Original Article

INFLUENCE OF DIABETES ON PHYSICAL FUNCTION AMONG THE ELDERLY PERSONS

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Abstract

There is growing recognition that the complications associated with type-2 diabetes may translate into functional impairments in older people. This cross sectional study was conducted between January and June 2008 to determine the influence of diabetes on physical functions in an elderly (≥55 years) population. Fifty-five elderly diabetics attending the out-patient department of a diabetic centre were selected by convenient sampling and compared with fifty-five non-diabetic elderly persons of the near-by community. Their physical functions were assessed by Barthel Index, SF-36 Health Survey and Modified Physical Performance test. Diabetic elderly persons, on average, obtained lower scores in all these three tests. After removing the effect of socio-demographic variables, influence of diabetes on level of independence measured by Barthel Index did not persist. However, the difference in SF-36 health survey and Modified Physical Performance test scores between diabetics and non-diabetics remained significant after controlling for socio-demographic variables. The current study showed influence of diabetes on physical functions in the elderly. People should be motivated and guided properly to practice a healthy lifestyle in order to prevent and control diabetes and thus avoid complications of diabetes mellitus and disabilities in later life.

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Introduction

The aged population in Bangladesh is growing both in absolute numbers and as a percentage of the total population. Although the steady increase in proportion doesn't seem to be remarkable, yet the increase in absolute numbers is quite significant.[1] According to 2001 census, 6.2% of the total population of Bangladesh is 60 or higher years of age.[2] Those over 60 or 65 years of age are prone to develop certain diseases and ailments which are uncommon in younger years. The problems are mainly due to the aging process such as, senile cataract, glaucoma, osteoporosis; some diseases are associated with long term illnesses, like degenerative diseases of the heart and blood vessels, cancer, accidents, diabetes, diseases of the locomotor system, respiratory illness, hearing impairments, genito-urinary problems and psychological problems such as, mental changes and emotional disorders, which affect their quality of life.[3] Physical functioning is a core element of health related quality of life and predicts further functional decline, morbidity, health service use and death.[4] Although diabetes is often accompanied by vascular and neuropathic co-morbidities,[5] the threats of physical disability, loss of independence, and diminished quality of life may ultimately be the greatest concern for many with the disease.[6-8] The prevalence and projection of diabetes for all age groups worldwide were estimated to be 2.8% in 2000 and 4.4% in 2030. Diabetes mellitus of all ages is reaching epidemic proportions in Bangladesh. In some sectors of the society, more than 10% of the

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people have diabetes.[9] Estimated total cases of diabetes in Bangladesh was 3.2 million in the year 2000 (Ranking 10 in the world) and projected at 11.1 million in 2030 (Ranking 7 in the world).[10]

Although there are many reasons to suspect that diabetes could lead to increased physical disability, the magnitude or key factors explaining such a relationship have rarely been examined.[5] The primary prevention of diabetes and the prevention of complications and co-morbid conditions among people with diabetes will be necessary to help reduce the burden of physical limitations and disability. Further studies are needed to identify factors and interventions that will help to delay or prevent the progression from diabetes to disability.[11]

Although many studies have described the high prevalence of complications and morbidity in type 2 diabetes mellitus patients, very few data concerning the impact of type 2 diabetes mellitus on the functional health status of elderly patients are available,[13] particularly in our setting. This study compares the functional impairment between elderly diabetic and non-diabetic persons.

Materials and Methods

To compare the physical functions, this cross-sectional study was conducted on two samples of elderly persons of 55 years and above, one sample of 55 diabetic and another 55 non-diabetics, were selected by purposive sampling technique. The diabetics were recruited from a diabetic centre and the non-diabetics from a nearby community so that respondents of both the groups possessed similar socioeconomic status. The diabetic status of the non-diabetics was excluded by using glucometers. The total study period lasted six months commencing from January 2008. Physical functions of the respondents were tested by Barthel Index, SF-36 Health Survey and Modified Physical Performance test. The Barthel Index is an ordinal scale used for measuring functional independence in the domains of personal care and mobility. The main aim is to ascertain the degree of independence from any help, physical or verbal, however minor and/or whatever reason. Individuals are scored on ten activities which are summed to give a score of 0 (totally dependent) to 20 (fully independent).[14] The SF-36 Health Survey is a generic measure of health related quality of life, with scores ranging from 0 to 100, higher scores indicating greater satisfaction. Aggregate scores of 8 categories are compiled as a percentage of the total points possible; using the Research and Development (RAND) scoring table.[15] The Modified Physical Performance test is a 9 item test which measures the physical function by testing usual daily basic activities of daily living. Each of 9 items has levels of performance scored from 0 to 4 based on completion of the task. The individual item scores are added for a total score (range= 0-36).[16] Scores obtained by three different scales were compared between the diabetics and non-diabetics by uni-variate analysis first and then after removing the effect of socio-demographic variables by multiple regression model.

Results

Both the samples were similar in all socio-demographic characteristics except for occupation ($p < 0.05$) where housewives were seen in a higher proportion (56.4%) in the diabetic group while working persons (34.5%) and retired (32.7%) were more common in the non-diabetic group (Table 1).

Level of independence was measured using Barthel Index. Table 2 shows overall average Barthel score of the diabetic and non-diabetic elderly. Although diabetics scored, on average, significantly lower points (18.27) than the non-diabetic respondents (19.56, $p = 0.011$), after removing the effect of socio-demographic variables this difference did not persist.

There were 8 categories of questions in the SF-36 health survey. The categories included general health, physical functioning, role of physical health, role of emotional health, social functioning, bodily pain, vitality and mental health. The mean ($\pm$SD) general health score was lower in the diabetic (25.55 ± 22.21) than the non-diabetic respondents (55.82 ± 16.91) and this difference was statistically significant before and after removing the effect of socio-demographic variables ($p < 0.001$). The multiple regression model could explain 66% of the variation in the general health score. The diabetic elderly persons obtained significantly, on average, lower score in physical function (25.91 vs. 63.75, $p < 0.001$), physical health (16.82 vs. 63.64), emotional health (39.39 vs. 94.53), social functioning (41.36 vs. 80.91), bodily pain (63.09 vs. 87.36), vitality (37.82 vs. 58.55) and mental health

Table-1: *Socio demographic characteristics of the respondents*

Characteristics	Diabetic (55)		Non-diabetic (55)		χ^2	p
	n	%	n	%		
Age group (years)						
≤ 60	13	23.6	14	25.5	0.052	ns
61-70	34	61.8	33	60.0		
≥ 71	8	14.5	8	14.5		
Mean ± SD	65.93 ± 5.85		64.95 ± 5.03		0.944*	ns
Sex						
Male	23	41.8	33	60.0	3.638	ns
Female	32	58.2	22	40.0		
Marital status						
Not married	17	30.9	12	21.8	1.171	ns
Married	38	69.1	43	78.2		
Educational status						
Never went to school	18	32.7	17	30.9	4.829	ns
< SSC	14	25.5	6	10.9		
SSC and HSC	9	16.4	11	20.0		
Graduation and above	14	25.5	21	38.2		
Occupation						
Retired	13	23.6	18	32.7	6.389	<0.05
House wife	31	56.4	18	32.7		
Working person	11	20.0	19	34.5		
Monthly expd.(Taka)						
≤ 15000	9	16.4	12	21.8	0.979	ns
16000-35000	29	52.7	30	54.5		
≥ 36000	11	30.9	13	23.6		
Mean ± SD	30,000.00 ± 16024.53		26,000.00 ± 13995.7		0.146*	ns
Family member						
3-4	15	27.3	18	32.7	1.350	ns
5-6	25	45.5	27	49.1		
≥ 7	15	27.3	10	18.2		
Family type						
Joint family	29	52.7	20	36.4	2.981	ns
Nuclear family	26	47.3	35	63.6		

* t test

Table-2: *Barthel Index mean score in diabetic and non-diabetic respondents*

Respondents	Mean	SD	t	p	p*
Diabetic	18.27	3.535	-2.614	0.011	ns
Non-diabetic	19.56	0.958			

*Adjusted for socio-demographic variables

(47.09 vs. 69.82) than their non-diabetic counterparts (Table 3). After adjusting for the socio-demographic variables by multiple regression analyses, these differences remained significant.

Table 4 shows the comparison in the mean score of modified physical performance test between diabetic (21.52) and non-diabetic (28.89) persons. The difference in the mean score between diabetic and non-diabetic

Table-3: *Score of different categories of SF-36 Health Survey in diabetic and non-diabetic respondents*

SF-36 Health Survey	Diabetic Mean ± SD	Non-diabetic Mean ± SD	t	p	p*
General health	25.55 ± 22.21	55.82 ± 16.91	-8.043	<0.001	<0.001
Physical function	25.91 ± 19.03	63.75 ± 21.91	-9.664	<0.001	<0.001
Physical health	16.82 ± 30.07	63.64 ± 45.09	-6.407	<0.001	<0.001
Emotional health	39.39 ± 45.40	94.53 ± 22.92	-8.042	<0.001	<0.001
Social functioning	41.36 ± 30.89	80.91 ± 26.34	-7.225	<0.001	<0.001
Bodily pain	63.09 ± 33.61	87.36 ± 71.39	-4.518	<0.001	<0.001
Vitality	37.82 ± 25.73	58.55 ± 13.80	-5.265	<0.001	<0.001
Mental health	47.09 ± 23.14	69.82 ± 13.40	-6.302	<0.001	<0.001

*Adjusted for socio-demographic variables

respondents was statistically significant before and after adjusting for the socio-demographic variables.

Discussion

This study was done to compare the functional impairments of the elderly diabetic and non-diabetic persons. Various parameters like degree of independence, health related quality of life, physical functions were taken into account to assess the functional capability in this study. This was the first attempt to explore this influence of diabetes on functional capability which might be utilized as baseline data for further research work.

Considering the Bangladeshi population structure and life expectancy at birth, the current study defined those, who were ≥55 years, as elderly whereas most international studies on this issue consider ≥60 years as the cut-off point. However, ≥60 years old elderly constitute three fourths of this study sample. The mean (±SD) age was 64.95 ± 5.03) years in non-diabetics and 65.93 ± 5.85 years in the diabetic subjects. Sinclaire *et al.*[17] included samples with mean (±SD) age of 75 ± 7.1 years (diabetic) and 75 ± 6.9 years (non-diabetic). Although two groups were not matched initially but the data showed that both the groups were similar in socio-demographic characteristics except for their occupational status. Housewives were in higher proportion (56.4%) in diabetic group and other occupations i.e., working persons (34.5%) and retired (32.7%) were more in the non-diabetics.

Table-4: *Score of Modified Physical Performance test in diabetic and non-diabetic respondents*

Respondents	Mean	SD	t	p	p*
Diabetic	21.52	5.940	-7.487	<0.001	<0.001
Non-diabetic	28.89	4.232			

*Adjusted for socio-demographic variables

The level of functional independence was measured by using Barthel Index (BI), a scale which measures the basic activities of daily living with higher scores indicating greater independence. This is an internationally accepted ordinal scale that measures the degree of independence from any help, physical or verbal for minor or major reasons. Diabetics scored, on average, lower Barthel points (18.27) than the non-diabetic respondents (19.56, $p < 0.05$). It also showed similarity with the result of the study done by Sinclaire *et al.* ($p < .0001$).[17] However, the difference did not remain significant in the current study after removing the effect of socio-demographic variables.

In all the 8 areas in SF-36 health survey diabetics obtained, on average, significantly lower score than the non-diabetics. The score obtained in physical function domain corresponds with the studies conducted by Caruso *et al.*[18] and Sinclair *et al.*[17] The scores obtained in others categories could not be compared with other study findings as no such data could be found by the researcher.

Physical function was measured by using the 9-item Modified Physical Performance Test. It was a test of usual daily activities. The diabetic respondents scored lower than the non-diabetics. None of the study findings could be compared with Bangladeshi data as no such study could be retrieved in extensive literature searches.

Diabetic elderly persons scored lower than the non-diabetic persons in all the three tests. This might be probably due to the accompanied co-morbidities of the diabetic persons. Data showed that diabetic respondents were more commonly with different types of co-morbidities and on average, had a higher number of morbidities (2.64 vs. 1.25, $p < .05$).

Although this study found some association between the functional and diabetic status, the association doesn't mean any causal inference as the study was cross sectional in design. Therefore, the study findings need to be interpreted carefully. However, as diabetes undoubtedly causes functional impairment, individuals should be encouraged to practice healthier lifestyles in order to prevent diabetes as well as to avoid complications and disabilities in their later life.

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