The Intermediary Role of Self-Efficacy in Relation with Stress, Glycosylated Haemoglobin and Health-Related Quality of Life in Patients with Type2 Diabetes

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Abstract

Background: Stress is not always a direct result of stressful conditions, but rather the way they are perceived. Thus individual variables that may be associated with perceived stress should be examined in stress studies. This study investigates the intermediary role of self-efficacy in relation with stress, glycosylated haemoglobin and health-related quality of life in patients with type2 diabetes.

Methods: All women with diabetes in Yazd Diabetes Research Centre, in 2012, were considered and 80 women were selected by random sampling. They completed Shirer's self-efficacy scale questionnaire, depression, anxiety and stress scale (DASS), and ADDQ0L19 questionnaire. Then they were introduced to the lab for blood test. Data were analysed by SPSS software and stepwise regression method.

Results: Pearson correlation test results showed that the hemoglobin A1c ($r = 0.35$) and Quality of Life ($r = -0.22$) are associated with stress ($P < 0.05$). As so hemoglobin A1c ($r = 0.83$) and Quality of Life ($r = 0.37$) with variable of self efficacy are associated positively and significantly ($P < 0.05$). Results of stepwise regression also showed that self efficacy and stress scales 0.697 of variance hemoglobin A1c and 0.140 of variance of Quality of life explaining to do.

Conclusion: The impact of stress on blood sugar and patients' health-related quality of life can be influenced by their self-efficacy; therefore it is suggested that an educational intervention is done to increase patients' self-efficacy to better cope with stress in their life.

Keywords: Diabetes, HbA1c, Self efficacy, Health-related quality, Stress

Introduction

Diabetes is a heterogeneous metabolic disease characterized by chronic hyperglycaemia and impaired metabolism of carbohydrates, fats and protein and consequently causes some defects in insulin secretion or function (1). This disease is in the centre of behavioral problems and psychological and social factors have a crucial role in its management (2, 3). According to theory ś Biorentorp ; mental stress with a reaction of failure feeling or distress leads to activation of hypothalamus-pitui-tary-adrenal axis which finally results in hormonal abnormalities including increase of serum cortisol level and decrease of sex steroids and growth hormone whose action is against insulin function (4). Stress increases insulin resistance in different cells and consequently HbA1c index increases in diabetic patients (4-6).

Stress is not always a direct result of stressful conditions, but rather the way they are perceived. Similar stressful events produce different effects

on different people. Hence the belief that there are some variables which adjust the relation between stress and job satisfaction has been strengthened. Perceived self-efficacy is one of these variables. People with high levels of perceived self-efficacy experience less stress (7). Self-efficacy enables individuals to do extraordinary things using skills in dealing with barriers; therefore its understanding is a crucial stage. Effective functions depend on both skills and believe the ability to use them. People who believe in their efficacy show more efforts to overcome barriers and problems (8, 9). People with high self-efficacy are stronger facing problems compared to other people. Little and colleagues proposed that specific behaviors and cognitive interventions can be arranged for patients who have low self-esteem and self-efficacy to control their diabetes better (10). Type1 diabetic people who had higher self-efficacy were more adaptive and suffered from less emotional problems (11).

This study was aimed to investigate the role of self-efficacy in relation with stress and its effects on HbA1 and health-related quality of life in type2 diabetic patients.

Materials and Methods

Subjects

All women with type 2 diabetes (diagnosed by centre's diabetes specialist) who were members of Diabetes Research Centre of Yazd Province, in 2012, were considered as statistical community of whom 80 samples were selected randomly. In this way a complete list of all diabetic women was prepared using centre's computer engineer and then those who had inclusion criteria and lacked exclusion criteria were selected as the sample. There were 100 individuals with these features; they got a call. From these, the educational level of 20 was recorded wrongly; therefore 80 patients were invited to Diabetes Research Centre. First they signed the consent form and then were given some tests and enough information on how to complete them. After coordination with laboratory, according to the schedule given to subjects, they were asked to go there for blood test. Mean

age of subjects was 46 years and 2 months. Of this number 20 patients used insulin, 59 tablets and one person had not started any drug treatments. Inclusion criterion was the age of 40-50, diabetes mellitus type2 for at least six month, and an educational degree higher than guidance school. The following items were considered as exclusion criterion: acute or chronic medical problems which make blood sampling difficult, history of receiving relaxation training or stress management, and having family background of diabetes.

Tests

Shirer's general self-efficacy scale: This scale was made by Shirer and Maddox in 1982 with 17 categories. Woodruff and Cushman (1993) confirmed its reliability and validity. Internal consistency coefficient of this scale is 0.83 and to study validity criterion, its correlation with "Ratter's internal control scale" equals 0.342 which is significant in $P<0.01$ level (12).

Depression, Anxiety, and Stress Scale (DASS): This scale is designed by Lovibond and Lovibond (13) to measure the severity of depression, anxiety and stress simultaneously and has acceptable reliability. Cronbach's alpha coefficient for subscales was 0.81 for depression, 0.73 for anxiety and 0.83 for stress in a normal sample containing 717 people. Cronbach's alpha coefficient for short form (21 questions).

Audit of Diabetes-Dependent Quality of Life (ADDQoL19) (Bradley and colleagues, 1999): This questionnaire has 19 categories and is designed to measure people's perception of diabetes effects on health-related quality of life. Every category is graded in a seven degree scale. According to Cronbach's alpha (0.85), there is a good internal reliability. Factor analysis and Cronbach's alpha support category integration on one scale. This tool has been designed for both insulin dependent and non-insulin patients. Constructive reliability of ADDQoL is confirmed by difference between patients taking insulin, those who consume tablets, or patients with a diet (15). Cronbach's alpha coefficient which equals 0.91 in Pursharifi and colleagues study (2007) represents an acceptable internal consistency.

HbA1c test: HbA1c is a protein which is clinically recognized as an important marker for long-term blood sugar control. HbA1c test measures average blood glucose 2-3 months ago (16, 17). In fact, the effects of treatment and better control of blood sugar can be recognized by HbA1c decrease. This index is reported by percentage and can be interpreted according to normal range set by each examiner. This rate was variable between 5.5-12.5 in subjects of this study. Patients' classification was done according to blood sugar control and patients were divided into 3 groups: group1 with good control (HbA1c less than 7), group2 with control (average Hab1c, greater or equal to 7 and less than 9), and group3 with poor control (HbA1c higher than 9).

Results

Table1 presents Pearson correlation, mean and standard deviation of scores under stress scales, self-efficacy, A1C hemoglobin, and health-related quality of life in type2 diabetic people. According to Table1 there was a negative relation between psychological stress and health-related quality of life, and also between self-efficacy and HbA1c, while there was a positive relation between psychological stress with HbA1c and also self-efficacy and health-related quality of life. Thus all variables have a significant correlation with each other and the direction of correlation is as predicted. Regression analysis can be used for data analysis. To test the first hypothesis, stress subscales and self-efficacy were selected as predictor variables and A1C hemoglobin was entered regression equation as standard variable. Table 2 shows a summary of stepwise regression model.

Table1: Findings of Pearson correlation test between variables, mean and standard deviation of variables

Variables	Stress	Self-efficacy	Life quality	HbA1c
Stress	-	-0.31	-0.22	0.35
Self-efficacy	-0.31	-	0.37	0.83
Life quality	0.22	0.37	-	0.45
HbA1c	0.35	0.83	0.45	-
Mean	14.11	50.40	56.98	8.42
Standard deviation	3.90	19.86	18.63	1.70

The results of stepwise regression in predicting A1C hemoglobin through stress scale in the first model showed a significant variance ($R2=0.127$) of A1C hemoglobin. In second model, self-efficacy scale entered into regression equation and explained A1C hemoglobin variance 0.697 with previous model variable.

To test the second hypothesis, stress subscales, and self-efficacy were considered as predictor variables and health-related quality of life entered into regression equation as standard variable. Summary of stepwise regression model is presented in Table 3.

The results of stepwise regression in predicting health-related quality of life through stress scale in the first model showed a significant variance ($R2=0.052$) of health-related quality of life. In the second model, self-efficacy scale entered into regression equation and explained life Health-Related Quality of Life variance 0.140 with previous model variable.

Table 2: Summary of stepwise regression model for self-efficacy, stress and hemoglobin

Steps	Variables	R	R²	B	Standard deviation	β	t	Significant
Model1	Stress	0.36	0.127	0.813	2.106	0.356	3.302	0.001
Model2	Self efficacy	0.835	0.697	-9.704	0.725	-0.835	-13.385	0.001

R= Multiple correlation between studied variables in the model and A1C haemoglobin, R2= squared correlation (the ratio of dependent variable variance which is defined by studied variable), B= slope of regression, β= standardized regression coefficient, *t*= standard feature for test and significance of each variable in predicting the dependent variable

Table 3: Summary of stepwise regression model of self-efficacy and stress on life quality

Steps	Variables	R	R²	B	Standard deviation	β	t	Significant
Model1	Stress	0.227	0.052	-0.048	0.024	-0.227	-2.020	0.001
Model2	Self efficacy	0.375	0.140	0.399	0.112	0.375	3.570	0.001

R= Multiple correlation between studied variables in the model and A1C hemoglobin, R2= squared correlation (the ratio of dependent variable variance which is defined by studied variable), B= slope of regression, β= standardized regression coefficient, *t*= standard feature for test and significance of each variable in predicting the dependent variable

Discussion

There is an agreement in different studies that perceived stress rate in diabetic patients is higher than ordinary population and in these patients diabetes is a kind of stress itself. In this study, all patients showed high scores according to stress sub-scale score from DASS questionnaire (17). The first finding of this study which considers the role of stress in predicting health-related quality of life and HbA1c agrees with other researches (16-19) and shows that stress caused by disease conditions has important effects on health-related quality of life and glycaemic control. The second finding of this study is also consistent with previous studies (20-22) which confirm the role of self-efficacy in increasing mental health. Evidence suggests that high self-efficacy prevents the effects of stressful factors and increases immune system function (21). When people are stressed, those who perceive themselves capable and efficient try more to deal and cope with problems (23). However, those who perceive themselves incapable and inefficient submit easily and feel depressed, anxious and hopeless.

Today the main purpose of diabetes treatment is having appropriate HbA1C control (lower than 7%), because it is related to reduction of mortality rate in these patients (17). Several studies have been done on the relation between sugar control and health-related quality of life, some of which have verified this relation while others have not. It is suggested that appropriate sugar control is related to better control of health-related quality of life and some researchers have found a curved form relation between HbA1C and health resulting from life quality. They believe that low quality of life in diabetic patients is accompanied by high level of HbA1C (<8). Higher life quality is observed in patients with average sugar control (7-8) and lower life quality is related to proper sugar control (<7). According to the present study, patients with a lower level of blood sugar experience a better health-related quality of life because they have more satisfaction which influences their life.

Diabetic patients should have special attitudes and judgments on their abilities in addition to daily skills of self-care and prevention of glucose changes. Programs on adaptation and life skills can promote these abilities and improve self-esteem and self-efficacy (18). Considering the importance of self-efficacy in diabetes control and its applicability with the least health facilities, especially nurses should promote self-efficacy and self-care behaviors in diabetic patients.

Conclusion

Stress and self-efficacy could influence health-related quality of life and HbA1C level. On this basis two functional and theoretical consequences could be recognized. In functional level, education and intervention programs could improve and change personal characteristics while teaching individuals appropriate and efficient skills and methods to confront stress. After primary changes in personal characteristics, the results could be used in educational programs and self-efficacy promotion. In theoretical level, the results of study can help functional achievement based on intermediate variables in stress control. It leads to self-care behaviors and prevention of diabetes side effects which is a continuous challenge for health system and government.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsi-

fication, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

Acknowledgement

References

1. American Diabetes Association (ADA) (2005). National standards for diabetes self-management education. *Diabetes Care*, 28:72-79.
2. Snoek FJ (2002). *Management of diabetes: Psychological aspects of diabetes management*. The Medicine Publishing Company, Ltd.
3. Kreyer I (2003). Endocrine stress responses in critical care nurses: a possible relation to job turnover?. *PhD Thesis*. University of Zurich.
4. Goymann W, Wingfield JC (2004). Allostatic load, social status, and stress hormones: the costs of social status matter. *Animal Behaviour*, 67(3):591.
5. Bjorntorp P, Holm G, Rosmond R (1999). Hypothalamic Arousal, insulin resistance and type2 diabetes mellitus. *Diabetes Med*, 16(5): 373-383.
6. Denollet J, Van Heck GL (2001). Psychological risk factors in heart disease. What type D personality is (not) about. *J Psychosom Res*, 51(3).
7. Shu-fang Vivienne wu Mary Courtney, Helen Edward (2008). Development and validation of Chinese version of the diabetes management self efficacy scale. *International Journal of Nursing Studies*, 45(4) :534-542.
8. Bandra A (1994). Self-efficacy. In V.S. Ramachaudran. *Encyclopaedia of human Behaviour*, 4: 71-8.
9. Abdollahi B (2007). The effects of self-efficacy on staff efficiency. Available: http://www.imi.ir/tadbir/tadbir-168/article.
10. Littlefieldch C H, craven Jl, Rodin GM (1992). Relationship of self-efficacy and binging to adherence to diabetes regimen among adolescent. *Diabetes Care*, 15(1): 90-4.
11. Vandeven N, Weinger K, Yi J (2003). The confidence in diabetes self-care scale, psychometric properties of a new measure of diabetes-specific self-efficacy in Dutch and Us patient with type 1diabetes. *Diabets Care*, 26(3): 713-718.
12. Aditama S (2011). The relationship of self-care, self-efficacy and social support with HbA1c among type2 diabetes mellitus patients. *Medicine Gadjah Mada University Yogyakarta*.
13. Lovibond SM, Lovibond PFM (1995). *Manual for the Depression Anxiety Stress Scales*, 2nd Edition. Australia, Sydney: Psychology Formulation.
14. Sahebi A, Mirabdollahi E S, Salari R (2001). Standardization of anxiety, stress and depression scale in university students in Mashhad. *Report on research projects, Mashhad, Ferdowsi University*.
15. Bradley C, Todd C, Gorton T, Symonds E, Martin A, Plowright R (1999). The development of an individualized questionnaire measure of perceived impact of diabetes on quality of life: the ADDQoL. *Quality of Life Research*, 8(1-2).
16. Pursharifi H, Purnaghash Tehrani S et al. (2007). Investigation of linguistic validity and psychometric properties of QOL questionnaires, personal patterns and welfare of diabetes patients. *Draft research report approved by school of psychology and educational sciences, Tabriz University*.
17. Aerab Sheibani kh, Janbozorgi M, Akhondi N (2012). The relationship between coping styles with stress and levels of psychological adjustment with blood sugar control in diabetic teenagers. *4th International Congress of Diabetes Updates, Endocrinology & Metabolism Research Institute Tehran University of Medical Sciences*.p.181
18. Shi Q, Ostwald SK, Wang S (2010). Improving glycaemic control self efficacy and glycaemic control behaviour in Chinese
19. Kotsanos JC, Marrfero D, Viginati JG, Mathias AD, Huster W (1997). Health- related quality of life results from multinational clinical trail of insulin lipro: Assessing benefits of a new diabetes therapy. *Diabetes Care*, 20(6):948- 58.
20. Jex SM, Gudanowski DM (1992). Efficacy beliefs and work stress: an exploratory study. *Journal of Organizational Behavior*, 3(5): 509-517.
21. Schaubroeck J, Lam S, Xie JL, Merritt DE (2000). Collective efficacy versus self-efficacy in coping responses to stressors and control: a cross-cultural study. *J Appl Psychol*, 85(4): 512-525.
22. Jex SM, Bliese PD (1999). Efficacy beliefs as a moderator of the impact of work-related stressors: A multilevel study. *J Appl Psychol*, 84(3): 349-61.
23. Bandura A (1996). *A socio-cognitive view on shaping the future*. Seoul, Korea: HK Mun Publishing.