertensives with subsequent increase in the risk of MI, stroke, and all-cause mortality [12]. In a previous systematic review, prevalence of hypertension in diabetic patients reported to be 60% [13], with countries like India [14] and Japan [15] had prevalence estimates below 50%, whereas, Mexico [16] and Romania [17] had estimates just above 50%. This prevalence reached up to 70%–80% in USA [12].

In the present study we found about three quarters of the participants had diabetic neuropathy. In contrast to other studies who estimated its prevalence in type 2 DM to range from 19.5% in newly diagnosed cases to 27.8% in known diabetic patients in India [18], and about one third of diabetic population in UK [19]. and from 10–26% in newly diagnosed adults with diabetes in USA [20] with 22% in youth with T2DM [21]. The high prevalence observed in our study may be attributable to higher rates of poorly controlled DM in our patients to exceed two thirds of participants in addition to associated co-morbidities and obesity. Previous reports [22,23] emphasized the multifactorial effects of glycaemic control, associated co-morbid conditions in the incidence of diabetic neuropathy in type 2 DM patients.
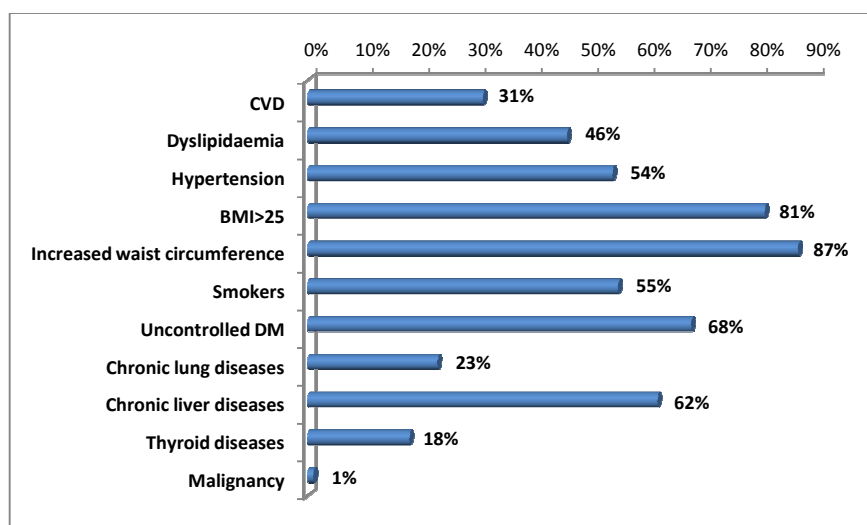

Fig. 4. **Frequencies of non-communicable disease and co-morbid conditions among participants**

We found slightly less than one quarter of the participants had chronic pulmonary diseases; the majority of them (84%) had chronic obstructive pulmonary disease. These results were more than other studies who estimated COPD prevalence to be 16% in diabetic patients and 19% in those developed DM within 10 years COPD diagnosis [24]. Moreover, these results are inconsistent with previous studies [25,26] which reported the prevalence to be approximately 10% in diabetic patients and globally to be approximately 10% of adults over 40 years of age [27]. This high prevalence of COPD documented in our study may be explained by the high prevalence of smoking, pollution, hypertension, obesity and dyslipidaemia in our participants. Hypertension is considered an independent associated factor with COPD [28]. The estimated prevalence of COPD in patients with metabolic syndrome may reach up to 37 %in some studies [29]. Several epidemiological studies documented that DM is more frequent in COPD patients and had strong impact on their prognosis [30]. This relation may be explained by low grade chronic inflammation and inflammatory mediators present in the pathogenesis of both conditions [31] although a more complex relation is suspected.

Our data also revealed high prevalence of chronic liver diseases in type 2 diabetic patients. These results are exceeding those of other studies reported lower prevalence especially for NASH ranging from 7 to 41% [32,33,34]. This may be expected in our results due to associated co-morbid conditions as obesity and suspected insulin resistance in our patients; in addition to the fact that Egypt has the highest prevalence of HCV infection, worldwide.

As regard prevalence of thyroid diseases more than half of participants had hypothyroidism, and about one quarter had hyperthyroidism. Some studies found the incidence of thyroid disorders in both types of diabetes to be 13.4% [35] and 10.8% [36] but they included fewer numbers of patients than our study. It is known that thyroid dysfunctions are more common in type 1 DM but some literature reports suggest equal frequency in both types of DM [37]. Hypothyroidism is much more frequent in diabetic patients than hyperthyroidism [38]. It can cause hypoglycaemia, with increase insulin resistance [39].

In our survey participants had several types of malignancy. There is significant association between T2 DM and cancer [40,41].

This association may also be explained by increased patient's age, obesity, sedentary life and lack of physical activity. Implicated pathogenesis includes hyper-insulinaemia both, directly due to over-expression of insulin receptors on malignant cells [42], and indirectly through insulin-like growth factor (IGF)-1 which has a mitogenic and anti-apoptotic effect [43,44]. Also, direct effect of hyperglycemia [45] and chronic inflammatory cytokines [46] in T2DM may play a role. For these reasons American diabetes Association [47] advocates age and sex-appropriate cancer screenings in addition to controlling modifiable cancer risk factors in diabetic patients. Some studies [48,49] discussed the role of some antidiabetic drugs on increasing or reducing the incidence of some types of cancers but results are conflicting.

5. CONCLUSION AND RECOMMENDA-TIONS

There is high prevalence of other NCDS and other co-morbid conditions among T2DM patients in Egypt, which will affect the overall outcomes in these patients. This mandates more organized efforts to face them.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380:2095-128.
2. World Health Organization. Cause-specific mortality, 2008: WHO region by country. Geneva; 2011.

3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006;3(11): e442.

4. Murray CJL, Lopez AD. Measuring the global burden of disease. N Engl J Med. 2013;369:448-57.

5. World Health Organization. Non-communicable diseases. Geneva; 2013.

6. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380:2197-223.

7. David J Hunter, Srinath Reddy K. Global health noncommunicable diseases. N Engl J Med. 2013;369:1336-43.

8. Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome: An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation. 2005;112:2735.

9. Musaiger AO. Overweight and obesity in the Eastern Mediterranean: Prevalence and possible causes. J Obes. 2011; 407237.

10. Kilpi F, Webber L, Musaigner A, et al. Alarming predictions for obesity and non-communicable diseases in the Middle East. Public Health Nutr. 2014;17(5):1078-86.

11. NCD Risk Factor Collaboration (NCD-RisC). Trends in adult body-mass index in 200 countries from 1975 to 2014: A pooled analysis of 1698 population-based measurement studies with 19·2 million participants. Lancet. 2016;387(10026): 1377-1396.

12. Caroline S Fox, Sherita Hill Golden, Cheryl Anderson, et al. Update on prevention of cardiovascular disease in adults with type 2 diabetes mellitus in light of recent evidence: A scientific statement from the American Heart Association and the American Diabetes Association. Diabetes Care. 2015;38(9):1777-1803.

13. Colosia AD, Palencia R, Khan S. Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: A systematic literature review. Diabetes Metab Syndr Obes. 2013;6:327-338.

14. Tharkar S, Satyavani K, Viswanathan V, et al. Cost of medical care among type 2 diabetic patients with a co-morbid condition – hypertension in India. Diabetes Res Clin Pract. 2009;83(2):263-267.

15. Kano S, Ito T, Furuya K, et al. Ambulatory blood pressure level rather than dipper/nondipper status predicts vascular events in type 2 diabetic subjects. Hypertens Res. 2004;27(9):647-656.

16. Jiménez-Corona A, Rojas R, Gómez-Pérez FJ, et al. Early-onset type 2 diabetes in a Mexican survey: Results from the National Health and Nutrition Survey 2006. Salud Publica Mex. 2010;52(Suppl 1):S27-S35.

17. Babeş EB, Babeş V, Ofrim D, et al. Prevalence and prognostic significance of silent myocardial ischemia in diabetic patients with and without hypertension. Arch Balk Med Union. 2009;44(3):210-214.

18. Pradeepa R, et al. Prevalence and risk factors for diabetic neuropathy in an urban south Indian population: The Chennai Urban Rural Epidemiology Study (CURES-55). Diabet. Med. 2008;25:407-412.

19. Abbott CA, Malik RA, van Ross ER, et al. Prevalence and characteristics of painful diabetic neuropathy in a large community-based diabetic population in the U.K. Diabetes Care. 2011;34(10): 2220-2224.

20. Rodica Pop-Busui, Andrew JM Boulton, Eva L Feldman, et al. Diabetic neuropathy: A position statement by the American Diabetes Association. Diabetes Care. 2017;40(1):136-154.

21. Jaiswal M, et al. Prevalence of and risk factors for diabetic peripheral neuropathy in youth with type 1 and type 2 diabetes: Search for diabetes in youth study. Diabetes Care. 2017;dc170179.

22. Chun-Pai Yang, Cheng-Chieh Lin, Chia-Ing Li, et al. Cardiovascular risk factors increase the risks of diabetic peripheral neuropathy in patients with type 2 diabetes mellitus medicine (Baltimore). 2015;94(42): e1783.

23. Lynn Ang, Mamta Jaiswal, Catherine Martin, et al. Glucose control and diabetic neuropathy: Lessons from recent large clinical trials. Curr Diab Rep. 2014;14(9): 528.

24. Te-Wei Ho, Chun-Ta Huang, Sheng-Yuan Ruan, et al. Diabetes mellitus in patients with chronic obstructive pulmonary disease-The impact on mortality. PLoS One. 2017;12(4):e0175794.

25. Caughey GE, Roughead EE, Vitry AI, et al. Comorbidity in the elderly with diabetes: Identification of areas of potential treatment conflicts. Diabetes Res Clin Pract. 2010;87:385-393.

26. Kerr EA, Heisler M, Krein SL, et al. Beyond comorbidity counts: How do comorbidity type and severity influence diabetes patients' treatment priorities and self-management? J Gen Intern Med. 2007;22:1635-1640.

27. Buist AS, McBurnie MA, Vollmer WM, et al. International variation in the prevalence of COPD (the BOLD Study): A population-based prevalence study. Lancet. 2007;370:741–50.

28. Kim SH, Park JH, Lee JK, et al. Chronic obstructive pulmonary disease is independently associated with hyper-tension in men: A survey design analysis using nationwide survey data. Medicine (Baltimore). 2017;96(19):e6826.

29. Vujic T, Obradovic Nagorni, Maric G, et al. Metabolic syndrome in patients with chronic obstructive pulmonary disease: Frequency and relationship with systemic inflammation. Hippokratia. 2016;20(2): 110–114.

30. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management and prevention of COPD; 2017.

31. Glaser S, Kruger S, Merkel M, et al. Chronic obstructive pulmonary disease and diabetes mellitus: A systematic review of the literature. Respiration. 2015;89(3): 253-264.

32. Neuschwander-Tetri BA, Clark JM, Bass NM. Clinical, laboratory and histological associations in adults with nonalcoholic fatty liver disease. Hepatology. 2010;52(3):913–924.

33. Angulo P, Hui JM, Marchesini G. The NAFLD fibrosis score: A noninvasive system that identifies liver fibrosis in patients with NAFLD. Hepatology. 2007;45(4):846–854.

34. Rao H, Wu E, Fu S, et al. The higher prevalence of truncal obesity and diabetes in American than Chinese patients with chronic hepatitis C might contribute to more rapid progression to advanced liver disease Aliment Pharmacol Ther. 2017;1–10.

35. Perros P, McCrimmon RJ, Shaw G, et al. Frequency of thyroid dysfunction in diabetic patients: Value of annual screening. Diabet Med. 1995;12:622-7.

36. Smithson MJ. Screening for thyroid dysfunction in a community population of diabetic patients. Diabet Med. 1998;15: 148-50.

37. Radaideh AR, Nusier MK, Amari FL, et al. Thyroid dysfunction in patients with type 2 diabetes mellitus in Jordan. Saudi Med J. 2004;25:1046-50.

38. Tarig Karar, Rayan Alhammad, Mohamed Abdel Fattah, et al. Relation between glycosylated hemoglobin and lipid and thyroid hormone among patients with type 2 diabetes mellitus at King Abdulaziz Medical City, Riyadh. J Nat Sci Biol Med. 2015;6(Suppl 1):S75-S79.

39. Farasat T, Cheema AM, Khan MN. Relationship of thyroid hormones with serum fasting insulin and insulin resistance in euthyroid glycemic anomalies. Pak J Zool. 2011;43:379-86.

40. Kentaro Shikata, Toshiharu Ninomiya, Yutaka Kiyohara. Diabetes mellitus and cancer risk: Review of the epidemiological evidence. Cancer Sci. 2013;104(1):9–14.

41. Suh S, Kim KW. Diabetes and cancer: Is diabetes causally related to cancer? Diabetes Metab J. 2011;35:193–198.

42. Giovannucci E, Harlan DM, Archer MC, et al. Diabetes and cancer: A consensus report. Diabetes Care. 2010;33:1674–85.

43. Hu FB, Manson JE, Liu S, et al. Prospective study of adult onset diabetes mellitus (type 2) and risk of colorectal cancer in women. J Natl Cancer Inst. 1999;91:542–7.

44. Giovannucci E. Insulin and colon cancer. Cancer Causes Control. 1995;6:164–79.

45. Richardson LC, Pollack LA. Therapy insight: Influence of type 2 diabetes on the development, treatment and outcomes of cancer. Nat Clin Pract Oncol. 2005;2:48–53.

46. Vona-Davis L, Howard-McNatt M, Rose DP. Adiposity, type 2 diabetes and the metabolic syndrome in breast cancer. Obes Rev. 2007;8:395–408.

47. American Diabetes Association. Standards of medical care in diabetes; 2017.

48. Currie CJ, Poole CD, Gale EA. The influence of glucose-lowering therapies on cancer risk in type 2 diabetes. Diabetologia. 2009;52:1766–77.

49. Libby G, Donnelly LA, Donnan PT, et al. New users of metformin are at low risk of incident cancer: A cohort study among people with type 2 diabetes. Diabetes Care. 2009;32:1620–5.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/20974