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RESEARCH ARTICLE

The Effect of Physical Exercise Program in Patients with Type 2 Diabetes Mellitus in Ratchaburi Province, Thailand

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Abstract:

Objective:

This study aimed at investigating the relationship between demographic and psychological characteristics with the status of physical activity of type 2 diabetic patients from Sub-District Health Promoting Hospital (SDHPH).

Methods:

Data were collected from 1,890 type 2 diabetic patients using self-registered questionnaires. The questionnaire included questions about demographic characteristics, and exercise, while medical records were examined for complications, treatments, and diabetes control indicators. Furthermore, descriptive statistics, chi-square tests and Fisher's exact test were performed. *P*-values <0.05 were considered statistically significant.

Results:

According to the result of Chi-square tests and Fisher's exact test, it was observed that education level and occupation were significantly influenced by physical activity level at significance levels of 0.05.

Conclusion:

This study shows that socio-demographic factors play an important role in exercise behavior, and these should be taken into account accordingly while designing fitness intervention.

Keywords: Physical activity, Diabetes, Education level, Occupation, Socio-demographic factors, Thailand.

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1. INTRODUCTION

Diabetes is a disease caused by a disruption of the production function of insulin which increases blood sugar levels in the bloodstream. This disorder will later damage the most vital organs of the body [1]. Globally, this disease has been the cause of death of around 1.3 million; the main cause of death is kidney failure. Economically, diabetes has resulted in more than 15% of health-realted costs [2]. The incidence of diabetes occurs in almost 21-25% due to lack of physical activity [3]. In addition, the lack of exercise is a cause of death of 6% in the world [4].

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Physical activity plays an important role in energy balance and management by keeping our body healthy [5]. It has been known that physical activity affects directly the metabolic system [5]. In accordance, diabetes can be controlled and prevented by exercise, weight management, healthy food consumption, as well as the cessation of smoking [1]. All these prevention strategies cannot be fully achieved but at least, we can encourage patients to follow these recommendations. These recommendations include exercise, a healthy lifestyle, and regular diabetic medication compliance.

It was reported that 37-60% of diabetic patients did not follow exercise recommendation [6]. Research has noted that around 80% diabetes cases were caused by the lack of awareness, and knowledge of healthy lifestyle and physical activities [7]. The intervention to promote physical activity and

exercise should be encouraged due to some reasons, namely socio-demographic, and psychological factors. This study was designed to investigate the impact of psychological and demographic factors on physical activity in type 2 diabetic patients.

2. METHODS

2.1. Settings

Data were conducted from Tambon Health Promoting Hospitals in Mueang Ratchaburi Province, Thailand from January 2018 to March 2018. The samples were diabetic patients over the age of 18 with multi-stage randomization. Mueang Ratchaburi is a province in the Kingdom of Thailand. The province is divided into 10 districts, namely Ratchaburi, Chom Bueng, Suan Phueng, Damnoen Saduak, Ban Pong, Bang Phae, Wat Phleng, Photharam, Pak Tho and Ban Kha. The first step was to select 5 districts from 10 districts which were Danein district, Muang district, Baang Pair district, Photharam district and Wat Phleng district. Step two: a total of 84 hospitals were enrolled as the district health-promoting hospitals; 42 (SDHPH) [9]. Sub-district hospitals that are based on health promotion play an important role in providing core services to all communities, including individuals, families and societies as a whole. In the health promotion hospital unit which consists of doctors, nurses, public health officials, technicians, public health, dentistry, medical techniques and traditional Thai medicine, each promotional hospital provides services to approximately 5,000 residents [8]. Finally, we selected patients with pre-defined qualifications. The data covers 1,890 patients who were older than 15 years.

2.2. Ethical Considerations

The Institutional Research Board of Boromarajonani College of Nursing, Ratchaburi (IRB-BCNR) - Ministry of Public Health approved this study with the certificate of approval number BCNR. No. 02/2018.

2.3. Measures

The data collection was carried out by using a self-administered questionnaire. The questionnaire consists of two parts. The first part was socio-demographic characteristics (namely age, sex, educational attainment, and Body Mass Index (BMI). The second part was adopted by the International Physical Activity Questionnaire (IPAQ). The IPAQ measured the physical activity during the last 7 days, the final score would represent the intensity of physical activity [9]. The content validity was compiled by 3 experts, who considered the appropriateness of the language used and checked the reliability using the Cronbach's Alpha Coefficient to test the consistency of the questionnaire. The overall reliability was greater than 0.70. The collected data was thoroughly examined before it was analyzed by applying the SPSS application.

2.4. Statistical Analysis

The data was tested by implementing descriptive statistics, Chi-square and completed by Fisher's exact test. Chi-square was applied to test the relationship between the demographic factors and physical activity level. The chi-square test for independence compared two variables in the table to see whether they were related to each other or not. In general, tests are performed to see if the distribution of variables is different from each other or not. Chi-square statistics are one way to show the relationship between two categorical variables. Since the p-value was less than the significance level $\alpha = 0.05$, we rejected the null hypothesis and concluded that there was an association between the two variables.

3. RESULTS

Table **1** shows the characteristics of 1,890 respondents who successfully gave the data. The average age of respondents was 57.6 years (SD = 1.76) and the number of male respondents was more than females. Most respondents (36.2%) had a bachelor's degree. Most of the respondants (28.4%) were employees being diabetic of age 11-20 years. In terms of body mass index, 29.7% had a body mass index of 25.0-29.9 (which is overweight).

Table 1. Frequency and percentage of patients characteristic (1,890 patients)

Demographic variables	Frequency (%)
Sex	
Male	1,050 (55.6)
Female	840 (44.4)
Education	
Primary	153 (8.1)
Junior High	220 (11.6)
High school / Vocational	368 (19.5)
Diploma	330 (17.5)
Bachelor	684 (36.2)
Post graduate	120 (6.3)
Other	14 (0.8)
Occupation	
Farmers	120 (6.3)
Government	196 (10.4)
Contractor	283 (10.3)
Employees	411 (31.8)
Student	72 (13.8)
Business	536 (18.4)
Other	172 (9.1)
Duration of diabetes	
<5 year	590(31.2)
5-10 year	500 (26.5)
11-20 year	536 (28.4)
>20 year	264 (13.9)
Mean = 7.56, SD. = 0.78	
Body Mass Index	
<18.5, (underweight)	296(15.7)
18.5-24.9, (normal)	217(11.5)
25.0-29.9, (overweight)	561(29.8)
30.0-34.9, (obese class 1)	411(21.8)
35.0-39.9, (obese class 2)	82(4.3)
>40 (obese class 3)	321(16.9)
Mean = 34.2, SD. = 0.72	

Table **2** presents the association between socio-demographic factors and physical activity level. The statistical analysis results showed there was a significant association between physical activity level, education and occupation, which were significant at alpha 0.05. However, there was no association between physical activity and sex, duration of diabetes, and body mass index (p>0.05).

Table 2. Relationship between demographic variables and level of physical activity among diabetic patients (1,890 patients)

Demographic variables	Physical activity levels			P-value
	Low	Moderate	High	
Sex				0.543
Male	648(34.3)	309(16.3)	93(4.9)	
Female	486(25.7)	258(13.7)	96(5.1)	
Education				0.005
Primary	106(5.6)	33(1.7)	14(0.7)	
Junior High	134(7.1)	63(3.3)	23(1.2)	
High school / Vocational	214(11.3)	126(6.7)	28(1.5)	
Diploma	207(11.0)	93(4.9)	30(1.6)	
Bachelor	400(21.2)	207(11.0)	77(4.1)	
Post graduate	63(3.3)	41(2.2)	16(0.8)	
Other	10(0.5)	4(0.2)	1(0.1)	
Occupation				0.001
Farmers	79(4.2)	30(1.6)	11(0.6)	
Government	123(6.5)	52(2.8)	21(1.1)	
Contractor	170(9.0)	89(4.7)	24(1.3)	
Employees	252(13.3)	128(6.8)	31(1.6)	
Student	43(2.3)	19(1.0)	10(0.5)	
Business	327(17.3)	154(8.1)	55(2.9)	
Other	140(7.4)	95(5.0)	37(2.0)	
Duration of diabetes				0.734
<5 year	366(19.4)	169(8.9)	55(2.9)	
5-10 year	305(16.1)	151(8.0)	44(2.3)	
11-20 year	325(17.2)	158(8.4)	53(2.8)	
>20 year	138(7.3)	89(4.7)	37(2.0)	
Body Mass Index				0.657
<18.5, underweight	190(10.1)	78(4.1)	28(1.5)	
18.5-24.9, normal	132(7.0)	66(3.5)	19(1.0)	
25.0-29.9, overweight	341(18.0)	172(9.1)	48(2.5)	
30.0-34.9, obese class 1	251(13.3)	119(6.3)	41(2.2)	
35.0-39.9, obese class 2	46(2.4)	26(1.4)	10(0.5)	
>40 obese class 3	174(9.2)	106(5.6)	43(2.3)	
Total	**1,134**	**567**	**189**	

4. DISCUSSION

In an effort to make effective physical activity interventions for diabetics, this study seeks to find out factors that are related to the motivation of diabetic patients in physical activity. Many studies have confirmed that the physical activity of a person with diabetes is lower than those who do not have diabetes. For example, a research in Nepal by Vaidya A. Krettek found that 43.3% of diabetics had low physical activity [10]. Other studies found differences in physical activity between male and female diabetics, their activities were 36.6% and 28.6%, respectively. Likewise, other activities show that women with diabetes are more passive than men [11]. Other studies also support the results of this study that most women with diabetes are less active than men [12]. Although there are methodological differences in the various studies discussed above, it can be concluded that gender is an important factor in various degenerative diseases, for example cardiovascular, cancer and diabetes-related diseases. This is related to the behavior of physical activity related to gender, while on the other hand, physical activity is an inhibiting factor for the occurrence of this degenerative disease. Physical activity has a great influence on several diseases and also on psychological aspects. People who have a positive attitude are more encouraged to do enough physical activity. Besides, active people have high self-efficacy which ultimately makes them think more positively [13].

Likewise, the results of this study indicated a meaningful relationship between sex, education level and also the type of work with a level of physical activity. Other studies showed that the level of education is a strong predictor to determine the level of one's physical activity [14]. However, there is also a research that contradicts with this finding, that one's level of education does not affect the level of physical activity [15]. This is because of other factors, for example, whether or not people are too busy at work, or taking care of their families, and also psychological barriers which prevent people from doing physical activities better.

Several studies confirmed that there is a significant relationship between working status and physical activity. A study in Canada showed that those who are not employed have lower health status compared with those who have a job. Similarly, a European study found that unemployment status is related to poor physical activity. The type of job is a significantly strong predictor for physical activity either for men or women. While the employment status is associated significantly with the daily physical activity for men [16]. Furthermore, regarding the recent economic trends, the sedentary jobs increased significantly, in consequence, it could result in less physical activity. Thus, it needs special programs that promote a higher activity level.

In conclusion, exercise is one of the most powerful tools that can help in controlling weight and blood sugar. Muscles use glucose without insulin when one performs an exercise. Exercise can also help people with type 2 diabetes avoid complications in the long term, particularly heart problems [17]. Diabetics are sensitive to the development of arteries. (arteriosclerosis) which can lead to a heart attack. The benefits of exercise are it reduces cholesterol, LDL cholesterol, and triglycerides. Exercise can help control the blood and the body's sensitivity to insulin, both are critical for diabetics [18].

Many studies indicate that exercise greatly helps in the treatment of diabetes. Aerobic exercise improves blood sugar control in type 2 diabetes, especially when performing an exercise at least 150 minutes / week. Resistance exercise increases strength in adults with type 2 diabetes, approximately 50% [19]. According to a meta-analysis, adults with type 2 diabetes reported a greater reduction in A1C following aerobics compared with resistance training [20].

CONCLUSION

The results of this study indicated a real relationship between physical activity and demographic characteristics. This relationship shows that demographic characteristics (such as education and work) are important in intervening and promoting physical activity. Governments should arrange appropriate exercise programs for patients with diabetes. Patients should start exercise with a warm-up session (*i.e.*, stretching within the neck, triceps chest upper back torso and low back). Importantly, exercise should be initiated slowly and gradually (from light to heavy). It should start with normal walking for 10 minutes to running for 15 minutes.

LIMITATION

The limitation of this study is self-reporting of physical activity. The data collection methods could encourage biasness in information, because people may have provided incorrect information .

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Institutional Research Board of Boromarajonani College of Nursing, Ratchaburi (IRB-BCNR) - Ministry of Public Health has approved this study with approval number BCNR. No. 02/2018.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all the participants.

AVAILABILITY OF DATA AND MATERIAL

The data supporting the findings of the article is available in the project of type 2 diabetes mellitus in Ratchaburi Province at Boromrajonani College of Nursing Ratchaburi, Ministry of Public Health, Thailand, reference number 2561/250.

FUNDING

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REFERENCE

[1] Bauman A, Lewicka M, Schoppe S. The Health Benefits of Physical Activity in Developing Countries. Geneva: World Health Organization 2005.

[2] Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 2010; 87(1): 4-14. [http://dx.doi.org/10.1016/j.diabres.2009.10.007] [PMID: 19896746]

[3] World Health Report: Reducing risks, promoting healthy life. Geneva: World Health Organization 2002.

[4] Ghazanfari Z, Niknami Sh, Ghofranipour F, Larijani B. Regular physical activity from perspective of females with diabetes: A qualitative study. Horizon of Medical Sciences 2009; 15(1): 514.

[5] Moeini B, Jalilian M, Moghimbeigi A, Tarigh SN. Factors affecting physical activity and metabolic control in type 2 diabetic women referred to the diabetes research center of hamadan: Applying trans-theoretical model. Sci J Hamadan Univ Med Sci 2011; 18(2): 31-7.

[6] Brown H, Roberts J. Exercising choice: The economic determinants of physical activity behaviour of an employed population. Soc Sci Med 2011; 73(3): 383-90. [http://dx.doi.org/10.1016/j.socscimed.2011.06.001] [PMID: 21757272]

[7] Plotnikoff RC, Brez S, Hotz SB. Exercise behavior in a community sample with diabetes: understanding the determinants of exercise behavioral change. Diabetes Educ 2000; 26(3): 450-9. [http://dx.doi.org/10.1177/014572170002600312] [PMID: 11151292]

[8] Vasheghani-Farahani A, Tahmasbi M, Asheri H, Ashraf H, Nedjat S, Kordi R. The persian, last 7day, long form of the International Physical Activity Questionnaire. Asian J Sports Med 2011; 2(2): 10616. [http://dx.doi.org/10.5812/asjsm.34781] [PMID: 22375226]

[9] Vaidya A, Krettek A. Physical activity level and its sociodemographic correlates in a peri-urban Nepalese population: A cross-sectional study from the Jhaukhel-Duwakot health demographic surveillance site. Int J Behav Nutr Phys Act 2014; 11(1): 39. [http://dx.doi.org/10.1186/1479-5868-11-39] [PMID: 24628997]

[10] Forghani B, Kasaeyan N. FaghihImani B, Hosseinpour M, Amini M. The assessment of physical activity in non-insulin dependent diabetic women reffered to Endocrine & Metabolism Research Center. Majallah-i Ghudad-i Darun/Riz va Mitabulism-i Iran 2000; 2(3): 169-73.

[11] Humphreys BR, Ruseski JE. The economic choice of participation and time spent in physical activity and sport in Canada. University of Alberta, Department of Economics 2010.

[12] Momenan AA, Delshad M, Mirmiran P, Ghanbarian A, Azizi F. Leisure time physical activity and its determinants among adults in Tehran: Tehran lipid and glucose study. Int J Prev Med 2011; 2(4): 243-51. [PMID: 22174964]

[13] Didarloo AR. Physical activity among women with type 2 diabetes: Prediction by the extended theory of reasoned action. Payesh 2012; 11(2): 187-98.

[14] Daniali SSh, Azadbakht L, Mostafavi DF. The relationship between body image, selfEfficacy and physical activity in female employees of Isfahan University of Medical Sciences and University of Isfahan, Iran. J Health Syst Res 2012; 8(6): 991-1001.

[15] Grayson JP. Health, physical activity level, and employment status in Canada. Int J Health Serv 1993; 23(4): 743-61. [http://dx.doi.org/10.2190/W5NR-A7A4-BX4A-T4F7] [PMID: 8276533]

[16] Alavinia SM, Burdorf A. Unemployment and retirement and ill-health: A cross-sectional analysis across European countries. Int Arch Occup Environ Health 2008; 82(1): 39-45. [http://dx.doi.org/10.1007/s00420-008-0304-6] [PMID: 18264715]

[17] King GA, Fitzhugh EC, Bassett DR Jr, *et al.* Relationship of leisure-time physical activity and occupational activity to the prevalence of obesity. Int J Obes Relat Metab Disord 2001; 25(5): 606-12. [http://dx.doi.org/10.1038/sj.ijo.0801583] [PMID: 11360141]

[18] Umpierre D, Ribeiro PA, Kramer CK, *et al.* Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes: A systematic review and meta-analysis. JAMA 2011; 305(17): 1790-9. [http://dx.doi.org/10.1001/jama.2011.576] [PMID: 21540423]

[19] Gordon BA, Benson AC, Bird SR, Fraser SF. Resistance training improves metabolic health in type 2 diabetes: A systematic review. Diabetes Res Clin Pract 2009; 83(2): 157-75.

[http://dx.doi.org/10.1016/j.diabres.2008.11.024] [PMID: 19135754]

[20] Yang Z, Scott CA, Mao C, Tang J, Farmer AJ. Resistance exercise versus aerobic exercise for type 2 diabetes: A systematic review and meta-analysis. Sports Med 2014; 44(4): 487-99. [http://dx.doi.org/10.1007/s40279-013-0128-8] [PMID: 24297743]