

Study On Social Support for Exercise And Its Impact on the Level of Physical Activity of Patients with Type 2 Diabetes

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Abstract

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BACKGROUND: Physical activity is one of the most important self-care approaches to controlling complications of type 2 diabetes. According to Bandura's social theory, factors such as social support are effective factors in the incidence of the behaviour.

AIM: This study aims to determine the level of physical activity, social support and their determinants.

METHODS: This descriptive study was performed on 250 patients with type 2 diabetes by Cluster-Random Sampling method in Rafsanjan City. Data were collected using the International Physical Activity Questionnaire and Social Support Questionnaire for Sport, that their validity and reliability were confirmed. The results were analysed by t-test, ANOVA and logistic regression.

RESULTS: This study showed that 46.8% of the patients were in the inactive group. Social support score for exercise was low in this group. The results indicated that social support and gender are predictors of physical activity, and with an increase in the social support score, the odds of having minimal physical activity increased 1.17 fold (OR = 1.167) and men were 4.18 times more likely to have minimal physical activity (OR = 4.183).

CONCLUSION: Considering the low level of physical activity and social support in diabetic patients, and the effect of social support on the prediction of physical activity, interventions are recommended to increase social support in this group.

Introduction

According to the World Health Organization, type 2 diabetes is the fourth leading cause of death in the world and the greatest challenge to today's modern life [1]. In the last decade, the fastest growth rate of diabetes was reported in the Middle East countries. And this increase includes individuals aged 45-64 years who are still socially and economically productive [2]. Diabetes is also prevalent in Iran, 7.7% of the adult population of Iran aged 25-64 years have diabetes, while half of the cases have not been diagnosed yet [3]. Evidence-based on the prevention of diabetes complications suggests that behavioural measures such as cessation of a smoking, healthy diet and physical activity are also necessary to prevent and reduce its complications, reduce blood

sugar, lipids and blood pressure [4]. Although, diabetic patients are encouraged to carry out sufficient physical activity. Usually, they do not find much success in this task. Some of them cannot maintain their motivation to continue the physical activity, and there are numerous personal and environmental barriers that cause instability in physical activity [5]. According to Bandura's social cognitive theory, environmental factors are one of the important factors in the formation of behaviour, and Social support is considered as one of the influencing factors for the performance of physical activity [6]. Social support is considered as perceived support by others such as family and friends and is one of the factors associated with physical activity [7]. Duncan, according to the conclusions of some theories about social support, defined social support as any behaviour that helps an individual to reach his/her goals and consequences

[8]. These behaviours are categorised into four: emotional, tangible or practical, informative and supportive [9]. Social-emotional support involves expressing feelings, values and attitudes. Tangible support includes the provision of the necessary facilities for performing a behaviour, and information support include providing information, recommendations and guidelines for solving behaviour-related problems, and ultimately accompanying social support, including social belonging sense and presence of a companion to engage in activity [10].

Considering the chronic nature of diabetes, it is essential for these patients to change their behaviour and lifestyle. Social support is considered as an effective factor in self-care and acceptance of therapeutic procedures and lifestyle changes [11]. However, patients with type 2 diabetes have the least social support of physical activity among recommended behaviours [12].

Although there is no consensus, several studies indicate a positive impact of social support on the status of diabetic patients [13], and it is considered as one of the effective factors in initiating recommended behaviour in these patients [14]. Although the study of Morowati [15] showed that diabetic patients did not have favourable social support for self-care behaviours. Also, social support and family support had a low rate; they were able to predict self-care behaviours in diabetic patients, in these studies, self-care behaviours and social support were mentioned generally [16]. Until the present study, a study that specifically evaluates the social support for exercise and its dimensions, as well as its impact on physical activity behaviour in diabetic patients in the Iranian population, was not found.

This study aimed to evaluate the social support for exercise and the predictive power of social support in promoting the level of physical activity in diabetic patients. More interventional studies are recommended to assess the effects of social support for exercise in improving the level of physical activity in patients with diabetes.

Methods

This descriptive-analytical study was performed on patients with type 2 diabetes in health centres of Rafsanjan City, based on a similar study [15]. A group of 250 people entered the study. The random-cluster sampling method was used in this study, and four clusters were randomly selected from the eight health centres.

People with a previous diagnosis of type 2 diabetes were recruited. Patients were excluded from

the study if they had a history of any psychiatric disorder, as well as the inability to carry out physical activity. The International Physical Activity Questionnaire was used to determine the level of physical activity that measures all physical activities in the environment including sports, working and daily activities. This standard questionnaire has been approved by the World Health Organization, and its reliability and validity have been approved in different countries [17]. In Iran, the Persian version of this questionnaire has been used in several cases, and its validity has been approved [18]. This self-report questionnaire examines three types of physical activity including walking, activity with moderate intensity and activity with high intensity.

The total score was calculated by the sum of duration and the number of days of the week spent on moderate and high-intensity activities and walking then turning them into metabolic equivalent per minute (METs), This questionnaire divides the individuals into three levels of activity: low, moderate and severe. The social support questionnaire of sport which was developed by Sallis et al., with 20 questions were used to determine the amount of social support of Exercise [19]. These questions were examined in the form of a five-point Likert scale on social support in two dimensions: social support of friends and support of family members. This questionnaire was translated by Noroozi et al. in Iran, and its reliability and validity were reviewed and confirmed by using exploratory and confirmation analysis procedures [20]. Data were analyzed by using SPSS18. The Kolmogorov–Smirnov test was used to examine the data normalisation. T-student, ANOVA, Chi-square and logistic regression tests were used for data analysis

Results

A group of 190 females (76%) and 60 males (24%) participated in the study. The guidelines recommended by (Sallies) were used to determine the level of social support. The results of social support study showed that the average score of social support was 29.42 ± 10.17 . The study on social support dimensions showed that the maximum achievable score of social support of the family, as well as the score of verbal social support, was higher in this group (Table 1).

Table 1: Social Support Scores and Its Dimensions in Patients with type 2 Diabetes

Variable	Mean \pm SD	Possible Range
Family social support	23.22 \pm 7.34	0-60
Friends Social support	6.19 \pm 3.86	0-20
Verbal support	6.84 \pm 3	0-16
Practical support	4.22 \pm 2.75	0-16
Emotional support	4.93 \pm 3.14	0-20
Total social support	29.42 \pm 10.17	0-80

T-test and variance analysis were used to investigate the effect of demographic factors on the rate of social support. The results showed that total social support score among individuals with different levels of education and income was significantly different (Table 2).

Table 2: Frequency distribution of social support regarding demographic characteristics

Variable		Mean \pm SD Family social support	Mean \pm SD Friends social Support	Mean \pm SD Total social Support	P value
Gender	Male	24.45 \pm 7.11	6.1 \pm 3.95	30.55 \pm 9.87	0.325
	Female	22.83 \pm 7.39	6.22 \pm 3.85	29.06 \pm 10.26	
Age	25-39	20.93 \pm 6.38	5.93 \pm 3.3	26.86 \pm 8.59	0.290
	40-49	24.23 \pm 6.62	6.50 \pm 4.02	30.73 \pm 9.50	
	50-59	23.30 \pm 7.38	6.23 \pm 3.88	29.54 \pm 10.23	
	60-65	21.60 \pm 9.02	5.35 \pm 3.70	26.96 \pm 11.77	
Education	Elementary	20.43 \pm 7.80	4.90 \pm 4.17	25.36 \pm 11.09	< 0.001
	Mid school	23.63 \pm 6.40	6.56 \pm 3.65	30.16 \pm 8.86	
	Diploma	27.02 \pm 7.02	7.04 \pm 3	34.06 \pm 9.54	
	Post graduate	23.33 \pm 6.2	11.33 \pm 6.80	34.66 \pm 12.50	
Income	Weak	19.44 \pm 6.50	4.23 \pm 3.05	23.60 \pm 9.19	< 0.001
	Moderate	24.30 \pm 7.12	6.82 \pm 3.74	31.15 \pm 9.59	
	Good	24.30 \pm 7.12	9.50 \pm 2.81	41.62 \pm 4.17	

The use of Post Hoc test showed that individuals with elementary education had lower social support scores than those with higher grades regarding educational level. Also, with an increase in income, the score of social support was significantly increased. The results of physical activity evaluation showed that 117 patients (46.8%) were in the inactive group based on the questionnaire scores and 133 patients (53.2%) were in the group with the minimal activity, and none of the patients was in the high-activity group. Probable factors affecting the level of physical activity in diabetic patients were analysed using the Analysis of Variance (ANOVA) and Chi-square test. The results showed that factors such as gender, education and income level had a remarkable effect on the rate of physical activity in diabetic patients. However, the age factor did not show any significant difference (Table 3).

Table 3: The relationship of demographic characteristics with physical activity in patients with type 2 diabetes

Variables		Inactive N(%)	Minimally active N(%)	P value
Gender	Male	16 (26.7)	44 (73.3)	< 0.001*
	Female	101 (53.2)	89 (46.8)	
Age	25-39	6 (40.0)	9 (60.0)	0.327
	40-49	27 (39.1)	42 (60.9)	
	50-59	68 (49.3)	70 (60.9)	
	60-65	16 (57.1)	12 (42.9)	
Education	Elementary	56 (71.8)	22 (28.2)	< 0.001*
	Middle school	50 (40.0)	75 (60.0)	
	Diploma and Above	11 (23.4)	36 (76.6)	
Income	Weak	52 (75.4)	17 (24.6)	< 0.001*
	Moderate	63 (36.4)	11 (63.9)	
	Good	6 (75)	2 (25)	

Logistic regression analysis was used to consider the predictive power of the factors affecting the physical activity behaviour in patients with diabetes. Using the Hosmer-Lemeshow test showed that the final model was well-fitted ($p = 0.62$). The results showed that the male gender (OR = 4.183) and high social support for exercise (OR = 1.167) were the predictors for promoting the level of physical activity in patients with diabetes from the level of

inactive to minimal active. The income level and level of education were not confirmed as predictors of physical activity changes in patients with type 2 diabetes (Table 4).

Table 4: Regression analysis of variables as predictors of physical activity in Patients with type 2 Diabetes

Variable	B	OR	Wald	P value	95% C.I. for EXP (B)	
					Lower	Upper
Social Support	0.155	1.167	47.961	< 0.001 *	1.117	1.220
Gender	1.431	4.183	10.921	0.001 *	1.790	9.775
Education	0.709	2.033	2.547	0.176	0.851	4.858
Income	0.849	2.338	3.349	0.067	0.941	5.804

Discussion

The results of this study showed that the level of social support for exercise was not appropriate in type 2 diabetic patients. So that, the average score of social support in these patients was less than the half score of the questionnaire. However, the low level of social support is also mentioned in other studies. Studies conducted by Heidari and Morowati [15], [21] in Iran showed that the level of social support in diabetic patients is not appropriate, and in comparison with other recommended behaviours for the diabetic patient such as exercise and medical treatment, less amount of social support was reported for physical activity [22].

Low level of social support for physical activity can be due to different factors such as reduced awareness of individuals and families about the impact of physical activity on the improvement of the status of patients, as well as cultural perspectives and concerns about physical activity in patients with diabetes, especially elderly patients and women. With regards to the definition of social support in communicating with others, feeling of frustration and depression has also been mentioned as the reason for the reduction in this communication in patients. As indicated in several studies, one of the reasons for low social support is the existence of some level of depression [23]. On the other hand, some studies have shown that about half of patients with type 2 diabetes have some level of depression.

The mean score of practical social support was low in comparison with other areas [24]. These results are consistent with the results of other studies which showed that the highest social support was the verbal type and include a discussion on the benefits of sport and verbal encouragement. Although, according to the theory of social support, verbal induction has a positive effect on solving obstacles of the performance of behaviour and success in its implementation [25]. Due to the chronic and debilitating nature of diabetes as well as the complex nature of the onset of regular and continuous physical activity behaviour, providing practical support by family, friends, and essential

health systems are important. Assessing the influence of demographic factors on social support showed that, although social support score was higher in men, this difference was not statistically significant, which is consistent with the results of Daniel's study [26]. Of course, there are different views on the impact of gender on social support; in some studies, the level of social support of women is reported to be lower than that of men [27]. Some studies show that women are more dependent on social support in solving their problems [28]. It seems that friendship groups for exercise are increasing in Iranian women. The results of this study showed that with an increase in the level of education and income, the level of social support also increased. Access to financial resources, social value, as well as gaining more social support and widespread social networks are the most important effects of high educational level on health consequences [29]. In this study, Physical Activity Questionnaire was used to assess the level of physical activity. In this tool, the participants are divided into three levels: inactive, minimally active and highly active. The study showed that most people were at a minimal activity level. Studies also indicate that about 60-80% of people with type 2 diabetes do not meet the recommended levels of physical activity [30].

The results of this study indicate a lower level of physical activity in women with diabetes. Studies show that inactivity is common especially in elderly Iranian women [31]. This low mobility can be due to many social and individual factors. Among the social factors, the cultural limitations of physical activity in Iranian women, especially in an outdoor environment such as parks and green places, have been mentioned [32]. Other reasons include the involvement of multiple roles, home works and taking care of children and the family, which despite taking a large amount of women's time, do not lead to effective physical activity.

The present study has shown that the level of physical activity had a significant relationship with education and income, while age was not effective. This is consistent with Costanzo's study [33]. The effect of education on physical activity can be explained by the effect of awareness on self-care behaviours [34]. Although awareness does not necessarily lead to the adoption of behaviour, a higher level of education can be effective in physical activity by increasing the ability of understanding and accessing information necessary for carrying out physical activity. With regards to age, some studies have shown that lifestyle behaviours such as physical activity have been shaped since childhood and do not change with age [35].

On the other hand, there was no limit to the recommended physical activity for diabetic patients until 65 years for those who participated in this study. The use of a regression model showed that after adjusting for the confounding factors, two factors:

gender and perceived social support, could predict the improvement of physical activity behaviour in patients with type 2 diabetes. The chance of having minimal physical activity in men is 4.18 times more than that of women. Also, those who had higher social support score, have 1.17 time's higher chance or 17% more likely chance to have minimal activity. Although, there is no specific mechanism for the impact of social support on self-care behaviors, some direct and indirect effects are mentioned. Social support can be directly influenced by the behavior of individuals, or it is indirectly effective by increasing self-efficacy and self-confidence, or by reducing individual stress and anxiety in self-care behaviors [36].

Given the complex nature of exercise in diabetes, social support provision from different sources including family, friends and health care providers would be helpful in this regard.

This study had some limitations including the descriptive nature of the study, which is necessary for interventional studies and to design and implement a more detailed examination of the impact of promoting social support in different dimensions on the amount of physical activity. On the other hand, in this study, the level of physical activity was assessed through self-reporting, which can be assessed by using the physiological dimensions of physical activity, such as cardiac fitness more precisely.

In conclusion, this study presents a low level of social support and physical activity in diabetic patients. On the other hand, social support was suggested as a predictor of physical activity behaviour, family and community interventions are recommended to improve the level of social support for exercise, to increase the level of physical activity in patients with type 2 diabetes.

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References

1. Mellitus C, Seino Y, Nanjo K, Tajima N, Kadowaki T, Kashiwagi A, et al. Report of the committee on the classification and diagnostic criteria of diabetes mellitus. *Journal of diabetes investigation*. 2010; 1(5):212-28. <https://doi.org/10.1111/j.2040-1124.2010.00074.x> PMID:24843435 PMCID:PMC4020724
2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004; 27:1047-53. <https://doi.org/10.2337/diacare.27.5.1047> PMID:15111519

3. Esteghamati A, Gouya MM, Abbasi M, Delavari A, Alikhani S, Alaedini F, et al. Prevalence of diabetes and impaired fasting glucose in the adult population of Iran: National Survey of Risk Factors for Non-Communicable Diseases of Iran. *Diabetes Care*. 2008; 31:96–8. <https://doi.org/10.2337/dc07-0959> PMID:17921357
4. Gaede P, Lund-Andersen H, Parving HH, Pedersen O. Effect of a multifactorial intervention on mortality in type 2 diabetes. *N Engl J Med*. 2008; 358:580–591. <https://doi.org/10.1056/NEJMoa0706245> PMID:18256393
5. Thomas N, Alder E, Leese GP. Barriers to physical activity in patients with diabetes. *Postgrad Med J*. 2004; 80(943):287–291. <https://doi.org/10.1136/pgmj.2003.010553> PMID:15138320 PMCID:PMC1742997
6. Bandura A. Health promotion by social cognitive means. *Health Educ Behav*. 2004; 31:143–164. <https://doi.org/10.1177/1090198104263660> PMID:15090118
7. Coleman S, Berg CJ, Thompson NJ. Social support, nutrition intake, and physical activity in cancer survivors. *Am J Health Behav*. 2014; 38(3):414-9. <https://doi.org/10.5993/AJHB.38.3.10> PMID:24636037 PMCID:PMC4514029
8. Duncan SC, Duncan TE, Strycker LA. Sources and types of social support in youth physical activity. *Health Psychol*. 2005; 24(1):3-10. <https://doi.org/10.1037/0278-6133.24.1.3> PMID:15631557
9. Uchino BN. Social support and physical health: Understanding the health consequences of relationships. Yale University Press, 2004. <https://doi.org/10.12987/yale/9780300102185.001.0001>
10. Heaney CA, Israel BA. Social networks and social support. Health behavior and health education: Theory, research, and practice. 2008; 4:189-210.
11. Trief PM, Ploutz-Snyder R, Britton KD, Weinstock RS. The relationship between marital quality and adherence to the diabetes care regimen. *Ann Behav Med*. 2004; 27(3):148-54. https://doi.org/10.1207/s15324796abm2703_2 PMID:15184090
12. Rad GS, Bakht LA, Feizi A, Mohebi S. Importance of social support in diabetes care. *Journal of education and health promotion*. 2013; 2.
13. Song Y, Song HJ, Han HR, Park SY, Nam S, Kim MT. Unmet needs for social support and effects on diabetes self-care activities in Korean Americans with type 2 diabetes. *Diabetes Educ*. 2012; 38(1):77-85. <https://doi.org/10.1177/0145721711432456> PMID:22222514 PMCID:PMC3649548
14. Ciechanowski P, Russo J, Katon WJ, Lin EH, Ludman E, Heckbert S, et al. Relationship styles and mortality in patients with diabetes. *Diabetes Care*. 2010; 33(3):539-44. <https://doi.org/10.2337/dc09-1298> PMID:20007946 PMCID:PMC2827504
15. Morowati -Sharifabad M, Rouhani Tonekaboni N, Baghianimoghadam M. Predictors of Self-Care Behaviors among Diabetic Patients Referred to Yazd Diabetes Research Centre Based on Extended Health Belief Model. *JSSU*. 2007; 15(3):85-9.
16. Zare Shahabadi A, Hajizade Meimandi M, Ebrahimi Sadrabadi F. Influence of social support on treatment of type II diabetes in Yazd. *SSU_Journals*. 2010; 18(3):277-8.
17. Wendel-Vos GC, Schuit AJ, Saris WH, Kromhout D. Reproducibility and relative validity of the short questionnaire to assess health-enhancing physical activity. *J Clin Epidemiol*. 2003; 56(12):1163–9. [https://doi.org/10.1016/S0895-4356\(03\)00220-8](https://doi.org/10.1016/S0895-4356(03)00220-8)
18. Seyed Emami R, Eftekhari Ardebili H, Golestan B. Effect of a health education intervention on physical activity knowledge, attitude and behavior in health volunteers. *Journal of hayat*. 2011; 16(3):48-55.
19. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Prev Med*. 1987; 16:825-836. [https://doi.org/10.1016/0091-7435\(87\)90022-3](https://doi.org/10.1016/0091-7435(87)90022-3)
20. Noroozi A, Ghofranipour F, Heydarnia AR, Nabipour I, Amin Shokravi F. Validity and reliability of the social support scale for exercise behavior in diabetic women. *Asia Pac J Public Health*. 2011; 23(5): 730– 741. <https://doi.org/10.1177/1010539509357342> PMID:20460282
21. Heidari SH, NooriTajer M, Shirazi F, Sanjari M, Shoghi M, Salemi S. Relationship between family support and glycemic control in patients with type-2 diabetes. *Iran J Diabetes Lipid Disord*. 2008; 8:93–102.
22. Kirk A, Mutrie N, Macintyre P, Fisher M. Increasing physical activity in people with type 2 diabetes. *Diabetes Care*. 2003; 26:1186-1192. <https://doi.org/10.2337/diacare.26.4.1186> PMID:12663595
23. Barg FK, Huss-Ashmore R, Wittink MN, Murray GF, Bogner HR, Gallo JJ. A Mixed-Methods Approach to Understanding Loneliness and Depression in Older Adults. *The journals of gerontology Series B, Psychological sciences and social sciences*. 2006; 61(6):S329-S339. <https://doi.org/10.1093/geronb/61.6.S329> PMID:17114313 PMCID:PMC2782769
24. Das R, Singh O, Thakurta RG, Khandakar MR, Ali SN, Mallick AK, et al. Prevalence of Depression in Patients with Type II Diabetes Mellitus and its Impact on Quality of Life. *Indian J Psychol Med*. 2013; 35(3):284-9. <https://doi.org/10.4103/0253-7176.119502> PMID:24249932 PMCID:PMC3821207
25. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977; 84(2):191–215. <https://doi.org/10.1037/0033-295X.84.2.191> PMID:847061
26. Berard DM, VanDenKerkhof EG, Harrison M, Tranmer JE. Gender differences in the influence of social support on one-year changes in functional status in older patients with heart failure. *Cardiology Research and Practice*. 2012; 2012.
27. Ghasempour M, Jahanbakh S. The relationship between social support and mental health in students of Khoramabad. *Journal of Lorestan University of Medical Sciences*. 2010; 12(1):43-7.
28. Kafetsios K. Social support and well-being in contemporary Greek society: Examination of multiple indicators at different levels of analysis. *Soc Indic Res*. 2006; 76(1):127-45. <https://doi.org/10.1007/s11205-005-4859-2>
29. Montez JK, Zajacova A. Trends in mortality risk by education level and cause of death among U.S. white women from 1986 to 2006. *Am J Public Health*. 2013; 103(3):473-9. <https://doi.org/10.2105/AJPH.2012.301128> PMID:23327260 PMCID:PMC3673510
30. Thomas N, Alder E, Leese G. Barriers to physical activity in patients with diabetes. *Postgrad Med J*. 2004; 80(943):287-91. <https://doi.org/10.1136/pgmj.2003.010553> PMID:15138320 PMCID:PMC1742997
31. Kelishadi R, Alikhani S, Delavari A, Alaedini F, Safaie A, Hojatzadeh E. Obesity and associated lifestyle behaviours in Iran: findings from the first national non-communicable disease risk factor surveillance survey. *Public health nutrition*. 2008; 11(3):246-51. <https://doi.org/10.1017/S1368898007000262> PMID:17625028
32. Dashti S, Joseph HL, Esfehiani AJ, Su TT, Latiff LA, Esfehiani RJ. Perceived Barriers to Physical Activity among Iranian Women. *World Applied Sciences Journal*. 2014; 32(3):422-8.
33. Costanzo C, Walker SN, Yates BC, McCabe B, Berg K. Physical activity counseling for older women. *West J Nurs Res*. 2006; 28(7):786-801. <https://doi.org/10.1177/0193945906289495> PMID:17056774
34. Wu TY, Jwo JL. A prospective study on changes of cognitions, interpersonal influences, and physical activity in Taiwanese youth. *Res Q Exerc Sport*. 2005; 76(1):1-10. <https://doi.org/10.1080/02701367.2005.10599256>
35. Clark M. Diabetes self-management education: a review of published studies. *Prim Care Diabetes*. 2008; 3:113–120. <https://doi.org/10.1016/j.pcd.2008.04.004> PMID:18779034
36. Kadirvelu A, Sivalal Sadasivan SH. Social support in type II diabetes care: a case of too little, too late. *Diabetes Metab Syndr Obes*. 2012; 5:407-417. <https://doi.org/10.2147/DMSO.S37183> PMID:23226028 PMCID:PMC3514066