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Gender: does it have a role in blood pressure in Caucasians with well-controlled type 2 diabetes?

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Abstract

Background: Blood pressures are increased in type 2 diabetics presenting an enhanced risk of myocardial infarction and subsequent death. It is controversial whether males have a greater risk of myocardial infarction and resultant death in type 2 diabetes. **Objective:** The purpose of this study was to review the literature regarding gender in blood pressure and to test the hypothesis that there would be gender inequality in blood pressure in well-controlled Caucasian type 2 diabetics in Cape Breton, Nova Scotia resulting in at least one gender exceeding the Canadian Diabetes Association (CDA) guidelines for systolic and/or diastolic pressures. **Methods:** Blood pressure were done by sphygmomanometry and using a stethoscope. **Results:** This study revealed statistically identical blood pressures in males and females which were above the CDA guidelines for systolic and diastolic pressures. **Conclusion:** It is concluded that neither males nor females as a population in this study are meeting the CDA guidelines for systolic or diastolic pressures and as such may well be at greater risk of myocardial infarction than if they were meeting these CDA guidelines. Ultimately it will have to be determined what approaches are suitable in bringing blood pressures to clinical target endpoints and what role gender may play in these approaches to management of hypertension in type 2 diabetics. However, this was only a very small study and a much larger one would answer whether there is gender inequality in blood pressure among persons with well-controlled type 2 diabetes.

Key Words: *Blood pressure, type 2 diabetes, Gender*

Introduction

Cape Breton Island in the province of Nova Scotia, Canada suffers from among the highest rates of type 2 diabetes in Canada, the consequence of which are seen in the overall economy and in the competition for healthcare dollars with other health issues. Consequently it is important to control this disease as much as possible so as to reduce its economic and social impact. There appear to be no reports regarding gender equity of management of blood pressure anywhere, such information being of clear importance for the medical, economic and social impacts of this disease.

Type 2 diabetes increases the risk of atherosclerosis-induced myocardial infarction and subsequent death.[1,2,3] Myocardial infarction may result from the formation of thrombi and/or emboli in type 2 diabetics. [4,5] It was hypothesized that as the preponderance of studies show a greater risk of myocardial infarction and subsequent death in male type 2 diabetics, [6,7,8,9] there should be higher blood pressure in males. However, other studies show a greater risk of myocardial infarction and subsequent death in female type 2 diabetics.[10,11,12] It has never been clear whether hypertension plays a role in gender differences in myocardial infarction incidence in type 2 diabetics. Ong et al.[13] showed no gender difference in hypertension while Keyhani et al.[14] showed females to be less likely to meeting blood pressure goals. However neither Ong et al.[13] or Keyhani et al.[14] specifically referred to type 2 diabetics.

Hypertension increases platelet aggregation, in part via damage to the arterial endothelium,[15] which exposes platelets to vascular wall collagen.[16,17] Increased platelet aggregation enhances the risk of myocardial infarction.[18,19, 20, 21, 22] Hypertension features in many type 2 diabetics[23,24] along with an increase in platelet aggregability.[25,26] However, no work has ever been done to assess potential gender difference in blood pressures in type 2 Caucasian diabetics. The purpose of this work was to determine if there was a significant difference between blood pressures in male versus female Caucasian type 2 diabetics that are well-controlled (< 8 % HbA1c) and if either or both genders are meeting the CDA guidelines for systolic and diastolic pressures.

Methods

Subjects (n =20 male, 20 female) were randomly chosen from among 84 Caucasians responding in approximately equal sex numbers to a Sydney, Nova Scotia newspaper advertisement and two area physicians. This study received approval from the Cape Breton University Human Ethics Review Committee. Subjects came for visit 1 and 3 months

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Table 1: Pre-treatment characteristics of subjects (all Caucasian). Data (N = 32) is reported as mean ± standard error of the mean (S.E.M.).

	Males visit 1	Males visit 2	Females visit 1	Females visit 2	Males –mean of visits 1 and 2	Females-mean of visits 1 and 2
N	18	18	14	14	18	14
Age (years)	59.5 ± 1.7	60.7 ± 2.9	60.7 ± 2.9	60.7 ± 2.9	59.5 ± 1.7	60.7 ± 2.9
Body mass index (BMI) kg/m^2	30.3 ± 0.7	30.3 ± 0.8	33.7 ± 1.6	33.4 ± 1.7	30.3 ± 0.8	33.6 ± 1.8

Table 2: Blood pressures (mm Hg), Data (N = 32) is reported as mean ± standard error of the mean (S.E.M.).

	Males visit 1	Males visit 2	Females visit 1	Females visit 2	Males –mean of visits 1 and 2	Females-mean of visits 1 and 2
N	18	18	14	14	18	14
Systolic	135.7 ± 3.7	140.7 ± 5.4	140.4 ± 5.1	145.6 ± 4.3	138.2 ± 4.1	143.0 ± 4.4
Diastolic	82.6 ± 2.8	85.8 ± 2.0	83.4 ± 3.0	85.4 ± 2.8	84.2 ± 2.0	84.5 ± 2.6

[a] significantly different from males (mean of visits one and two). There were no significant differences for a given gender between visits one and two.

later for visit 2. On both visits, body weight and height were determined. Blood pressure was measured by the same person for all patients using the same stethoscope and sphygmomanometer.

Statistical analyses

The data in tables 1 and 2 was analysed by an unpaired t-test for male versus female for each of visits 1, 2, and the combined visits 1 and 2. The data reflects patients who completed both visits 1 and 2. A paired t-test was performed for each gender for each of BMI (table 1) and for systolic and diastolic pressures (table 2) going from visit 1 to visit 2.

Results

Subject characteristics are contained in table 1. There were no significant differences in BMI between visits for males or females nor was there any difference between males and females in age or BMI for either visit 1 or 2. Blood pressures are found in table 2. Males had statistically identical blood pressures compared to females (visit 1, visit 2, and visits 1 and 2 combined). There were no differences in blood pressures going from visit 1 to visit 2 for either gender.

Discussion

Platelet function and activation [16,17] are reflected in blood pressure. The reduction of blood pressure results in lower platelet activation[27] and risk of other cardiovascular complications.[28]

The blood pressure data is validated by its consistency between visits one and two. The subjects of this study, each by gender population, are not meeting the Canadian Diabetes Association (CDA) 2003 guidelines[29] for systolic (≤ 130 mm Hg) and diastolic (≤ 80 mm Hg) pressures. This appears to be the first study addressing gender and hypertension in type 2 diabetics.

Thus, it seems that males may be in no greater need of intervention or intensity of intervention[30] to decrease blood pressures than females and that both require intervention to overcome this risk factor for myocardial infarction and potential subsequent death. Weight reduction is an important feature in blood pressure reduction[31,32] and certainly as a population the persons involved in the current study are obese as assessed by BMI. Wan et al [33] have indicated that individuals with a high BMI have worse (elevated) systolic pressures. However regardless of the method(s) used to reduce hypertension, Osher and Stern[34] have cautioned that getting systolic pressures to less than 130 mm Hg may be associated with diastolic hypotension. Regardless, Bebb et al[35] have observed that it appears very difficult at the present time to meet the CDA targets though intensive intervention did improve target achievement in one study.[36]

The current study was only a very small study and a much larger one would answer whether there is gender inequality in blood pressure among persons with well-controlled Caucasian type 2 diabetes. The role of gender and dose in any in specific blood pressure intervention threshold also remains to be determined.

In conclusion, Caucasian type 2 diabetic males may require no more aggressive intervention to decrease blood pressures than do Caucasian type 2 diabetic females. It would appear that hypertension may play no role in gender differences in myocardial infarction incidence in Caucasian type 2 diabetics. However, both sexes continue to have hypertension as defined by the CDA and this presents an enhance risk of myocardial infarction and potential subsequent death.

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References

1. Green B, Dufull S, Cotterell N and D'Emden, M. Myocardial infarction and type 2 diabetes- preferential treatment for high risk patients? J Clin Pharm Ther 2002; 27:371-376.
2. Mozejko-Pastewka B, Taton J, Haczynski J, Strojek K, Ametov AS, Milicevik Z, and the diabetes international research and education cooperative. Retrospective analysis of cardiovascular outcomes in patients with type 2 diabetes mellitus after the first acute myocardial infarction. Acta Diabetol 2003; 40:S354-S357
3. Zia S, and Hasan ZU. Survival after myocardial infarction in patients with type 2 diabetes. J Pak Med Assoc 2004; 54:73-80.
4. Ferroni P, Basili S, Falco A, Davi G. Platelet activation in type 2 diabetes mellitus. J Thromb Haemost 2004; 2: 1282-1291.
5. Packard C, Olsson AG. Management of hypercholesterolaemia in the patient with diabetes. Int J Clin Pract Suppl 2002; 130:27-32.
6. Dai study group. The prevalence of coronary heart disease in type 2 diabetic patients in Italy: The DAI study. Diabet Med 2004; 21:738-745.
7. Orchard TJ. The impact of gender and general risk factors on the occurrence of atherosclerotic vascular disease in non-insulin-dependent diabetes mellitus Ann Med 1996; 323-333.
8. Juutilainen A, Kortelainen S, Lehto S, Rönnemaa T, et al. Gender difference in the impact of type 2 diabetes on coronary heart disease risk. Diabetes Care 2004;27: 2898-2904.
9. Bog-Hansen E, Larsson CA, Gullberg B, Melander A, et al. Predictors of acute myocardial infarction mortality in hypertensive patients treated in primary care. Scandinavian J Primary Health Care 2007; 25: 237-243.
10. Tron'ko MD, Khalanhot MD, Kravchenko VI, Kul'chyns'ka IaB, et al. Gender-related risk of non-fatal stroke, myocardial infarction, and blindness in the type 2 diabetic patients depend on the type of treatment. Lik Sprava 2006; 1-2:23-27.
11. Zuanetti G, Lnatini R, Maggioni AP, Santoro L and Franzosi MG. Influence of diabetes on mortality in acute myocardial infarction:data from the GISSI-2 study. J Am Coll Clin Nutr 1993; 22:1788-1794.
12. Legatto MJ, Gelzer A, Goland R, Ebner SA, et al. Gender-specific care of the patient with diabetes: review and recommendations. Gender Medicine 2006; 3:131-158.
13. Ong KL, Tso AWK, Lam KSL, Cheung BMY. Gender differences in blood pressure conrol and cardiovascular risk factors in Americans with diagnosed hypertension. Hypertension 2008; 51:1142-1148.
14. Keyhani S, Scobie, JV, Hebert PL and McLauglin MA. Gender disparities in blood pressure control and cardiovascular care in a national sample of ambulatory care visits. Hypertension 2008; 51:1149-1155.
15. Savoia C and Schriffrin EL. Vascular inflammation in hypertension and diabetes: Molecular mechanisms and therapeutic interventions. Clinical Science 2007; 112:375-384.
16. Born GVR. Platelets and blood vessels. J Cardiovasc Pharm 1984;6: S706-S713.
17. Kristensen SD, Schmidt EB and Dyerberg J. Dietary supplementation with n-3 polyunsaturated fatty acids and human platelet function: a review with particular emphasis on implications for cardiovascular disease. J. Int. Med 1989; 22Suppl1:141-150.
18. Pitney WR, Nicol M, Dean S, Hickey A. Effect of flurbiprofen on bleeding time and platelet aggregation. Thromb Res 1978; 13: 811-819.
19. Milner PC and Martin JF. Shortened bleeding in acute myocardial infarction and its relation to platelet mass. Brit Med J 1985; 290:1767-1770.
20. Kristensen SD, Bath PM and Martin JF. Differences in bleeding time, aspirin sensitivity and adrenaline between acute myocardial infarction and unstable angina. Cardiovasc Res 1990; 24:19-23.
21. Harrison P, Mackie I, Mathur A, Robinson MSC, et al. Platelet hyperfunction in acute coronary syndromes. Blood Coag Fibrinolysis 16:557-562.
22. O'Brien JR, Jamieson S, Etherington M, Klaber MR, Ainsworth JF. Stressed template bleeding time and other platelet-function tests in myocardial infarction. Lancet 1973; 301:694-696.
23. Hillier TA and Pedula KL. Characteristics of an adult population with newly diagnosed type 2 diabetes. Diabetes Care 2001; 24:1522-1527.
24. Kirpichinov D and Sowers JR. Diabetes mellitus and diabetes-associated vascular disease. Trends in Endocrinology and Metabolism 2001; 12:225-230.
25. Sagel J, Colwell JA, Crook L, Laimins M. Increased platelet aggregation in early diabetes mellitus. Ann Intern Med 1975; 82:733-738
26. Mandal S, Sarode R, Dash S, Dash RJ. Hyperaggregation of platelets detected by whole blood platelet aggregometry in newly diagnosed noninsulin-dependent diabetes mellitus. Am J Clin Pathol 1993; 100:103-107.
27. Nomura S, Shouzu A, Omoto S, Nishikawa M, et al. Lorsatan and Simivistatin inhibit platelet activation in hypertensive patients. Journal of Thrombosis and Thrombolysis. 2004; 18:177-185.
28. Mancia G. The association of hypertension and diabetes: prevalence, cardiovascular risk and protection by blood pressure reduction. Acta Diabetol 2005; 42: S17-S25.
29. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2003:27(Suppl 2):S1-152.
30. Greving JP, Denig P, de Zeeuw, D, Bilo HJK and Haiaijer-Ruskamp FM. Trends in hyperlipidemia and hypertension management in type 2 diabetes patients from 1998-2004: a longitudinal observational study. Cardiovascular Diabetology 2007;6:25-30.

31. Ridderstrale M, Gudbjornsdottir S, Eliasson B, Nilsson PM and Cederholm J, for the steering committee of the Swedish National Diabetes Register (NDR). Obesity and cardiovascular risk factors in type 2 diabetes: results from the Swedish National Diabetes Register. J Int Med 2006; 259:314-322.
32. The Look Ahead Research Group (Espeland M et al.). Reduction in weight and cardiovascular disease risk factors in individuals with type 2 diabetes. Diabetes Care 2007;30: 1374-1383.
33. Wan A, Taggart J, Harris MF, Jayasinghe UW, et al. Investigation of cardiovascular risk factors in a rural Australian Division of General Practice Med J Aust 2008;189: 86-89.
34. Osher E and Stern N. Diastolic pressure in type 2 diabetes. Can target systolic pressure be reached without diastolic hypotension? Diabetes Care 2008; 31(Suppl 2):S249-S254.
35. Bebb C, Kendrick D, Coupland C, Madeley R, et al. A cluster randomized controlled trial of the effect of a treatment algorithm for hypertension in patients with type 2 diabetes. Brit J Gen Pract 2007;57:136-143.
36. Menard J, Payette H, Baillargeon J-P, Maheux P, et al. Efficacy of intensive multitherapy for patients with type 2 diabetes: a randomized controlled trial. CMAJ 2005; 173:online 1-6.