Original Research Article

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Assessment of physical activity level among patients with type 2 diabetes mellitus attending rural health centre, Marappadi

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ABSTRACT

Background: Insufficient physical activity is one of the ten leading risk factors for death among patients with Non-Communicable Diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes mellitus worldwide. Globally, one in four adults is not physically active. More than 80% of the world's adolescent population is insufficiently physically active. Physical inactivity is very common in India with a prevalence of 54.4%. Lack of knowledge regarding physical activity leads to non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes which in turn can lead to death and disability.

Methods: The cross sectional study was conducted on patients diagnosed to be diabetic visiting the Out Patient Department of Rural Health Centre Marappadi. Convenient sampling was used and the study was conducted from January 2017 to June 2018 using a pre-tested, semi-structured questionnaire.

Results: The mean age of the patients was 57.00±8.747 years. Patients aged 60 years and above had a lower physical activity level. In the older age group, low physical activity was associated with obesity. Adequate motivation was found to be reason for high physical activity level in patients (60.0%).

Conclusions: The physical activity levels of the diabetic patients were unsatisfactory especially in the elderly. Low physical activity was associated with poor glycaemic control in the older age group. There is a need to encourage diabetic patients to undertake regular physical activity in order to achieve good health and well-being, optimal glycaemic control and to prevent diabetic complications.

Keywords: Rural health centre, Physical activity level, Type 2 diabetes mellitus

INTRODUCTION

Insufficient physical activity is one of the ten leading risk factors for death worldwide and one of the key risk factors for non-communicable diseases (NCDs) such as cardiovascular diseases, cancer and Diabetes. Physical activity has significant health benefits and it contributes to prevent NCDs. Globally, one in four adults is not active enough. More than 80% of the world's adolescent population is insufficiently physically active. Policies to address insufficient physical activity are operational in 56% of WHO Member States. WHO Member States have agreed to reduce insufficient physical activity by

10% by 2025.⁵ Physical inactivity is very common in India among 54.4% of people. Lack of knowledge regarding physical activity leads to NCDs such as cardiovascular diseases, cancer and diabetes which can lead to death and disability.⁶

Objective

The objective of the study was to assess the physical activity level among patients with Type 2 diabetes attending out patient department of rural health centre, Marappadi.

METHODS

Study design

Cross sectional study.

Study area

Out patient department of rural health centre, Marappadi, Kanyakumari District, Tamil Nadu.

Study period

The study was carried out from January 2017 to June 2018 (one and half years).

Study participants

Patients diagnosed to be having diabetes mellitus attending Rural Health Centre, Marappadi for more than 6 months consecutively during the study period.

Sampling method

Convenient sampling method was used.

Study tools

Pre designed, pre tested semi- structured questionnaire.

Patients with diabetes were interviewed about sociodemographic details, health profile, physical activity and factors influencing the physical activity. Data on Health profile like (FBS, PPBS, and HbA1c) and medical history from records in past 3 months were obtained.

Assessment of physical activity was done by face to face interview using (IPAQ) short form version consisting of 3 specific activities such as low, moderate and vigorous intensity activity based on scoring mechanism.

Calculation of sample size using the formula⁵

Sample size (n) =
$$\frac{Z_{\alpha^2}pq}{L^2}$$

Based on study conducted by Camila et al where p=37.1%

$$Z_{\alpha}$$
= 1.96, Z_{α} ²= 3.84, $q = 10 - p = 62.9$

With relative precision 20% of p, L=20% of 37.1=7.4

$$n = \frac{3.84 \times 37.1 \times 62.9}{7.4^2} = 163.64$$

With 10% non-response rate, n=179.94

Approximated the sample size to 180.

Sample size, n=180

Inclusion criteria

All patients of age more than 30 years and on treatment for more than 6 months having diabetes mellitus type 2, attending Out Patient Department of Rural Health Centre, Marappadi with or without complications of diabetes mellitus, with other co morbidities such as hyperlipidemia, and hypertension were included. The patients were able to communicate as not deaf, dumb or not having any mental health problems.

Exclusion criteria

Those who were not willing to give consent, with physical disability, had diabetes type 1 or other conditions such as stroke and cancer were excluded from the study.

Ethical committee clearance

The study was approved by the Institutional Human Ethical Committee of Sree Mookambika Institute of Medical sciences, Kulasekharam.

Written consent was obtained from patients.

Data collection

Subjects were interviewed to obtain information on socio-demographic, health profile, physical activity and factors influencing the physical activity. Health profiles were collected from past medical history records. Biochemical profile included Fasting Blood Sugar (FBS), HbA1c value and 2-hour post-prandial blood sugar level. Only values recorded for the past three months were used for the study.

Measurement of physical activity and factors influencing physical activity

Physical activity was assessed through face to face interview using modified IPAQ-short form (IPAQ Research Committee 2005). ¹⁰ The short version of IPAQ consisted of three specific activities of low, moderate and vigorous-intensity activities. There was also a question on sitting activity as an indicator.

Each activity was assigned an intensity code by a scoring mechanism of IPAQ expressed in terms of metabolic equivalent (METs). As compared to the metabolic rate during rest the MET is the ratio of metabolic rate during the activity. In each type of activity, the weighted MET minute per week was calculated as follows (IPAQ research committee).

Walking MET-min/week= $3.3 \times$ walking minutes \times walking days.

Moderate MET-min/week= $4.0 \times$ moderate intensity activity minutes \times moderate activity days.

Vigorous MET-min/week= 8.0 × vigorous intensity activity minutes × vigorous activity days.

Total physical activity MET-minute/week was computed by summing the scores of walking, moderate and vigorous activity in MET minute/week. According to the IPAQ categorical score, the scores were then categorized into low, moderate and vigorous physical activity level. In addition, questions on factors influencing physical activity were also asked.

Anthropometric measurements

Weight, height, waist and hip circumferences were measured by using standardized measurement scales. The reading of the weight was recorded to the nearest 0.1 kg. Height was recorded to the nearest 0.1 cm. A non-elastic measuring tape was used to measure waist and hip circumferences and recorded to the nearest 0.1 cm.

Table 1: Criteria for physical activity score.

Categorical score	Criteria
Category 1 (Low)	This is the lowest level of physical activity. Those individuals who did not meet the criteria for Categories 2 or 3 were considered to have a 'low' physical activity level.
Category 2 (Moderate)	The pattern of activity to be classified as 'moderate' was any one of the following criteria: (a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day; OR (b) 5 or more days of moderate intensity activity and/or walking of at least 30 minutes per day; OR (c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum Total Physical Activity of at least 600 MET-minutes/week.
Category 3 (High)	The two criteria for classification as 'high' were: (a) vigorous-intensity activity on at least 3 days achieving a minimum Total Physical Activity of at least 1500 MET-minutes/week OR (b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total Physical Activity of at least 3000 MET-minutes/week.

Body mass index (BMI) was calculated using the following formula: weight (kg)/height (m^2) and classified accordingly based on World Health Organization.

The cut-off point for waist hip ratio was compared to normal range according to WHO (Table 2).

Table 2: Cut-off point for glycaemic control and waist circumference.

Parameters	Normal range		
Glycaemic control			
Fasting blood sugar	126 mg/dl		
HbA1c (%)	<6.5		
2-hours post-prandial	200 mg/dl		
Waist hip ratio			
Men	<1.0		
Women	< 0.85		

Statistical analysis

The results are presented as mean and standard deviation. Chi square was used to examine the relationship between physical activity and glycemic control [HBA1c] as well as socio-demographic factors. Data were entered in Microsoft Excel 2013 spreadsheet and analyzed using SPSS trial Version 20.0.

RESULTS

A cross sectional study was done to assess the physical activity level among type 2 diabetic patients attending Out patient Department of Rural Health Centre, Marappadi from January 2017 to June 2018 using IPAQ. Required sample size was calculated to be 180. 180 patients satisfying inclusion criteria were included out of which 170 responded making the response rate of 94.44% for the present study.

Demography

A total of 170 patients (95 men and 75 women) participated in the study. The mean age for the subjects was 57.00±8.747 years old. The mean age for men and women were 57.57±8.39 years and 56.28±9.17 respectively. Majority of the subjects were married 128 (75.29%) and most of the participants had completed primary school certificate 100 (58.82%). 101 (59.41%) of the participants were doing clerical job. Among 170 participants, 17.5% had morbidities such as diabetes mellitus 21 (13.1%), hypertension 21 (13.1%), hyperlipidemia 14 (8.8%).

Bio chemical profile

The mean and range for the biochemical profile were compared by gender. The mean FBS for men (115.21±17.06) was higher than that for women

(112.25±15.47) (Table 4). All the means for the glycemic profile of the patients had not exceeded the normal range used by WHO recommendations (Table 2).

Anthropometry

Females were heavier and taller than men (p<0.05) (Table 3). The normal range for waist: hip ratio for women and men were less than 0.85 and less than 1.0 respectively (WHO). According to the BMI category (WHO, 2004), most of the subjects 116 (72.5%), were pre-obese (Figure 1).

Physical activity profile

According to IPAQ category (IPAQ Research Committee, 2005) 51 (31.87%) of patients had low

physical activity level followed by 44 (27.5%) of the participants who fell into the moderate physical activity level. Majority patients aged 60 years and above had a lower physical activity level and low physical activity was significantly associated with obesity (p<0.001).

Relation of physical activity level with glycemic control and socio demographic profile

A higher percentage of participants those married had a moderate physical activity level (p<0.001) (Table 5). In the older age group, a higher percentage of patients with low physical activity level had poor HBA1c control (p<0.001).

Table 3: Socio-demographic characteristics of the participants by gender.

Socio-demographic characteristics		Men (n=95)	Women (n=75)	Total (n=170)
Socio-demograp	socio-demographic characteristics		N (%)	N (%)
Age	30-60	62 (65.26)	55 (73.3)	117 (68.82)
(in years)	More than 61	33 (34.7)	20 (26.66)	53 (31.17)
Manital status	Married	67 (70.52)	61 (81.3)	128 (75.29)
Marital status	Unmarried	10 (10.52)	6 (8)	16 (9.41)
	Others	18 (18.94)	8 (10.66)	26 (15.29)
	Illiterate	10 (10.5)	10 (10.7)	20 (11.76)
	Primary school certificate	47 (49.4)	33 (38.82)	80 (47.05)
Education	Middle school certificate	8 (8.42)	9 (9.3)	17 (10)
	High school certificate	11 (11.5)	10 (10.7)	21 (12.35)
	Post high school certificate	13(13.68)	7 (9.3)	20 (11.76)
	Graduate or postgraduate	6 (6.31)	6 (6.7)	12 (7.05)
	Unemployed	8 (8.42)	3 (4)	11 (6.4)
	Unskilled	13 (13.68)	8 (10.7)	21 (12.35)
Occupation	Semiskilled	5 (5.26)	2 (2.7)	7 (4.11)
	Skilled	3 (3.15)	5 (6.7)	8 (4.7)
	Clerical	54 (56.84)	47 (62.7)	101 (59.41)
	Semi-profession/profession	12 (12.63)	10 (13.3)	22 (12.94)

Table 4: Mean for biochemical and anthropometry profile of the participants.

Parameters	Men (n=95)	Women (n=75)
Biochemical values		·
Fasting blood sugar (mmol/l)	115.21±17.06	112.25±15.47
HbA1c (%)	7.02±0.72	6.92±0.67
2 hours post-prandial (mmol/l)	157±19.78	154.53±19.12
Anthropometry profile		
Weight (kg)	67.74±7.35	68.95±5.56
Height (cm)	166.66±2.64	166.76±2.05
BMI (kg/m^2)	24.37±2.71	24.80±2.12
Waist circumferences (cm)	105±7.27	89.44±6.73
Hip circumferences (cm)	105.83±22.58	68.50±14.22
Waist hip ratio (cm)	0.99±0.14	0.76±0.10

Presented as mean±SD (n=170).

Table 5: Relation of physical activity levels with glycemic control and socio-demographic profile.

Parameters	Physical activity level				
	N	Low	Moderate	High	P value
Gender					
Men	122	35	24	36	
Women	48	21	25	29	0.280
Age group				-	
Less than 60 years	122	9	49	64	
More than 61 years	48	47	0	1	< 0.001
Occupational status					
Unemployed	11	1	7	3	
Unskilled	21	12	5	4	
Semiskilled	7	1	3	4	
Skilled	8	4	1	3	0.012
Clerical	101	38	29	34	
Semi-profession/profession	22	1	4	17	
Educational level					
Illiterate	18	5	1	12	
Primary school certificate	87	36	24	27	
Middle school certificate	15	2	5	8	
High school certificate	19	6	5	8	0.019
Post high school certificate	20	9	5	6	
Graduate or postgraduate	11	3	4	4	
Marital status					
Married	18	9	6	3	
Unmarried	16	8	3	5	0.902
Others	13	4	6	3	
Glycemic control					
Good HbA1c value (<6.49%)	119	10	44	65	
Poor HbA1c value (>6.5%)	51	51	0	0	< 0.001

Level of Physical activity was significantly associated with age and glycemic control (p<0.001).

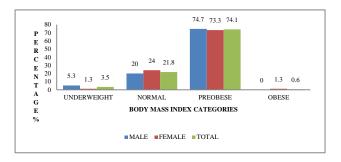


Figure 1: Gender wise distribution of participants according to body mass index.

DISCUSSION

In the present study 56 (32.94%) patients with type 2 diabetes had low physical activity, 49 (28.82%) had moderate physical activity and 65 (38.23%) had high physical activity levels. A cross sectional study by Rajappan among university students showed that a greater percentage (56%) of males had high physical activity level than females. In an analytical observational study conducted by Fattahi among patients with type 2 diabetes, 57.5% of them showed moderate physical

activity.3 The cross sectional study conducted by Patil among 200 adult patients attending the health centres of Indira Gandhi Government Medical College found that 59% were having a sedentary lifestyle, 27% were having a moderately active lifestyle and 14% were having a vigorously active lifestyle.4 Two hundred twenty five patients were assessed in a study by Camila et al and it revealed that 107 (47.6%) had diabetes mellitus type 2 (DM2) and 118 (52.4%) had type 1 diabetes mellitus (DM1).⁵ An epidemiological and biochemical study done by Dewan conducted in the District Sangrur, Punjab (India) found out that in a total sample of 1000 subjects, 359 persons were performing physical activities and 641 are doing work in the sitting posture. Borderline, newly detected, known and total diabetic subjects were more among those performing work in sitting posture. Men were more physically active than women.⁸ A study among 129 subjects with type 2 diabetes mellitus conducted by Colak et al found that 51 (39.5%) had low, 67(51.9%) had moderate and 11 (8.5%) had high activity levels. Majorie et al conducted a cross-sectional study to assess the physical activity levels of 151 patients with type 2 diabetes mellitus (46 men and 105 women) and found out that majority (68.9%) of subjects had moderate to high physical activity.

The middle aged and older individuals with diabetes should be encouraged to be physically active as the aging process leads to degeneration of muscles, ligaments, bones and joints, and disuse and diabetes may exacerbate the problem.8 Fattahi conducted an analyticalobservational study among 320 type 2 diabetic patients and revealed that the associations between physical activity and age, education, occupation and marital status were significant (P<0.05).3 A cross sectional study conducted by Patil among adult patients attending the health centres of Indira Gandhi Government Medical College found a statistically significant increasing trend for low physical activity with age among study subjects.⁴ Shazwani et al conducted a cross-sectional study to assess the physical activity levels among a total of 132 patients (62 men and 70 women) with type 2 diabetes mellitus (DM) at Cheras Health Clinic in Kuala Lumpur. Patients who were unmarried and aged 60 years and above had a lower physical activity level (p<0.05). 10 In a cross sectional study done by Palermo among adult patients diagnosed with T2DM seen at the PGH diabetes outpatient clinic during the study period of 6 months from September 2015 to February 2016 revealed that there is no significant association between physical activity, age, occupation, education. In a cross sectional study done by Patil among adult patients attending the Indira Gandhi government medical college, older age was associated with less physical activity (p<0.01) and educational status was not associated with physical activity (p value 0.12).

In an analytical observational study done among type 2 diabetic patients attending the Diabetes Center of Hamadan by Fattahi the age and education was associated with physical activity (p<0.001) and occupation was not associated with physical activity.3 In a cross sectional study done among individuals with type 2 diabetes mellitus attending Cheras Health Clinic by Shazwani et al the education is associated with physical activity (p<0.01) in which person having primary school certificate has highest physical activity. ¹⁰ In a cross sectional study done among individuals with type 2 diabetes mellitus attending Cheras Health Clinic by Shazwani et al the occupation is associated with physical activity(p<0.01) in which person having clerical job highest physical activity. 10 Shazwani et al in the cross sectional study among individuals with type 2 diabetes mellitus attending Cheras Health Clinic found out that low educational status was associated with high physical activity (p<0.01). Individuals having primary school certificate showed highest physical activity. 10 Changes in an individual's status from single to married did bring about a positive change in engaging oneself with regular physical activity as per center for disease control and prevention.

In the present study, inactivity among the older age group was associated with poor glycaemic control. In a cross sectional study done by Palermo among type 2 diabetic patients showed that most of the patients had poor glycaemic control based on HbA1c of \geq 7% (68.2%). Shazwani et al found out that in the older age group and

low physical activity was associated with poor glycaemic control (p<0.05) based on HbA1c (70.7%), FBS (71.9%) and 2HPP (85.4%).

A cross-sectional study among 151 patients with type 2 diabetes mellitus (46 men and 105 women) by Majorie et al found out that most of the patients had poor glycaemic control with HbA1c of ≥7% (68.2%). Participants aged 60 years and above (68.1%; p=0.022) and with poor glycaemic control (89.4%; p=<0.001) had low physical activity level. A study from United States also indicate that about 28 to 34% of elderly people aged 65 to 74 years and 35 to 44% of elderly aged 75 or older were less active. ¹¹

CONCLUSION

The physical activity levels among participants were unsatisfactory especially in the elderly. Low physical activity was associated with poor glycaemic control in the older age group. To achieve good health and well-being among diabetic patients, optimal glycaemic control and regular physical activity need to encourage in order to prevent complications of diabetes mellitus.

Recommendations

- Education programs for improvements in modifications of life style can be done by providing leaflets which promote activities like aerobic exercise, gardening, mopping etc.
- Improvement in physical activity may be done by introducing unplanned exercise at work place or office reducing period of sedentary life.
- 3. Promote Cycling, walking and other forms of active transportation that are accessible and safe for all.
- 4. Labour and workplace policies should encourage physical activity.
- 5. Schools should have facilities and safe places for students to spend their free time actively.
- Quality physical education in educational institutions supports children to develop behavior patterns that will keep them physically active throughout their lives.
- 7. Recreation facilities and sports provide opportunities for everyone to keep physically active.

Limitations

- 1. The results of the study may not be generalized to the overall diabetic population as this study was conducted only among the outpatients.
- All biochemical profiles whose date exceeded three months from the period of the present study were excluded.
- 3. Most of the patients were unable to remember exactly the type and duration of the activity done. So physical activity levels reported might not strictly reflect the true situation.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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