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

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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 systematically 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 -0.199, 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 \(\geq 240 \text{ mg/dL}.\)\(^4\)

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 \(\alpha\) 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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total sample (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>≤ 25 years</td>
<td>5 (12.5%)</td>
</tr>
<tr>
<td>26-30 years</td>
<td>21 (52.5%)</td>
</tr>
<tr>
<td>≥ 31 years</td>
<td>14 (35.0%)</td>
</tr>
<tr>
<td>Total blood cholesterol</td>
<td></td>
</tr>
<tr>
<td>≤ 200 mg/dL</td>
<td>19 (47.5%)</td>
</tr>
<tr>
<td>201-239 mg/dL</td>
<td>17 (42.5%)</td>
</tr>
<tr>
<td>≥ 240 mg/dL</td>
<td>4 (10.0%)</td>
</tr>
<tr>
<td>Statin adherence</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>29 (74.4%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>11 (25.6%)</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Total blood cholesterol</th>
<th>Low adherence (score &lt; 6)</th>
<th>Medium adherence (score 6-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 200 mg/dL.</td>
<td>12 (41,4%)</td>
<td>7 (63,6%)</td>
</tr>
<tr>
<td>201-239 mg/dL.</td>
<td>13 (44,80%)</td>
<td>4 (36,4%)</td>
</tr>
<tr>
<td>≥ 240 mg/dL.</td>
<td>4 (13,8%)</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>29 (100%)</td>
<td>11 (100%)</td>
</tr>
</tbody>
</table>

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).
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.

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