Original Article

# Clinical Profile and Quality of Life in Myasthenia Gravis Using MGQOL15 R(Hindi): An Indian Perspective

**Ganeshgouda Majigoudra, Ashish K. Duggal, Debashish Chowdhury, Arun Koul, Vineet K. Todi, Sujata Roshan**

Department of Neurology, Govind Ballabh Pant Postgraduate Institute of Medical Education and Research, New Delhi, India

## Abstract

**Background:** Myasthenia Gravis (MG) is a chronic fluctuating illness, due to the dysfunction of neuromuscular junction which is autoimmune in nature. The disease severely affects the Quality Of Life (QOL). **Objective:** The primary objective of our study was to assess the QOL in patients with MG using Short Form 36 (SF 36) and MGQOL 15 R (Hindi translated).The secondary objective was to assess the correlation of age, sex, illness duration, clinical characteristics, severity, and treatment with the QOL in MG patients. **Methodology:** A cross sectional study of 55 MG patients was done to analyse and evaluate the clinical status using Hybrid Myasthenia Gravis Foundation of America (HMGFA), Myasthenia gravis composite score (MGCS) and The Myasthenia Gravis Activities of Daily Living (MG – ADL). QOL was assessed by SF 36 and Hindi version of Myasthenia Gravis Quality of Life 15 – Revised (MG-QOL15R) score. **Results:** 78.2% patients had generalized MG. The mean MGC and MG-ADL scores were 5.27 and 3.29 (95% CI: 2.24 -4.34) respectively. The mean MGQOL15R score was 6.52 ± 7.7 and the score correlated with the symptoms. The SF 36 scores were the best and the worst in the bodily pain (93.72 ± 13.52) and general health subset (61.81 ± 39.64) respectively. Except for steroid dose, there was no significant correlation between SF36 and other factors. **Conclusion:** QOL in MG was found to be affected due to the disease. The MGQOL 15 R scores correlated with the clinical features, remission or active status, steroid use and thymectomy. No Significant association was observed between MG QOL scores and various lab parameters and repetitive nerve stimulation (RNS) test results. Higher dose of steroid was associated with poor QOL, while thymectomy was associated with better QOL scores. MGQOL15R (Hindi) is a quick and simple tool to assess the QOL in MG patients.

**Keywords:** MG ADL, MG composite score, MGQOL15R score(Hindi), QOL in myasthenia, SF 36

## Introduction

Myasthenia Gravis (MG) is characterized by fatigable and fluctuating weakness of the skeletal muscles due to the dysfunction of the neuromuscular junction.[1] Diagnosis is made on the basis of clinical features, serology, and electrophysiological studies. Anticholinesterases and immune modulation are the standard treatment modalities.

The disease severely affects the Quality Of Life (QOL), and studies in the past have found the same.[2] Burns *et al*.[3] established the usefulness of the MG-QOL15 for individuals with MG. QOL is determined by health-related factors (physical, functional, emotional, and mental well-being) and non–health-related factors (jobs, family, friends, spirituality, and other life circumstances). Health-related QOL (HRQOL) is more narrowly defined than global QOL. It is important to note that some items in QOL scales are designed to measure the "symptom impact" of a disease, whereas other items are designed to measure the impact of the disease on certain life domains. QOL scale scores can usually be sum-mated as a total score and sometimes be broken into meaningful sub-scores that assess specific domains.

A particular challenge is the fluctuating nature of the disease, which makes a reliable assessment of the disease status difficult. Several scales have been used to properly assess the therapeutic response. These scales measure disease severity (MGC), disability due to the disease (MG – ADL), and the quality of life (SF- 36, MG-QOL) in patients with MG. It is essential to realize that improvement in disease severity may not translate into good QOL because various other factors like drugs and social stigma may also impact the QOL. The degrees of clinical disability are heterogeneous; hence, clinical scores should cover the entire spectrum ranging from mild to severely affected cases. MG-QOL15 is administered to patients with MG because it provides real-time information about a patient's estimate of his or her MG-related dysfunction and the tolerability of that dysfunction. The present study was undertaken to evaluate the clinical profile and its association with quality of life in patients with myasthenia gravis using the MGQOL15 R. The MGQOL15 R version used in this

**Address for correspondence:** Dr. Sujata Roshan, Department of Neurology, Academic Block, Room No. 501, Govind Ballabh Pant Postgraduate Institute of Medical Education and Research, New Delhi - 110 002, India.
E-mail: drsujataroshan@gmail.com

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study was translated and validated in Hindi using standard international guidelines.

## Material and Methods

The present study was a hospital-based cross-sectional observational study, carried out at a tertiary care teaching institute in North India, New Delhi. Fifty-five patients with a diagnosis of myasthenia gravis attending the Neuromuscular Clinic, Neurology OPD, Wards, and emergency were included. The study period was from July 2020 to December 2021.

We included patients of MG, who were clinically stable, >18 years of age diagnosed as per the following criteria: Fluctuating weakness of ocular, bulbar, or limb girdle muscles along with the presence of any two of the following three criteria[4] a) positive decremental response on slow RNS b) positive Neostigmine test c) positive AChR or MusK Antibodies. Mandatory exclusion was a) acute myasthenia crisis and b) Lambert Eaton Myasthenic syndrome.

All the patients underwent detailed history taking and clinical examination which was recorded on a pre-designed proforma with specific emphasis on clinical presentation, duration of MG, number of respiratory "crisis," current and worst HMGFA grade, serology, electrophysiology, thymus status, and treatment. The clinical status was assessed using these scales (1) Hybrid Myasthenia Gravis Foundation of America (HMGFA) which has 5 classes: pure ocular (class I), Class (II-IV) mild, moderate and severe generalized, and intubation/myasthenic crisis (class V). Further, the sub-classes are A for predominantly generalized or class B for Bulbar,[5] (2) Myasthenia gravis composite score (MGCS) which measures the MG severity and is composed of 10 items, 4 of which are reported by the patient. The total score ranges from 0 (no symptoms) to 50 (maximum symptoms). It has an excellent test–retest reliability of close to 100%[6] (3) The Myasthenia Gravis Activities of Daily Living (MG – ADL) scale: It is a patient-reported scale which combines 2 items on daily life activities— the ability to brush teeth or comb hair, and limitations in the ability to rise from a chair. There are 6 items reflecting other MG symptoms: diplopia, ptosis, chewing, swallowing, voice/speech problems, and respiratory symptoms. The scores range from 0 to 24, with higher scores indicating severity. It has high test-retest reliability and good construct validity when correlated with other scales for severity.[7] The Quality of Life in these patients was measured using a non – disease-specific quality of life questionnaire – Short Form 36 which is a patient-reported survey, consisting of 36 items organized into eight domains. The standardized means for the Physical and Mental components are not reported in the Indian population, henceforth these parameters were not reported in the present study. Apart from evaluating individual patients' health status it is also successfully used for research purposes, evaluating the cost-effectiveness of a treatment, monitoring, and comparing disease burden.[8,9] A free version of SF 36 is available from Rand Health Care which was used in the study. We also applied myasthenia gravis-specific quality of life questionnaire – Myasthenia Gravis Quality of Life 15 – Revised (MG-QOL15R) which is a shortened version of MG-QOL60. The revised version retained the 15 items with some minor changes in the form of adding psychometric parameters. Changes were made in item no 2 which was reworded to add diplopia to improve the specificity of the item. In item no 8, work at home was added to reflect activity beyond occupational work which is particularly important for students and homemakers. Changes were also made in item no 10 to include loss of independence due to inability to drive or to shop and run other errands. The MGQOL15 R measures scores ranging from 0 to 30 with higher scores indicating worse HRQOL.[9] Furthermore, the Correlation and association of various disease demographics, symptoms, and treatment modalities with quality of life were done. This study used the Hindi-translated version of the MG-QOL15R. The translation process was done as per the published international guidelines,[10] The steps were 1) Preparation: two neurologists and two bilingual professionals 2) Forward translation- was performed by a bilingual teacher and a neurologist fluent in Hindi and English, two independent Hindi versions of original MG-QOL 15 (R) were prepared. 3) Reconciliation: The discrepancies, were addressed by a third neurologist who was not involved in the forward translation. 4) Back translation: The final Hindi language version was re-translated back to English by another bilingual teacher and 5) Back translation review: which compared the translated version with the original English version of MG- QOL – R to look for any inconsistencies. 6) Cognitive debriefing review results and finalization. 7) Proofreading: after proofreading the final version was used in the study population to assess the QOL.

### Statistical analysis

MS Excel 2016 was used for data entry and data analysis was done using SPSS (Statistical Package for Social Sciences) version 22.0. Quantitative and qualitative variables were expressed as mean and proportions, respectively. Differences in proportions was tested for statistical significance using the chi square test. Tests of normality were done for continuous variables to determine normal distribution. Wilcoxon signed rank test was carried out to test the difference in means of the paired samples that are not normally distributed. Correlations between two variables were assessed using the Pearson correlation coefficient if the data fit bi-variate normal distribution or the Spearman correlation coefficient if the data was not normally distributed. A correlation coefficient of 0.7 to 0.9 was defined as a high correlation, 0.5 to 0.7 as moderate, and 0.3 to 0.5 as low correlation.

### Ethical considerations

Informed written consent was obtained from all patients before including them in the study. Institute ethical committee clearance was sought and obtained prior to the commencement of the study.

## Observation and Results

Demographic profile: The baseline demographic profile and clinical characteristics are summarized in Table 1.

Clinical assessment scales (A) MGFA Classification: Forty-seven percent of patients were in remission at the time of evaluation 22: pharmacological remission, 3: minimal manifestation status; 1: complete remission. Twelve patients (21.8%) had ocular and 78.2% of patients had generalized myasthenia gravis. (B) MG composite score: The mean MG composite score at baseline was 5.27 (95% CI: 3.38-7.17). (C) MG-ADL score: The mean MG-ADL score in the study population was 3.29 (95% CI: 2.24 -4.34). The minimum MG – ADL at the initial visit was 0 and the maximum was 14. Quality of Life scales a) SF 36: The scores in various subsets are presented in Table 2. The scores were best in the bodily pain subset (93.72 ± 13.52) and worst in the general health (GH) subset (61.81 ± 39.64) b) MGQOL15R Hindi: The mean score of the study population was 6.52 ± 7.7. When stratified as per HMGFA grades remission/I/II/III/IV scores were: 1.9 ± 1.7/3.5 ± 1.7/10.9 ± 7.6/20 ± 3.6/25 ± 2.8. The Item "I am frustrated by my MG" had the maximum mean scores in the study population. It was also the most reported item (76.4%) followed by "Trouble using my eyes" which affected the quality of life with 56.2% of patients reporting difficulty with this item. Fifteen percent of patients felt that "occupational skills and job status" have been negatively affected by their disease to some extent. Correlation of MGQOL 15R Hindi with various disease and treatment factors yielded the following findings: Symptoms such as diplopia, bulbar symptoms, limb weakness, etc. had a significant association with poorer scores on MGQOL15R Hindi. There was no association between gender, age of onset, thyroid status, presence of thymoma, antibody status, presence of myasthenic crisis, and various medications. The scores were significantly better in the thymectomy as compared to the non-thymectomy group. The duration of thymectomy (from thymectomy to the current evaluation) did not have a correlation with QOL (correlation coefficient of -0.166, $P = 0.4495$). Steroids dosage had a moderate positive correlation with MGQOL15R Hindi scores (coefficient of 0.540 ($P < 0.0001$) and a coefficient of determination (r2) = 0.38 [Table 3]. Effect of disease and treatment factors on SF 36 scores revealed as follows: When correlation of various factors was done with physical domains (PF, PH, BP, SF, and GH) we found no significant correlation between various factors and SF36 scores on these domains except for the steroid dose. Steroid dose had a negative correlation between PH scores (r = -0.54, $P < 0.001$) and bodily pain (r = -0.537, *P*–value <0.001). Role limitation due to physical health and bodily pain had a significant association with MG composite scores ($P < 0.001$) and Hybrid MGFA scale ($P < 0.001$). No significant correlation was seen with other drugs (azathioprine and MMF) across these five domains.

**Table 1: Baseline demographic data**

| Features | Values |
|---|---|
| Mean age in years | 34±15.2 |
| Below 45 years | 67.3% |
| Above 45 years | 22.7% |
| Sex (F: M) | F (48%) |
| Mean delay in diagnosis in months | 3 |
| Ptosis | 30.9% |
| Diplopia | 34.5% |
| Bulbar | 10.9% |
| Limb girdle | 25.5% |
| Ocular MG | 12.7% |
| Generalized MG | 87.2% |
| Decremental RNS | 85.5% |
| AChR Antibodies | 87.3% |
| MUSK Antibodies | 5.45% |
| Thyroid status | |
| Hypothyroid | 18.2% |
| Hyperthyroid | 1.8% |
| Thymectomy | 41.8% |
| HPE Thymus | |
| Thymoma | 78.3% |
| Thymic hyperplasia | 21.7% |
| Treatment (Drugs) | |
| Pyridostigmine | 92.7% |
| Steroids | 81.7% |
| Other | 67.3% |

## Discussion

In the present study, we evaluated the clinical features of MG in the Indian population, attending a tertiary care university

**Table 2: Summary statistics of scores obtained on various subsets of SF 36 at initial visit**

| SF 36 parameter | Mean±SD | Median (IQR) | Minimum | Maximum |
|---|---|---|---|---|
| Physical Functioning (PF) | 83±27.99 | 100 (80 – 100) | 20 | 100 |
| Role Physical (RP) | 77.3±41.7 | 100 (0) | 0 | 100 |
| Bodily pain (BP) | 93.72±13.52 | 100 (0) | 55 | 100 |
| General health (GH) | 61.81±39.64 | 85 (20 – 95) | 0 | 100 |
| Emotional Well-Being/Mental Health (MH) | 76.72±28.13 | 88 (60-100) | 4 | 100 |
| Role Emotional (RE) | 77.57±40.60 | 100 (66.7-100) | 0 | 100 |
| Energy Fatigue/Vitality (EF) | 74±30.4 | 85 (65 – 100) | 5 | 100 |
| Social Functioning (SF) | 75.45±29.85 | 87.5 (62.5 – 100) | 0 | 100 |
| Health Change (HC) | 64.54±44.27 | 100 (0 – 100) | 0 | 100 |

**Table 3: Association between baseline characteristics and initial MGQOL (*n*=55)**

| Characteristics | Initial MG QOL | | *P* |
|---|---|---|---|
| | Mean | SD | |
| Age (in years) – Pearson Correlation Coefficient=-0.021, *P*=0.878 | | | |
| 15-30 | 6.2 | 8.0 | 0.677* |
| 31-45 | 8 | 9.2 | |
| 46-60 | 5.3 | 6.3 | |
| >60 | 7.5 | 7.6 | |
| Sex | | | |
| Male | 6 | 7.2 | 0.798# |
| Female | 7.1 | 8.5 | |
| Onset age - Pearson Correlation Coefficient=0.010, *P*=0.941 | | | |
| <15 years | 9.5 | 13.4 | 0.712* |
| 16-30 years | 5.8 | 8.0 | |
| 31-45 years | 9.5 | 8.3 | |
| 46-60 years | 4.7 | 5.8 | |
| >60 years | 4 | 3.6 | |
| Steroid dose - Pearson Correlation Coefficient=0.613, *P*<0.001 | | | |
| Azathioprine | 7.1 | 8.6 | 0.972# |
| Mycophenolate | 5.6 | 6.1 | |
| Thymoma patients | 7.2 | 9.0 | 0.761# |
| Myasthenia crisis | 9.2 | 8.6 | 0.160# |
| AChR status – Positive | 6.6 | 8.0 | 0.776# |
| Ptosis | 12.4 | 8.6 | <0.001# |
| Double Vision | 10.1 | 8.9 | 0.001# |
| Chewing Difficulty | 19 | 5.9 | <0.001# |
| Speaking Difficulty | 17.4 | 8.3 | <0.001# |
| Nasal Twang | 21.2 | 3.8 | <0.001# |
| Swallowing Difficulty | 16.5 | 6.1 | 0.001# |
| Limb Weakness | 17.8 | 6.3 | <0.001# |
| Hypothyroid | 5.8 | 7.2 | 0.228# |
| Decremental RNS | 6.6 | 7.8 | 0.842# |

hospital and assessed the QOL and factors affecting QOL in these patients using the SF 36 and translated Hindi MGQOL 15R.

MG is classically believed to be a disease of young women and older men. In the present study, the peak age of onset for the females was in the 3rd decade, while males had bimodal onset (first in the 2-3rd decade and other in 5th decade). A large retrospective cohort reported in the past had similar observations except that males had 6-7th decade onset.[11] This however contrasted with other studies which reported 3rd or 4th decade onset irrespective of gender.[12-15] Overall, it is believed that the age of onset is slightly delayed in the Indian, Japanese, and Chinese population as compared to the Western population. The males marginally outnumbered the females (M:F 1.1:1) in our study which compares with the published literature.[11,13,14] This has been attributed to the fact that in India, males are more likely to seek health care or that the symptoms of easy fatigability and fluctuating weakness may be misinterpreted in females leading to a missed diagnosis. Alternatively, it is possible that the epidemiology of MG in the Indian population is indeed different.

In the present study 7 (12.7%) had ocular, 18 (32.7%) had thymomatous, 3 (5%) had Musk, 18 (32%) had early onset (age of onset <40 years) and 7 patients (12.7%) had late-onset MG (onset >50 yrs). The percentage of Ocular MG in the present study is less as compared to other studies from India (25–34%) [Singhal,[11] Ashraf[12] Chithra,[13]]. This is probably due to the small sample size of our cohort and associated referral bias since the place of study is a tertiary referral center. On the other hand, the prevalence of thymomatous MG is relatively higher in our cohort (33%). (Ashraf,[12] Chithra *et al*.,[13] Kumar *et al*.[16]), which can be due to referral bias as ours is one of the few public sector hospitals offering thymectomy. MuSK myasthenia is relatively less common.[17] and only 3 patients (5%) had MuSK myasthenia in our cohort

Ocular symptoms (ptosis and diplopia), followed by limb and bulbar symptoms were among the most common presenting complaints in our study. Ocular complaints were the most commonly reported symptoms in several other cohorts as well.[14,18,19] Saha *et al*.[19] found diurnal variation in 60% of cases. In a recent study from southern India by Vemuri *et al*.[20] ocular motor weakness was the most common presentation in 74% of the patients. Ojha R *et al*.[14] found that 95.7% of patients had ptosis and diplopia, 87% had restricted eye movements, 60.9% had nasal voice, 47.8% had dysphagia, 43.5% had limb weakness, and 21.7% had shortness of breath, concordant to the observations in the present study.

Seropositivity for AchR antibodies varies from 3% (in older studies) to 96% in more recent studies.[11,13,14,16,21-25] The present study found AChR in most of the cases (87.3%) and MuSK in 5.5% of the cases. RNS was decremental in a majority of the study participants (85.5%). The positivity rate of RNS is also quite variable in the literature, mainly because of the confounding factor of pyridostigmine use prior to RNS.[11,14,20,22,24] In the present study, as per HMGFA 47.3% were in remission, 21.8% Class I, 16% Class II, 11% had Class III and 3.6% had Class IV MG at the time of evaluation. Singhal BS *et al*.[11] their study found 26.31% of their patients had ocular myasthenia (Class I) and 73.68% had generalized myasthenia (III-IV). In the study by Byju N *et al*.[18] around fifty percent of the patients were in Class I, 36% were generalized (III-IV) and 8% were Class V.

## Quality of life in myasthenia gravis

The mean MGQOL15R Hindi scores in the present study was 6.52 ± 7.7. The mean score in the Ocular and severe generalized MG (MGFA – IV) subgroup was 3.5 ± 1.7 and 25 ± 2.8 respectively. The mean MGQOL Scores in various studies that have evaluated the quality of life compared with the present study. Few Indian studies have also used MGQOL15 to evaluate the quality of life in MG. Kumar R *et al*.[16] found that the mean MG-QoL-15 score in 50 patients with MG was 10.34 ± 9.4. When stratified according to MGFA, MGQOL15 scores in subjects with MGFA grades I, II, and III/IV were 3.54, 9.4, and 15.94, respectively. QoL scores

correlated significantly with pyridostigmine use. Age, gender, thymectomized status, thymoma, and steroid therapy did not affect QoL scores. For all patients with MGFA grades I scored "0" or "1" in almost all items of MG-QoL-15. These findings are similar to those obtained in the present study. Vemuri *et al.*[20] in their cohort of 54 patients reported a mean MGQOL15R score of 15.24. The mean scores for subjects with MGFA grade I, II, III, and IV were 5.23, 12.42, 19.67, and 27.66. They also found a good correlation of MGQOL15R scores with MGFA, QMG (r = 0.84), and MGC (r = 0.80).

In almost all studies, the item on which the highest number of patients had responded positively on item 1 – was "I am frustrated by my MG". This is a relatively generic item and it is expected that even patients with minimal motor symptoms will respond to this item. In the present study, the 2nd most commonly marked item was item 2 – related to eye problems. In other studies, also this was the 2nd most commonly marked item.

The MGQOL15R Hindi scores in the present study are lower than those observed in other studies of similar nature from different populations. However, the scores of subjects in grade MGFA I – IV in the present study are similar to other studies including Indian studies. The principal reason for this discrepancy seems to be the higher proportion of patients in remission in the present study. In the present study, 47.3% of patients were in remission which accounts for the lower MGQOL scores (better quality of life). Furthermore, this could also be related to cultural differences in answering the items on the MGQOL15R scale. Masuda *et al.*[26] found higher MGQOL15 scores in asymptomatic patients as compared to other studies, which they attributed to psychological factors and the tendency of Japanese subjects to choose extreme responses. The QOL scores in patients in remission vary widely across different studies and underpin the fact that several factors other than the severity of the disease can have an impact on QOL.

### Impact of disease and treatment factors on quality of life

A significant positive correlation was observed between MG QOL 15 R and the steroid dose prescribed to the patient. This was also evident in a study conducted by Masuda *et al.*[26] who found that steroid dose had a negative correlation with MGQOL15 scores. There can be several reasons for this. Firstly, increased steroid dose is an indirect marker of disease severity which reflects poor quality of life. Additionally, the dose of oral corticosteroids also represents a major factor associated with depressive state in MG and this could also be responsible for poor QOL. The constant need for the medication itself might also cause psychological stress, but the use of other immunosuppressants such as azathioprine and mycophenolate were not associated with poor MGQOL15R scores. Although Kumar *et al.*[16] had found a significant effect of pyridostigmine dose on MGQOL15 scores, this was not the case in the present study. Masuda[26] used a decision tree model for good QOL and found that the cut-off dose of steroids for a good quality of life was 6 mg/day. This means that all attempts should be made to decrease the dose of steroids to a minimum effective dose.

Patients who underwent thymectomy had significantly better QOL scores as compared to patients who had not undergone thymectomy. Leite *et al*.[27] found that women who had undergone thymectomy had improvement in QOL though the effect of thymectomy on QOL in males was negligible. Other factors such as age, sex, number of myasthenic crises, age of onset, and use of pyridostigmine or immunosuppressants did not have an impact on MGQOL15R scores.

The present study comprehensively evaluated demographic characteristics, clinical patterns, and QOL parameters using the Hindi-translated MGQOL15R among patients with MG. The major previous studies that have utilized this questionnaire didn't use the translated version. However, the sample size was smaller which hampered the subgroup analysis. The MG-QOL15 may also be used to follow an individual patient's MG-specific QOL over time. Furthermore, specific changes in items and sub-scores of the MG-QOL15 must be considered in the context of the individual, the setting, and the clinical status of the MG patients. MGQOL15R gives patients a voice to express themselves while limiting subjective interpretation.

## Conclusion

QOL in MG was found to be affected due to the disease. The MGQOL 15 R scores correlated with the clinical features, remission or active status, steroids, and thymectomy. No significant association was observed between MG QOL scores and various different lab parameters and RNS. The higher dose of steroids was associated with poor QOL, while thymectomy was associated with better QOL scores. MGQOL15R (Hindi) is a quick and simple tool to assess the QOL in MG patients.

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### Conflicts of interest

There are no conflicts of interest.

## References

1. Keesey JC. Clinical evaluation and management of myasthenia gravis. Muscle Nerve 2004;29:484-505.
2. Szczudlik P, Sobieszczuk E, Szyluk B, Lipowska M, Kubiszewska J, Kostera-Pruszczyk A. Determinants of quality of life in myasthenia gravis patients. Front Neurol 2020;11:553626. doi: 10.3389/fneur.2020.553626.
3. Burns TM, Grouse CK, Wolfe GI, Conaway MR, Sanders DB, MG Composite and MG-OL15 Study Group. The MG-QOL15 for following the health-related quality of life of patients with myasthenia gravis. Muscle Nerve 2011;43:14-8.
4. Murai H. Japanese clinical guidelines for myasthenia gravis: Putting into practice. Clin Exp Neuroimmunol 2015;6:21-31.
5. Baggi F, Mantegazza R, Antozzi C, Sanders D. Patient registries: Useful tools for clinical research in myasthenia gravis. Ann N Y Acad Sci 2012;1274:107-13.
6. Burns TM, Conaway MR, Cutter GR, Sanders DB. Construction of an efficient evaluative instrument for myasthenia gravis: The MG composite. Muscle Nerve 2008;38:1553-62.
7. Wolfe GI, Herbelin L, Nations SP, Foster B, Bryan WW, Barohn RJ. Myasthenia gravis activities of daily living profile. Neurology 1999;52:1487-9.

8. Laucis NC, Hays RD, Bhattacharyya T. Scoring the SF-36 in orthopaedics: A brief guide. J Bone Joint Surg Am 2015;97:1628-34.
9. Burns TM, Sadjadi R, Utsugisawa K, Gwathmey KG, Joshi A, Jones S, *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.
10. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, *et al*. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR task force for translation and cultural adaptation. Value Health 2005;8:94-104.
11. Singhal BS, Bhatia NS, Umesh T, Menon S. Myasthenia gravis: A study from India. Neurology India 2008;56:352-5.
12. Ashraf VV, Taly AB, Vasanth A, Veerendrakumar M, Rao S. Myasthenia gravis: Clinical spectrum and long term follow-up study. Ann Indian Acad Neurol 2005;8:7-13.
13. Chithra P, Iype T, Bhagya S, Geetha S. Clinical-Immunological profile of myasthenia gravis-a tertiary care centre experience. JMSCR 2017;5:20130-34.
14. Ojha R, Oli KK, Gajurel BP, Karn R, Rajbhandari R, Kharel G. Clinical profile of patients with myasthenia gravis in a tertiary center of Nepal. Nepal J Neurosci 2017;14:14-7.
15. Fatima P, Savur S. A five-year retrospective study on the clinical profile of myasthenia gravis with ocular involvement in a tertiary hospital. J Clin Diagn Res 2019;13:1-3.
16. Kumar R, Nagappa M, Sinha S, Taly AB, Rao S. MG-QoL-15 scores in treated myasthenia gravis: Experience from a university hospital in India. Neurology India 2016;64:405-10.
17. Borges LS, Richman DP. Muscle-specific kinase myasthenia gravis. Front Immunol 2020;11:707. doi: 10.3389/fimmu.2020.00707.
18. Byju N, Sajna M, Mathew D S, Biju P R. Clinical Profile of Patients with Myasthenia Gravis Admitted in a Tertiary Care Centre in India. IOSR J Dent Med Sci (IOSR-JDMS) 2021;20:53-8.
19. Saha SP, Mukherjee S, Das SK, Ganguly PK, Roy TN, Maiti B, *et al*. Clinical profile of myasthenia gravis. J Assoc Phys India 1998;46:933-6.
20. Vemuri D, Garuda BR, Gopi S, Kumar TS, Kumari UA. Disease severity assessment and short-term outcome in patients with myasthenia gravis. Ann Indian Acad Neurol 2020;23:215-9.
21. Boldingh MI, Maniaol AH, Brunborg C, Dekker L, Heldal AT, Lipka AF, *et al*. Geographical distribution of myasthenia gravis in northern Europe-results from a population-based study from two countries. Neuroepidemiology 2015;44:221-31.
22. Mantegazza R, Baggi F, Antozzi C, Confalonieri P, Morandi L, Bernasconi P, *et al*. Myasthenia gravis (MG): Epidemiological data and prognostic factors. Ann N Y Acad Sci 2003;998:413-23.
23. Sharma S, Lal V, Prabhakar S, Agarwal R. Clinical profile and outcome of myasthenic crisis in a tertiary care hospital: A prospective study. Ann Indian Acad Neurol 2013;16:203-7.
24. Sadri Y, Haghi-Ashtiani B, Zamani B, Akhundi FH. Study of demographic, clinical, laboratory and electromyographic symptoms in Myasthenia Gravis patients referred to the neurology clinic of Rasoul Akram hospital in 2015. J Med Life 2015;8:218-21.
25. Grob D, Brunner N, Namba T, Pagala M. Lifetime course of myasthenia gravis. Muscle Nerve 2008;37:141-9.
26. Masuda M, Utsugisawa K, Suzuki S, Nagane Y, Kabasawa C, Suzuki Y, *et al*. The MG-QOL15 Japanese version: validation and associations with clinical factors. Muscle & nerve 2012;46:166-73.
27. Leite MI, Coutinho E, Lana-Peixoto M, Apostolos S, Waters P, Sato D, *et al*. Myasthenia gravis and neuromyelitis optica spectrum disorder: a multicenter study of 16 patients. Neurology 2012;78:1601-7.