Orthostatic hypotension and dizziness among insulin dependent diabetic patients.

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الملخص

اجريت هذه الدراسة على 90 مريض من المصابين بداء السكري المعتمد على الانسولين لمدة 10 سنوات على الاقل من الوافدين على عيادة داء السكري والعيادات الاستشارية في مستشفى الديوانية التعليمي وبعض العيادات الشعبية في مدينة الديوانية اضافة لـ 120 شخص من المرافقين للمرضى وبعض الكوادر الصحية المستخدمين كعينة للمقارنة مع التقارب من حيث العمر والجنس.تم قياس ضغط الدم في حالتي الوقوف والاستلقاء لكل شخص، عرفت حالات هبوط الضغط في حالة الوقوف على انها انخفاض ضغط الدم الانقباضي 20 ملم زئبق او اكثر بعد دقيقة واحدة من الوقوف والدوار المصاحب للوقوف هو اي احساس بالدوار، ألم رأس خفيف او الاغماء الذي يحدث في حالة الوقوف.ان انتشار هبوط الضغط في حالة الوقوف والدوار في في حالة الوقوف هو اكثر عند المرضى المصابين بداء السكري اكثر من الاشخاص المستخدمين كعينة للمقارنة وهنالك 27 مريض من مجموع الـ 90 مريض ظهر عندهم هبوط بالضغط في حالة الوقوف بينما 16 شخص من مجموع الـ120 شخص المستخدمين للمقارنة اصيبوا بحالة هبوط بالضغط في حالة الوقوف.اولئك المرضى المصابين بداء السكري وصارت عندهم حالات هبوط الضغط في حالة الوقوف كانوا اكبر عمراً وكان مستوى الكلوكوز بدون طعام اعلى وضغط الدم الانقباضي اقل في حالة الوقوف من الذين لا يوجد لديهم حالات انخفاض ضغط الدم في حالة الوقوف.

الدوار في حالة الوقوف كان اعلى عند المرضى المصابين بداء السكري من الاشخاص المستخدمين كعينة للمقارنة ولا يوجد اختلاف بين الذين لديهم دوار في حالة الوقوف مع هبوط الضغط في حالة الوقوف والذين لديهم دوار في حالة الوقوف بدون هبوط بالضغط في حالة الوقوف عند المصابين بداء السكري والاشخاص المستخدمين كعينة للمقارنة.

Abstract

This study was carried out on 90 patient with insulin dependent for at least 10 year those attending the diabetic clinic and internal medicine consultation unit in Al-Diwamiya Teaching hospital and some popular clinic in Al-Diwaniya city and a 120 age and sex match control subject from patients relatives and medical staff.

The blood pressure was measured in supine and standing position for each subject, orthostatic hypotension was defined as a decline in systolic blood pressure of 20mmHg or more one minute after standing, postural dizziness was any feeling of dizziness, light headedness, or faintness that occurred while standing.

The prevalence of orthostatic hypotension and postural dizziness was higher in patient with diabetes than in control subject from the 90 diabetic patient a 27 develop orthostatic hypotension while only 16 subject develop orthostatic hypotension from the 120 non diabetic control subjects.

Those patients with diabetes and had orthostatic hypotension were older and with high fasting glucose level and higher supine

systolic blood pressure and lower standing systolic blood pressure than those without orthostatic hypotension.

Postural dizziness among the diabetics patient were higher than its prevalence among non diabetic subject, and there was no significant difference between those who had orthostatic with postural dizziness and postural dizziness without orthostatic hypotension in both diabetic and non diabetic control subject.

Material and Methods

1-Materials:Representative subjects include patients attending the diabetic clinic and internal medicine consultate until in Al-Diwaniya teaching hospital and some popular clinics in Al-Diwaniya city and patients relatives with some medical staff the study was achieved throughout the period from October 2007 to July 2008, the study carried on 90 insulin –dependent diabetic patients for at least 10 years include 55 male and 35 females, and a120 sex and age matched control subject include 70 male and 50 females the age range for all subjects was 45-65 year old.

2- History and Examination:Careful medical history was obtained from the subjects use of medications was assessed using a standard question.All the subjects received a complete physical examination measurement of blood pressure, heart rate, blood glucose level were done.

3-Experimental Design:The subject included a 90 insulin dependent diabetic patients for at least 10 years and 120 non diabetic control subject, both include male and female.Appropriate –sized cuff was wrapped around the right upper arm, blood pressure, heart rate recorded after the subject rested in supine position for at least 5 minutes, then the subject asked to stand and measurement of blood pressure and heart rate repeated after 1, 2 and 3 minutes of standing[7]. The subject asked about any feeling of dizziness, light headedness, faintness during standing and any positive or negative results were recorded. positive results include those patients developed drop in systolic blood pressure from supine to standing position of 20 mm Hg or more after 1 minute of standing postural dizziness was defined any feeling of dizziness light headedness or faintness while standing during examination.

Introduction

Diabetic Neuropathy:Diabetic neuropathy is a disability disorder occurs in nearly 50% of patients with diabetes[10]. It is a late finding in type I diabetes but can an early finding in type 2 diabetic neuropathy. The primary types of diabetic neuropathy are sensor: motor and autonomic. Patients may present with combination of neuropathies distal symmetric polyneuropathy is the most common from of diabetic neuropathy.

Diabetic neuropathy also can cause motor deficit, silent cardiac ischemia, orthostatic hypotension, vasomotor instability bladder dysfunction and sexual dysfunction.[8]

Classification of Diabetic Neuropathy:The primary types of diabetic neuropathy are sensorimotor and autonomic (table 1).[2]
Table (1): Classification of Diabetic Neuropathy[2]

Sensoimotor neuropathy:
Distal symmetric polyneuropathy
Focal neuropathy
Diabetic mononeuropathy (cranial, truncal, peripheral nerves)
Mononeuropshty multiplex
Diabetic amyotrophy
Autonomic neuropathy:
Hypoglycemic unawareness
Abnormal pupillary function
Cardiovascular autonomic neuropathy
Vasomotor neuropathy
Sudomotor neuropathy (sweat glands)
Gastrointestinal autonomic neuropathy
Gastric atony
Diabetic diarrhea or constipation
Fecal incontinence
Genitourinary autonomic neuropathy bladder dysfunction
Sexual dysfunction.

Regarding vasomotor neuropathy it frequently causes orthostatic hypotension by affecting the splanchnic and peripheral vascular beds. Symptoms of syncope or dizziness often have day –to- day variability and may be exacerbated by insulin therapy or the postprandial state[5]

Orthostatic Hypotension:
Definition:Postural hypotension or known as orthostatic hypotension [3] is a physical finding in which there is sudden drop in systolic blood pressure of at least 20 mmHg or a diastolic blood pressure decrease of at least 10 mmHg within 3 minute of standing[8] usually after a period of rest[14] the condition which may be symptomatic or a symptomatic[8]

In healthy persons, muscle contraction increase venous return of blood to the heart through one-way valves that prevent blood from pooling in dependent parts of body. The autonomic nervous system responds to changes in position by constricting veins and arteries and increasing heart rate and cardiac contractility. When these mechanisms are faulty or if the patient is hypovolemic orthostatic hypotension may occur. in persons with orthostatic hypotension, gravitational opposition to venous return causes a decrease in blood

pressure and cerebral ischemia the incidence of orthostatic hypotension increase with age [9,16]

Still the blood pressure dose not normally fall very much because it immediately triggers avasoconstriction (baro receptor reflex), pressing the blood up to the body again, therefore a secondary factor that occur a greater than normal fall in blood pressure is often required such factors include hypovolemia, diseases such as diabetes and some medications [11].

Pathophysioloy:When an adult rises to the standing position 300 to 800 mL of blood pools in the lower extremities[8] maintenance of blood pressure during position change is quite complex; many sensitive cardiac, vascular, neurologic muscular and neurohormonal responses occur quickly. If any of these responses are abnormal, blood pressure and organ perfusion can be reduced as a result, symptoms of central nervous system hypoperfusion may occur, including feelings of weakness, nausea, headache, neck ache, lightheadedness, dizziness, blurred vision fatigue, tremulousness, palpitations and impaired cognition vertigo also has been reported.When a person moves from a horizontal to a vertical position, muscle contraction in the legs and abdomen compresses veins, because veins are equipped with one- way valves, normally blood is moved back to the heart to counter the gravitational tendency for blood to pool and the veins constrict. In euvolemic person, extra blood is held in the venous system, providing an additional reservoir of compensatory blood volume.The autonomic nervous system plays an important role in maintaining blood pressure when a person change position the sympathetic nervous system adjusts the tone in arteries, vein and the heart. Barorceptors located primarily in the carotid arteries and aorta are exquisitely sensitive to changes in blood pressure. When the barorceptors sense the slightest drop in pressure, a coordinated increase in sympathetic outflow occurs. Arteries constrict to increase peripheral resistance and blood pressure, and heart rate and contractility increase all of these responses are aimed at maintaining blood pressure and perfusion other physiologic mechanisms may be involoved, including low-pressure receptors in the heart and lungs, the rennin-angiotensin-aldosterone system vasopressin, and systemic release of norepinphrine.Normally, when a person moves to an upright position, blood pressure and heart rate change so quickly that continous electronic monitoring is required to detect the differences and ordinary clinical observations lag behind the physiologic changes, the line between normal and pathologic changes in blood pressure and heart rate is not easy to define clinically.[8]

Dizziness:Dizziness is any feeling of dizzy, light headed faint, spinning or unsteadiness. It is a common problem among older people there are many medical diseases which can produce dizziness, include neurological entities related to brain blood flow like carotid artery or

other cerebovascular diseases and heart problems such as aortic valve stenosis and congestive heart failure. Other neurologic diseases like parkinsonism, alcoholism, some psychiatric conditions like depression and anxiety medical problems like diabetes[1] dizziness may occur due to decrease blood supply to the brain.[8]

Results

The patients with diabetes had a significantly higher blood pressure, heart rate, fasting glucose level than non diabetic control subject as shown in table (2) which also shows that there is no significant difference between the 2 groups in age and sex

Table-2: The clinical variables comparison between diabetic and non diabetic control subject

Variables	Diabetic patients N=90	Non-diabetic subject N=120
Age	55.8±10	55.6±9.5
Average of 3 seated reading systolic blood pressure (mmHg) diastolic blood pressure (mmHg)	153.45±17.22* 97.12±19.26*	114.63±15.62* 74.45±16.84*
Heart rate beat / min	96.91±27.17*	70.73±13.42*
Fasting glucose level (mg/dl)	187±60*	102±10*

*** Significant difference present (P<0.01)**

The diabetic patients who had orthostatic (postural) hypotension were older than those diabetic patient without orthostatic hypotension also they had higher resting supine systolic blood pressure and a lower standing systolic blood pressure and higher prevalence of hypertension shown in table (3) which shows no difference between patients with diabetes who had orthostatic hypotension and those who didn't in, supine resting heart rate. The non diabetic control subject with orthostatic hypotension were older and higher supine systolic blood pressure, lower standing systolic blood pressure than those without postural hypotension.

Table-3: **The clinical variables comparison in groups with and without postural hypotension in diabetic and non diabetic subject**

Clinical variable	Subject with diabetic N=90		Non diabetic control subject N=120	
	With orthostatic hypotension n=27	Without orthostatic hypotension n=63	With orthostatic hypotension n=16	Without orthostatic hypotension n=104
Age	63.2±8.2	55.6±10	62.5±7.4	54.2±10.2
Supine systolic blood pressure (mmHg)	170.18±23.16	146.28±5.19	149.68±1.25	109.24±7.84
After 1 min standing	143.48±24.26	142.68±6.59	123.48±1.45	104.2±9.74
Supine heart rate (beat/ min)	95.92±5.01	97±31.79	67.18±2.56	71.27±14.31
After 1 min standing	102.9±9.02	105±32.49	72.2±5.6	78.3±17.4

Table-4: The number of subject with and without orthostatic hypotension and those with postural dizziness in diabetic patient and non diabetic control subject

Diabetic patients N=90		Non diabetic subject N=120	
With orthostatic hypotension	Without orthostatic hypotension	With orthostatic hypotension	Without orthostatic hypotension
N= 27	N=63	N=16	N=104
With postural dizziness	With postural dizziness	With postural dizziness	With postural dizziness
N= 8	N=20	N=3	N=19

The prevalence of orthostatic hypotension was higher in diabetic patient than non diabetic control subjects as shown in figure (1).

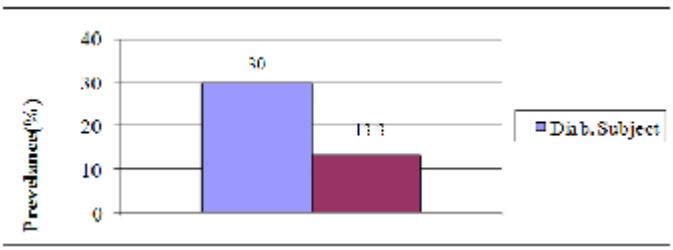

Figure (1): The prevalence of orthostatic hypotension in diabetic patients and non-diabetic control subject.

The prevalence of postural dizziness also was higher in diabetic than non diabetic control subjects as shown in figure (2).

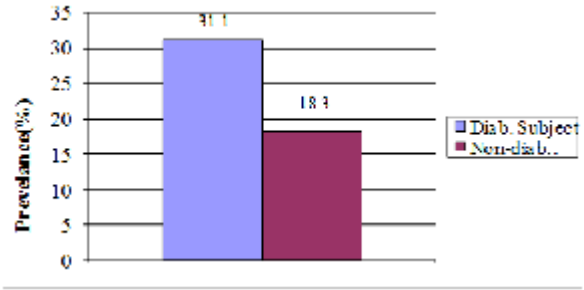

Figure (2): The prevalence of postural dizziness in diabetic and non-diabetic control subject.

The difference present between those subject who postural dizziness with and without orthostatic hypotension both in diabetic and non-diabetic control subject as shown in figure (3).

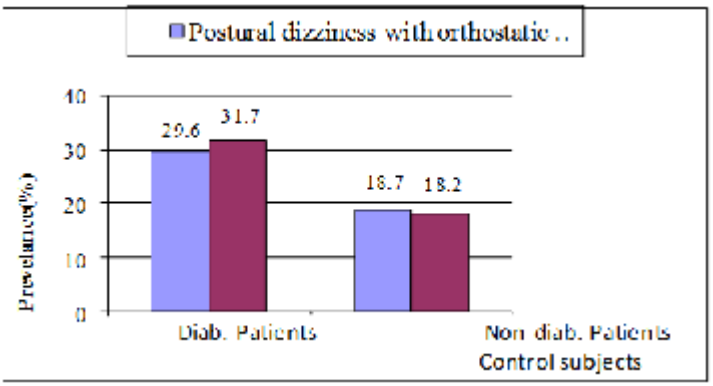

Figure (3): The prevalence of postural dizziness with and without orthostatic hypotension in diabetic and non-diabetic control subject.

Discussion

The diabetic patients in this study showed significantly higher blood pressure than non-diabetic control subject as shown in table (2) this agreed by other investigators[4,12,1,18,19] hypertension has been shown to be associated with impaired baroreflex sensitivity which may be due to a decreased in vascular compliance and consequent diminution of baroreceptor stretch and relaxation during blood pressure change[19]. The heart rate also shown to be higher in the diabetic patients than non-diabetic control subject (table 2) this agreed with Sundiskivist et al.[17] and Wheelere T.[21] this high heart rate is due to cardiac vagal neuropathy[17,21] with progression of cardiac sympathetic nerve dysfunction[5]. This study showed that subject who had developed orthostatic hypotension were older both in diabetic and control subject this is agreed with Jin Shang Wu et al.[7], Shibao C. et al.[15] who reported that the incidence of postural hypotension is increased with age, and an estimated 10-20% of elderly have postural hypotension[9]. This impart is a normal physiological changes in addition to that the blood flow in the brain is decline with age[9].

All subjects with orthostatic hypotension in this study with and without diabetes had lower heart rate (table 3) this may be due to minor role of diminished cardiac acceleration in development of orthostatic hypotension thus causing under estimated in the relationship between orthostatic hypotension and heart rate changes after standing[7].

The blood pressure was higher in subjects who had orthostatic hypotension both in diabetic and non diabetic control subject this is agreed by[4,7,12,1,18,19] increase in blood pressure may exacerbate the decline in baroreflex sensitivity, impart, causing orthostatic hypotension.[14]

The prevalence of orthostatic hypotension was higher in diabetic patients than non diabetic control subject Table (4), Figure (1), this agreed by Ewing DJ[5], Jin Shang Wu[7] Ziegler MG[22], the development of postural hypotension in diabetic patients is more commonly dueto neurogenic cause and associated usually with efferent involvement of baroregulatory reflex arc with damage sympathetic vaso constrictor fiber in the splanchnic bed, muscle and skin[8,15].

The prevalence of postured dizziness was compared and it was higher in diabetic patients than non diabetic control subject table (4), figure (2) this agreed by other investigators[7], the mechanism of postural dizziness remain unclear and may be heterogenous, the most common reported disorders as a cause of dizziness include peripheral vestibular disorder, cervical disorder, some disorder related to brain blood flow, psychiatric disorder, visual, heart problems, some medical problems like diabetes, dizziness mainly occur due to reduce blood supply to the brain (I) one cause of postural dizziness is postural hypotension[1].

This study showed that there was no significant difference between those subject who had postural dizziness with and without postural hypotension both in diabetic and non diabetic subjects Jin Shang Wu[7], reported that postural dizziness was higher among those with postural hypotension than those without.

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