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Utility of the Patient Acceptable Symptom State (PASS) and Single Simple Question (SSQ) in a Malaysian myasthenia gravis cohort

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Abstract

Background & Objective: Assessing myasthenia gravis (MG) can be challenging and multiple outcome measures have been developed to evaluate disease severity. Both the Patient Acceptable Symptom State (PASS) and the Single Simple Question (SSQ) are validated patient-reported outcome measures, but they assess different dimensions of MG. In this study, we aimed to assess the utility of PASS and SSQ in a Malaysian cohort of patients with MG. *Methods:* In this cross-sectional study, patients with MG followed-up at the neurology clinic of University Malaya Medical Centre from July 2023 to October 2023 were invited to participate. Data on demographic and clinical characteristics were collected. Patients were required to complete the PASS, SSQ, Myasthenia Gravis Activities of Daily Living (MG-ADL) and Myasthenia Gravis 15-item Quality of Life Revised (MG-QOL15R) questionnaires. Additionally, the Myasthenia Gravis Composite Scale (MGCS) was scored by the physicians during their review. *Results:* A total of 71 patients were included. One-third (32.4%) of patients were dissatisfied (PASS-negative) with their current MG symptom state. Of note, significantly more Indians (26.1%) responded 'No' to PASS, while more Chinese (81.3%) responded 'Yes'. Patients with a PASS-negative response had lower SSQ scores (59.1±22.4% vs 80.4±19.0%, $p<0.001$) and higher MG-ADL (3.9±3.4 vs 1.8±2.0, $p=0.011$) and MG-QOL15R (11.2±7.3 vs 4.3±4.8, $p<0.001$). SSQ also showed significant correlations with MG-ADL ($r=-0.53$, $p<0.001$), MG-QOL15R ($r=-0.40$, $p=0.001$) and MGCS ($r=-0.39$, $p=0.001$). An SSQ score of ≥62.5% had 89.6% sensitivity in classifying patients as PASS-positive. PASS thresholds for MG-ADL, MG-QOL15R and MGCS were ≤3.5, ≤6.5 and ≤2.0 points, respectively. *Conclusion:* PASS and SSQ are closely associated, and an SSQ threshold of ≥62.5% predicts an acceptable MG state. Both PASS and SSQ are feasible, valid measures and may be easily incorporated into routine MG clinical assessment.

Keywords: Myasthenia gravis; patient acceptable symptom state; patient-reported outcome measure; quality of life; single simple question

INTRODUCTION

Myasthenia gravis (MG) is an autoimmune disease that targets proteins in the postsynaptic membrane of the neuromuscular junction such as acetylcholine receptors (AChR) or muscle-specific tyrosine kinase (MuSK).[1] This autoimmune condition leads to weakness and fatiguability of skeletal muscles, which range from ocular manifestations to generalised disease in terms of clinical presentation.[2] Moreover, generalised MG may involve the bulbar and respiratory muscles, resulting in dysphagia and respiratory crises.[3] Consequently, these symptoms can reduce functionality, personal independence, the ability to carry out daily activities and most importantly, quality of life.

Evaluating chronic disease activity in MG is notoriously difficult due to the fluctuating muscle weakness associated with the unique pathophysiology of the neuromuscular junction. Furthermore, assessing affected muscle groups such as the bulbar and respiratory muscles can be challenging during routine clinical examination. As a result, clinicians often face difficulties in

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assessing MG patients[4], leading to development of multiple scales designed to evaluate disease severity.[5-8] These scales vary in length, the level of examiner expertise required, necessary equipment and other parameters.

From both clinical and research perspectives, it is crucial to comprehensively and concisely capture the disease status of MG patients during each visit for effective management. Various tools have been developed to assess MG status, including the Myasthenia Gravis Activities of Daily Living (MG-ADL) scale, the Myasthenia Gravis 15-item Quality of Life Revised (MGQOL-15R), the Myasthenia Gravis Composite Score (MGCS) and the Myasthenia Gravis Foundation of America (MGFA) classification.[7,9-11] These tools are widely used to measure disease severity and disability in MG. The MG-ADL and MG-QOL15R are patient-reported, the MGFA is physician-reported, and the MGCS combine both perspectives. Although most assessment tools are physician-driven, the patient's perspective on disease status may differ from clinical assessments. In recent years, there has been growing interest in patient-centred assessments in both clinical practice and research.[12]

The emergence of the Single Simple Question (SSQ) which asks patients, "What percentage of normal do you feel regarding your MG, where 100% is normal?" was well-demonstrated in a study conducted on Canadian patients.[13] The study has shown positive associations between the SSQ and established MG scales. However, there have been limited studies involving other populations. The Patient Acceptable Symptom States (PASS) is another method used to determine thresholds in outcome measures, where patient indicates whether they are satisfied with their current symptom state.[14] PASS estimation involves a simple dichotomous question (yes/no) regarding the patient's current state, thereby assessing their overall satisfaction with their MG status. PASS has been validated in previous MG studies[14-16], demonstrating that approximately 30% of the patients with MG were dissatisfied with their symptom state.

The SSQ and PASS are both patient-reported measures but they assess different aspects of MG. The SSQ provides an overall estimate of current disease severity, which can fluctuate over time, but it does not inherently offer a patient-driven interpretation of what constitutes an acceptable score. Understanding PASS thresholds helps us assign clinical significance to SSQ scores. Further to this, another challenge is aligning patient satisfaction with various outcome measures, as the threshold for satisfaction varies among patients. Previous studies have been retrospective and did not compare PASS results with commonly used clinician-reported MG assessments in the same patient group. Both SSQ and PASS have not been validated in our local MG cohort, where Malaysia's diverse multi-ethnic and sociocultural composition may influence disease perception, health-seeking behaviour, and clinical presentation, which can be heterogeneous.[17] Therefore, the aims of this study were to (1) evaluate the utility of PASS and SSQ in our Malaysian cohort of MG patients, (2) identify factors related to PASS status, and (3) establish PASS threshold for the SSQ and other outcome measures.

METHODS

Participants

This cross-sectional study was conducted at the University Malaya Medical Centre (UMMC), Kuala Lumpur from July 2023 to October 2023. Patients with a confirmed diagnosis of MG who arrived consecutively for their regular follow-up in the neurology clinic were invited to participate. The diagnosis of MG was confirmed based on clinical presentation, the ice-pack test, antibody status, repetitive nerve stimulation, single-fibre electromyography, or response to pyridostigmine. The study was approved by the Medical Research Ethics Committee of UMMC (202185-10461) and all recruited patients provided written informed consent. Demographic and disease characteristics data were collected. Demographic details included age, sex, race, education level, employment status, marital status and medical comorbidities. Disease characteristics such as MGFA class at diagnosis, age of onset, disease duration, antibody status, history of thymectomy and thymus histology were obtained from the electronic medical records.

Questionnaires and clinical assessment

Patients were required to complete the PASS and SSQ questions as well as the MG-ADL and MG-QOL15R questionnaires. Patients were interviewed in English, which is widely spoken and understood in Malaysia. For patients who did not understand English, the Malay version of MG-ADL and MG-QOL15R was used.[18] Each survey took approximately 15 minutes to complete. Additionally, the attending neurologist (PNG and CYT) scored the MGCS and MGFA

class during the consultation.

The PASS assesses a patient's satisfaction with their current health condition and MG status by asking a "Yes" or "No" question. The PASS question was phrased as "Considering all the ways you are affected by MG, if you had to stay in your current state for the next few months, would you say your current disease status is satisfactory?".[14]

The SSQ is a simple and validated question that asks patient what percentage of normal they feel with respect to their overall MG status, where 0% represents the worst status and 100% represents normal. The SSQ asks the patient "What percentage of normal do you feel regarding your MG?". For patients who had difficulty responding, the question was clarified as follows: "If 100% means no symptoms or limitations due to MG, and 0% means maximum disability, where would you rank your disease at present?".[13]

The MG-ADL is a patient-reported measure consisting of 8 items that assess symptoms severity and its impact on activities of daily living.[9] Each item is scored from 0 to 3, with a total score ranging from 0 to 24. The higher the score, the greater the disease severity.

The MG-QOL15R is a patient-reported disease specific questionnaire that evaluates the impact of MG symptoms on quality of life.[10] The measure contains 15 items, each scored on a 3-level Likert scale. The total score ranges from 0 to 30, with higher scores reflecting greater symptom severity, thus a poorer quality of life.

The MGCS is a measure of disease severity that combines clinical assessment through both patient history and physical examination. The MGCS consists of 10 items, with a total score ranging from 0 to 50. Higher scores indicate more severe disease.[7]

The MGFA classification is based on a physician's clinical assessment to determine disease severity. The MGFA consists of 5 classes: Class I for pure ocular MG, Class II for mild generalised MG, Class III for moderate generalised MG, Class IV for severe generalised MG and Class V for myasthenic crisis. Additionally, Classes II through IV are subdivided into A and B, with Class A indicating predominant limb symptoms and Class B indicating predominant bulbar symptoms.[11] Since the MGFA does not include a category for asymptomatic or normal patients, they were classified as '0' in the current study.

Statistical analysis

All the statistical analyses were performed with SPSS version 25.0 (IBM Corporation, Armonk, NY, USA) for Windows. Categorical variables were expressed in frequencies and percentages and analysed with Chi-square test. Continuous variables were displayed as mean ± standard deviation (SD) and analysed with independent *t*-test. Correlation analysis between two continuous data was evaluated with bivariate Pearson's correlation coefficient. Correlation coefficients in the range of 0.10-0.39 were considered weak, 0.40-0.69 as moderate and 0.70-1.00 as strong or very strong [19]. A *p*-value of <0.05 was considered statistically significant. Receiver operator characteristic (ROC) curves were used to estimate optimal PASS thresholds, sensitivity and specificity for the outcome measures to predict PASS-positive status.

RESULTS

A total of 71 patients with a confirmed diagnosis of MG were recruited (Table 1). The mean age was 57.7±15.4 years (range 23-84), with 28 men (39.4%) and 43 women (60.6%). The majority of patients were Chinese (69.0%), followed by Malays (16.9%), Indians (11.3%) and two other races (2.8%). Most patients had received secondary education (52.1%) or higher (32.4%). More than two-thirds of the patients were married. A similar proportion of patients were employed (29.6%) and unemployed (26.8%), while 40.8% had retired. Thirty-five patients (49.3%) had medical comorbidities, with the most common being diabetes mellitus (19.7%), followed by degenerative bone and joint diseases (14.0%), ischaemic heart disease (14.0%), thyroid disorders (11.2%), malignancy (5.6%) and chronic lung disease (4.2%).

Of the 71 patients, 41 (57.7%) had generalised MG, while 30 (42.3%) had ocular MG. The mean age of onset was 46.3±17.0 years, with early-onset MG (<50 years) in 50.7% of patients and late-onset MG (≥50 years) in 49.3% of patients. Anti-AChR antibodies were positive in 56 (78.9%) patients and negative in eight (11.3%). Three patients (4.2%) tested positive for anti-MuSK antibodies. Thymectomy was performed in 28 (39.4%) patients, with thymic histopathology revealing thymoma in 14 (50.0%) and thymic hyperplasia in five (17.9%).

At the time of assessment, 31 (43.7%) patients were asymptomatic (MGFA Class 0) and 30 (42.3%) were in MGFA Class I. The remaining 14.1% were still in generalised disease classes (MGFA II to III) (Table 2). A total of 67.6% (n=48)

Table 1: Demographic and clinical characteristics of MG patients (N=71)

Characteristic	N (%) / Mean ± SD
Age (years)	57.7 ± 15.4
Sex	
Male	28 (39.4%)
Female	43 (60.6%)
Race	
Malay	12 (16.9%)
Chinese	49 (69.0%)
Indian	8 (11.3%)
Others	2 (2.8%)
Education level	
No formal education	2 (2.8%)
Primary	9 (12.7%)
Secondary	37 (52.1%)
Tertiary	23 (32.4%)
Marital status	
Single	14 (19.7%)
Married	49 (69.0%)
Divorced	4 (5.6%)
Widower	4 (5.6%)
Employment status	
Employed	21 (29.6%)
Unemployed	19 (26.8%)
Retired	29 (40.8%)
Student	2 (2.8%)
Comorbidities	
Diabetes mellitus	14 (19.7%)
Degenerative arthropathy	10 (14.0%)
Ischaemic heart disease	10 (14.0%)
Thyroid disorders	8 (11.2%)
Malignancy	4 (5.6%)
Chronic lung disease	3 (4.2%)
Systemic lupus erythematous	2 (2.8%)
Generalised anxiety disorder	2 (2.8%)
Epilepsy	1 (1.4%)
Duration of disease (years)	11.4 ± 10.8
Disease type	
Ocular MG	30 (42.3%)
Generalised MG	41 (57.7%)
MGFA at onset	
I	33 (46.5%)
II A	4 (5.6%)
II B	16 (22.5%)
III A	2 (2.8%)
III B	8 (11.3%)
IV A	1 (1.4%)
IV B	0 (0%)
V	7 (9.9%)
Age of onset (years)	46.3 ± 17.0
Early-onset MG (<50)	36 (50.7%)
Late-onset MG (≥50)	35 (49.3%)
Antibody status	
Anti-AChR antibodies	56 (78.9%)
Anti-MuSK antibodies	3 (4.2%)
Seronegative for AChR Ab	8 (11.3%)
Not tested	4 (5.6%)

Thymectomy	
Yes	28 (39.4%)
No	43 (60.6%)
Thymus HPE (N=28)	
Thymoma	14 (50.0%)
Thymic hyperplasia	5 (17.9%)
Thymic atrophy/involuted thymus	3 (10.7%)
Normal thymus	6 (21.4%)

AChR, acetylcholine receptor; HPE, histopathological examination; MGFA, Myasthenia Gravis Foundation of America; MuSK, muscle specific kinase

of patients achieved a PASS 'Yes' response, with a mean SSQ of 73.5±22.4% (Figure 1a). The mean scores for MG-ADL, MG-QOL15R and MGCS were 2.5±2.7, 6.5±6.6 and 2.1±2.8, respectively.

When we compared the demographics and disease characteristics with the PASS response, none of the variables were significant except for race (Table 3). We found that significantly more Chinese patients (81.3%) achieved a PASS 'Yes' response compared to non-Chinese patients (p=0.001), while more Indians patients (26.1%) achieved a PASS 'No' response compared to non-Indians (p=0.006).

In terms of outcome measures, MG patients who responded with PASS-positive scored significantly higher on the SSQ compared to PASS-negative patients (80.4±19.0% vs 59.1±22.4%, p<0.001) (Table 4). Conversely, the same group of patients scored lower on the MG-ADL (3.9±3.4 vs 1.8±2.0, p=0.011) and MG-QOL15R (11.2±7.3 vs 4.3±4.8, p<0.001) compared to the PASS-negative group. There were no significant differences in MGCS or MGFA between the PASS-positive and PASS-negative groups.

We found significant correlations between SSQ and other clinical evaluation scales: moderate correlations with MG-ADL (r=–0.53, p<0.001) and MG-QOL15R (r=–0.40, p=0.001), and a weak correlation with MGCS (r=–0.39, p=0.001) (Figure 1c-d). SSQ scores were also significantly higher (p=0.004) in patients with MGFA Class 0 to II and lower in those with MGFA Class III (Figure 2).

PASS threshold for SSQ and other outcome measures are displayed in Table 5. An SSQ of ≥62.5%, MG-ADL of ≤3.5, MG-QOL15R of ≤6.5 and MGCS of ≤2.0 were the threshold for achieving a PASS 'Yes' response, with fair AUC values (0.620-0.788) and sensitivities (62.5-89.6%) (Figure 3).

Table 2: Assessment of the outcome measures

Parameter	N (%) / Mean ± SD
PASS	
No	23 (32.4%)
Yes	48 (67.6%)
SSQ (%)	73.5 ± 22.4
MG-ADL	2.5 ± 2.7
MG-QOL15R	6.5 ± 6.6
MGCS	2.1 ± 2.8
MGFA (at assessment)	
0	31 (43.7%)
I	30 (42.3%)
II A	1 (1.4%)
II B	6 (8.5%)
III A	2 (2.8%)
III B	1 (1.4%)
IV A	0 (0%)
IV B	0 (0%)
V	0 (0%)

PASS, patient acceptable symptom state; SSQ, single simple question; MG-ADL, Myasthenia Gravis Activity of Daily Living; MGCS, the 10 items myasthenia gravis composite scale; MGFA, Myasthenia Gravis Foundation of America; MG-QOL15R, the 15 items Myasthenia Gravis Quality of Life 15 revised

DISCUSSION

Our results demonstrate that the two different patient reported outcomes, PASS and SSQ, are closely associated, as predicted. A cut-off point of ≥62.5% on the SSQ predicts a PASS-positive response with high sensitivity. We also found that, aside from the SSQ, patient-reported MG-ADL and MG-QOL15R had an impact on the PASS response, while physician-derived MGCS and MGFA did not. Other demographic factors, except for races, and disease-related factors did not influence the PASS response.

One-third of our MG patients did not achieve an acceptable symptom state, consistent with previous studies.[14-16] In this study, none of the demographic factors including age, gender,

Table 3: Comparison of demographic and clinical characteristics with PASS

	PASS [N (%) / Mean ± SD]		*P*-value
	No (N=23)	**Yes (N=48)**	
Age (years)	57.4 ± 14.3	57.9 ± 16.0	0.911
Sex			0.579
Female	15 (65.2)	28 (58.3)	
Male	8 (34.8)	20 (41.7)	
Race			**0.008**
Malay	6 (26.1)	6 (12.5)	
Chinese	10 (43.5)	39 (81.3)	
Indian	6 (26.1)	2 (4.2)	
Others	1 (4.3)	1 (2.1)	
Education level			0.728
No formal education	1 (4.3)	1 (2.1)	
Primary	2 (8.7)	7 (14.6)	
Secondary	11 (47.8)	26 (54.2)	
Tertiary	9 (39.1)	14 (29.2)	
Marital status			0.859
Single	4 (17.4)	10 (20.8)	
Married	16 (69.6)	33 (68.8)	
Divorced	1 (4.3)	3 (6.3)	
Widower	2 (8.7)	2 (4.2)	
Employment status			0.425
Employed	8 (34.8)	13 (27.1)	
Unemployed	4 (17.4)	15 (31.3)	
Retired	11 (47.8)	18 (37.5)	
Student	0 (0)	2 (4.2)	
Presence of comorbidities	8 (34.8)	27 (56.3)	0.090
Duration of disease (years)	9.7 ± 12.2	12.2 ± 10.2	0.365
Disease type			0.241
Ocular MG	12 (52.2)	18 (37.5)	
Generalised MG	11 (47.8)	30 (62.5)	
Age of onset (years)	47.7 ± 16.6	45.7 ± 17.3	0.634
Early-onset MG (<50)	8 (34.8)	28 (58.3)	0.063
Late-onset MG (≥50)	15 (65.2)	20 (41.7)	
Positive AChR Ab	18/19 (94.7)	38/45 (84.4)	0.255
Thymectomy	7 (30.4)	21 (43.8)	0.283
History of thymoma	3/7 (42.9)	11/21 (52.4)	0.663

AChR, acetylcholine receptor; PASS, patient acceptable symptom state

education level, marital status, employment status or medical comorbidities were associated with the PASS response, in keeping with previous studies.[14-16] However, we did observe a significant difference in PASS outcomes between races: Chinese patients were more likely to report a PASS-positive response while Indian patients were more likely to report a PASS-negative response. This difference could be due to variations in sociocultural backgrounds, psychological sensitivities, expectations or biological responses to disease.

We also found no significant association between disease-related factors such as disease duration, age of onset, MG type, antibody status, thymectomy or thymic pathology, and the PASS response. This is consistent with earlier studies.[14,15] However, PASS status was significantly associated

Table 4: Comparison of outcome measures with PASS

	PASS [N (%) / Mean ± SD]		*P*-value
	No (N=23)	**Yes (N=48)**	
SSQ (%)	59.1 ± 22.4	80.4 ± 19.0	**<0.001**
MG-ADL	3.9 ± 3.4	1.8 ± 2.0	**0.011**
MG-QOL15R	11.2 ± 7.3	4.3 ± 4.8	**<0.001**
MGCS	3.1 ± 3.5	1.6 ± 2.2	0.065
MGFA (at current)			0.107
0	8 (34.8)	23 (47.9)	
I	9 (39.1)	21 (43.8)	
II A	0 (0)	1 (2.1)	
II B	4 (17.4)	2 (4.2)	
III A	2 (8.7)	0 (0)	
III B	0 (0)	1 (2.1)	

PASS, patient acceptable symptom state; SSQ, single simple question; MG-ADL, Myasthenia Gravis Activity of Daily Living; MGCS, the 10 items myasthenia gravis composite scale; MGFA, Myasthenia Gravis Foundation of America; MG-QOL15R, the 15 items Myasthenia Gravis Quality of Life 15 revised

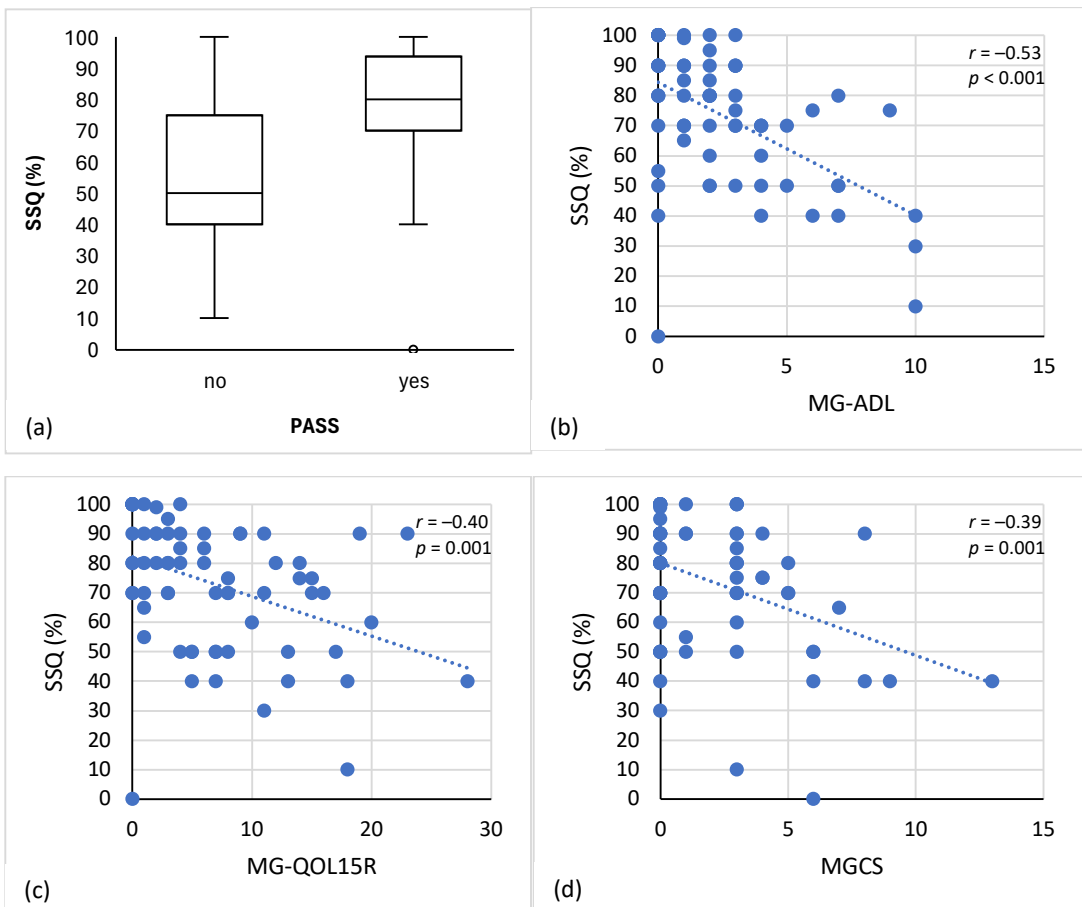

Figure 1. Comparison and correlation analysis of SSQ vs PASS, MG-ADL, MGQOL-15R and MGCS.

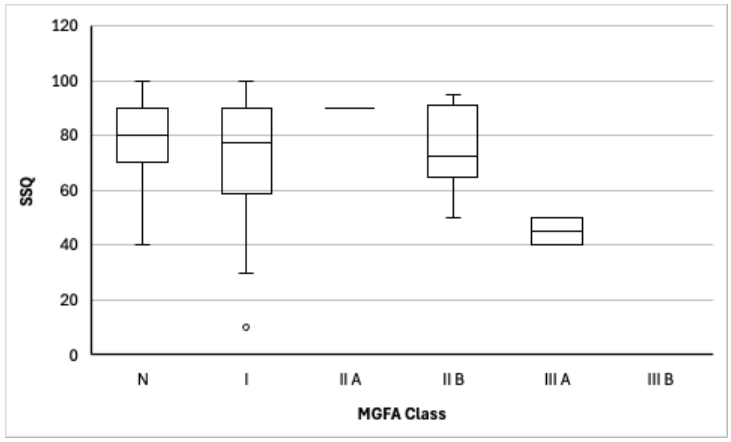

Figure 2. Comparison of MGFA classes with SSQ

with patient-reported outcomes, specifically SSQ, MG-ADL and MG-QOL15R scores. By using PASS, we aimed to explore underlying dissatisfaction by simultaneously evaluating a range of MG-specific outcomes in 71 MG patients. Our findings reveal that dissatisfaction is related to disease severity and lower MG-related quality of life. In contrast, physician-reported measures (MGCS and MGFA) did not correlate with PASS, which diverges from earlier studies where these measures were also significant.[14,16] This discrepancy may be due to our sample size and study design, larger studies might yield different results.

We found the SSQ to be a valid patient-reported outcome that moderately correlates with MG-ADL and MG-QOL15R, and weakly with MGCS in this study. These findings are consistent with previous study that demonstrated correlations between SSQ and other clinical outcome measures like the Quantitative Myasthenia Gravis Score (QMGS), Myasthenia Gravis Impairment Index (MGII) and MG-QOL15.[13] The SSQ can easily be administered during routine follow-ups and offer a holistic view of how MG impacts daily life and mental well-being, allowing physicians to tailor management plans to individual needs. Recognising patient perceptions is essential for improving compliance, health outcomes and patient satisfaction.[12] Although SSQ correlates with clinical outcome measures, it cannot entirely replace assessment like MG-ADL and MG-QOL15R, which evaluate the functional impact of MG in more specific areas. SSQ's subjectivity can be influenced by factors such as sociocultural background, financial status, educational level, mental health and medication side effects.

The MGCS had a weak correlation with SSQ, likely because MGCS includes both patient-reported symptoms and physician assessments. Another explanation could be the relatively small sample size, which warrant further investigation. In our study, SSQ, MG-ADL and MG-QOL15R were better predictors of patient satisfaction than clinician-derived measures like MGCS and MGFA, highlighting the importance of subjective, patient-reported evaluations in MG.[12] Objective physician assessments may not always align with patient's perception, as demonstrated in our ROC analysis, where SSQ (AUC=0.778)

Table 5: PASS thresholds for the outcome measures

	AUC (95% CI)	PASS threshold	Specificity (%)	Sensitivity (%)	P-value
SSQ (%)	0.778 (0.655-0.901)	≥62.5	60.9	89.6	**<0.001**
MG-ADL	0.675 (0.528-0.823)	≤3.5	52.2	87.5	**0.017**
MG-QOL15R	0.788 (0.670-0.907)	≤6.5	73.9	75.0	**<0.001**
MGCS	0.620 (0.474-0.767)	≤2.0	56.5	62.5	0.102

AUC, area under the curve; PASS, patient acceptable symptom state; SSQ, single simple question; MG-ADL, Myasthenia Gravis Activity of Daily Living; MGCS, the 10 items myasthenia gravis composite scale; MG-QOL15R, the 15 items Myasthenia Gravis Quality of Life 15 revised

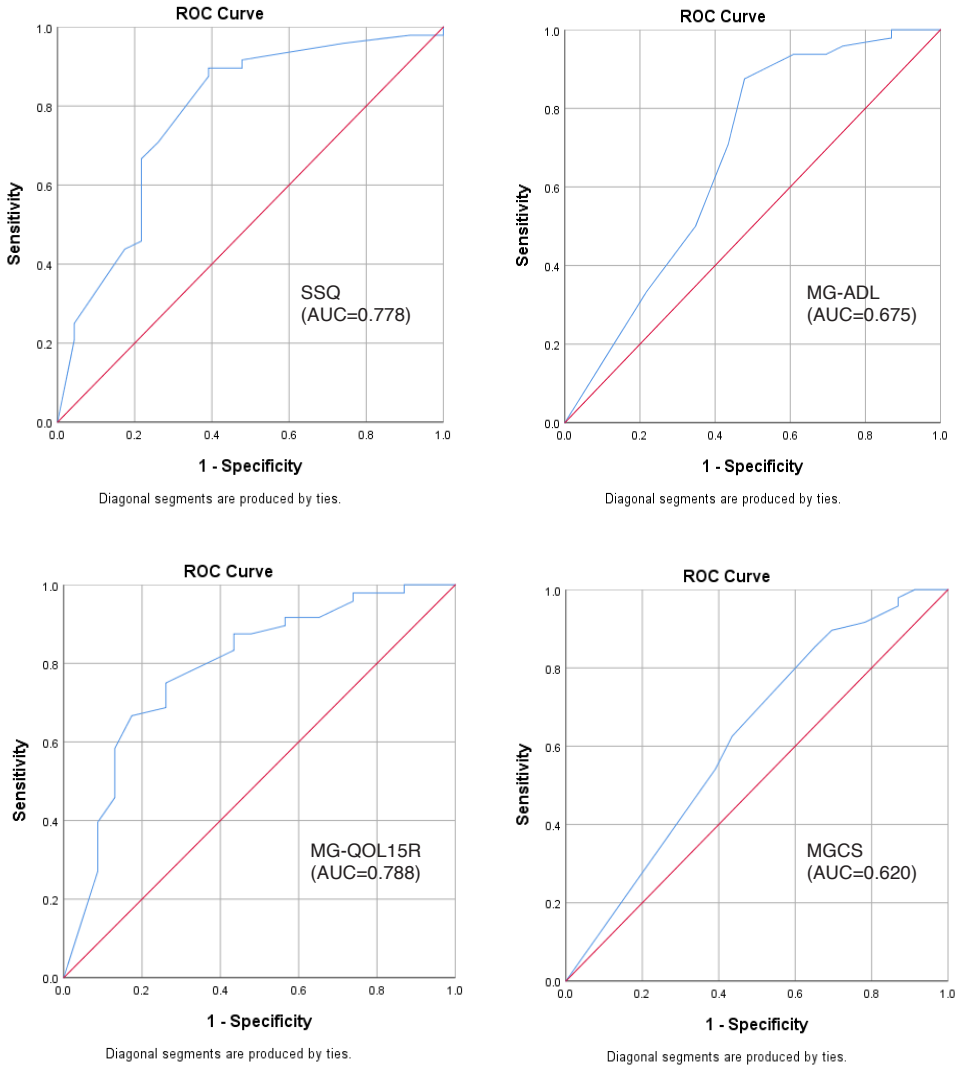

Figure 3. ROC analysis of the SSQ, MG-ADL, MG-QOL15R and MGCS with the PASS-positive status

predicted PASS responses more strongly than MGCS (AUC=0.620) (Figure 3).

As expected, we found a strong association between SSQ and PASS, with an SSQ of ≥62.5% predicting a positive PASS response with high sensitivity (90%). Patients who were satisfied with their disease state consistently reported higher SSQ scores compared to those who were dissatisfied. This finding aligns with other study showing a close relationship between SSQ and PASS.[15]

In one retrospective validation cohort, PASS responses were used to determine cut-off scores for MG-ADL, MG-QOL15 and MGCS.[14] Although our cohort was similar in terms of demographics, clinical characteristics and the proportion of PASS-negative patients, our cut-off points for MG outcome measures differed from previous studies. This may be due to cultural differences or variations in study design, as our study was cross-sectional, whereas previous studies were retrospective.[14,15] The PASS-SSQ cut-offs reported here may be influenced by sociocultural and demographic factors not assessed in this study. Patient expectations, adaptability, education and economic factors may affect their responses. PASS is more apt for assessing patient satisfaction, while SSQ evaluate a patient's overall disease status at each visit.

This study has several limitations. One major limitation is the small sample size of 71 patients, drawn from a single centre. As a result, the findings may not be generalisable to MG populations in other centres. Future studies with larger sample

sizes are needed to address this limitation and further validate our results. Another potential limitation is the possibility of examiner bias in framing the questions, whereby patients' responses to PASS may not be related to disease severity but rather to other factors, such as adverse effects of treatment. The adverse effects of treatment were not assessed in this study, which may have contributed to some patients' dissatisfaction. Additionally, we did not investigate the role of sociocultural factors, which could influence a patient's perception of their disease status, and thus the SSQ cut-off threshold may not be applicable to different populations. This study also did not account for comorbidities as confounding factors, which could have affected how patients scored their SSQ, MG-ADL and MG-QOL15R. Patients with multiple comorbidities might struggle to isolate symptoms specifically caused by MG when rating their quality of life, potentially leading to lower overall patient-reported scores. Furthermore, due to the cross-sectional design of the study and the lack of a clear threshold between good and poor SSQ scores, the SSQ is most useful when comparing an individual's current score to their previous scores, to track symptom improvement or deterioration over time. Lastly, recall bias in prior patient responses was not considered, as it may render the current score a relative rather than an absolute measure of their present disease status.

Patient-reported outcomes are essential in the assessment of MG.[20,21] Both PASS and SSQ are concise yet comprehensive tools that capture different aspects of the MG disease state, and they have been validated in previous studies. By using a combination of patient-reported and clinician-derived outcome measures, we were able to examine PASS status from a more holistic perspective. The PASS question is a valuable tool for assessing patient satisfaction during follow-up visits, while the SSQ offers insight into the overall impact of MG on daily functional status, expressed as a percentage. Future studies should incorporate both tools to evaluate treatment outcomes or to investigate the minimal clinically important difference (MCID) that is meaningful to patients.

In conclusion, one-third of the MG patients in this study reported dissatisfaction with their current symptom state. These patients experienced more severe MG symptoms and lower MG-related quality of life but were otherwise similar to the rest in terms of demographics and disease status. Interestingly, there were differences in the perception of disease status among different racial groups. The findings suggest that a broader perspective, beyond focusing solely on objective symptoms and treatment is crucial in understanding the underlying causes of dissatisfaction. In this context, the PASS question and SSQ could serve as useful, easy-to-use tools for routine assessment of MG patients.

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DISCLOSURE

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REFERENCES

1. Gilhus NE, Verschuuren JJ. Myasthenia gravis: Subgroup classification and therapeutic strategies. *Lancet Neurol* 2015;14:1023-36. doi: 10.1016/S1474-4422(15)00145-3
2. Thomsen JLS, Andersen H. Outcome measures in clinical trials of patients with myasthenia gravis. *Front Neurol* 2020;11:596382. doi: 10.3389/fneur.2020.596382
3. Meriggioli MN, Sanders DB. Autoimmune myasthenia gravis: emerging clinical and biological heterogeneity. *Lancet Neurol* 2009;8:475-90. doi: 10.1016/s1474-4422(09)70063-8
4. Burns TM. The best of both worlds: using patient-reported plus physician-scored measures during the evaluation of myasthenia gravis. *Muscle Nerve* 2016;53:3-4. doi: 10.1002/mus.24953
5. Muppidi S, Wolfe GI, Conaway M, Burns TM, MG Composite and MG-QOL15 Study Group. MG-ADL: still a relevant outcome measure. *Muscle Nerve* 2011;44:727-31. doi: 10.1002/mus.22140
6. Barnett C, Katzberg H, Nabavi M, Bril V. The Quantitative Myasthenia Gravis Score: comparison with clinical, electrophysiological, and laboratory markers. *J Clin Neuromuscul Disord* 2012;13:201-5. doi: 10.1097/cnd.0b013e31824619d5
7. Burns TM. The MG composite: An outcome measure for myasthenia gravis for use in clinical trials and everyday practice. *Ann N Y Acad Sci* 2012;1274:99-106. doi: 10.1111/j.1749-6632.2012.06812.x
8. Barnett C, Bril V, Kapral M, Kulkarni A, Davis AM. Development and validation of the Myasthenia Gravis Impairment Index. *Neurology* 2016;87:879-86. doi: 10.1212/WNL.0000000000002971
9. Wolfe GI, Herbelin L, Nations SP, Foster B, Bryan WW, Barohn RJ. Myasthenia gravis activities of daily living profile. *Neurology* 1999;52:1487-9. doi: 10.1212/wnl.52.7.1487

10. Burns TM, Sadjadi R, Utsugisawa K, *et al*. International clinimetric evaluation of the MG-QOL15, resulting in slight revision and subsequent validation of the MG-QOL15r. *Muscle Nerve* 2016;54:1015-22. doi: 10.1002/mus.25198
11. Jaretzki A, Barohn RJ, Ernstoff RM, *et al*. Myasthenia gravis: recommendations for clinical research standards: Task Force of the Medical Scientific Advisory Board of the Myasthenia Gravis Foundation of America. *Neurology* 2000;55:16-23. doi: 10.1212/wnl.55.1.16
12. Gilhus NE, Verschuuren JJGM, Hovland SIB, Simmonds H, Groot F, Palace J. Myasthenia gravis: do not forget the patient perspective. *Neuromuscul Disord* 2021;31:1287-95. doi: 10.1016/j.nmd.2021.07.396
13. Abraham A, Breiner A, Barnett C, Katzberg HD, Bril V. The utility of a single simple question in the evaluation of patients with myasthenia gravis. *Muscle Nerve* 2018;57:240-4. doi: 10.1002/mus.25720
14. Mendoza M, Tran C, Bril V, Katzberg HD, Barnett C. Patient-acceptable symptom states in myasthenia gravis. *Neurology* 2020;95:e1617-28. doi: 10.1212/wnl.0000000000010574
15. Menon D, Barnett C, Bril V. Comparison of the single simple question and the patient acceptable symptom state in myasthenia gravis. *Eur J Neurol* 2020;27:2286-91. doi: 10.1111/ene.14397
16. Andersen LK, Jakobsson AS, Revsbech KL, Vissing J. Causes of symptom dissatisfaction in patients with generalized myasthenia gravis. *J Neurol* 2022;269:3086-93. doi: 10.1007/s00415-021-10902-1
17. Tan JY, Tan CY, Gengadharan RN, Shahrizaila N, Goh KJ. Clinical characteristics and outcomes of generalized myasthenia gravis in Malaysia: A single-center experience. *J Clin Neurol* 2024;20:412-21. doi: 10.3988/jcn.2023.0285
18. Mohd Thabit A, Rosli N, Solehan H, *et al*. Validation study of the Malay version of the Myasthenia Gravis Quality of Life (MGQOL)15 and Myasthenia Gravis Activities of Daily Living (MGADL) questionnaires. *Neurol Asia* 2016;21:33-9.
19. Schober P. Correlation coefficients: appropriate use and interpretation. *Anesth Analg* 2018;126(5):1763-8. doi: 10.1213/ane.0000000000002864
20. Barnett C, Herbelin L, Dimachkie MM, Barohn RJ. Measuring clinical treatment response in myasthenia gravis. *Neurol Clin* 2018;36:339-53. doi: 10.1016/j.ncl.2018.01.006
21. Meisel A, Saccà F, Spillane J, Vissing J; MG Collegium Sub-committee. Expert consensus recommendations for improving and standardising the assessment of patients with generalised myasthenia gravis. *Eur J Neurol* 2024;31:e16280. doi: 10.1111/ene.16280