Validity and reliability of Morisky Medication Adherence Scale 8 Bahasa version to measure statin adherence among military pilots

Vika,[1] Minarma Siagian,[2] Grace Wangge[1]

[1]Aviation Medicine Specialist Program, Department of Community Medicine, Medical Faculty, University of Indonesia, Jakarta
[2]Physiology Departement, Medical Faculty, University of Indonesia, Jakarta

Corresponding address: Vika
Email: dr.vikacokronegoro@gmail.com

Abstrak

Latar belakang: *Hiperkolesterolemia merupakan penyebab penyakit kardiovaskular yang dapat menyebabkan inkapasitasi dalam penerbangan. Salah satu cara untuk mengontrol hiperkolesterolemia adalah dengan minum obat antikolesterol golongan statin, namun belum ada instrumen yang dapat digunakan untuk mengukur kepatuhan minum obat statin di kalangan penerbang militer di Indonesia. Tujuan penelitian ini adalah melakukan uji validitas dan reliabilitas kuesioner Morisky Medication Adherence Scale 8 (MMAS-8) versi bahasa Indonesia untuk mengukur kepatuhan konsumsi statin pada penerbang militer di Indonesia.*

Metode: *MMAS 8 diterjemahkan secara sistematik ke dalam bahasa Indonesia. Uji validitas dan reliabilitas MMAS 8 pada 40 penerbang militer di Skadron Udara Halim Perdanakusuma dilaksanakan pada tanggal 6 April-15 Mei 2016. Validitas diuji dengan validitas kriteria. Reliabilitas diuji dengan konsistensi internal dan uji ulang (test-retest).*

Hasil: *Sebagian besar penerbang (52,5%) memiliki kadar kolesterol tinggi (>200 mg/dL) dan tingkat kepatuhan minum statin yang rendah (74,4%). Didapatkan korelasi negatif lemah dan tidak ditemukan hubungan bermakna antara antara kadar kolesterol dan tingkat kepatuhan minum statin (koefisien Spearman -0,199; p=0,218). Konsistensi internal moderat (Cronbach's α=0,759) dengan reliabilitas tes ulang yang baik (koefisien Spearman=0,860).*

Kesimpulan*: Hasil uji validitas dan reliabilitas MMAS 8 versi bahasa Indonesia pada penerbang militer.* ***(Health Science Journal of Indonesia 2016;7(2):129-133)***

Kata kunci*: statin; kepatuhan; validitas; reliabilitas; penerbang; militer; Indonesia*

Abstract

Background: Hypercholesterolemia is the cause of cardiovascular disease which lead to inflight incapacitation. One of the way to control hypercholesterolemia is using statin medication, however there has not been an instrument to measure statin adherence in military pilots in Indonesia. The aim of this study was to analyze the validity and reliability of MMAS 8 Bahasa version to measure statin adherence among military pilot in Indonesia.

Methods: MMAS 8 sistematically translated into Bahasa. Validity and reliability test among 40 military pilots in Halim Perdanakusuma Air Force Base was held on April 06th - May 15th 2016. Validity was confirmed using crirerion-related validity. Reliability was tested for internal consistency and test-retest reliability.

Results: Most of the pilots (52.5%) had high cholesterol level and 74.4% had low statin adherence. Negative weak correlation and no significant association between cholesterol and statin adherence level (Spearman coefficient -.199, p=0.218) was found. Moderate internal consistency and excellent test-retest reliability were found (Cronbach's α=0.759; Spearman correlation=0.860).

Conclusions: Validity and reliability of MMAS 8 Bahasa version has not been able to be used to measure statin adherence among military pilots in Indonesia. ***(Health Science Journal of Indonesia 2016;7(2):129-133)***

Keywords: statin; adherence; validity; reliability; pilots; military; Indonesia

Hypercholesterolemia may lead to cardiovascular disease which is the leading cause of worldwide morbidity and mortality.[1,2] Rintasanti study in Aviation Medical Center Jakarta among civilian pilots underwent routine medical examination on May 2013 found the prevalence of hypercholesterolemia was 55.4%.[3]

Hypercholesterolemia or high cholesterol is a condition of total blood cholesterol is $\geq$ 240 mg/dL.[4] In aviation, it has serious impact such as vertigo, syncope, flight illusion and cardiovascular disease which strike unexpectedly and lead to incapacitation which has serious and life-threatening impact for passengers and cabin crews.[5]

According to the National Cholesterol Education Program–Adult Treatment Panel III (NCEP-ATP III) guidelines which is in line with the guideline of International Civil Aviation Organization (ICAO) and the Aerospace Medical Association (AsMA), the first line hypercholesterolemia pharmacologic therapy is statin.[6,7] Statins long term use has been shown to be safe and beneficial for cardiovascular disease prevention.[7] Although many studies have shown that statins have pleiotropic effects that can reduce pain and improve activity endurance, but statin adherence has not been optimal.[8,9] There is no measurement standard for statin adherence.[10] The most inexpensive and easy measurement is subjective measurements using Morisky Medication adherence Scale (MMAS) questionnaires developed by Morisky et al which consists of 8 items.[11] Validity and reliability of MMAS 8 has been tested to measure antihypertensive drugs adherence in 1367 patients in Los Angeles and 200 patients in Iran.[11,12] MMAS 8 has also been translated and validated for 223 and 41 patients with type 2 diabetes mellitus in Malaysia and China.[13,14] In addition MMAS 8 was also used by Foraih to study the relationship between diet, physical activity and lifestyle to statin adherence in 200 hypercholesterolemic patients in Kuwait.[15] However, its validity and reliability has never been tested to measure statin adherence among military pilots in Indonesia.

METHODS

Validity and reliability test for MMAS 8 among statin consuming military pilots in Halim Perdanakusuma Air Force Base was held on April 6th until May 15th 2016. The adherence rate was obtained from twice questionnaires fulfilment in a span of 15 days. Blood cholesterol levels data was obtained from the medical records available in the squadron clinic.

Classification of adherence level was based on MMAS 8 total score i.e score <6 categorized as low adherence, score 6-8 categorized as moderate adherence, and a score of 8 categorized as high adherence.

Blood cholesterol level criteria was classified into normal cholesterol (<200 mg / dL), borderline (201-239 mg / dL) and high cholesterol (> 240 mg / dL).

Validity was tested using criterion-related validity which was analyzed using correlation coefficient between adherence level criteria and blood cholesterol level criteria. Internal consistency reliability test was analyzed with Cronbach α and stability test was analyzed with correlation coefficient comparing the MMAS 8 total score from the first and second data. Data analysis was performed using SPSS version 20. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, University of Indonesia, Jakarta.

Questionnaire translation was conducted by two different sworn translators. Questionnaire translation phases are as follows:
1. MMAS 8 was translated from English into Bahasa by an independent sworn translator.
2. Bahasa version questionnaire was translated back into English by another sworn translator. Any inconsistency would be discussed in a meeting to formulate the final form of questionnaire that was test ready.
3. The questionnaire that had been translated into Bahasa would be distributed to five people who understands Bahasa well and were not included in the study but has the same characteristics as the subjects. Items that were not well understood would be reviewed by the researchers.
4. The final version of the Bahasa version questionnaire had been completed and ready to be tested for validity and reliability.

RESULTS

The number of subjects participated in the study was 40 whose age between 24-38 years old. Table

1 showed that most of the pilots (52.5%) were 26-30 years old and classified as having high blood cholesterol (> 200 mg / dL), 74.4% of subjects had low statin adherence level and there was no pilot with high adherence level.

Table 1. Characteristics of subjects

Characteristics	Total sample (N)
Age	
≤ 25 years	5 (12,5%)
26-30 years	21 (52,5%)
≥ 31 years	14 (35,0%)
Total blood cholesterol	
≤ 200 mg/dL	19 (47,5%)
201-239 mg/dL	17 (42,5%)
≥ 240 mg/dL	4 (10,0%)
Statin adherence	
Low	29 (74,4%)
Moderate	11 (25,6%)
High	0

Criterion-Related Validity

Validity was assessed with criterion-related validity which showed the relationship between adherence level and total blood cholesterol.

Table 2 showed among 40 subjects, 29 subjects had low adherence level and 11 subjects had moderate adherence level. Among 29 low adherence subjects, 58.6% had high blood cholesterol level (≥200 mg/dL) and among 11 moderate adherence subjects, 63.6% had normal blood cholesterol level. Negative weak correlation and no significant association between total blood cholesterol level and MMAS 8 total score were found (r = -0.199; p = 0.218).

Table 2. Relationship between adherence criteria and total blood cholesterol.

Total blood cholesterol	Low adherence (score < 6)	Medium adherence (score 6-8)	
≤ 200 mg/dL	12 (41,4%)	7 (63,6%)	
201-239 mg/dL	13 (44,80%)	4 (36,4%)	0,293
≥ 240 mg/dL	4 (13,8%)	0	
Total	29 (100%)	11 (100%)	

Median of total blood cholesterol 204 mg/dL.

Internal consistency

Table 3 showed the test of internal consistency with Cronbach's α for the eighth item MMAS 8 questions was 0.759. The correlation coefficient for each item to the total score ranged from 0.008 to 0.860. The smallest coefficient was on the question about taking the drug the day before the test (item 5), but the value of Cronbach's α if the item was removed only slightly increase to 0.787. Overall, the correlation of each item if removed to the value of Cronbach's α tend to decrease so no changes was implied to the items of MMAS.

Questionnaire stability

Table 4 showed the stability of this questionnaire was very good (r = 0.860). The most inconsistent response were in the questions about the degree of difficulty remembering treatment (item 8) and also about taking medication the day before data collection (item 5).

Table 3. Internal consistency of MMAS 8 Bahasa version

Questions	Response Yes (%)			No (%)			Corrected item-total correlation	Cronbach's alpha if item deleted
Sometimes forget to take medication	26 (65.0%)			14 (35.0%)			0.860	0.674
Any day did not take medication	25 (62.5%)			15 (37.5%)			0.666	0.704
Stop medication without warning to doctor	15 (37.5%)			25 (62.5%)			0.419	0.740
Forget medication when travelling	26 (65.0%)			14 (35.0%)			0.764	0.690
Take medication yesterday	7 (17.5%)			33 (82.5%)			0.008	0.787
Stop medication when cholesterol is controlled	32 (80.0%)			8 (20.0%)			0.391	0.746
Distressed for following treatment	6 (15.0%)			34 (85.0%)			0.305	0.757
Difficulty to remember taking anticholesterol	Never	Almost never	Sometimes	Frequently	Always			
	15 (37.5%)	4 (10.0%)	14 (35.0%)	5 (12.5%)	2 (5.0%)		0.670	0.753

Tabel 4. Test-retest reliability of MMAS 8 Bahasa version

Questions	Consistent	Inconsistent	Spearman correlation coefficient
Sometimes forget to take medication	36 (90.0%)	4 (10.0%)	
Any day did not take medication	34 (85.0%)	6 (15.0%)	
Stop medication without warning to doctor	32 (80.0%)	8 (20.0%)	
Forget medication when travelling	36 (90,0%)	4 (10.0%)	0.860
Take medication yesterday	28 (70.0%)	12 (30.0%)	
Stop medication when cholesterol is controlled	36 (90.0%)	4 (10.0%)	
Distressed for following treatment	36 (90.0%)	4 (10.0%)	
Difficulty to remember taking anticholesterol	26 (65.0%)	14 (35.0%)	

DISCUSSION

This study was the first study aimed to test the validity and reliability of the MMAS 8 questionnaire to statin adherence among military pilots in Indonesia.

The result of validity results in this study demonstrated a negative weak correlation and no significant relationship were found between total score MMAS 8 with total cholesterol levels (Spearman Rank Order coefficient -0.199; p: 0.218). MMAS 8 total score negative correlation with blood pressure and HbA1c levels were also obtained on research in Iran and Malaysia with a stronger correlation coefficient to systolic blood pressure -0.306, diastolic blood pressure -0.279 and HbA1C levels -0.431.[12,13]

Reliability test results showed the internal consistency that is lower than the initial research Morisky in the US, but it was better compared to studies in other countries (Cronbach's α: 0.759) with higher stability than studies in Malaysia and China (Spearman correlation coefficients: 0.860).[11-14] Test-retest reliability demonstrated that inconsistent responses were in the difficulty of remembering treatment (item 8) and about taking medication the day before data collection (item 5). It could appear because item 8 is not "yes-no" question as another items, but using 5 Likert scale so the responses are more varied. While inconsistency in the question about taking medication the day before the study (item 5) could occur because of the caution in the first questionnaire so the respondents were more likely to remember to take medication ahead to the second questionnaire. However, Cronbach's alpha if item 5 deleted only slightly increased to 0.787 so no changes was applied in the item.

Limitations of this study was the data of total cholesterol level was obtained from medical records regardless of the treatment duration and therefore could not describe the blood cholesterol level when collecting data. Statins may improve blood lipid profiles within 4 weeks and 1 week discontinuation of statins can increase blood cholesterol levels so time factor when respondents were taking statins may have an impact on blood cholesterol levels when data collection.[16] This was in contrast to other studies that examine blood pressure, blood sugar levels or HbA1C levels at the same time with data collection.[11-14]

Another limitation is less variation of the study subjects. Military pilot consists of transport, fighter aircraft and helicopter pilots. In this study, subjects consist only of transport and helicopter pilots.

In conclusion, validity and reliability of MMAS 8 Bahasa version has not been able to be used to measure statin adherence among military pilots in Indonesia.

Acknowledgments

REFERENCES

1. Nelson RH. Hyperlipidemia as a risk factor for cardiovascular disease. Prim Care. 2013;40(1):195–211.
2. Perkumpulan Endokrinologi Indonesia (PERKENI). Konsensus pengelolaaan dislipidemia di Indonesia. Jakarta: Pusat Penerbitan Ilmu Penyakit Dalam Fakultas Kedokteran Universitas Indonesia; 2012.

3. Rintasanti A. Pengaruh penerbangan jarak panjang terhadap risiko hiperkolesterolemia pada penerbang sipil di Indonesia [Tesis]. Jakarta: Universitas Indonesia; 2013 [cited 2016 Feb 03].

4. Aerospace Medical Association. Clinical practice guideline for hyperlipidemia [Internet]. 2002 [cited 2016 Feb 18]. Available from: http://www.asams.org/guidelines/Completed/NEW%20Hyperlipidemia.htm.

5. Zhao R, Xiao D, Fan X, et al. Epidemiological survey of dyslipidemia in civil aviators in China from 2006 to 2011. International Journal of Endocrinology. 2014; Article ID 215076.

6. International Civil Aviation Organization (ICAO). Manual of civil aviation medicine 3rd edition. 2012.

7. US Air Force. Air Force Waiver Guide. 2013.

8. Golomb BA, Evans MA. Statin adverse effects: a review of the literature and evidence for a mitochondrial mechanism. Am J Cardiovasc Drugs. 2010;8(6):373-418.

9. Eussen S, van der Elst ME, Klungel OH, et al. A Pharmaceutical care program to improve adherence to statin therapy: A randomized controlled trial. The Annals of Pharmacotherapy. 2010;44:1905-13.

10. Maningat P, Gordon BR, Breslow JR. How do we improve patient compliance and adherence to long-term statin therapy? Curr Atheroscler Rep. 2013;15(1):291-303.

11. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich). 2008;10(5):348-54.

12. Moharamzad Y, Saadat H, Shahraki BN, et al. Validation of the Persian version of the 8 item Morisky Medication Adherence Scale (MMAS-8) in Iranian hypertensive patients. Global Journal of Health Science. 2014;7(4):173.

13. Al-Qazaz H, Hassali MA, Shafie AA, et al. The eight-item Morisky Medication Adherence Scale (MMAS): translation and validation of the Malaysian version. Diabetes Res Clin Pract. 2010;90(2):216-21.

14. Wang J, Bian RW, Mo YZ. Validation of the Chinese version of the eight-item Morisky medication adherence scale in patients with type 2 diabetes mellitus. Journal of Clinical Gerontology & Geriatrics. 2013;4:119-22.

15. Al-Foraih M. Dietary, physical activity and other lifestyle habits and their association with medication adherence in a group of hypercholesterolemic patients prescribed statin therapy in Kuwait [Thesis]. Kuwait city: Griffith University; 2013.

16. Safeer R, Lacivita CL. Choosing drug therapy for patients with hyperlipidemia. Am Fam Physician. 2000;61(11): 3371-82.