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ORIGINAL ARTICLE

Factor Structure of The Malay-Version Generalized Anxiety Disorder-7 (GAD-7) Questionnaire among Patients with Diabetes Mellitus

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ABSTRAK

Soal-selidik Kecelaruan Keresahan Menyeluruh-7 (GAD-7) versi Bahasa Melayu telah menunjukkan kesahan bersamaan, iaitu kepekaan dan kekhususan yang tinggi sebagai alat saringan untuk keresahan. Namun, ciri-ciri psikometriknya dari segi kesahan faktor belum lagi dikaji dengan lebih lanjut. Kajian ini memeriksa struktur faktor GAD-7 versi Bahasa Melayu di antara 300 orang pesakit luar kencing manis (purata umur: 60.4 tahun, sisihan piawai: 13.4 tahun; 52.7% lelaki) di sebuah hospital universiti di Kuala Lumpur, Malaysia. Peserta kajian mengisi soal-soal selidik tentang maklumat sosiodemografik, GAD-7, Inventori Kemurungan Beck (BDI), dan WHOQOL-BREF. GAD-7 versi Bahasa Melayu menunjukkan konsistensi dalaman yang baik (Alfa Cronbach=0.91) dan kesahan konvergen yang tinggi dengan kemurungan (R Pearson=0.642, p<0.001), persepsi kualiti hidup keseluruhan (R=-0.277, p<0.001), dan persepsi kesihatan keseluruhan (R=-0.257, p<0.001). Dalam analisis faktor eksploratori, hanya ada satu komponen dengan eigenvalue >1 (eigenvalue=4.614), mencadangkan struktur faktor satu dimensi. Analisis faktor konfirmatori dilakukan dengan meletakkan loading kesemua tujuh item ke satu faktor (keresahan menyeluruh). Model ini tidak begitu bersesuaian dengan data. Setelah memeriksa indeks modifikasi, model ini diubahsuai spesifikasinya supaya terma-terma kesilapan item 1 dan 2, serta 2 dan 3, berubah bersama. Model yang telah diubahsuai ini lebih bersesuaian dengan data (χ^2=35.216, df=12, p<0.001, CFI=0.98, TLI=0.97, RMSEA=0.08, and AIC=67.22). Hasil kajian ini mencadangkan bahawa item 1, 2 dan 3 GAD-7 mungkin berkongsi varians unik yang tidak dapat dijelaskan oleh faktor keresahan menyeluruh sahaja. Secara keseluruhan, kajian ini menunjukkan bahawa GAD-7 versi Bahasa Melayu merupakan satu alat pengukuran gejala keresahan menyeluruh yang sah.

Kata kunci: analisis faktor konfirmatori, diabetis mellitus, GAD-7, keresahan

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ABSTRACT

The Malay-version Generalised Anxiety Disorder-7 (GAD-7) questionnaire previously demonstrated good concurrent validity, i.e. sensitivity and specificity as a screening instrument for anxiety. However, its psychometric properties on factorial validity had not been further investigated. This study investigated the factor structure of the Malay-version GAD-7 in among 300 diabetic outpatients (mean age: 60.4 years, SD: 13.4 years; 52.7% male) in a Malaysian university hospital in Kuala Lumpur. Study participants completed questionnaires on sociodemographic information, the GAD-7, the Beck's Depression Inventory (BDI), and the WHOQOL-BREF instrument. The Malay-version GAD-7 displayed good internal consistency (Cronbach's =0.91) and satisfactory convergent validity with depression (Pearson's R=0.642, p<0.001), overall perceptions of QOL (R=-0.277, p<0.001) and health (R=-0.257, p<0.001). In exploratory factor analysis, there was only one component with an eigenvalue >1 (eigenvalue=4.614), suggesting a unidimensional factor structure. All seven items were loaded on a higher-order factor ('generalized anxiety') in confirmatory factor analysis. This model did not have a good fit with the data. After examining the modification indices, the model was respecified to allow covariance of the error terms of items 1 and 2, and 2 and 3. The respecified model appeared to fit the data better (χ^2=35.216, df=12, p<0.001, CFI=0.98, TLI=0.97, RMSEA=0.08, and AIC=67.22). The findings suggested that items 1, 2 and 3 of GAD-7 may share distinctive variance out of that explained by the 'generalized anxiety' factor. Overall, the Malay-version GAD-7 appeared to be a valid measurement of the symptoms of anxiety in this study.

Keywords: anxiety, confirmatory factor analysis, diabetes mellitus, GAD-7

INTRODUCTION

Diabetes mellitus is a heterogeneous condition that can be associated with serious morbidity with considerable emotional impact. According to the International Diabetes Federation (IDF), by 2045, an estimated number of 629 million adults would be afflicted with the condition (IDF 2017). In Malaysia, the National Health and Morbidity Surveys have found an increasing trend of diabetes prevalence from 11.5% (95% CI: 11.2-12.0) in 2006 (Institute for Public Health 2008) to 17.5% (95% CI: 16.6-18.3) in 2015 (Institute for Public Health 2015).

In recent decades, more attention has been given to comorbid mental disorders of diabetes. Anxiety disorders are up to 2 times more common among people with diabetes, and is associated with unhealthy lifestyles, poor diabetic self-management, increased HbA1c, low overall quality of life (QOL) as well as increased long-term complications (Kruse et al. 2003; Hendriecks et al. 2016). Anxiety disorders also often co-

occur with depression among patients with diabetes (Nefs et al. 2019; Khan et al. 2019). The American Diabetes Association (ADA) recommends that healthcare practitioners regularly screen patients for mental health afflictions such as anxiety, depression, distress, and cognitive impairment (ADA 2014). Thus, early detection of anxiety among diabetic patients is critical, relying on the availability of suitable instruments with sound psychometric properties.

The 7-item Generalised Anxiety Disorder (GAD-7) scale is a self-reported instrument that was initially developed to be used in the primary care setting. It has displayed good reliability, having a sensitivity of 92% and specificity of 76% for diagnosing anxiety when a score of 8 was used as a cut-off point for anxiety disorders (Spitzer et al. 2006). The GAD-7 is seen as an appropriate screening instrument for GAD, panic disorder, social phobia, and post-traumatic stress disorder (PTSD).

The Malay-version GAD-7 has been translated and tested by Mohd Sidik et al. (2012) in the primary care setting in Malaysia. It showed good sensitivity (76%, 95% CI: 61%-87%) and specificity (94%, 95% CI: 88%-97%) in detecting anxiety cases in a sample with general medical conditions, with the Composite International Diagnostic Interviews (CIDI) used as the reference standard. However, subsequently its psychometric properties were not investigated further.

The original GAD-7 instrument was conceived based on the one-dimensional nature of generalized anxiety (Löwe et al. 2008). However, this has not been confirmed in following studies. For instance, Kertz et al. (2012) concluded that the model with one factor had poor fit for their data. By allowing the error terms of items 4 and 5, 5 and 6, and 4 and 6 to covary in the subsequent respecified model, they managed to increase the model fit, even though the RMSEA value still indicated an insufficient model. Study by Beard & Björgvinsson (2014) also suggests considering items 4, 5 and 6 as pointing to a separate factor. Based on these works, Bártolo et al. (2017) compared the two-factor model (with 3-item somatic factor and 4-item cognitive-emotional factor) with the one-factor model. They concluded that a modified unidimensional model that permits the error terms for items 4 and 5, and the error terms of 5 and 6 to covary provides a fair fit (RMSEA=0.062).

This paper is part of another study, the Anxiety, Depression And Personality Traits in Diabetes Mellitus (ADAPT-DM) study carried out at the Universiti Kebangsaan Malaysia Medical Centre (UKMMC) (Woon et al. 2020. Based on the available literature, we hypothesized that the Malay-version GAD-7 has decent internal consistency and at least moderate correlations among the items. We anticipated that the GAD-7 sum score would have positive correlation with depression and negative correlation with general well-being. We also scrutinized the factor structure of the instrument, hypothesizing a single-factor model that would require some degree of modifications.

MATERIALS AND METHODS

Participants and Procedures

This study was conducted at the Endocrine Clinic of the UKMMC in metropolitan Kuala Lumpur, Malaysia. The study received ethical approval from the Research Ethics Committee of UKMMC. It included all patients with diabetes mellitus who were 18 years old and above and under follow-up at the Endocrine Clinic. Patients with diminished mental capacity, for instance those with cognitive impairment or psychotic features, were not included.

Patients were recruited via convenient sampling. Participants underwent a structured clinical interview after giving written informed consent. During this interview, relevant demographic information was collected.

Measures

Besides the Malay-version GAD-7, a number of additional outcome measures were also collected using the following instruments.

BDI

This is a self-rating questionnaire for the assessment of depression severity, composed of items that examine symptoms of depression including guilt, hopelessness, and physical symptoms such as loss of appetite. It has demonstrated good test-retest reliability, high internal validity, as well as good construct and concurrent validity and discriminant validity (Beck et al. 1988). Factor analysis shows that the Malay-version BDI has good validity. It also has a high level of internal consistency, with the values of Cronbach's alpha (α) ranged from 0.71 to 0.91 (Mukhtar & Oei 2008).

WHOQOL-BREF

This is the shortened form of the WHOQOL-100 (WHOQOL Group 1998). It contains 26 items: two general items measuring overall perception of QOL and overall perception of health, and another 24 items that cover four domains: physical health, psychological, social relationship and environmental. It is rated on a five-point Likert scale, with higher score indicates a better QOL in a particular domain. The WHOQOL-BREF Malay version has displayed good internal consistency, test-retest reliability, besides having good discriminant validity and construct validity (Hasanah et al. 2003). The two general items were used in this study.

Data Analyses

The SPSS 20.0 software (IBM Corporation, Armonk, NY) was used to check and clean the data and to generate descriptive statistics. Cronbach's values were calculated to assess the internal consistency of the scale. Pearson's correlation coefficients were computed to check the convergent validity between the Malay-version GAD-7 and the BDI and the general items of the WHOQOL-BREF.

Table 1: Item characteristics and internal consistency for Generalized Anxiety Disorder-7 items (N=300)

No	Item	M	SD	Corrected item-total correlation	Cronbach's α
1	Feeling nervous, anxious or on edge	0.5	0.8	0.67	
2	Not being able to stop or control worrying	0.3	0.7	0.72	
3	Worrying too much about different things	0.4	0.7	0.74	
4	Trouble relaxing	0.3	0.6	0.74	
5	Being so restless that it is hard to sit still	0.2	0.5	0.77	
6	Becoming easily annoyed or irritable	0.3	0.6	0.80	
7	Feeling afraid as if something awful might happen	0.4	0.7	0.71	
	GAD-7 sum score	2.5	3.8		0.91

GAD-7: Generalized Anxiety Disorder-7; SD: standard deviation

Principal components analysis (PCA), one of the methods for exploratory factor analysis (EFA), was initially undertaken to uncover the latent variable(s) of the questionnaire items. Factor(s) were retained based on the Kaiser criterion of an eigenvalue of >1.

Confirmatory factor analysis (CFA) using the AMOS 26.0 software (IBM Corporation, Armonk, NY) was subsequently performed to investigate the factor structure of the Malay-version GAD-7 in order to test the one-factor hypothesis. The CFA model fit was assessed using the following indices: chi-square statistics (χ^2), comparative fit index (CFI), Tucker and Lewis's index of fit (TLI), normal fit index (NFI), root mean square error of approximation (RMSEA), and Akaike Information Criteria (AIC). Values of 0.90 or more for the CFI, TLI, and NFI suggest good model fit, with values close to 1 for any of the indexes representing a very good fit. A RMSEA value of 0.11 or less signifies reasonable model fit, whereas a value of 0.05 or less signifies good fit. In the comparison of models, lower AIC value signifies a better fit of the hypothetical model (Hu & Bentler 1995).

RESULTS

There were 300 diabetic patients who were involved in the study. They had a mean age of 60.4 years (SD=13.4 years); 52.7% were male. A total of 27 participants (9.0%, 95% CI: 5.6-12.4%) were screened positive for anxiety using the Malay-version GAD-7. Age did not show significant correlation with GAD-7 scores (Pearson's R =-0.110, p=0.057). There was no significant difference in GAD-7 scores between female (M=2.15, SD=3.45) and male participants (M=2.75, SD=4.05), t (300) =1.39, p=0.165.

Table 1 presents means for the individual item scores and the sum score of the Malay-version GAD-7. The Malay-version GAD-7 showed very good level of internal consistency with

Table 2: Generalized Anxiety Disorder-7 correlations with depression and overall well-being (N=300)

		M	SD	1	2	3	4
1	GAD-7 score	2.5	3.8	1			
2	BDI score	6.1	6.4	0.642*	1		
3	Overall perception of QOL	3.8	0.7	-0.277*	-0.346*	1	
4	Overall perception of health	3.3	0.7	-0.257*	-0.268*	0.430*	1

GAD-7: Generalized Anxiety Disorder-7; BDI: Beck's Depression Inventory; QOL: Quality of life; SD: standard deviation.
*p<0.001

a Cronbach's of 0.91. The values of corrected item-total correlations were between 0.67 and 0.80, while inter-item correlations extended from 0.51 to a high of 0.75.

Correlations between GAD-7 sum scores and the BDI scores and the general items of the WHOQOL-BREF was examined to evaluate the convergent validity of the Malay-version GAD-7 with these measures. It showed a significant positive correlation with depression (Pearson's R=0.642). Higher GAD-7 scores also correlated inversely with an overall perception of QOL (R=-0.277) and overall perception of health (R=-0.257) (Table 2).

EFA showed that there was only one component with an eigenvalue >1 (eigenvalue=4.614), which was confirmed by the inspection of scree plot. All items also had high communalities (ranged from 0.565 to 0.746), suggesting a unidimensional factor structure.

A CFA was conducted by loading all seven items of the Malay-version GAD-7 on one higher-order factor ('generalized anxiety'). The model did not have a good fit with the data (χ^2=76.654, df=14, p<0.001, CFI=0.95, TLI=0.93, RMSEA=0.12, and AIC=104.65) (Table 3).

After examining the modification indices, changes were made to the model to allow error terms of item 1 and item 2 to covary. Based on the

Table 3: Summary of models for confirmatory factor analysis

No		χ^2	df	CFI	TLI	NFI	RMSEA (90% CI)	AIC
M1	One factor: Generalized anxiety	76.654*	14	0.95	0.93	0.94	0.12 (0.10-0.15)	104.65
M2	M1 + correlated errors of items 1 and 2	52.374*	13	0.97	0.95	0.96	0.10 (0.07-0.13)	82.37
M3	M1 + correlated errors of items 1 and 2, and 2 and 3	35.216*	12	0.98	0.97	0.97	0.08 (0.05-0.11)	67.22

Note: χ^2: chi-square test; CFI: comparative fit index; TLI: Tucker and Lewis's index of fit; NFI: normed fit index; RMSEA: root mean square error of approximation; AIC: Akaike's information criterion.
*p<0.001

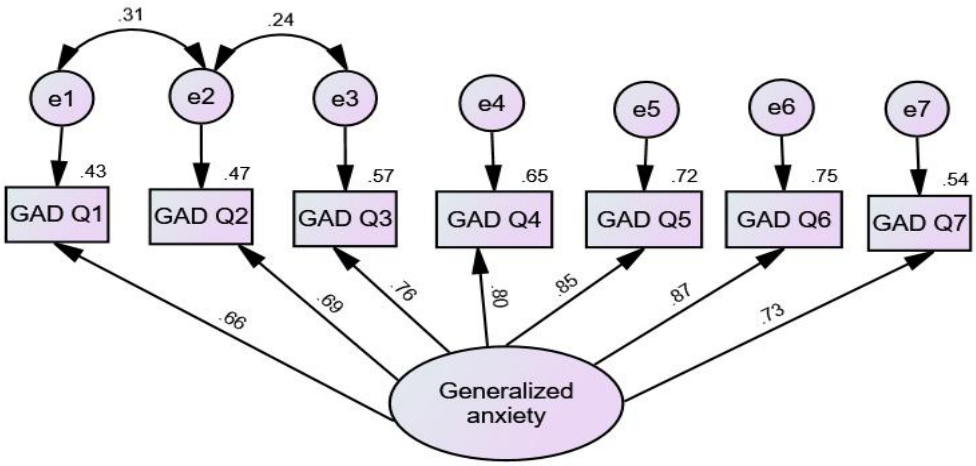

Figure 1: The final modified one-factor model for the Malay-version GAD-7. Note: standardized estimates based on confirmatory factor analysis (CFA). All factor loadings were statistically significant ($p < 0.001$).

subsequent modification indices of the second model, it was further respecified to allow error terms of items 1 and 2, and 2 and 3, to vary together. The final model was able to fit the data better than the initial model (χ^2=35.216, df=12, p<0.001, CFI=0.98, TLI=0.97, RMSEA=0.08, and AIC=67.22), with the RMSEA value suggested less than ideal but reasonable fit (Figure 1).

DISCUSSION

This study scrutinized the validity of the Malay-version GAD-7 scale among diabetic outpatients in a tertiary medical centre. Although the original GAD-7 scale has been shown to be a valid and reliable screening tool in the primary healthcare setting (Spitzer et al. 2006), hence presumably suitable for use among patients with diabetes, it is yet to be examined in a Malaysian population using the translated Malay-version.

In our sample, the positive screening rate for anxiety was 9%. This figure was low compared to the results reported among diabetic patients in Saudi Arabia, which was 45.5%, (Alharithy et al. 2019) and Jordan, which was 37.7% (Ahmad et al. 2018) respectively, using the GAD-7. However, it was comparable to the finding of the previous Malaysian study conducted using the GAD-7 among female patients in primary care clinics at 7.8% (Mohd Sidik et al. 2012). It also concurred with a more recent community survey in Malaysia employing GAD-7 which found the prevalence of anxiety as 8.2% (Kader et al. 2015).

Our findings supported the hypothesis that the internal consistency of the Malay-version GAD-7 is good. In this study sample, the Malay-version GAD-7 has demonstrated excellent internal consistency with a Cronbach's of 0.91. In comparison, in a validation study of the original GAD-7 in a general population, the reported Cronbach's

value was 0.89 (Löwe et al. 2008).

The correlation of the Malay-version GAD-7 total scores with the Malay BDI scores is not surprising, as GAD and depression frequently co-occur (Nefs et al. 2019; Khan et al. 2019). This result suggested that this instrument can be sensitive to depressive symptoms among diabetic patients. The negative correlations that the Malay-version GAD-7 displayed with the Malay-version WHOLQOL-BREF general items were also consistent with our hypothesis. Together, these results affirm that the Malay-version GAD-7 has satisfactory convergent validity.

As anticipated, even though EFA concluded the presence of unitary factor structure, a simple one-dimensional model did not have a good fit with the data in CFA. A better model fit was obtained by allowing error terms of items 1, 2, and 3 to covary. The findings suggested that items 1, 2 and 3 may share unique variance related to the cognitive symptoms of anxiety beyond that explained by the 'generalized anxiety' factor. This is in contrast to previous studies (Kertz et al. 2012; Bártolo et al. 2017) which suggest a somatic component among items 4, 5 and 6. Whether our findings reflect the cultural and linguistic influence on the respondents' understanding of the questionnaire items and their conceptualization of anxiety requires further investigation.

To the best of the authors' knowledge, this work was the first to study psychometric characteristics of the Malay-version GAD-7 among diabetic patients in Malaysia. Compared with the previous Malaysian study (Mohd Sidik et al. 2012), which only included female participants, in this study the instrument was applied to patients of both genders. There were some limitations to this study. No diagnostic tool for anxiety was used as the reference standard for the Malay-version GAD-7. Therefore, the concurrent validity of this instrument could not be established. The absence of a reference tool also prevented determination of sensitivity and specificity for the GAD-7. Hence, a receiver operating characteristic (ROC) curve could not be constructed to determine the cut-off score for anxiety in this sample. As this was a single-site study, the findings might not be representative of the psychometric properties of the GAD-7 when applied in other diabetic populations in Malaysia.

CONCLUSION

The Malay-version GAD-7 is a short and easy-to-administer screening instrument for anxiety. It has displayed excellent internal consistency, besides showing good convergent validity with other measures in this study. Factor analyses demonstrated that the instrument has an underlying unidimensional factor structure measuring generalized anxiety, albeit with some degree of covariance among certain items. Overall, it can be a valid screening tool for generalized anxiety symptoms among Malaysian patients with diabetes.

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REFERENCES

Ahmad, A., Abujbara, M., Jaddou, H., Younes, N.A., Ajlouni, K. 2018. Anxiety and depression among adult patients with diabetic foot: prevalence and associated factors. *J Clin Med Res* **10**(5): 411-8.

Alharithy, M.K., Abdalgader, O.R., Alobaylan, M.M., Alsugair, Z.O., Alswat, K.A. 2019. Anxiety prevalence in type 2 diabetes patients in Taif Saudi Arabia. *Saudi J Health Sci* **8**(2): 88-92.

American Diabetic Association. 2014. Standards of Medical Care in Diabetes 2014. *Diabetes Care* **37**(Suppl 1): S14-S80.

Bártolo, A., Monteiro, S., Pereira, A. 2017. Factor structure and construct validity of the Generalized Anxiety Disorder 7-item (GAD-7) among Portuguese college students. *Cadernos de Saúde Pública* **33**(9): e00212716.

Beard, C., Björgvinsson, T. 2014. Beyond generalized anxiety disorder: psychometric properties of the GAD-7 in a heterogeneous psychiatric sample. *J Anxiety Disord* **28**(6): 547-52.

Beck, A.T., Steer, R.A., Garbin, M.G. 1988. Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clin Psychol Rev* **8**(1): 77-100.

Hasanah, C.I., Naing, L., Rahman, A.R.A. 2003. World Health Organization Quality of Life Assessment: Brief Version in Bahasa Malaysia. *Med J Malaysia* **58**(1): 79-88.

Hendrieckx, C., Halliday, J.A., Beeney, L.J., Speight, J. 2016. Diabetes and Emotional Health: A Handbook for Health Professionals Supporting Adults with Type 1 or Type 2 Diabetes. Canberra: National Diabetes Services Scheme.

Hu, L.T., Bentler, P.M. 1995. Evaluating model fit. In *Structural equation modeling: Concepts, issues, and applications*. Edited by Hoyle RH. Thousand Oaks, CA: Sage; 76-99.

International Diabetes Federation diabetes atlas - 2017 Atlas. Available at: https://diabetesatlas.org/resources/2017-atlas.html. [Accessed: 30th April 2019].

Institute for Public Health. 2008. *The Third National Health and Morbidity Survey (NHMS III). Diabetes Mellitus.* Kuala Lumpur.

Institute for Public Health. 2015. *National Health and Morbidity Survey 2015 (NHMS 2015). Vol II: Non-Communicable Diseases, Risk Factors and Other Health Problems.* Kuala Lumpur.

Kader Maideen, S.F., Mohd Sidik, S., Rampal, L., Mukhtar, F. 2015. Prevalence, associated factors and predictors of anxiety: a community survey in Selangor, Malaysia. *BMC Psychiatry* **15**: 262.

Kertz, S., Bigda-Peyton, J., Bjorgvinsson, T. 2013. Validity of the Generalized Anxiety Disorder-7 Scale in an acute psychiatric sample. *Clin Psychol Psychother* **20**(5): 456-64.

Khan, P., Qayyum, N., Malik, F., Khan, T., Khan, M., Tahir, A. 2019. Incidence of anxiety and depression among patients with type 2 diabetes and the predicting factors. *Cureus* **11**(3): e4254.

Kruse, J., Schmitz, N., Thefeld, W. 2003. On the association between diabetes and mental disorders in a community sample: Results from the German National Health Interview and Examination Survey. *Diabetes Care* **26**(6): 1841-6.

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., Herzberg, P.Y. 2008. Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Med Care* **46**(3): 266-74.

Mohd Sidik, S., Arroll, B., Goodyear-Smith, F. 2012. Validation of the GAD-7 (Malay version) among women attending a primary care clinic in Malaysia. *J Prim Health Care* **4**(1): 5-11.

Mukhtar, F., Oei, T.P.S. 2008. Exploratory and confirmatory factor validation and psychometric properties of the Beck Depression Inventory for Malays (BDI-Malay) in Malaysia. Malays J Psychiatry **17**(1). http://www.psychiatrymalaysia.org/file_dir/16510073164861a7e47a8ae.pdf [Accessed 13th January 2017].

Nefs, G., Hendrieckx, C., Reddy, P., Browne, J.L., Bot, M., Dixon, J., Kyrios, M., Speight, J., Pouwer, F. 2019. Comorbid elevated symptoms of anxiety and depression in adults with type 1 or type 2 diabetes: Results from the International Diabetes MILES Study. *J Diabetes Complications* **33**(8): 523-9.

Spitzer, R.L., Kroenke, K., Williams, J.B.W., Löwe, B. 2006. A brief measure for assessing Generalised Anxiety Disorder. The GAD-7. *Arch Intern Med* **166**(10): 1092-7.

WHOQOL Group. 1998. Development of the World Health Organization WHOQOL-BREF Quality

of Life Assessment. *Psychol Med* **28**(3): 551-8.
Woon, L. S.-C., Sidi, H., Ravindran., A., Gosse, P.J., Kaunismaa, E.S., Mainland, R.L., Hatta, N.H., Arnawati, P., Zulkifli, A.Y., Mustafa, N., Abdullah, M.F.I.L. 2020. Depression, anxiety, and associated factors in patients with diabetes: evidence from the anxiety, depression, and personality traits in diabetes mellitus (ADAPT-DM) study. *BMC Psychiatry* **20**: 227.

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