ORIGINAL ARTICLE

Comparison of Functional Capacity in Type 2 Diabetic and non-diabetic cases with respect to gender

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ABSTRACT

Aim: To compare the functional capacity in type 2 diabetic and non-diabetic cases with respect to gender.
Methods: This Cross sectional comparative study included 400 randomized diabetic and non diabetic subjects, aged 30-69 years, and underwent symptom-limited maximal treadmill exercise using Bruce Protocol. Patients were recruited through the out-door department of Punjab Institute of Cardiology, Lahore Pakistan, from 1st July to 30th December, 2013. P-value ≤ 0.05 was taken as significant.
Results: Out of 400 patients, 300(75%) were males while 100(25%) were female. The mean age of the study population was 46.93±8.97 years. Hypertension and family history were the important risk factors found in the study population. In diabetic patients, the trend towards poor functional capacity was higher in female as compare to non-diabetic patients (38.5% vs. 27.1%). At age group 50-59 years risk of poor functional capacity was higher in women compare to men.
Conclusion: Poor functional capacity is more significantly associated with diabetic females.

Key words: CAD: Coronary artery disease, IHD: Ischemic heart disease, Type 2 Diabetes: T 2 DM,

INTRODUCTION

Coronary artery disease is the foremost cause of mortality and morbidity in male and female with diabetes[1,2]. The diagnosis of CAD in women is tricky owing to different reasons[3]. At the same time prompt diagnosis of CAD in female is vital to avoid the outcomes of unrecognized and untreated ischaemia[4].

Exercise plays a major role in the prevention and control of CAD, insulin resistance, prediabetes, gestational diabetes mellitus (GDM), type 2 diabetes, and diabetes-related health complications[5].

Exercise capacity as determined by MET_S during an exercise tolerance test (ETT) which is noninvasive, relatively inexpensive test[6], used for diagnostic and prognostic purposes and to monitor the effects of therapeutic interventions. Such testing is a modality for evaluation of individuals with known or suspected coronary artery disease (CAD)[7].

Poor exercise capacity is associated with an increased risk of adverse cardiovascular morbidity and mortality as proved in epidemiologic studies of healthy women[8,9]. The risk of adverse cardiovascular events is found to be higher in patients with poor exercise capacity demonstrated on a treadmill stress and these finding have been consistent among patients of different ethnicities, men and women, non-diabetics and diabetics[10]. The treadmill test becomes more useful prognostic test, if the patient selected is male with age >40 years and has multiple associated risk factors.[2] As stated by American Heart Association and American diabetics Association that moderate to poor functional capacity in asymptomatic diabetic patients increase the coronary artery disease risk based on one or more risk factors[11].

In addition poor functional capacity with (<6 METs) had a 3-fold increased risk of mortality compared with women who achieved moderate to good functional capacity (>8 METs)[8].

The study was conducted to formulate appropriate treatment plans, and develop therapeutic prescriptions for preventions of diabetic females.

PATIENTS & METHODS

A total of 400 patients, 200 diabetic and 200 non-diabetic patients aged 30-69 years were selected from out-door department of Punjab Institute of cardiology, Lahore from 1st July to 30th December 2014. Patients were recommended either be randomly grouped for diabetic and non-diabetic through computer generating random table method.

Patients coming to ETT department for chest pain diagnosis and screening of ischemic heart disease were included while, all cases of ST-segment and bundle branch block abnormalities, co-existing hypertension and who were on anti hypertensive medicine, chronic kidney disease (Serum creatinine >1.5 mg%), systolic blood pressure >200 mmHg, diastolic blood pressure >100 mmHg, Heart rate > 120/min or <60/min, congestive heart failure, valve heart disease, LV dysfunction and thyroid disease were excluded from the study. Patients coming for

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ETT for indications other than screening and chest pain diagnosis were also excluded.

Following data was calculated for each patient by interview and direct observation: patient characteristics like sex, age, indications for ETT, major cardiovascular risk factors i.e. diabetes (estimated by fasting plasma glucose FBG ≥126 mg/dl or 7mmol/l[2,13], hypertension, smoking, family history of IHD and dyslipidemia) and functional capacity. Exercise was stopped on the basis of severe chest pain, fatigue, leg discomfort or dyspnea, appearance of premature ventricular beats, systolic blood pressure >250mmHg or drop in the pre test >10mmHg. Functional capacity was calculated by estimation of METs (Metabolic equivalents) which was categorized as 1: Poor (<6 METs) 2: Moderate (6-10 METs) 3: Good (>10 METs). An experienced cardiologist examined all the patients for factors regarding inclusion and exclusion criteria. He also supervised the test and interpreted the ECG for ST-changes and appearance of any arrhythmia.

Statistical analysis was performed with SPSS Version 20.0. Categorical variables were reported as frequencies and percentages. For the comparison of the qualitative variables with groups Chi-Square Statistics was applied. P value ≤0.05 will be considered significant. Test was applied as two tailed.

RESULTS

Out of 400 patients, 300(75%) were males while 100(25%) were female. The mean age of the patient was 46.93±8.97, fall between the age group 30-69 years. Half of the patients were diabetic and half were non diabetic. Hypertension was found to be an important risk factor, while dyslipidemia and smoking were found to be present in 43(10.8%) and 87(21.8%) patients respectively. Overall 31.8% patients had positive family history of ischemic heart disease. Indication of Chest pain was more frequently observed for referring treadmill stress test, while screening was less common indication. Higher numbers of patients were able to attain the moderate functional capacity (Table 1). Poor functional capacity is more frequently observed in female as compared to male 67(29.8%) vs. 56(7.2%) as shown in (Fig.1). At age group 40-49 years risk of poor functional capacity was higher in men compare to women. At age group 30-39 functional capacity is good in male. Poor functional capacity was more deleterious in women than in men at age group 50-59 years. The risk of poor functional capacity in females at age group 40-49 years was initiated less likely than age group 50-59 years as shown in (Table 2). For female the risk of the poor functional capacity was more frequent among diabetic patients as compare to non-diabetic. (38.5% vs. 27.1%) (Table 3).

Fig. 1: Graphical distribution of functional capacity according to gender

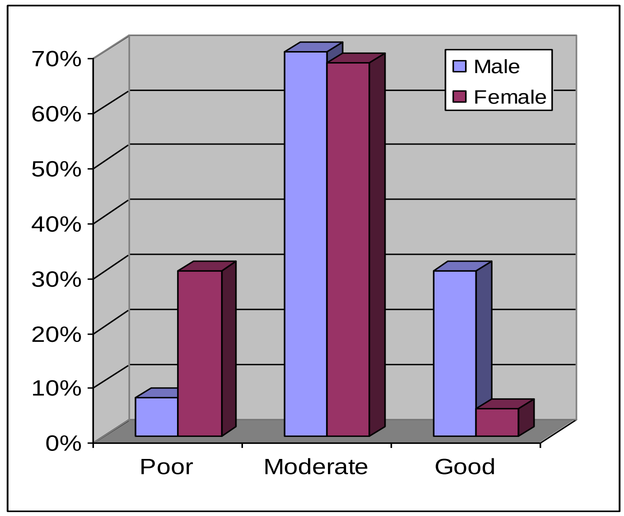

Table 1: Demographical and clinical characteristics:

Male	300(75%)
Female	100(25%)
Age	46.93±8.97
Diabetes	200(50%)
Hypertension	237(59.2%)
Smoking	87(21.8%)
Family history of IHD	127(31.8%)
Dyslipidemia	43(10.8%)
Indications	
Chest pain	385(96.2%)
Screening	8(2.0%)
Functional capacity	
Poor	59(14.8%)
Moderate	270(67.5%)
Good	71(17.8%)

Table-2: Association of functional capacity and age with respect to gender.

Age group in years	**Male**			**Female**		
	Poor	**Moderate**	**Good**	**Poor**	**Moderate**	**Good**
30-39	4(15.4%)	44(21.5%)	22(31.9%)	4(12.1%)	15(23.1%)	0
40-49	12(46.2%)	78(38.0%)	33(47.8%)	9(27.3%)	37(56.9%)	2(100%)
50-59	5(19.2%)	57(27.8%)	9(13.0%)	16(48.5%)	12(18.5%)	0
60-69	5(19.2%)	26(12.7%)	5(7.2%)	4(12.1%)	1(1.5%)	0
P value	0.061			0.003		

Table 3: Association of functional capacity and Diabetes mellitus with respect to gender.

Functional capacity	Diabetes mellitus		Non diabetes mellitus	
	Male	Female	Male	Female
Poor	11(7.4%)	20(38.5%)	15(9.9%)	13(27.1%)
Moderate	109(73.6%)	30(57.7%)	96(63.2%)	35(72.9%)
Good	28(18.9%)	2(3.8%)	41(27.0%)	0
P value	0.001		0.001	

DISCUSSION

Exercise stress testing is presently used to assess physical fitness, diagnose cardiac disease, determine exercise capacity, define the prognosis of non-cardiac illness, prescribe exercise plan, and guide cardiac rehabilitation. Exercise tolerance test is one of the various ways by which we can assess the patient's functional capacity[14]. The present study provides evidence that poor functional capacity as determined by METS during an ETT is more frequently observed in diabetic elderly females as compared to non-diabetic.

Our results are comparable with the previous literatures as a study by Adekunle AE et al scrutinized that the confounding factor like gender, has been found to affect exercise capacity as obtained to be higher in males (7.5±2.0 METs) than females (6.4±1.5 METs) and exercise capacity differs in age group of type 2 diabetic men and their women counterparts[15].

A further study by Syed FA et al found that poor functional capacity was more common in female than male as (6.9±2.8 vs. 9.6±3.5) while the age variation was statistically insignificant[16]. Zhi YF et al examined that type 2 diabetes is related with significant cardiopulmonary dysfunction. The association of poor glycemic controlled male with worse exercise capacity in this study is consistent as compared to asymptomatic type 2 diabetic male (48% vs. 65%)[17].

Another study by Pamela N et al established that patients with lower exercise capacity were more likely to be female (female: 55.38% vs. male: 42.62%) to have co-morbidities such as diabetes (DM: 23.16% vs. NDM: 9.61%), even as age difference was statistically insignificant [7]

Claire ES et al determined the relative influence of estimated functional capacity and thallium-201 (Tl-201) single photon emission computed tomographic (SPECT) findings; established that 36% of men and 48% of women had poor estimated functional capacity while the age and diabetic disparity was insignificant[18]. Segerstrom A et al studied the different aspects of exercise capacity in healthy, with impaired glucose tolerance and type 2 diabetes individuals. Age difference between all groups was statistically significant (30, 60 and 50 years) and poor exercise capacity was strongly related to the female[19]. We also demonstrated the similar results.

Pierre-Louis B et al investigated the poor exercise capacity during a treadmill exercise sestamibi stress is insignificantly slightly analogous for both gender in diabetics and non-diabetics (male:49% vs. female:51%; P value >0.05).The mean age of the patients was also found to be similar[10] showed the dissimilar results with the present study.

Another study mentioned by Priya K et al analyzed the functional capacity as determined by METS during a treadmill sestamibi stress test (TESST) in women as a method of diagnosing, to improve the diagnostic accuracy of the exercise stress test, as well as the prognostic assessment in women. Results initiated insignificant difference between the gender both male and female and test accuracy due to the small sample size as well as the bias in selection of women when included, may be the reason for the misconceptions regarding the value of exercise stress testing in women[20].

CONCLUSION

The results showed that in diabetic patients, there is a difference in functional capacity between females and male. Female have poor functional capacity as compared to male. The factors related with this difference may be due to difference in heart rate reflecting a withdrawal of vagl tone. The need to advise exercise as part of the management strategies in type 2 diabetes mellitus is established. But before this a non-invasive method such as exercise stress test is required for appropriate cardiac risk stratification.

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