Defining the Relationship of Psychological Well-Being and Diabetes Distress with Glycemic Control among Malaysian Type 2 Diabetes

Seyed Reza Alvani [1*], Norzarina Mohd Zaharim [1], Laurel Wynne Kimura [2]

1. School of Social Sciences, Universiti Sains Malaysia (USM), Penang Island, Malaysia.
3. INTI International College Penang, Penang Island, Malaysia.

Article info:
Received: 25 Dec. 2014
Accepted: 06 Apr. 2015

ABSTRACT

Objective: Type 2 diabetes mellitus is a chronic and progressive disease that has reached the epidemic level around the world. In Malaysia, according to the third National Health and Morbidity Survey (2006), the prevalence of diabetes has increased to 14.9% from 8.3% in 1996. Co-morbid psychological factors such as depression, anxiety, and stress have been shown to be high among type 2 diabetic patients in Malaysia and they were also associated with the level of glycemia. The present study sought to examine the relationships of diabetes distress and psychological well-being to glycemic control among adults with type 2 diabetes.

Methods: A total of 60 adults with type 2 diabetes participated in the study and were given the diabetes distress scale (DDS-17) and well-being questionnaire (W-BQ 22) to measure their level of distress and psychological well-being using Pearson correlation test. The most recent data on glycemic control (or blood glucose level, HbA1c) were obtained from the participants ب medical records, (with poor glycemic control defined by HbA1c>7.5%). Statistical Package for the Social Sciences (SPSS 19) used to analyze the data obtained from questionnaires.

Results: Pearson correlation results indicated significant positive relationship between blood glucose level and variables of diabetes distress (r=0.27, P=0.03) and psychological well-being (r=0.53, P=0.00). There were no significant relationships between blood glucose level and diabetes distress dimensions (emotional burden, physician-related distress, regimen-related distress, and internal distress). However, there were significant relationships between blood glucose level and variables of depression (r=-0.27, P=0.03) and anxiety (r=-0.41, P=0.00), both of which are dimensions of psychological well-being.

Conclusion: The study results have shown that diabetes distress and psychological well-being are associated with glycemic control and while it is not always possible to avoid stress, learning to recognize and cope with stressors may help individuals with diabetes maintain good glycemic control and improve general well-being. These results are consistent with the results of past studies in Malaysia.abuse.

Keywords:
Anxiety, Blood glucose level , Depression, Psychology, Stress

1. Introduction

Diabetes-related stress is defined as the experience of diabetes-related demands (such as self-management behaviors, e.g. diet and regular exercise) exceeding perceived coping resources (Karlson et al., 2004). An individual ب perceived ability to cope with diabetes-related demands has been previously shown to adversely alter glucose control (Sultan & Heurtier-Haremann, 2001). Achieving glycemic control is not only striving to consume less medicine or to prevent acute and chronic complications, but also improving the psychological well-being, quality of life, and per-

*** Corresponding Author:**
Seyed Reza Alvani, PhD
Address: *School of Social Sciences, Universiti Sains Malaysia (USM), Main Campus, Penang Island, Malaysia.*
Tel: *+60 (12) 5998071*
E-mail: *sralvani79@yahoo.com*

ception of patients (Debono et al., 2007). Well-being in diabetic patients is associated with the perception of their ability to cope with the demands of diabetes and its treatment, to sustain social relationships, and to prevent the onset of complications in order to yield greater life satisfaction (Eiser et al., 2001). Relatively few studies have been conducted on the relationship between diabetes distress and psychological well-being with diabetic control among Malaysian adults, however, most Malaysian researchers agree on the necessity to work on this issue. Despite some research on psychological factors and diabetes, scientific research on the well-being and impact of stress factors on Malaysian diabetic patients is inadequate (Ali, 2009). This matter is of particular importance, especially considering that diabetes distress and psychological well-being are often co-morbid factors in the diagnosis of diabetes (Goldney, 2004).

Previous studies in this area have neither determined the possible role and relationship of diabetes distress and psychological well-being on glycemic control, nor have they been able to fully address the role of other psychological factors in mediating the control of blood glucose level in Malaysian adults. To fill this gap, this study used tools which were designed exclusively for diabetic patients, avoiding use of Beck depression inventory (Beck, 1961), which is often used inappropriately on diabetic patients. Beck؛ measure includes items concerning fatigue, loss of appetite, loss of libido, and weight loss, which may be symptoms of depression in the general population; however, such symptoms in diabetic patients are more likely to be associated with hyperglycemia, hypoglycemia, or other chronic complications of diabetes.

Hence, when such a measure is used on diabetic patients, their symptoms can be diagnosed as psychological in nature, causing them to visit psychiatric clinics instead of directing their attention to improve their diabetes control. Therefore, in the current study, the well-being questionnaire (W-BQ 22) was used, which measures anxiety, depression, and various aspects of positive well-being that are specifically related to diabetes complications, and also the diabetes distress scale (DDS-17), which has been developed to measure the level of distress only in diabetic patients.

As a result, the present study examined the relationship of diabetes distress and psychological well-being with glycemic control among people who have been diagnosed as type 2 diabetes at least one year ago.

2. Methods

Statistical analyses were conducted using the SPSS software. Blood glucose level (HbA1c) was define by the most recent measure for each participant. The researcher used Pearson correlation test to measure the relationship between diabetes distress and psychological well-being with blood glucose level (HbA1c). Also, in order to find out any relationship between subscales of W-BQ 22 or DDS-17 with blood glucose level (HbA1c), the researcher tested Pearson correlation for each subscale separately.

The estimated number of diabetes patients registered at Pusat Sejahtra, (Universiti Sains Malaysia Clinic) in 2013 were 358 patients, most of who were diagnosed as having type 2 diabetes (personal communication, December 31, 2014). According to Chassan (1979) as cited by Hill (1998), there should be 20 to 25 participants for each independent variable in order to obtain valid results in analyzing the data with SPSS.

The convenience sampling technique used to collect participants on the present study. Sixty adults suffering from type 2 diabetes (≥20 years) with HbA1c≥7.5 (when the normal range by Ministry of Health Malaysia, (2010) for type 2 diabetes is ≤6.5%) referred to Pusat Sejahtra, were invited to participate in the study. Those who had a history of alcohol or substance abuse, or were suffering from any severe psychological or physical disorder, were deemed ineligible to participate. Patients having diabetes for less than one year were also excluded, because their HbA1c levels may have increased during their period of adjustment to their diagnosis. After obtaining written informed consent from the selected participants, patients were asked to complete the well-being questionnaire (W-BQ 22) and diabetes distress scale (DDS-17). W-BQ 22 is sensitive to any increase in anxiety or depression that might be associated with intensified treatment regimens and at the same time is sensitive to positive changes in an individual؛ well-being (Bradley, 1994).

In the present study Cronbach؛ alphas were 0.69 for Depression, 0.69 for Anxiety, 0.71 for Energy and 0.78 for Positive Well-Being. Cronbach؛ alpha for the overall instrument was 0.82. Likewise, DDS-17 contained useful measures, consisting of 17 items and 4 subscales: 5 items in emotional burden (EB), 5 items in regimen-related distress (RD), 4 items in physician-related distress (PD), and 3 items in interpersonal distress (ID). Cronbach؛ alpha for the DDS-17 in the present study

was 0.95 for the overall instrument and 0.86 for EB, 0.85 for PD, 0.89 for RD, and 0.88 for I.

3. Results

The demographic details of the study sample are given in Table 1. Of 60 participants in this study, 21 were female (35%) and 39 (65%) were male. A majority of the participants (n=57, 95%) were married and more than half of the participants (n=35, 58%) were Malay, 8 (13.3%) Chinese, 15 (25%) Indians, and 2 (3.3%) were foreigners. The participants were mostly in the age group of 50-59 years (46.7%). About half of the participants (n=33, 55%) were employed, 14 (23.3%) were unemployed (e.g. housewives), and 13 (21.7%) were pensioners. Eight (13.3%) participants had an income of RM 400-999 (approximately equivalent to 125-282), 21 (35%) had an income of RM 1000-2999 (approximately equivalent to 312-937), 20 (33.3%) had an income of RM 3000-5999 (approximately equivalent to 938-1874.5), and 11 (18.3%) had an income of RM 6000 (approximately equivalent to 1875$) or more.

Participants' health characteristics

As demonstrated in Table 2, most of the participants (n=54, 90%) were nonsmokers and half of the participants were taking medication for blood pressure and cholesterol (n=29, 48% and n=27, 45%, respectively). Out of 60 participants, 18 (30%) people did not exercise at all, and only 11 (18.3%) of them exercised daily. The participants averaged 70.63 kg in weight (SD=12.13), 26 (43.3%) participants had normal body mass index (BMI), 20 (33.3%) were overweight, and 14 (23.3%) were obese. Forty-four (73.3%) participants had siblings with diabetes and most of them (n=42, 70%) had no previous experience of hypoglycemia or hyperglycemia. Descriptive statistics for the diabetes-related factors are indicated in Table 3.

Table 1. Demographic variables of the participants (n=60).

Variable	Frequency	Percentage
Age, Y		
30-39	2	3.3
40-49	11	18.3
50-59	28	46.7
+60	19	31.7
Gender		
Female	21	35
Male	39	65
Marital status		
Single	2	3.3
Married	57	95
Divorced	1	1.7
Employment status		
Employed	33	55
Non Employed	14	23.3
Pensioner	13	21.7
Ethnicity		
Malay	35	58.3
Chinese	8	13.3
Indian	15	25
Others	2	3.3
Income status		
Low income (≤RM400–RM999)	8	13.3
Low mid income (RM1000–RM2999)	21	35
Up mid income (RM 3000–RM 5999)	20	33.3
High income (≥RM 6000)	11	18.3

Table 2. Health variables of the participants (n=60).

Variable	Frequency	Percentage
Blood pressure		
Normal	31	51.7
High	29	48.3
Smoking status		
Nonsmoker	24	90
Smoker	6	10
Cholesterol		55
Normal	33	45
High	27	
Exercise atatus		
No exercise	18	30
Once a week	12	20
Twice a week	19	31.7
Everyday	11	18.3
Diabetes duration		
Less than five years	20	33.3
More than five years	40	66.7
Family history of diabetes		
No	16	26.7
Yes	44	73.3
Experience of hypoglycemia or hyperglycemia	42	70
No	18	30
Yes		
Body mass index status, kg/m^2		
Normal	26	43.3
Over weight	20	33.3
Obese	14	23.3

PRACTICE in CLINICAL PSYCHOLOGY

The total means and standard deviations for diabetes-related factors were calculated for the entire sample of the study (n=60) (Table 3). The total mean score for blood glucose level (HbA1c) for those sampled was higher (M=8.74%) than the level recommended by the Ministry of Health in Malaysia (2010) for type 2 diabetes (≤6.5%). The total mean for BMI was 26.49 kg/m^2, which means that according to adult Asian criteria (WHO, 2000), the sample of the study were overweight (25<BMI<29.9). According to Fisher and his colleagues (2012), the classification of the total mean score for diabetes distress showed moderate level of stress (M=2.86). Among all diabetes distress subscales, emotional burden (M=3.13) got the highest stress score for the sample population. In terms of psychological well-being, the total mean was 44.2. The highest mean score of psychological well-being among the participants of study was 61, while the maximum score obtained from the questionnaire was 66. It demonstrates that the participants of the study enjoyed almost a high level of psychological well-being.

Correlations

Before analyzing the data for testing the objective of the present study, the researcher examined the normality of the data with use of the Kolmogorov-Smirnov (K-S) test. The result of the K-S test for the mean differences in blood sugar level (HbA1c) scores were 0.09 with a p value of 0.20; results of the K-S test for the mean differences in the Well-Being Questionnaire (W-BQ 22) scores were 0.11 with a p value of 0.97; and finall , the results of the K-S test for the mean differences in the Diabetes Distress Scale (DDS-17) scores were 0.09 with a p value of 0.97. The results of the K-S test revealed that the sample of the current study was distributed normally.

The Pearson correlation showed a significant positive relationship (P=0.006) between psychological well-being and blood glucose level (Table 4). Significan associations were also evident among some of the psychological well-being indicators, including depression (P=0.035), anxiety (P=0.001), and negative well-being (P=0.009). However, the association between energy and positive well-being factor was not significant. Also the Pearson correlation test indicated a significant positive (P=0.034) relationship between diabetes distress level and blood glucose level (Table 4). However, there was no significant relationship between blood glucose level and diabetes distress variables (emotional burden, physician related distress, regimen related distress, and internal distress). The results are summarized in Table 4.

4. Discussion

The present study showed that there was a significan positive relationship between psychological well-being and blood glucose level in the participants. This result supports previous research which reported a relationship between well-being and blood glucose level (Diabetes Control and Complication Trial Group, 1996; Petterson et al., 1998; Saatci et al., 2010).

W-BQ 22 test was administered to measure the level of psychological well-being among the participants of the current study. In the study of Bradley and Lewis (1990), who introduced W-BQ 22, the score of psychological well-being was not correlated to HbA1c. They believed that it could be due to the ability of W-BQ 22 to distinguish between specific cognitive symptoms associated with diabetes and the symptoms of poor glycemic control, which is not related to psychological criteria. Many instruments are available to measure health-related well-being.

Numerous studies used different tests other than W-BQ 22 to measure psychological well-being and quality of life in diabetic people. Generic instruments (e.g. Beck Depression Inventory) have been validated to compare diabetes with other diseases, but they may be less sensitive for the purposes of this study compared to disease specific instruments like W-BQ 22, which was specifically developed for diabetic people. However, when choosing W-BQ 22 as a psychological well-being scale, there is a concern to provide a scale, which can discriminate between the somatic symptoms of inadequate diabetic control from those symptoms caused by psychological factors. Many previous studies that used depression and anxiety tests and developed for the general population, showed the prevalence of depression and anxiety in diabetic patients. However, there are some researchers, who used W-BQ 22 and found contrary results, and there are still other studies that reported the same results as those of our study (e.g. research

Table 3. Descriptive data for diabetes related factors (n=60).

Variables	M	SD	Range
HbA1c %	8.74	0.62	7.7-10.2
BMI. Kg/m^2	26.49	4.98	17.1- 43
Weight, kg	70.63	12.13	43-96
Total diabetes distress	2.86	0.89	1.17-5.47
Emotional burden	3.13	1.04	1.04
Physician-related distress	3.11	1.18	1.25-6.5
Regimen-related distress	3.05	1.10	1-5.6
Interpersonal-distress	2.58	1.06	1-5.6
General well-being	44.21	8.60	19-61
Negative well-being	6.23	2.27	2-12
Positive well-being	13.78	2.84	2.84
Depression factor	4.06	2.36	0-11
Anxiety factor	7.78	2.37	1-14
Energy factor	4.06	2.36	2-12

Table 4. Differences in pearson's correlation between measures.

Variables	HbA1c
General well-being	0.531**
Depression	-0.272*
Anxiety	-0.417*
Energy	0.219
Positive well-being	0.238
Negative well-being	-0.333**
Diabetes distress	0.274*
Emotional burden	-0.026
Physician related distress	-0.045
Regimen related distress	-0.017
Internal distress	-0.029

Note. ** The relationship is significant at the 0.01 level.

PRACTICE in CLINICAL PSYCHOLOGY

* The relationship is significant at the 0.05 level.

conducted by Petterson et al. (1998) on well-being and treatment satisfaction of diabetes people).

In the present study, the mean score for general well-being (W-BQ 22) was 44.21 (range=19-61), which is considered a somewhat high level of well-being. Since the number of studies that used Bradley W-BQ 22 was not large, there was not enough data to compare with our results as well. Saatci et al. (2010) assessed W-BQ 22 among patients with diabetes type 2 and obtained the mean of 44.40 for their sample, which was similar to the findings of the present study, and reported that there was no association between the blood test results and the W-BQ 22 scores. There were also a number of researchers who could not confirm the association between HbA1c and well-being.

In another study, Petterson et al. (1998) studied 1000 diabetic patients and measured well-being using the W-BQ 22 to find the association between psychological well-being and HbA1c. They also found no association between the level of HbA1c and well-being scores. Therefore, they concluded that W-BQ 22 relies more on those psychological factors, which can distinguish between specific cognitive symptoms associated with diabetes and the symptoms of poor glycemic control, while at the same time, it could have missed the other factors such as the age of the participants that influenc well-being.

The other underlying reason could be the age of the participants. As mentioned before, more than half of the participants in the current study were older than 50 years. This age group has different priorities from young people, and they may attribute some of their complications to aging, and not to diabetes. Paddison, Alpass, and Stephens (2007) found that older adults with diabetes may be more exposed to health problems (as the risk of common chronic illnesses such as coronary heart disease increases with age), and as a result, they could develop greater skills for coping successfully with the emotional impact of illness in comparison with younger adults.

The other possible reason for the high level of well-being among the participants of the study could be due to the considerable support provided by the health professionals at Pusat Sajahtera (USM clinic). According to the results of the study, the level of stress related to physicians was relatively low, which could mean that they were satisfied with the service they were receiving. For example, they did not pay for their medication, and also they received a call regarding their regular check up appointments. The Diabetes Control and Complications Trial (DCCT) (1996) evaluated the effects of patients quality of life on diabetes treatment among 1441 individuals. They evaluated the quality of life, symptom index, and psychosocial events to provide a clear spectrum of well-being. They also reported no association between glycemic control and well-being. DCCT also came to this conclusion that when a clinic centre provides a good quality of care for patients, the level of well-being can increase, i.e. when the support team has

ample time to care for the patients, a sense of well-being may be promoted.

One of the factors influencing the psychological well-being in diabetic patients is their knowledge about diabetes. The author believes that one of the reasons that the variables were positively correlated with each other was due to the lack of diabetes knowledge as well as lack of blood glucose monitoring at home. Surprisingly, none of the participants of the current study have ever done home monitoring. Prior studies have indicated that the level of diabetes knowledge is low in Malaysia (Al-Qazaz et al., 2011; Ali & Jusoff, 2009), while patients generally make decisions and set goals based on the knowledge they acquire.

Because of incomplete and inadequate knowledge, they cannot make correct decisions and set rational goals. They feel happy and satisfied with their fleetin targets, which were selected wrongly for fleeting joys. However, they miss the big picture, which is the control of blood glucose for a long and healthy life. In other words, they are happy for the time being, and when their blood glucose level goes up, they believe it is accidental and without rational cause. A specific example arose during the sample collection when a participant got happy because of consuming bitter gourd (a type of vegetable; peria in Malay), which was good for controlling blood glucose level. However, the participant did not modify the level of oil or sugar consumption in daily meals. This person was happy because she or he believed that the bitter gourd was controlling blood glucose level.

The present study also showed that diabetes distress had a positive significant correlation with blood glucose level (HbA1c). This result was supported by finding of previous studies, such as Fisher et al., (2008), Fisher et al. (2012), Islam et al. (2013), Lloyd et al. (1999), Nichols, Hillier, Javor, and Brown (2000), Peyrot and McMurry (1992), and Tol et al. (2011). The total mean score of diabetes distress among the participants in the current study was 2.8, that according to Fisher یِ classification (2012) any score between 2.0ت2.9is considered as a moderate level of distress.

This result is consistent with the findings of previous studies in Malaysia. For instance, Kaur et al. (2013) reported a moderate level of stress among 2508 patients with type 2 diabetes. Fisher et al. (2012) employed DDS-17 among 506 adults with type 2 diabetes and also reported a moderate level of distress among participants. In a different study with 140 patients with type 2 diabetes in Iran, Tol et al. (2011) used the same instrument (DDS-17), and obtained a mean score for diabetes distress of 2.9, which is similar to the mean score of stress in our study.

Islam and his colleagues (2013) used DDS-17 to measure diabetes distress among 165 adults with type 2 diabetes and found a strong positive correlation between diabetes distress scores and blood glucose level. They concluded that understanding distress as a health problem among diabetic patients can play an important role in controlling blood glucose level. In a different study by Van Bastelaar et al. (2010) on 2055 type 1 and type 2 diabetic patients, a significant positive relationship was found between blood glucose level and diabetes-related distress, for both types of diabetes. They emphasized the role of factors such as education, age, and social and medical barriers in affecting the level of distress in people with diabetes.

One of the possible factors in the relationship between distress and blood glucose level in the present study could be the age of participants. As is shown in Table 1, most of the participants in the current study were older adults. Nichols et al. (2000) also pointed out the role of age on distress and blood glucose level. Their study on 1178 people with type 2 diabetes enabled them to identify different characteristics such as young age and emotional distress that could influence blood glucose level. They found a significant correlation between diabetes distress and HbA1c level with a moderate mean of diabetic distress. They stated that with increasing age, participants become less sensitive to personal factors and as a result, experienced a lower level of stress compared to younger adults.

In another study conducted by Fisher et al. (2008) on 506 adults with type 2 diabetes, a significant positive correlation was reported between diabetes distress and blood glucose level. Similar to Nichols et al. (2000), they found that age was one of the important factors influencing the relationship between distress and blood glucose level. They concluded that younger adults are more emotionally reactive to life stressors, and therefore experience a chronic condition as a more unexpected incidence, with which they cope less effectively compared to older adults.

Literature review has shown that most studies have one or more limitations; the present study is not an exception. All participants were from Universiti Sains Malaysia clinic, which restricts the generalizability of the data. The other limitation was related to the age of

the sample: there were only two people younger than 40 years old, as opposed to many participants elder than 58 years old. Therefore, the results of the study could not be generalized to a younger population.

Since the sample of the current study was collected only from Universiti Sains Malaysia Clinic, for future research we recommend to expand this study to include other locations or other hospitals in the area for the purpose of increasing sample size and hence comparison would be possible which provide additional insights. This would also serve to make different ethnic groups and a variety of participants more available for inclusion in the study, in addition to younger populations who are often found in different clinical settings. These steps would improve the generalizability of the current research findings. In the current study, the relation between psychological well-being and blood glucose level among the participants was positive. One of the reasons regarding the reverse relationship could be the level of knowledge about diabetes among the participants. According to Malaysian researchers, knowledge about diabetes among Malaysian diabetic patients is very low. Therefore, future Malaysian diabetic research should focus more on the diabetic knowledge and well-being of diabetic patients and other related factors.

As mentioned before, in Malaysia, there is a considerable lack of research on the psychological complications of diabetes. Therefore, given the importance of diabetes in Malaysia, the need for further research in this area, particularly in the field of mental health, should be considered. Over the past decade, the impetus for integrating psychologists and other healthcare professionals into primary care settings has been great. Thus, by expanding the research in this area and increasing access to medical settings and patients with chronic illness, the field of psychology may have greater opportunities in intervention programs targeting early assessment and interventions for early onset of emotional problems.

Acknowledgements

The present research was funded by Post Graduate Research Scheme (PRGS) at Universiti Sains Malaysia (Grant number: NMRR-12-507-11455).

The present research approved by Medical Research and Ethics Committee of the Ministry Health Malaysia, and informed consent was obtained from all patients participated in the study.

References

Ali, S. M., & Jusoff, K. (2009). Barriers to optimal control of type 2 diabetes in Malaysian Malay patients. *Global Journal of Health Science, 1*(2), 106-113.

Al-Qazaz, H. K., Hassali, M. A., Shafie, A. A., Syyed Sulaiman, S. A., & Sundram, S. (2011). Perception and knowledge of patients with type 2 diabetes in Malaysia about their disease and medication: A qualitative study. *Research in Social and Administrative Pharmacy, 7*(2), 180-191.

Beck, A., Ward, C., & Mendelson, M. (1961). Beck depression inventory (BDI). *Archives of General Psychiatry, 4*, 561-571.

Bradley, C. (1994). *Handbook of psychology and diabetes: A guide to psychological measurement in diabetes research and practice* (1st ed.). New York: Harwood Academic.

Bradley, C., & Lewis, K. (1990). Measures of psychological well-being and treatment satisfaction developed from the responses of people with tablet-treated diabetes. *Diabetic Medicine, 7*(5), 445-451.

Debono, M., & Cachia, E. (2007). The impact of diabetes on psychological well being and quality of life. The role of patient education. *Psychology, Health and Medicine, 12*(5), 545-555.

Diabetes Control and Complications Trial Research Group. (1996). Influence of intensive diabetes treatment on quality-of-life outcomes in the diabetes control and complications trial. *Diabetes Care, 19*(3), 195-203.

Eiser, J. R., Riazi, A., Eiser, C., Hammersley, S., & Tooke, J. E. (2001). Predictors of psychological well-being in types 1 and 2 diabetes. *Psychology and Health, 16*(1), 99-110.

Fisher, L., Glasgow, R. E., Mullan, J. T., Skaff, M. M., & Polonsky, W. H. (2008). Development of a brief diabetes distress screening instrument. *The Annals of Family Medicine, 6*(3), 246-252.

Fisher, L., Hessler, D. M., Polonsky, W. H., & Mullan, J. (2012). When is diabetes distress clinically meaningful? Establishing cut points for the Diabetes Distress Scale. *Diabetes Care, 35*(2), 259-264.

Goldney, R. D., Phillips, P. J., Fisher, L. J., & Wilson, D. H. (2004). Diabetes, depression, and quality of life a population study. *Diabetes Care, 27*(5), 1066-1070.

Islam, M., Karim, M., Habib, S., & Yesmin, K. (2013). Diabetes distress among type 2 diabetic patients. *International Journal of Medicine and Biomedical Research, 2*(2), 113-124.

Karlson, B., Idsoe, T., Dirdal, I., Rokne Hanestad, B., & Bru, E. (2004). Effects of a group-based counseling program on diabetes-related stress, coping, psychological well-being and metabolic control in adults with type 1 or type 2 diabetes. *Patient Education and Counseling, 53*(3), 299-308.

Kaur, G., Tee, G. H., Ariaratnam, S., Krishnapillai, A. S., & China, K. (2013). Depression, anxiety and stress symptoms among diabetics in Malaysia: A cross sectional study in an urban primary care setting. *BMC Family Practice, 14*(1), 69.

Lloyd, C. E., Dyer, P. H., Lancashire, R. J., Harris, T., Daniels, J. E., & Barnett, A. H. (1999). Association between stress and glycemic control in adults with type 1 (insulin-dependent) diabetes. *Diabetes Care, 22*(8), 1278-1283.

Malaysia Ministry of Health. (2010). *Clinical Practice Guidelines (CPG). Management of diabetes mellitus type 2*. Malaysia: Malaysia Health Technology Assessment Section (MaHTAS), Medical Development Division, Ministry of Health. Retreived from: http://www.moh.gov.my/cpgs.

Nichols, G. A., Hillier, T. A., Javor, K., & Brown, J. B. (2000). Predictors of glycemic control in insulin-using adults with type 2 diabetes. *Diabetes Care, 23*(3), 273-277.

Paddison, C., Alpass, F., & Stephens, C. (2007). Deconstructing distress: the contribution of cognitive patterns to elevated distress among people with type 2 diabetes. *European Diabetes Nursing, 4*(1), 23-27.

Petterson, T., Lee, P., Hollis, S., Young, B., Newton, P., & Dornan, T. (1998). Well-being and treatment satisfaction in older people with diabetes. *Diabetes Care, 21*(6), 930-935.

Peyrot, M. F., & McMurry, J. F. (1992). Stress buffering and glycemic control: The role of coping styles. *Diabetes Care, 15*(7), 842-846.

Saatci, E., Tahmiscioglu, G., Bozdemir, N., Akpinar, E., Ozcan, S., & Kurdak, H. (2010). Research the well-being and treatment satisfaction of diabetic patients in primary care. *Health and Quality of Life Outcomes, 8*, 67.

Sultan, S., & Heurtier-Hartemann, A. (2001). Coping and distress as predictors of glycemic control in diabetes. *Journal of Health Psychology, 6*(6), 731-739.

Tol, A., Baghbanian, A., Rahimi, A., Shojaeizadeh, D., Mohebbi, B., & Majlessi, F. (2011). The relationship between perceived social support from family and diabetes control among patients with diabetes type 1 and type 2. *Journal of Diabetes and Metabolic Disorders, 10*, 1-8.

Van Bastelaar, K. M. P., Pouwer, F., Geelhoed-Duijvestijn, P. H. L. M., Tack, C. J., Bazelmans, E., & Beekman, A. T., et al. (2010). Diabetes-specific emotional distress mediates the association between depressive symptoms and glycaemic control in Type 1 and Type 2 diabetes. *Diabetic Medicine, 27*(7), 798-803