Development and Preliminary Validation of Diabetes Adjustment Assessment Scale (DAAS): a New Measure of Adjustment with Type 2 Diabetes

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ABSTRACT

Introduction: Several adjustment scales are available for Diabetes, but, unfortunately most of them focused on the limited dimensions of diabetes and are not specific for type 2 diabetes. The aim of this study was to develop a multidimensional scale for Diabetes type 2 Adjustment Assessment and to test preliminary validity, reliability and clinical utility of the scale for this population.

Methods: In this methodological design study, the Diabetes Adjustment Assessment Scale was developed and the psychometric properties of this scale was assessed in patients with type 2 diabetes. This study included internal consistency, content validity and exploratory factor analysis.

Results: 1000 patients with type 2 diabetes completed the 45-item Diabetes Adjustment Scale. After eliminating two item, the 43-item measure demonstrated good internal consistency (Cronbach's α= 0.75). Factor analysis identified eight factors including; reshape (11 questions), seek to acceptance of illness (7 questions), normal life with the disease (6 questions), initial self-management (2 questions), comparing (4 questions), initial imaging of illness (4 questions), return to resources(3 questions), and advanced self- management (6 questions).

Conclusion: Considering that validity and reliability indexes of the scale are reported in an appropriate level, it can be used as a valid and reliable tool in measuring level of adjustment with type2 diabetes.

Introduction

Diabetes mellitus (DM) is one of the most challenging and burdensome chronic diseases of the 21st century.[1] DM currently affects about 285 million adults worldwide and it is expected to rise to over 400 million adults by 2030.[2] Diabetes mellitus type 2 is responsible for over 90% of all cases of diabetes.[3] Most new patients with diabetes are from developing countries and it seems that the Middle East is among the regions that will have the largest increase in the prevalence of diabetes by 2030. According to the previous study, the prevalence of diabetes is about 8.7% in Iranians peapole.[4] After the diagnosis of chronic illness as diabetes, patients are confronted with new situations that challenge their habitual coping strategies and go through a process of psychosocial adjustment.[5] Living with DM has been described as a dynamic personal transitional adjustment, based on restructuring of the illness perceived experience and management of the self.[6]

The experience of disease led patients to engage in adjustment and management of chronic disease. Adjustment and management

in diabetes are simultaneous and interdependent.[7]Accurate understanding of adjustment is necessary in the management of the disease.[8]It seems that nursing interventions promoting the adjustment level in diabetes require early identification the adjustment level using a native instrument.[9] Among famous scales measuring diabetes's adjustment, it can be pointed to Diabetic Adjustment Scale developed by Sullivan. It was designed to assess life adjustment in adolescent girls with juvenile diabetes. The scale extracted information on peer relationships, family relationships, body image concerns, dependence-independence conflicts, school adjustment and attitudes toward diabetes. The scale used for patients with type 1 diabetes with an age range of adolescents that its nature is different from type 2 diabetes.[10]

Other scale is the Psychosocial Adjustment with Illness Scale that designed by Derogates to measure psychosocial adjustment to physical disease or the residual effects of the disease. The ATT39 scale (the cryptic name is designed to limit the potential motivational distortion inherent in more transparent title such as "adjustment scale") was developed by Dunn et al as a norm-referenced measure of emotional adjustment in diabetic patients.[11] The majority of available tools in the field has been formed on qualitative studies with different content and culture. Cultural context and norms which present in all populations, influence on practices of management and adaptation to disease.[12] But so far there hasn't been specific tool for measuring adjustment with disease among type 2 diabetes patients.

Materials and methods

This study was a methodological study, which has been done in two phases. First phase: for providing item. Items were derived from a qualitative study. The second phase: studying face validity, content and construct validity had been done as following: In order to study face validity, two quantitative and qualitative methods had been used. In qualitative method,

15 patients with type 2 DM stated their views about the appearance and suitability of the tools for evaluating considered aims. In quantitative method: after correcting items based on view of persons with type 2 DM, in the next stage for decreasing and omitting inappropriate phrases, quantitative method of item effect had been used. The work was like this that for each items, five-point Likertscale had been considered in the form of "very important to not important". Then it was asked from ten persons with type 2 diabetes to answer the questions according to their experiences during living with diabetes.[13] Questions that the score of their effect size was less than 1.5 were omitted from the scale. Also for determining content validity, two qualitative and quantitative methods had been used. In qualitative method, diabetes experts and specialists' views (endocrinologists, diabetes nurse educators, psychologists, social workers and dieticians) had been used regarding observing grammar, using appropriate words, putting items in its appropriate place and appropriate scoring. In quantitative method, two indexes of Content Validity Ratio (CVR) and Content Validity Index (CVI) had been calculated.

For calculation of CVR, it was asked from the experts group to assess each item based on a three-point scale of; necessary, useful, but not necessary, and it is not necessary.[14] Considering that there were 10 respondents, the minimum of accepted CVR was 0.59. CVI: regarding this, three criteria of simplicity, specificity and clarity had been considered in a five-point Likert scale for every item.[13]Then, it was asked from ten experts to provide the necessary feedback after assessment of tool in term of quality and quantity based on the following criteria. The minimum of accepted CVI was 0.79.

After studying internal consistency of the scale phrases, exploratory factor analysis method, which studies internal relationship among variables, had been used for class discovery of the variables that had the most relationship with each other. In the analysis, factors of the items that had factor load of

more than 0.3 had been used. Sample size was 1000 patients with type 2 diabetes referring to Imam Reza and Sina hospitals and Tabriz branch Diabetes Association, Tabriz, Iran .Sample size is important in factor analysis and the sample size of thousands is excellent in factor analysis. Prior to the extraction of the factors, several tests should be used to assess the suitability of the respondent data for factor analysis.

For measuring of sampling adequacy, Kaiser-Meyer-Olkin Sampling Index had been done.[15] KMO sampling index amount in this factor analysis model was 0.765. To determine whether the correlation matrix is an identity matrix, which would indicate that the factor model is inappropriate, Bartlett test of Sphericity had been done. Bartlett test of Sphericity with the amount of 980.445 in the level of 0.0001 was significant. So it could be concluded that performing factor analysis base on Matrix, achieved correlation in the sample of the study is justifiable. Rotation maximizes high item loadings and minimizes low item loadings.[15] In this study, Varimax Rotation had been used for simplification and interpretation of the factor constructs of satisfaction survey scale of adjustment with type 2 diabetes.

In this study for determining reliability of the scale, internal consistency calculation had been done with Chronbach's alpha coefficient.[13] In the study of correlation between different areas of the scale with the entire scale, Pearson correlation coefficient calculation method had been used. Statistical analyses were conducted using SPSS (version 13.0, Chicago, IL, USA).

The Ethics Committee of the Mashhad University of Medical Sciences approved the study (no. 900603). Informed consents were obtained from all participants who met inclusion criteria for the study. Patients had a right to participate or not participate in the study. All participants received whole information on the aim of the study and was ensured about the confidentiality of data. Confidentiality of their information and also explanation about the scale being anonymous had been done.

Results

At the end of the first phase, the initial scale had been prepared with 124 items. Then items had been classified based on their contents to eight areas including reshape, seek to acceptance of illness, Normal life with the disease, initial self-management, comparing, initial imaging of illness, return to resources, and advanced self- management. There was a scale including socio-demographic and clinical characteristics (Table 1).

Following evaluation of face validity, ten items were omitted and the scale had been decreased to 114 items. After qualitative content validity, the scale had been decrease to 51 items. After CVR calculation of all the phrases, six phrases were omitted and the scale had been decreased to 45 questions. After CVI calculation, the number of the items not changes. For evaluating construct validity for determining the number of factors that make the scale in exploratory factor analysis, screen plot method and Eigen value had been used. Screen plot showed that questions are included in eight areas and eight factors are enough for explaining the factor construct of the scale after studying internal consistency of the tools phrases. In this stage, after calculating correlation matrix between variables, factors were extracted. Variables that had high correlation with each other were classified in eight category or factor; reshape (11 questions), seek to acceptance of illness (7 questions), normal life with the disease (6 questions), initial self-management (2 questions), comparing (4 questions), initial imaging of illness (4 questions), return to resources(3 questions), and advanced self-management (6 questions) (Table2).

In reliability calculation, the achieved Chronbach's alpha for the area of reshape was 0.82, seek to acceptance of illness 0.80, Normal life with the disease 0.70, initial self-management 0.78,initial comparing 0.73,Initial imaging of illness0.72,return to resources 0.74, advanced self- management 0.75 and for the total scale was 0.75.

Discussion

The diabetes adjustment scale showed appropriate reliability and construct validity to assess adjustment with illness in type 2diabetes. The results of this study suggested that the scale has good reliability in assessing adjustment with diabetes. It has been generally accepted that self-report measures should have a reliability of more than 0.70 and/or 0.80 for it to be used as a screening tool.[16]

The ''reshape''subscale reflects fundamental changes in cognitive, emotional and behavioral dimensions relationship with self, life and the illness to further control the disease. This factor was concordant with the report that reshape as reconstitution is an important factor in living with chronic illness.[17]

The "seek to acceptance of illness "reflects reaction cognitive, emotional and behavioral reactions since the experience of the first warning signs to obtain a definitive diagnosis and the illness acceptance. This factor was concordant with the report that seek health care and emotional and behavioral reactions as an important factor early stages of adjusting with illness.[18,19]The "Normal life with the disease" subscale reflects having a normal life with the disease in the form of a return to activities of daily living with maintaining a healthy lifestyle. This factor was concordant with the report that disease is a common part of life.[20-22] The "initial self-management" subscale reflects adhere to the diet, medication, activity and rest, and daily monitoring of blood glucose by patients with type2 diabetes.

In other studies daily management has been expressed as measuring blood glucose levels in diabetic patients daily activities, adhere to prescribed diet and medications.[17,23]

Table1. Socio-demographic and clinical characteristics of the participants (n=1000)

Variable	Mean (SD)
Age (years)	55.9 (11)
Duration of diabetes (years)	8.97 (6.36)
HbA1c[*]	7.14 (1.84)
Duration of perceive the first signs to see doctor (months)	4.36 (3.2)
Women[*]	68.6
Employment status[*]	
Employed	23.4
Household	51.8
Other (unemployed, retired)	24.8
Positive family history	63.8
Having complication of the disease	26.6
Type of treatment[*]	
Diet	1.4
Insulin	9.3
Diet + oral drugs	36.2
Diet +oral drugs + insulin	27
Marital status[*]	
Single	1
Married	77.8
Widow	19.6
Divorced	1.6
Level of education[*]	
Literate	73.8
High school	11.2
University	3.6
Having early symptoms before diagnosis	94.8

[*] Value is reported as percent

Table 2. Factors loading for the eight extracted subscales after varimax rotation

Subscales and items	1	2	3	4	5	6	7	8
In diabetes control‹the individual plays an essential role.	0.784							
Diabetes is manageable.	0.730							
Diabetes will be with me for lifetime.	0.718							
In daily life, in addition to work, I am dedicated to recreation time.	0.687							
In my expectations of life, I am considering my medical conditions.	0.669							
I am willing to participate in research on diabetes.	0.643							
Diabetes does not cause escape the responsibilities and duties.	0.635							
Many people with diabetes are in the community.	0.598							
I accept successful diabetes as my pattern.	0.530							
When at a party they offer pastry to me, I tell them I have diabetes and I refused it.	0.502							
I hope progress in achieving effective treatment of diabetes in the future.	0.451							
Following the experience of the early warning signs, I disregard and consider them insignificant.		-0.895						
Over time and persistence of symptoms, I suspect the problem myself.		-0.881						
After experiencing early symptoms, I started to Self-remedy.		-0.849						
After experiencing early symptoms, I see the doctor immediately.		0.828						
I was upset when I first heard the diagnosis of diabetes.		0.828						
After the initial reaction to the diagnosis immediately, I accept diabetes.		0.572						
Earlier, I gain information about diabetes through various sources.		0.545						
Often I am immersing in your daily life that I forget I diabetes.			0.884					
I was able to transfer my experiences about diabetes control to other diabetes.			0.785					
According to diabetes status, I do my duties at home.			0.779					
I continuing to adherence to the doctor's prescriptions			0.768					
According to diabetes status, I have plans for the future of my life and my family.			0.755					
According to diabetes status, I continuing to work outside the home.			0.453					
Earlier diabetes, I did adherence to the doctor's prescriptions.				0.963				
Early diabetes, I regularly checked my blood sugar daily.				0.949				
Diabetes compared to some diseases is lighter.					0.917			
My knowledge about diabetes is higher than in early disease.					0.913			
Now, my condition compared to many diabetes who know is good.					0.876			
Compared to early disease, I'm sensitive to my health care.					0.824			
Early in my disease, I thought it would be short time and temporary.						0.967		
Earlier, I thought a few people in the community are infected to diabetes.						0.930		
Early, I thought my disease would have multiple effects.						0.674		
Earlier I thought that my illness is not curable.						-0.398		
The doctor gave sufficient information about the disease and its treatment.							0.829	
Media providing useful and clear information about the disease.							0.828	
My family helps in controlling diabetes.							0.390	
For unpredictable situations, I have some chocolate or sugar.								0.758
I can do the appropriate action in situations of increased blood sugar.								0.719
No measure, I can estimate somewhat my blood sugar level.								0.487
I know the signs of increased blood sugar.								0.590
I know the signs of decreased blood sugar.								0.635
I can do the appropriate action in situations of decreased blood sugar.								0.493

The "comparing" subscale reflects comparison of themselves and their disease with diabetes and other diseases. It seems that comparing effects on adjustment with diabetes.[24, 25] The "initial imaging of illness "subscale reflects initial understanding of the disease in diabetes. This factor was concordant with the report that illness perception is an important part in adjustment with diabetes.[26,27]

The "return to resources" subscale reflects individual and social conditions as facilitators and barriers to adjustment with diabetes. Other studies reported individual, communication, support, education factors as barriers and facilitators of care and management of illness in diabetes.[28] The "advanced self-management" subscale reflects reaching a level of internal control, preventive self-

management in order to effectively control the disease. Other studies showed that advanced self- management normalizes life with diabetes.[29, 30]

Generally, there are a number of tools to assess adjustment with diabetes. Some of the tools such as Diabetic Adjustment Scale has been designed to type 1 diabetes that its nature is different from type 2 diabetes.[10] Some of the tools such as Psychosocial Adjustment with Illness Scale are generally dedicated to somatic and chronic diseases.[9] Some tools focus only on a particular aspect of diabetes such as negative emotions related to diabetes or adjustment such as the Problem Areas in Diabetes Scale and ATT39.[31,11]

Conclusion

Due to the impact of socio-cultural context in managing and adjustment with the disease, tool originating from the culture can comprehensively measure the adjustment with the disease. Considering that indexes of scale reliability and validity are all reported in an appropriate level, scale of adjustment with diabetes can be used as a valid and reliable scale in measuring adjustment with diabetes in patients with type 2 diabetes.

The diabetes adjustment scale is validated for patients with type 2 diabetes; so, it may not be used for patients with type 1 diabetes. In addition, this tool was provided according to special needs of Iranian patients considering social and cultural perspectives.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

References

1. Tuncay T, Musabak I, Gok DE, Kutlu M. The relationship between anxiety, coping strategies and characteristics of patients with diabetes. Health Quality of Life Outcomes 2008, 16: 1–9. doi: 10.1186/14 77 - 7525-6-79.

2. Wild S1, 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 (5): 1047-53. doi:10.2337/diacare.27.5.1047.

3. Olshansky E, Sacco D, Fitzgerald K, Zickmund S, Hess R, Bryce C. Living with diabetes: normalizing the process of managing diabetes. The Diabetes Educator 2008; 34 (6): 1004–12. doi: 10.1177/01457217 08327304.

4. Harati H, Hadaegh F, Saadat N, Azizi F.Population-based incidence of type 2 diabetes and its associated risk factors: results from a six-year cohort study in Iran. BMC Public Health 2009; 9 (1): 186. doi: 10.1186/1471-2458-9-186.

5. Chan F, Da Silva Cardoso E, Chronister JA. Understanding psychosocial adjustment to chronic illness and disability: a handbook for evidence-based practitioners in rehabilitation. New York: Springer Publishing Compony; 2009.

6. Gois CJ, Ferro AC, Santos AL, Sousa FP, Ouakinin SR, do Carmo I, Barbosa AF. Psychological adjustment to diabetes mellitus: high lighting self-integration and self-regulation. Acta Diabetol 2012, 49 [Suppl 1]:S33–S40. doi: 10.1007/s00592-010-0191-7.

7. Paterson BL, Thorne S, Dewis M. Adapting to and managing diabetes. Image

J Nurs Sch 1998; 30(1): 57-62 .doi:10.1111/j.1547-5069.1998.tb01237.x.

8. Duangdao KM, Roesch SC. Coping with diabetes in adulthood: a meta-analysis. Journal of Behavioral Medicine 2008; 31(4): 291-300. doi: 10.1007/s10865-008-9155-6

9. Feghhi H, Saadatjoo A , Dastjerdi R. Psychosocial adaptation in patients with type 2 diabetes referring to diabetes research center of Birjand in 2013. Modern Care Journal 2014; 10(4): 249-56. (Persian)

10. Sullivan BJ. Adjustment in diabetic adolescent Girls: I. Development of the diabetic adjustment scale. Psychosomatic Medicine 1979; 41 (2): 119-26.

11. Dunn SM, Smartt HH, Beeney LJ, Turtle JR. Measurement of emotional adjustment in diabetic patients: validity and reliability of ATT39. Diabetes Care 1986; 9 (5): 480-9. doi: 10.2337/diacare.9.5.480

12. Purnell LD, Paulanka BJ. Transcultural health care: a culturally competent approach.2nd ed. Philadelphia: F.A. Davis Company; 2003.

13. Burns N, Grove SK. Understanding nursing research: Building an evidence-based practice.5th ed. New York: Elsevier Health Sciences; 2010.

14. Rubio DM, Berg-Weger M, Tebb SS,Lee ES, Rauch S. Objectifying content validity: conducting a content validity study in social work research. Social Work Research 2003; 27 (2): 94-104. doi: 10.1093/swr/27.2.94

15. Williams B, Brown T, Onsman A. Exploratory factor analysis: A five-step guide for novices. Australasian Journal of Paramedicine 2012; 8 (3):1-13

16. DeVon HA, Block ME, Moyle-Wright P, Ernst DM, Hayden SJ, Lazzara DJ, et al. A psychometric toolbox for testing validity and reliability. Journal of Nursing Scholarship 2007; 39 (2): 155-64. doi: 10.1111/j.1547-5069.2007.00161.x

17. Paterson B, Thorne S, Crawford J, Tarko M. Living with diabetes as a transformational experience. Qual Health Res 1999; 9 (6): 786-802. doi: 10.1177/104973299129122289

18. Shaw C, Brittain K, Tansey R, Williams K. How patients decide to seek health care: a qualitative study. Int J Nurs Stud 2008; 45 (10): 1516-24 .doi: 10.1016/j.ijnurstu.2007.11.005

19. Peel E, Parry O, Douglas M, Lawton J. Diagnosis of type 2 diabetes: a qualitative analysis of patients' emotional reactions and views about information provision. Patient Education and Counseling 2004; 53 (3): 269-75. doi :10.1016/j.pec.2003.07.010

20. Choi HJ, Hong YS. Transformational experience of a student nurse with diabetes: a case study. Taehan Kanho Hakhoe Chi 2007; 37 (2):192-200.

21. Lin CC, Anderson RM, Hagerty BM, Lee BO. Diabetes self-management experience: a focus group study of Taiwanese patients with type 2 diabetes. Journal of Clinical Nursing 2008; 17 (5a): 34-42. doi: 10.1111/j.1365-2702.2007.01962.x

22. Hörnsten A, Sandström H, Lundman B. Personal understandings of illness among patients with type 2 diabetes. Journal of Advanced Nursing 2004; 47 (2):174-82. doi: 10.1111/j.1365-2648.2004.03076.x

23. Ellison GC, Rayman KM. Exemplars' experience of self-managing type 2 diabetes. Diabetes Educ1998; 24 (3): 325-30. doi: 10.1177/014572179802400307

24. Gorawara-Bhat R, Huang ES, Chin MH. Communicating with older diabetes patients: self-management and social comparison. Patient Education and Counseling 2008; 72 (3): 411-7. doi: 10.1016/j.pec.2008.05.011.

25. Schokker MC, Keers JC, Bouma J, Links TP, Sanderman R, Wolffenbuttel BH, Hagedoorn M. The impact of social comparison information on motivation in patients with diabetes as a function of regulatory focus and self-efficacy. Health Psychology 2010; 29 (4): 438-45. doi: 10.1037/a0019878.

26. Fukunaga LL, Uehara DL, Tom T. Peer reviewed: perceptions of diabetes, barriers to disease management, and service needs: a focus group study of working adults with diabetes in Hawaii. Prev Chronic Dis 2011; 8 (2): A32.

27. Yilmaz-Aslan Y, Brzoska P, Bluhm M,Aslan A, Razum O. Illness perceptions in Turkish migrants with diabetes: a qualitative study. Chronic Illness 2014; 10 (2):107-21. doi: 10.1177/1742395313 501 207.

28. Wilkinson A, Whitehead L, Ritchie L. Factors influencing the ability to self-manage diabetes for adults living with type 1 or 2 diabetes. Int J Nurs Stud 2014; 51 (1):111-22. doi: 10.1016/j.ijnurstu. 2013. 01.006.

29. George SR, Thomas SP. Lived experience of diabetes among older, rural patients. Journal of Advanced Nursing 2010; 66 (5): 1092-100. doi: 10.1111/j.1365-2648.2010. 05278.x

30. Moser A, van der Bruggen H, Widdershoven G,Spreeuwenberg C. Self-management of type 2 diabetes mellitus: a qualitative investigation from the perspective of participants in a nurse-led, shared-care programme in the Netherlands. BMC Public Health 2008. 8: 91. doi: 10.1186/1471-2458-8-91.

31. Schmitt A, Reimer A, Kulzer B1, Haak T, Ehrmann D, Hermanns N. How to assess diabetes distress: comparison of the Problem Areas in Diabetes Scale (PAID) and the Diabetes Distress Scale (DDS). Diabet Med 2015. doi: 10.1111/dme. 12887.