Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Inter-Arm Blood Pressure Difference In Type 2 Diabetic Patients

Dr. Imad H. Tahir (M. B. Ch. B , M.D, F.I.C.M.S)
Al-Nasiryiah Diabetic and Endocrine Center

ABSTRACT

Background: Long standing metabolic derangement in diabetes mellitus(DM) is associated with functional and structural changes in many organs particularly the vascular system, where hyperglycaemia represents an independent risk factor for both small and large blood vessels diseases which lead to the clinical complications of diabetes"[1]". Poorly controlled type 2 DM is associated with microvascular, macrovascular, and neuropathic complications. Microvascular complications of DM include retinal, renal, and possibly neuropathic disease. Macrovascular complications include coronary artery and peripheral vascular disease"[4]". Blood pressure should be measured in both arms either in rapid succession or simultaneous-ly ; normally the blood pressure measurement should differ by less than 10 mmHg, independent of handedness. However, as many as 20% of healthy individuals have a blood pressure difference greater than 10 mmHg in the absence of symptoms or other examination findings. Blood pressure difference of >10mmHg can be associated with subclavian artery disease(atherosclerosis or inflammatory), supravalvular aortic stenosis, aortic coarctation, or aortic dissection"[6]".

Aim of study: To explore the association of type 2 diabetes mellitus and inter-arm difference of blood pressure.

Subjects and Methods: In this case-control study, 132 patients with type 2 DM were included to evaluate the inter-arm systolic and diastolic blood pressure difference and compare the results with that present in 132 healthy individuals as a control. In this study we excluded:1-All diabetic patients with a history of cardiovascular diseases like: ischemic heart disease, valvular heart diseases, heart failure, congenital heart diseases and others. 2-All diabetic patients with a history of cerebro-vascular diseases like ischaemic strokes and others. 3-Those with peripheral arterial diseases like intermittent claudication or ischemic limbs. 4-Those with a history of hypertension. In the both groups, different parameters were recorded including the patients age, sex, BMI, cigarettes smoking, s. lipid profile. In addition, duration of DM and HbA1c as an indicator of glycemic control were recorded in diabetic group. In both diabetic and control groups, inter-arm systolic and diastolic blood pressure differences were evaluated using the mercurial sphygmomanometer by the same doctor who checked the blood pressure in both arms in the same (sitting) positions for all diabetics and control groups.

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Results and Discussion: In this study there was no significant association between the inter-arm blood pressure difference and most of the parameters that recorded including (age, sex, BMI, cigarettes smoking, duration of DM, s. lipid profile, and HbA1c). Christopher E Clark et al. stated that a systolic inter-arm blood pressure difference ≥ 10 mmHg was observed in 10 % of patients with diabetes"[16]". In this study, I noticed that most of diabetics (44.7%) have IASBP difference less than 5 mmHg, 31.8% of them have IASBP difference in the range of (11-15mmHg), 14% of them have a difference in the range of (16-20 mmHg), and 4.5% have IASBP difference of > 20 mmHg. While most of the control group (85.2%) have IASBP difference of less than 5 mmHg, and only 4.9% have a difference more than 10 mmHg. With significant correlation between diabetes and IASBP difference (P. value = 0.00001). Regarding the IADBP difference, most of diabetics (84.8%) and most of control group (88.1%) have a difference of less than 5 mmHg, (6.8% of diabetics and 7.9% of control group) have a difference in the range of 6-10 mmHg, and only (8.4% of diabetics and 4% of control group) have IADBP difference of more than 10 mmHg. No significant association between diabetes and IADBP difference (P. value = 0.633).

Conclusion: There is a significant association between diabetes and inter-arm systolic blood pressure differen-ce. For this reason, all patients with DM should be checked for inter-arm blood pressure difference to avoid misdiagnosis of diabetics as normotensive depending on the arm with lower blood pressure reading, a problem that may expose the diabetic patient to further complications of hypertension in addition to that of diabetes.

Introduction:

Diabetes mellitus (DM) is a clinical syndrome characterized by hyperglycaemia due to absolute or relative insulin deficiency. there are many causes for hyperglycaemia, but is most commonly due to type I and type II diabetes. Lack of insulin affect the metabolism of carbohydrate, proteins and fat, and can cause significant water and electrolyte disturbances and death may result from acute metabolic decompensation. Long standing metabolic derangement is associated with functional and structural changes in many organs particularly the vascular system, where hyperglycaemia represents an independent risk factor for both small and large blood vessels diseases which lead to the clinical complica-tions of diabetes"[1]".

Epidemiologic considerations: In 2007, it is estimated that in the united states of America, 23.6 million people had diabetes of which approximately 1 million have type I diabetes and the rest mostly have type 2 DM. A third group that was designated as "other specific types" by the American Diabetes Association (ADA) number only in the thousands. Among these are the rare monogenic defects of either pancreatic B cell function or of insulin action, primary diseases of the exocrine pancreas, endocrinopathies, and drug induced diabetes "[2]".

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Clinical features and complications of DM: The clinical features of type 2 DM can be insidious; classic symptoms (polyuria, thirst, polydipsia, polyphagia, and weight loss) may be mild. Fatigue, weakness, dizziness, blurred vision, and other nonspecific complaints may dominate the clinical picture and may be tolerated for many years before the patients seeks medical attention. Moreover, if the degree of hyperglycemia is insufficient to produce any symptoms, the diagnosis of DM can be made only after the development of vascular or neuropathic complications"3". Poorly controlled type 2 DM is associated with microvascular, macrovascular, and neuropathic complications. Microvascular complications of DM include retinal, renal, and possibly neuropathic disease. Macrovascular complications include coronary artery and peripheral vascular disease. Diabetic neuropathy affects autonomic and peripheral nerves"4".

Diagnosis of DM: diagnostic criteria for diabetes include the following"5":

1- Symptoms of diabetes plus random blood glucose concentration ≥11.1 mmol/L (200 mg/dl). or

2- Fasting plasma glucose level of ≥ 7.0 mmol/L (126 mg/dl). or

3- HbA1c >6.5%. or

4- Two-hour plasma glucose ≥ 11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test.

Blood pressure measurement: Important aspects should be taken in consideration during the measurement of blood pressure including:

1- The patient should be seated comfortably, back supported, bared upper arms, legs uncrossed.

2- Arm should be at heart level.

3- Cuff should be deflated at <3 mmHg per second.

4- Column or dial should be read to nearest 2 mmHg.

5- First audible Korotkoff sound is systolic pressure, last sound is diastolic pressure.

6- No talking between the patient and the observer during the blood pressure measurement.

Blood pressure should be measured in both arms either in rapid succession or simultaneous- ly ; normally the blood pressure measurement should differ by less than 10 mmHg, independent of handedness. However, as many as 20% of healthy individuals have a blood pressure difference greater than 10 mmHg in the absence of symptoms or other examination findings. Blood pressure difference of >10mmHg can be associated with subclavian artery disease(atherosclerosis or inflammatory), supravalvular aortic stenosis, aortic coarctation, or aortic dissection"6".

Aim of study: To explore the association of type 2 diabetes mellitus and inter-arm difference of blood pressure.

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Subjects and Methods:

In this case-control study which is done in The-Qar center for diabetes and endocrine diseases in Iraq/Annasiriyah extended from February/2017 to September/2017,132 patients with type II DM were included to evaluate the inter-arm systolic and diastolic blood pressure difference and compare the results with that present in 132 healthy individuals as a control. Exclusion criteria: in this study we excluded all diabetic patients who have the following criteria:

1- All diabetic patients with a history of cardiovascular diseases like: ischemic heart disease, valvular heart diseases, heart failure, congenital heart diseases and others.

2- All diabetic patients with a history of cerebro-vascular diseases like ischaemic strokes and others.

3- Those with peripheral arterial diseases like intermittent claudication or ischemic limbs.

4- Those with a history of hypertension.

In the diabetic group, different parameters were recorded including the patients age, sex, BMI, cigarettes smoking, duration of DM, s. lipid profile, and HbA1c as an indicator of glycemic control. In the control group we record the patients age and gender, BMI, cigarettes smoking and lipid profile.

In both diabetic and control groups, inter-arm systolic and diastolic blood pressure differences were evaluated using the mercurial sphygmomanometer by the same doctor who checked the blood pressure in both arms in the same (sitting) positions for all diabetics and control groups.

Statistical analysis was done by using frequency and percentage, chi-square had been used where p. value of < 0.05 considered as a significant level.

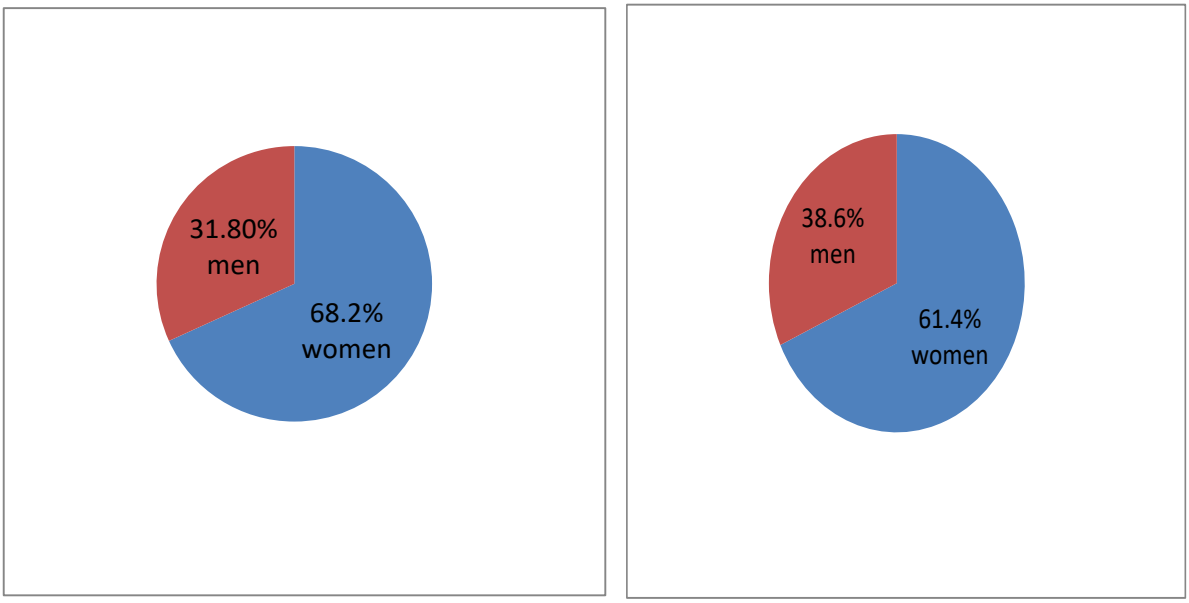
The patients and control group remained seated and at rest for 5 minutes before tacking the blood pressure and they were advised to avoid consumption of caffeinated products such as coffee, cola, or tea for at least 30 minutes prior to blood pressure measurement. In addition to that cigarettes smoking and exercise were avoided 30 minutes prior to blood pressure recording. While obtaining the blood pressure, there was no talk between the doctor and the both the patients and control.

Results:

Among diabetic group, 73 (68.2%)patients were women and 59 (31.8%) were men with a men to women ratio of 1.2:1 (nearly equal). While in the control group, the number of

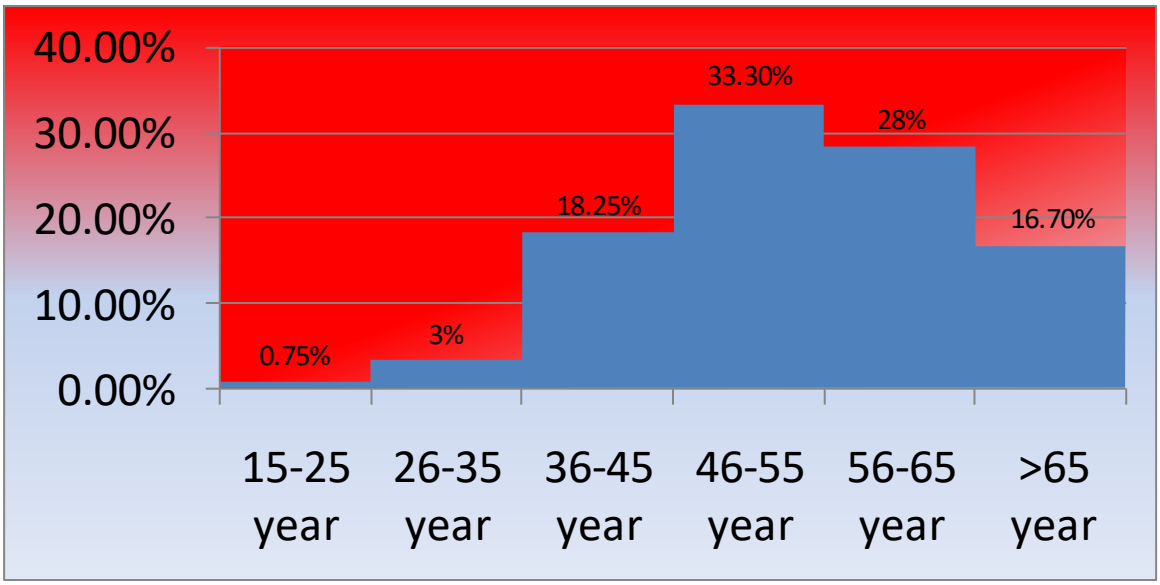
Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

women were 62 (61.4%) and the number of men in this group were 39 (38.6%) with men to women ratio of 1.6:1.



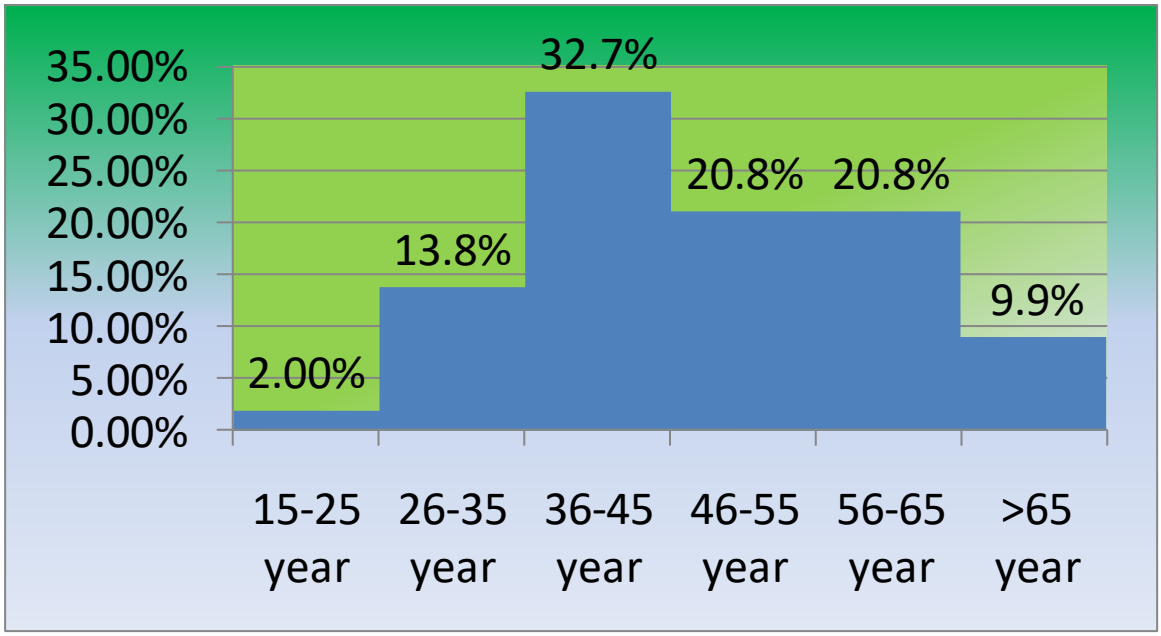
(Diabetic Group) (Control Group)

Figure (1) shows the sex distribution in diabetic and control group. (p. value =0.351)
Most of patients in diabetic group (33.3%) are located in the age reference of (46-55 year). While most of control group persons (32.7%) are located in the age reference of (36-45) as shown in figure (2).



Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

(A) diabetic group



(B)control group

Figure (2) shows the age distribution in diabetic and control groups.

Table(1): relationship between gender and inter-arm systolic and diastolic blood pressure difference among the diabetic group.

Inter-arm SBP difference among diabetics	Gender		Inter-arm DBP difference among diabetics	Gender		Odd's ratio for SBP, DBP
	Female	Male		Female	Male	
0-5 mmHg	29(45.3%)	35(54.7%)	**0-5 mmHg**	48(43.6%)	62(56.4%)	0.82, 0.332
6-10 mmHg	2(50%)	2(50%)	**6-10 mmHg**	7(70%)	3(30%)	
11-15 mm Hg	18(43.9%)	23(56.1%)	**11-15 mmHg**	2(40%)	3(60%)	1.058, 1.161
16-20 mmHg	7(41.2%)	10(58.8%)	**16-20 mmHg**	2(40%)	3(60%)	1.183, 1.161
>20 mmhg	3(50%)	3(50%)	**>20 mmHg**	1(50%)	1(50%)	0.827, 0.774

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

p. value = 0.994 **p. value = 0.606** **T test value = 0.399**

Table (1) shows that most of patients(64 out of 132) have inter-arm SBP difference of less than 5 mmHg(45.3% female and 54.7% male), and (41 out of 132) have inter-arm SBP difference in the range of 11-15 mmHg(43.9% female and 56.1% male).while in regard to inter-arm DBP difference, most of patients(110 out of 132) have blood pressure difference of less than5 mmHg(43.6% female and 56.4% male).

Table (2): relation between cigarettes smoking and inter-arm(SBP and DBP) difference among diabetics.

Inter-arm SBP difference in mmHg	Smoker	Non-smoker	Ex-smoker	Inter-arm DBP difference in mmHg	Smoker	Non-smoker	Ex-smoker	Odd's ratio SBP , DBP
0-5	10(16.7%)	5(8.3%)	45(75%)	**0-5**	15(13.9%)	14(13%)	79(73.1%)	25, 2.238
6-10	1 (12.5%)	2 (25%)	5(62.5%)	**6-10**	1 (11.1%)	2 (22.2%)	6 (66.7%)	
11-15	3 (7.7%)	7 (18%)	29 (74.3%)	**11-15**	1 (16.7%)	3 (50%)	2 (33.3%)	2.4068, 6.7143
16-20	6 (35.3%)	5 (29.4%)	6 (35.3%)	**16-20**	3 (50%)	1 (16.7%)	2 (33.3%)	4.58331.2702
>20	1 (12.5%)	1 (12.5%)	6 (75%)	**>20**	1 (33.3%)	1 (33.3%)	1 (33.3%)	

p. value= 0.080 p. value= 0.076 paired T test value = -2.974

Table(2) shows that most of patients (62.5%)with SBP inter-arm difference of more than 5 mmHg are ex-smoker , 74.3% of patients with inter-arm SBP difference in the range of (10-15) are also ex-smoker and most of patients with blood pressure difference in the range of (16-20mmHg), both smoker and ex-smoker are equally related and most of patients (75%) with SBP difference of more than 20mmHg are ex-smoker. Regarding the DBP inter-arm difference ,when the difference in the range of (0-5mmHg) and (6-10mmHg) are ex-smoker, most of patients with DBP difference in the range of (11-15mmHg) are non-smoker. while in case of DBP difference in the range of (16-20mmHg), 50% are smoker and 33.3% are ex-smoker.

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Table (3): systolic and diastolic inter-arm B.P difference in relation to DM duration in diabetics.

Duration of DM in years	Inter-arm SBP difference in mmHg					Duration of DM in years	Inter-arm DBP difference in mmHg				
	0-5	6-10	11-15	16-20	>20		0-5	6-10	11-15	16-20	>20
0-5	32 59.2%	1 1.9%	12 22.2%	7 13%	2 3.7%	0-5	45 88.2 %	3 5.9%	1 1.96%	1 1.96%	1 1.96%
6-10	17 42.5%	3 7.5%	17 42.5%	2 5%	1 2.5%	6-10	32 84.2 %	2 5.26 %	2 5.26%	1 2.63%	1 2.63%
11-15	8 40%	1 5%	6 30%	4 20%	1 5%	11-15	15 68%	2 9.1%	1 4.55%	3 13.6%	1 4.55%
16-20	5 41.7%	1 8.3%	2 16.7 %	3 25%	1 8.3%	16-20	11 73.3 %	1 6.67 %	1 6.67%	1 6.67%	1 6.67%
>20	1 16.7%	1 16.7 %	2 33.3%	1 16.7 %	1 16.7 %	>20	2 33.3 %	1 16.7 %	1 16.7%	1 16.7%	1 16.7%

P. value = 0.358 P. value = 0.433

Table(3) explains that most of patients(61.1%) with DM duration of less than 5 years, have SBP inter-arm difference of less than 10 mmHg and 94.1% of them have DBP difference of less than 10 mmHg. Those with diabetes duration in the range of 6-10 years, 50% of them have SBP inter-arm difference of more than 10 mmHg, and 89.4% of them have DBP difference of less than 10 %. 55% of diabetics with DM duration in the range of 11-15 years have SBP inter-arm difference of >10 mmHg, and 77.1% of them have DBP difference of < 10 mmHg. Those with DM duration in the range of 16-20 years, 50% of them have SBP inter-arm difference of more than 10 mmHg, and 79.97% of them have DBP difference of < 10 mmHg. 66.7% of diabetics with DM duration > 20 years have SBP inter-arm difference of >10 mmHg and 50% of them have DBP difference of < 10 mmHg. Overall, there is no significant relation between the duration of DM and inter-arm difference for both SBP and DBP (P. value = 0.358, 0.433 respectively).

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Table(4): the relation of inter-arm BP difference to BMI among diabetics.

BMI in Kg/m²	Inter-arm SBP difference in mmHg					Duration of DM in years	Inter-arm DBP difference in mmHg				
	0-5	6-10	11-15	16-20	>20		0-5	6-10	11-15	16-20	>20
<18.5	1 20%	1 20%	1 20%	1 20%	1 20%	<18.5	1 20%	1 20%	1 20%	1 20%	1 20%
18.5-24.9	11 36.7%	1 3.3%	8 26.7%	4 13.3%	6 20%	18.5-24.9	21 70%	5 16.7%	1 3.3%	2 6.7%	1 3.3%
25-29.9	21 45.7%	3 6.5%	18 39.1%	1 2.2%	3 6.5%	25-29.9	40 87%	2 4.3%	2 4.3%	1 2.2%	1 2.2%
30-39.9	18 44%	4 9.7%	10 24.3%	5 12.2%	4 9.8%	30-39.9	33 80.4%	2 4.9%	2 4.9%	2 4.9%	2 4.9%
≥40	4 40%	1 10%	1 10%	1 10%	3 30%	≥40	5 50%	1 10%	1 10%	2 20%	1 10%

p. value = 0.451 p. value = 0.158 T test value = 0.859

Table(4) shows that 60% of diabetics with normal body weight have SBP inter-arm difference of > 10 mmHg, and 86.7% of them have DBP difference of < 10 mmHg. Those who are overweight,52.2% of them have SBP inter-arm difference < 10 mmHg and 91.3% of them have DBP difference < 10 mmHg. 53.7% of the obese diabetics have SBP difference < 10 mmHg and 85.3% of them have DBP difference < 10 mmHg. 50% of morbidly obese diabetics have SBP difference < 10 mmHg, and 60% of them have DBP difference < 10 mmhg. No significant association between BMI and inter-arm blood pressure difference for both systolic and diastolic phases(P. value = 0.451, 0.158 respectively).

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Table(5): the relation of inter-arm BP difference to glycaemic control among diabetic group.

HbA1c level	Inter-arm SBP difference in mmHg					HbA1c level	Inter-arm DBP difference in mmHg				
	0-5	6-10	11-15	16-20	>20		0-5	6-10	11-15	16-20	>20
<6.5%	4 40%	1 10%	1 10%	3 30%	1 10%	<6.5%	4 40%	2 20%	1 10%	2 20%	1 10%
6.5-6.9%	6 40%	1 6.7%	5 33.3%	2 13.3%	1 6.7%	6.6-6.9%	10 62.5%	3 18.6%	1 6.3%	1 6.3%	1 6.3%
7-9%	25 43.1%	5 8.6%	14 24.1%	10 17.3%	4 6.9%	7-9%	50 86.2%	2 3.5%	3 5.2%	2 3.4%	1 1.7%
>9%	22 44.9%	3 6.1%	17 34.7%	4 8.2%	3 6.1%	>9%	41 85.4%	2 4.2%	2 4.2%	2 4.2%	1 2%

p. value =0.897 p. value = 0.109

Table(5)shows that, in patients with HbA1c < 6.5% (50% of them have SBP inter-arm difference >10 mmHg and 60% of them have DBP inter-arm difference <10 mmHg). While in patients with HbA1c >9% (51% of them have SBP inter-arm difference <10 mmHg and 89.6% of them have DBP < 10 mmHg). No significant association between the glycemic control and inter-arm blood pressure difference for booth the systolic and diastolic phases (P. value = 0.897, 0.109 respectively).

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Table(6): relation of inter-arm BP difference to serum lipid profile among diabetics..

Lipid profile	Inter-arm SBP difference in mmHg					Lipid profile	Inter-arm DBP difference in mmHg				
	0-5	6-10	11-15	16-20	>20		0-5	6-10	11-15	16-20	>20
Normal	41 71.9%	6 66.7%	22 57.9%	9 47.4%	5 55.6%	Normal	68 65.4%	6 60%	1 14.25%	4 57.2%	1 25%
↑ TG	6 10.5%	1 11.1%	7 18.4%	4 21.1%	2 22.2%	↑ TG	16 15.4 %	2 20%	2 28.6 %	1 14.2 5%	1 25 %
↑ Chole-sterol	7 12.3%	1 11.1%	4 10.5%	5 26.2%	1 11.1%	↑ Cholesterol	13 12.5%	1 10%	3 42.9 %	1 14.2 5%	1 25 %
↑ Both	3 5.3%	1 11.1%	5 13.2%	1 5.3%	1 11.1%	↑ Both	7 6.7%	1 10%	1 14.25 %	1 14.2 5%	1 25 %

p. value = 0.754 p. value = 0.477

Table(6) explore that most patients (71.9%) with IASBP difference below 5 mmHg have normal serum TG and total serum cholesterol,12.3% have increased serum cholesterol only, 10.% have increased serum TG only, and only 5.3% of them have increased both serum cholesterol and TG. Also most of diabetics (57.9%) with IASBP difference in the range of 11-15 mmHg have normal both serum TG and total serum cholesterol, 18.4% of them have increased serum TG only, 10.5% have increased total serum cholesterol only, and 13.2% of them have increased both serum TG and total serum cholesterol. Most of diabetics (65.4%) with IADBP difference below 5 mmHg have normal both serum TG and total serum cholesterol, 15.4% have increased serum TG only, 12.5% have increased total serum cholesterol only, and 6.7% of them have increased both serum TG and total serum cholesterol. Those who have IADBP difference in the range of 5-10 mmHg, most of them (60%) have normal (both serum TG and total serum cholesterol), 20% have increased serum TG only, 10% have increased total serum cholesterol only, and 10% of them have increased (both serum TG and

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

total serum cholesterol). No significant correlation between serum lipid nor with IASBP difference neither with IADBP difference.

Table(7): inter-arm SBP and DBP difference among diabetic and control groups.

Group	Inter-arm SBP difference in mmHg					Group	Inter-arm DBP difference in mmHg				
	0-5	6-10	11-15	16-20	>20		0-5	6-10	11-15	16-20	>20
diabetic	59 44.7%	6 4.55%	42 31.8%	19 14.4%	6 4.55%	Diabetic	112 84.8%	9 6.8%	5 3.8%	5 3.8%	1 0.8%
Control	113 85.65%	14 10.6%	1 0.75%	2 1.5%	2 1.5%	Control	117 88.7%	11 8.3%	2 1.5%	1 0.75%	1 0.75 %
T test	11.719	p. value	0.000 01	O.R	7.0937	T test	4.435	P. value	0.633	Odd's Ratio *.	1.37

Where the exposed group consider those with more than 10 mmhg difference

Table(7) explore that most of diabetics (44.7%) have IASBP difference less than 5 mmHg, 31.8% of them have IASBP difference in the range of (11-15mmHg), 14% of them have a difference in the range of (16-20 mmHg), and 4.5% have IASBP difference of > 20 mmHg. While most of the control group (85.2%) have IASBP difference of less than 5 mmHg, and only 4.9% have a difference more than 10 mmHg. With significant correlation between diabetes and IASBP difference (P. value = 0.00001).

Regarding the IADBP difference, most of diabetics (84.8%) and most of control group (88.1%) have a difference of less than 5 mmHg, (6.8% of diabetics and 7.9% of control group) have a difference in the range of 6-10 mmHg, and only (8.4% of diabetics and 4% of control group) have IADBP difference of more than 10 mmHg. No significant association between diabetes and IADBP difference (P. value = 0.633).

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

Discussion:

Inter-arm blood pressure differences are associated with increased cardiovascular and all- case mortality"7". Current hypertension guidelines advocate checking blood pressure in both arms, and using the higher reading arm for therapeutic decisions"8". Female gender may be one of the factors that associate with inter-arm difference in SBP of 10mmHg or more"9".

In this case-control study, most of patients(64 out of 132) have inter-arm SBP difference of less than 5 mmHg(45.3% female and 54.7% male), and (41 out of 132) have inter-arm SBP difference in the range of 11-15 mmHg(43.9% female and 56.1% male).while in regard to inter-arm DBP difference, most of patients(110 out of 132) have blood pressure difference of less than5 mmHg(43.6% female and 56.4% male), with no significant gender effect on both systolic and diastolic inter-arm BP difference (P. value = 0.994, 0.606 respectively).

In a study done on healthy Korean adults, age was not associated with differences in inter-arm blood pressure differences"10". In this study, most of patients in diabetic group (33.3%) are located in the age reference of (46-55 year). While most of control group persons (32.7%) are located in the age reference of (36-45) as shown in paragraph (2).

Cigarettes smoking status played little or no part in the association between inter-arm differences and mortality"11". In this study, most of patients (62.5%)with SBP inter-arm difference of more than 5 mmHg are ex-smoker , 74.3% of patients with inter-arm SBP difference in the range of (10-15) are also ex-smoker and most of patients with blood pressure difference in the range of (16-20mmHg), both smoker and ex-smoker are equally related and most of patients (75%) with SBP difference of more than 20mmHg are ex-smoker. Regarding the DBP inter-arm difference ,when the difference in the range of (0-5mmHg) and (6-10mmHg) are ex-smoker, most of patients with DBP difference in the range of (11-15mmHg) are non-smoker. while in case of DBP difference in the range of (16-20mmHg), 50% are smoker and 33.3% are ex-smoker. So there are no significant associa-tion between cigarettes smoking status and inter-arm (systolic and diastolic) blood pressure differences (p. value = 0.080 for SBP, p. value= 0.076 for DBP).

No significant correlation was found between inter-arm systolic blood pressure and hemoglobin A1c"12". In this study, patients with HbA1c < 6.5% (50% of them have SBP inter-arm difference >10 mmHg and 60% of them have DBP inter-arm difference <10 mmHg). While in patients with HbA1c >9% (51% of them have SBP inter-arm difference <10 mmHg and 89.6% of them have DBP < 10 mmHg). No significant association between glycemic control and inter-arm blood pressure difference for both systolic and diastolic phases (p. value =0.897, p. value = 0.109 respectively).

Overweight individuals with age more than 40 years have inter-arm difference of more than 10 mmHg in mean SBP, which

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

is an indicator of peripheral vascular disease"[13]".

In this study, most of the overweight patients(45.7%) have SBP inter-arm difference of less than 5 mmHg and 6.5% have a difference from six to less than 10 mmHg, and most of them (87%) have a DBP inter-arm difference of less than 5 mmHg. Regarding the obese patients, most of them(53.7%) have a SBP inter-arm difference of less than 10%, and 85.3% of them have a DBP inter-arm difference of less than 10%. So no significant association between BMI and inter-arm difference, neither with SBP(P. value = 0.451) nor with DBP(P. value = 0.158).

Kyoung Bong Kim et al. explore that the inter-arm blood pressure difference had no significant correlation with hyperlipidemia"[14]". In this study, we see that, most patients (71.9%) with IASBP difference below 5 mmHg have normal serum TG and total serum cholesterol,12.3% have increased serum cholesterol only, 10.% have increased serum TG only, and only 5.3% of them have increased both serum cholesterol and TG. Also most of diabetics (57.9%) with IASBP difference in the range of 11-15 mmHg have normal both serum TG and total serum cholesterol, 18.4% of them have increased serum TG only, 10.5% have increased total serum cholesterol only, and 13.2% of them have increased both serum TG and total serum cholesterol. Most of diabetics (65.4%) with IADBP difference below 5 mmHg have normal both serum TG and total serum cholesterol, 15.4% have increased serum TG only, 12.55 have increased total serum cholesterol only, and 6.7% of them have increased both serum TG and total serum cholesterol. Those who have IADBP difference in the range of 5-10 mmHg, most of them (60%) have normal (both serum TG and total serum cholesterol), 20% have increased serum TG only, 10% have increased total serum cholesterol only, and 10% of them have increased (both serum TG and total serum cholesterol). No significant correlation between serum lipid nor with IASBP difference (P. value = 0.754) neither with IADBP difference (P. value = 0.477).

Spannella F et al said that, patients with systolic inter-arm blood pressure difference ≥ 5 mmHg showed longer duration of diabetes and DM duration was also associated with systolic inter-arm blood pressure difference ≥ 10 mmHg"[15]". In this study, most of patients(61.1%) with DM duration of less than 5 years, have SBP inter-arm difference of less than 10 mmHg and 94.1% of them have DBP difference of less than 10 mmHg. Those with diabetes duration in the range of 6-10 years, 50% of them have SBP inter-arm difference of more than 10 mmHg, and 89.4% of them have DBP difference of less than 10 %. 55% of diabetics with DM duration in the range of 11-15 years have SBP inter-arm difference of >10 mmHg, and 77.1% of them have DBP difference of < 10 mmHg. Those with DM duration in the range of 16-20 years, 50% of them have SBP inter-arm difference of more than 10 mmHg, and 79.97% of them have DBP difference of < 10 mmHg. 66.7% of diabetics with DM duration > 20 years have SBP inter-arm difference of >10 mmHg and 50% of them have DBP difference of < 10 mmHg. Overall, there is no significant relation between the duration of DM and inter-arm difference

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

for both SBP and DBP (P. value = 0.358, 0.433 respectively).

Christopher E Clark et al. stated that a systolic inter-arm blood pressure difference ≥ 10 mmHg was observed in 10 % of patients with diabetes"[16]". In this study, I noticed that most of diabetics (44.7%) have IASBP difference less than 5 mmHg, 31.8% of them have IASBP difference in the range of (11-15mmHg), 14% of them have a difference in the range of (16-20 mmHg), and 4.5% have IASBP difference of > 20 mmHg. While most of the control group (85.6%) have IASBP difference of less than 5 mmHg, and only 3 % have a difference more than 10 mmHg. With significant correlation between diabetes and IASBP difference (P. value = 0.00001). Regarding the IADBP difference, most of diabetics (84.8%) and most of control group (88.1%) have a difference of less than 5 mmHg, (6.8% of diabetics and 7.9% of control group) have a difference in the range of 6-10 mmHg, and only (8.4% of diabetics and 4% of control group) have IADBP difference of more than 10mmHg. No significant association between diabetes and IADBP difference (P. value = 0.633). So about 50% of diabetics have IASBP difference of ≥ 10 mmHg.

Conclusion:

There is a significant association between diabetes and inter-arm systolic blood pressure difference. For this reason, all patients with DM should be checked for inter-arm blood pressure difference to avoid misdiagnosis of diabetics as normotensive depending on the arm with lower blood pressure reading, a problem that may expose the diabetic patient to further complications of hypertension in addition to that of diabetes.

Acknowledgement: I have to give all thanks to all diabetics and control persons who are participated in this study.

References:

1-B.M. Frier, M. Fisher: Diabetes mellitus; Chap. 21; P.798. Davidson's principles and practice of medicine-21st edition, 2010.

2-Umesh Masharani, MB, BS, MRCP(UK);Chap. 27; P. 1079. Current medical diagnosis and treatment-49th edition, 2010.

3-Silvio E. Inzucchi and Robert S. Sherwin; Type 2 Diabetes Mellitus; Chap. 248; P.1748. Cecil Medicine-23rd edition, 2008.

4-Type2 DM: Mediscape-2013.

5-Alvin C. Powers: Diabetes Mellitus; Chap. 344; P. 2968. Harrison's principles of internal medicine-18th edition, 2008.

ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

6-James C. Fang and Patrick T. O'Gara: The history and physical examination: An evidence-based approach; Chap.11; P.131. Braunwald's heart disease-8th edition, 2008.

7-Clark CE, Taylor RS, Shore AC et al. Association of a difference in systolic blood pressure between arms with vascular disease and mortality: a systematic review and meta-analysis. Lancet 2012; 379: 905-914.

8-Mancia G, Fagard R, Narkiewicz K et al; ESH/ESC Guidelines for the management of arterial hypertension. J hypertens. 2013; 31: 1281-1357.

9-Ho-Ming SU, T sung-Hsien Lin, Po-Chao Hsu, Chun-Yuan Chu, Wen-Hsien lee, Szu-chia Chen, Chee-Siong Lee, Wen-Chol Voon, Wen-Ter Lai, and Sheng-Hsiung Sheu; Association of Inter-arm Difference with Atherosclerosis and Left ventricular Hypertrophy. Published online 2012 Aug 23.doi: 10.1371/journal.Pone.0041173.

10-Bo Mi Song, Hyeon Chang Kim, Jee-Seon Dhim, Myung Ha Lee, Dong Phil Choi; Inter-arm Differences in Brachial Blood Pressure in the General population of Koreans. Korean Circ J. 2016 May; 46(3): 374-383. Published online 2016. May 3. doi: 10.4070/kcj.

11-James White, laust H Mortensen, Mika Kivimäki, Catharine R Gale, G David Batty; Inter-arm differences in systolic blood pressure and mortality among US army veterans: aetiological associations and risk prediction in the Vietnam experience study. SAGE journals July 1, 2013.

12-Hiroshi Okada, Michiaki Fukui, Muhei Tanaka, Shinobu Matsumoto, Hiroya Iwase, Kanae Kobayashi, Mai Asano, Masahiro Yamazaki, Goji Hasegawa, Naoto Nakamura; A difference in systolic blood pressure between arms is a novel predictor of the development and progression of diabetic nephropathy in patients with type 2 diabetes. Atherosclerosis 230 (2013) 198-201.

ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

13-Kumari NS, Venkateswarulu V, Sundar RM, et al. Association of body mass index with inter-arm blood pressure difference: a comparative and cross sectional study. Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 103, December 24; Page:16850-16851, DOI: 10.14260/jemds/2015/2532.

14-Kyoung Bong Kim, Mi Kyeong Oh, Haa Gyoung Kim, Ji Hoon Ki, Soo Hee Lee, Su Min Kim; Inter-arm Differences in Simultaneous Blood Pressure Measurements in Ambulatory Patients without Cardiovascular Diseases. Korean J Fam Med. 2013 Mar;34(2): 98-106.

15-Spannella F, Giulietti F, Fedecostante M, et al. Inter-arm blood pressure differences predict target organ damage in type 2 diabetes. J Clin Hypertens. 2017; 19:472-478.

16-Christopher E Clark, Colin J Greaves, Philip H Evans, Andy Dickens, John L Campbell; Inter-arm blood pressure difference in type 2 diabetes, a barrier to effective management. Br J Gen Pract. 2009 Jun 1; 59(563): 428-432.

Thi-Qar Medical Journal (TQMJ): Vol.(16), No.(2), 2018
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN(Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/16/2/10

الفرق في ضغط الدم الشرياني بين الذراعين لدى مرضى السكري من النوع الثاني

د. عماد حاتم طاهر

خلاصة البحث:

المقدمة: الخلل الايضي طويل الأمد لدى مرضى السكري قد يؤدي إلى تغيرات تركيبية و وظيفية في العديد من أعضاء الجسم و خاصة الأوعية الدموية، حيث تمثل زيادة نسبة السكر في الدم عاملا مستقلا للإصابة بإمراض الأوعية الدموية الصغيرة و الكبيرة وبالتالي تؤدي إلى المضاعفات السريرية لهذا المرض. سوء السيطرة على هذا المرض سوف تؤدي إلى اعتلال الأوعية الدموية و الأعصاب و مضاعفاتها، فإذا تأثرت الأوعية الدموية الدقيقة فإنها ستؤدي إلى اعتلال الكليتين وشبكية العين و الأعصاب، أما إذا كان الضرر في الأوعية الدموية الكبيرة فان ذلك قد يؤدي إلى أمراض الشرايين التاجية للقلب و أمراض الدماغ الوعائية و كذلك تصلب الأوعية الدموية للأطراف. الفرق في ضغط الدم الشرياني بين الذراعين يجب أن لا يتجاوز ١٠ملم زئبقي لدى غالبية الأشخاص الأصحاء، على كل حال قد يتجاوز مستوى الفرق في ضغط الدم الشرياني بين الذراعين أل ١٠ ملم زئبقي لدى هؤلاء الأشخاص بنسبة لا تتجاوز ال٢٠% . **الغاية من البحث:** لكشف العلاقة بين فرق مستوى ضغط الدم الشرياني بين الذراعين و مرض السكري من النوع الثاني.

طريقة البحث: أجريت هذه الدراسة في مركز السكري و الغدد الصم في العراق/ محافظة ذي قار للفترة من شهر شباط/٢٠١٧ و حتى شهر أيلول/٢٠١٧، حيث شملت هذه الدراسة ١٣٢ من المرضى المصابين بمرض السكري من النوع الثاني وتم فيها قياس الفرق في ضغط الدم الشرياني بين الذراعين الأيمن و الأيسر لكل المرضى وتمت مقارنة النتائج مع نتائج الفحص لدى ١٣٢ من الأشخاص الأصحاء بعد استبعاد كل مريض مصاب بإمراض الشرايين التاجية و امرض الدماغ الوعائية وامرض الأطراف الوعائية، كما تم استبعاد جميع المرضى المصابين بمرض ارتفاع ضغط الدم الشرياني، و قد تم قياس مستوى الضغط الشرياني في كلا الذراعين في وضع الجلوس من قبل نفس الطبيب و بواسطة نفس الجهاز الذي استخدم لقياس مستوى الضغط الشرياني.

النتائج و المناقشة: من خلال هذه الدراسة لم تكن هنالك علاقة مهمة بين فرق مستوى ضغط الدم الشرياني و معظم المتغيرات التي تم دراستها متضمنتا (العمر، الجنس، دليل كتلة الجسم، تدخين السكائر، فترة الإصابة بمرض السكري منذ اكتشافه، مستوى الهون في الدم بالإضافة إلى مستوى السيطرة على نسبة السكر في الدم). على الجانب الآخر، كانت هنالك علاقة واضحة بين مرض السكري من النوع الثاني و الفرق في مستوى ضغط الدم الشرياني الانقباضي بين الذراعين.

الاستنتاج: هنالك علاقة مهمة بين مرض السكري من النوع الثاني و الفرق في مستوى ضغط الدم الشرياني الانقباضي بين الذراعين و لهذا السبب، من الواجب قياس مستوى ضغط الدم الشرياني في كلا الذراعين لتجنب التشخيص الخاطئ للمرضى اعتمادا على القياس في ذراع واحدة وهذا قد يتسبب في المزيد من المضاعفات التي يتعرض لها المريض بسبب ارتفاع ضغط الدم الشرياني غير المشخص بالإضافة إلى مضاعفات مرض السكري.