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Prevalence of Inter Arm Blood Pressure Difference among Type 2 Diabetics in Primary Care

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Abstract

Hypertension in patients with diabetes is a common problem; it increases the risk of cardiovascular, renal and ophthalmologic complications. Appropriate measurement of blood pressure is important, as the readings are the target of all pharmacological and non-pharmacological treatment. The aim of the present study was to observe the prevalence of significant difference in blood pressure in the arms in type 2 Diabetics and to establish if there is association between inter-arm blood pressure difference (IAD) and cardiovascular risk. A cross sectional study conducted in 5 primary care health centers. BP measurements were done by automatic Omron 7 machine; the measurements were done two times with interchanging the instruments between two arms. Data collection included demographic data (including, age, sex, body mass index (BMI), waist cir-cumferences, duration of Diabetes, history of HTN, and smoking status).The data collection form also in-cluded entry of last biochemical investigations done including total cholesterol, LDL, HDL, triglyceride, glycosylated hemoglobin (HbA1c) and Cardiovascular risk (CV risk) calculated by UKPDS engine version 2.0. Data was analyzed with SPSS (version 19). A total of 155 patients were studied. Mean age of patients was 55yrs. 22 participants (14.2, 95% CI=9.1-20.7) had systolic IAD >10 mmHg, 51 (33%, 95% CI=25.6-40.9) had a diastolic IAD >5 mmHg and 9 (5.8 %, 95% CI=2.7-10.7) had a diastolic difference >10 mmHg. In addition, the results showed statistically significant correlation between systolic interarm BP difference and duration of diabetes (P=0.025).There is significant diastolic interarm blood pressure difference in dia-betic patients. Hence it is important to measure the blood pressure in both arms for patients with diabetes to treat hypertension in diabetics appropriately.

1. Introduction

Hypertension is a major risk factor for cardiovascular diseases and complications of hypertension including strokes, myocardial infarction, renal and heart failure are well-known.[1-2] In Oman 14% of the adult population is diabetic. Most of these diabetics have associated hypertension.[3-4] The importance of measuring blood pressure in both arms is initially to prevent the misdiagnosis of hypertension due to normal differences in blood pressure between the arms.[5-6] Appropriate measurement of blood pressure is important in all diabetics as the readings are the target of all pharmacological and non-pharmacological treatment. The inter-arm blood pressure difference (IAD) has been studied in general but there are only 2 studies of the IAD in Type 2 Diabetes (DM2) patients.[7-8] In a cross sectional study of 101 DM2 subjects, where bilateral simultaneous BP measurements was done it was concluded that: a systolic IAD of more than 10 mmHg was present in 10 %. Failure to recognize this would misclassify half of these as normotensive rather than hypertensive using the lower reading arm.[9-10] It recommends that new patients with type 2 diabetes should be screened for IAD. Another study reported a prevalence of systolic or diastolic IAD greater than 10 mmHg for 9% in 169 patients with type 2 diabetes in general practice.[11] The aim of the current study is to estimate the prevalence of Inter Arm Difference (IAD) in blood pressure in patient with DM2 and to establish whether there is association between IAD and cardiovascular risk and other demographic features.

2. Methods

A cross sectional study was done, taking a convenience sample of adults over 20 years known to have type 2 Diabetes Mellitus. The study was carried out in five Primary care Health Centers in the capital area of Muscat Oman (total of 2867 patients)which included Wadi Kabeer Health Centre (881 patients), Wattyah Health Centre (729 patients), SQUH, FAMCO (125 patients), ALKhoudh Health Centre (758 patients) and North Mawaleh Health Centre (374 patients) was conducted in Muscat. Recruitment was done by taking consecutive sample of one every third diabetes patient attending Diabetic clinic that day. The project was approved by the MREC of the SQU, Oman. Patients with hemi paresis, limb abnormality, and significant injury to upper limbs, patients with h/o vascular surgery, atrial fibrillation, gestational diabetes mellitus and type 1 diabetes mellitus were excluded.

For the study, the measurement was conducted by investigators. The blood pressure was measured simultaneously in both arms with two automated sphygmomanometers (Omron 7) that had been calibrated previously. Participants were seated quietly for 5 minutes and advised not to take coffee or smoke at least 30 minutes before taking BP readings. Appropriate-sized cuff was used-encircling at least 80% of the arms.The BP instruments were used interchanged between both arms, after taking written verbal consent. For each set of BP readings those for each arm was averaged and IAD defined as the difference in BP between the left and right arm for both systolic and diastolic BP. Data collection

sheets were completed with demographic data (including, age, sex, body mass index (BMI), waist circumferences, duration of Diabetes, history of HTN, and smoking status).The data collection form also included entry of last biochemical investigations done including total cholesterol, LDL, HDL, triglyceride, glycosylated hemoglobin (HbA1c) and Cardiovascular risk (CV risk) calculated by UKPDS engine version 2.0. The information was entered to Excel sheet and collated and analyzed with SPSS (version 19). Based on previous studies, we calculated that a sample size of 136 would have a power of 90% to detect 10% prevalence of inter-arm difference with 95% CI.

3. Results

Total number of participants studied were 160 patients, 5 patients were excluded as per exclusion criteria, ending with 155 participants with type 2 diabetes. Mean age was 55years.57% of the population were females. Mean BP was 141.5/88 mmHg. 22 participants (14.2%, 95%, CI=9.1-20.7) had systolic IAD >10 mmHg, 51 (33%, 95% CI=25.6-40.9) had a diastolic IAD >5 mmHg and 9 (5.8 %,95% CI=2.7-10.7) had a diastolic difference >10 mmHg(figure1). When using t-test for comparison, the results showed that there is significant correlation between Systolic IAD and duration of Diabetes (P=0.025) and diastolic IAD with BMI (0.016). On the other hand, The presence of systolic IAD of >10 or diastolic IAD >5 was not related to differences in Age, Sex, Smoking status, Waist circumference, Hba1c, T. Cholesterol, Low Density Lipoprotein, High Density Lipoprotein,Triglycerides or Cardiovascular risk of the patients when compared using the t-test. Significant correlation was found between diastolic IAD of >5 mmHg and duration of diabetes in female patients (CI 95%); increased duration of diabetes associated with more significant diastolic IAD.

Table 1: Demographic and clinical characteristics of the study population

	Mean	SD
Age	55	11
Female%	57%	
BMI	30	5
DM duration	8	7
SBP	141.5	24
DBP	88	12
HBA1C	8	2
HDL	1	1
T.cholesterol	5	1
LDL	3	1
CV risk	17	14

Table 2: Significant IAD percentage

	Percentage	95%CI
SIAD ≥10	14.2	9.1-20.7
DIAD≥5	33	25.6-40.9
DIAD≥10	5.8	2.7-10.7

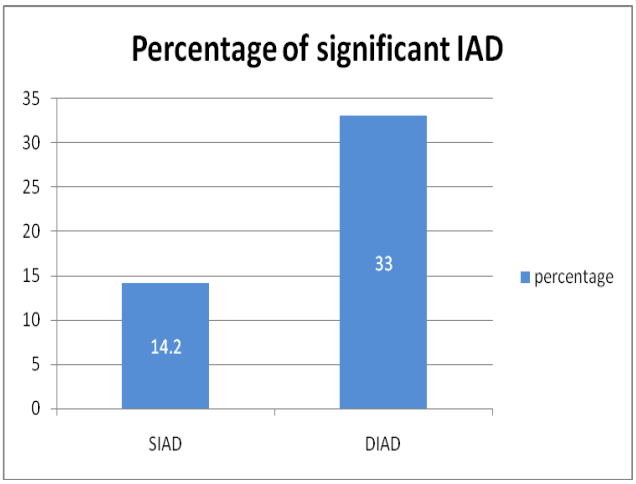

Fig1: prevalence of IAD

4. Discussion

This is imperative that the blood pressure should be measured in both the arms at the first visit because differences exist and measurement in only one arm may lead to under diagnosis of Hypertension.[12] The differences of a few mm of Hg are quite normal, but more than 10 mm of Hg in both arms could significantly increase the risk for cardiovascular outcomes.[13-14] Literature supports the view of inter-arm blood pressure difference as an alarming stage of increased disease risk that incorporated to investigate po-tential problems at an early diagnostic stage. A significant mean difference between left and right arm blood pressure recorded for many diseases.[15-16]

Demography in this study shows high BMI and uncontrolled diabetes (Table 1).This study reports the esti-mated prevalence of inter-arm blood pressure difference in primary care settings in patients with type 2 DM in Oman. A systolic inter-arm difference >10 mmHg was observed in 14.2% of patients with diabetes, a di-astolic inter -arm difference >5mmHg in 33% and a diastolic inter-arm difference >10 was observed in 5.8% (Table 2).The results showed statistically significant correlation between systolic inter-arm BP difference and duration of diabetes (P=0.025) (Fig I). However, presence of systolic or diastolic inter-arm difference was not related to other demographic features and cardiovascular risk. The measurements technique was found to be acceptable to patients. As reported in literature there is a significance implication in cardiovascular mortality.[17-18]

A systolic and diastolic inter-arm difference in blood pressure in diabetes population has significant mor-bidity in primary care patients. In our study, we concluded that there is no association between systolic or diastolic inter-arm difference and cardiovascular risk as it was pointed before to be worked on in previous study. An increase in blood pressure difference between left and right arm of a patient in a clinical condition may be considered as an alarming condition for many diseases. Literature reports that comparison between left and right arm BP showed that various diseases highly influenced the increase in both systolic as well as in diastolic blood pressure was confirmed strongly significant, which reflected in the findings that an IAD in SBP ≥10 mmHg could potentially be considered as a marker of increased arterial stiffness.[19-20]

A significant difference in IAD between left and right arm considered as a sign of some type of underlying pathology supported to investigate potential problems at an earlier diagnostic stage. Researchers reported the important findings that various diseases significantly influenced the increase in BP correlated with the find-ings of inter-arm SBP difference is common and associated with a significant increased risk for future car-diovascular events.[21-22] Recent recommendation is measuring blood pressure in both arm and the differ-ence of readings might be related to many diseases and therefore incorporated to investigate potential prob-lems at an early diagnostic stage.[23-25]

Strength and limitations of the study: This study recruited patients with type 2 DM from 5 primary health centers in Muscat. Sample size was adequate with power of 90%. The BP measurements techniques were reviewed and applied according to BP measurement protocols. BP was measured simultaneously in both arms to avoid bias. The study was previously piloted with good acceptance from participants. The measure-ment was conducted by investigators in diabetic clinic due to limited nursing resources for recruitment. The risk calculation has not yet established for Omani patients so we used UKPDS risk engine calculator which can be one of study limitations.

5. Conclusion

Hypertension is an important risk factor for diabetes related mortality and it is very essential not to miss di-agnosis of hypertension in diabetes patients. Therefore, it is proposed that blood pressure should be meas-ured in both arms when assessing diabetes patients. A simple approach can be done by measuring each arm at a time in the same consultation to promote effective care and management. This study explored the preva-lence of inter-arm difference in blood pressure measurements among outpatients and the assessment of blood pressure in both arms should become a “core component” when treating patients with high blood pressure or any fatal disease in primary care. Further studies are needed with larger sample size to confirm the current findings.

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