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Original Research Article

Correlation between Myasthenia Gravis Severity Score (MGFA) with Subjective Sleep Score (ESS, PSQI)

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Abstract

Background: Disruptions in sleep are gaining momentum as an additional facet of extraocular and even generalized non-motor symptoms of MG. Difficulties with sleep adversely affect one's daily performance and quality of life. We do not yet have a clear picture of how the disease severity based on MGFA classification corresponds with the use of subjective sleep assessment measures.

Objective: To evaluate the correlation between MGFA clinical severity and subjective sleep scores measured by the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) in patients with myasthenia gravis.

Methods: A hospital based cross-sectional observational study in 60 consecutively diagnosed myasthenia gravis was done in Department of Neurology of a tertiary care teaching hospital. Demographic and disease profile was noted out and severity of disease was graded on MGFA clinical classification. Patients completed their own subjective daytime sleepiness scale by using the Epworth sleepiness scale (ESS) and patient's sleep quality was determined by Pittsburgh sleep quality index (PSQI). Spearman's rank correlation coefficient was used to establish the association between MGFA severity and various sleep scores.

Results: Age mean was 42.8±13.6 years, with 56.7% women. The distribution of patients MGFA classes was what comes next; 36.7% were in MGFA class II and 33.3% in MGFA class III. Poor sleep (PSQI >5) was seen in 71.7% of the patients and excessive daytime sleepiness (ESS≥10) was present in 41.7%. The mean score of PSQI and ESS was within the higher index is significant by constant increase with MGFA classes. Spearman correlation coefficient was significant positive correlation between MGFA severity and ESS score ($r = 0.58$ $p<0.001$) and an even more significant positive correlation between MGFA severity and PSQI scores ($r = 0.71$ $p<0.001$).

Conclusion: Worsening MGFA severity strongly correlates with lower sleep quality and higher daytime sleepiness in myasthenia gravis patients. Subjectively measuring insomnia with PSQI and ESS is a straightforward and effective way to detect sleep problems in MG, mostly in those with generalized or more severe disease. Paying regular attention to sleep issues should be an integral part of a holistic patient-centred management for myasthenia gravis.

Keywords: Myasthenia Gravis, MGFA Classification, Pittsburgh Sleep Quality Index PSQI, Epworth Sleepiness Scale ESS, Sleep Quality, Daytime Sleepiness, Disease Severity, Neuromuscular Disorders.

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Introduction

Myasthenia gravis (MG) is a chronic autoimmune disease affecting the neuromuscular junction, presenting with variable skeletal muscle weakness and fatigability. The presentation can be isolated ocular disease or generalized weakness, involving bulbar, respiratory and limb muscles. Disease severity is graded per the clinical classification by Myasthenia Gravis Foundation of America (MGFA), as an agreed scoring system for functional disability and disease assessment [1,6]. Rest disruptions have a non-motor role in Myasthenia Gravis and it's being appreciated that sleep problems are just one of such symptoms. Patients say they suffer from not sleeping well,

daytime dozing, feeling tired, and waking up several times during their night. The sleep problems result in a decline in the patients' quality of life [1,2]. The sleep disturbances resulting from MG are likely the combination of different factors that may range from nighttime muscle weakness (one of the main symptoms of the condition) to the effect of the drugs used plus psychological and stress components to name a few [4].

Subjective sleep tools are very often utilized in various clinical and research situations to check the extent to which people are affected by sleep-related problems. Pittsburgh Sleep Quality Index (PSQI) is a comprehensive instrument which evaluates quality of sleep about several aspects. On the other side, the Epworth Sleepiness Scale (ESS) evaluates how easily people fall asleep in various situations like watching TV and driving etc. These questionnaires have advantages such as ease of use, good reliability and are suitable to find out if person has significant sleep issues or they may nap a bit in the day This line of research has become Most of all popular in myasthenia gravis, since in a real-world setting, one simply doesn't have the luxury of objective sleep tests [7].

Several researches have shown that sleep is really worse in patients suffering Myasthenia gravis than in the healthy population. The research by Martnez-Lapiscina et al. found that sleep quality was Quite a bit correlated with the severity of the disease and health-related quality of life. So, sleep disturbance could be a symptom and the measure of the burden of MG [1]. On a similar note, Kumar et al. have reported that MG patients have quite a few complaints about sleep using questionnaire-based assessments and This way, recommended the implementation of routine screening for sleep disturbances in this population [2]. Yang et al. further documented that more severe myasthenic symptoms and fatigue are predictors of worse sleep outcomes, which supports the notion that there is a connection between the disease activity, fatigue, and sleep dysfunction [3].

Polysomnographic and quality-of-life studies provide evidence that sleep disorders in stable MG still have clinical significance. Tascilar et al. reported that sleep disorders can result in a lower quality of life even among clinically stable patients [5]. A new study by Dede et al. showed that a major portion of the quality of life that relates to sleep is greatly degraded in MG patients, and that it is related to the patients' disease severity and some of their associated symptoms such as fatigue and feeling sleepy during the day [8].

A recent, well-done review said that there is quite a large number of MG patients with sleep disorders, and because of their potential clinical associations, further studies to clarify these associations, and improve the assessment strategies have been recommended [4]. Even though sleep disorders are increasingly being acknowledged as comorbidities in myasthenia gravis (MG), there is still a paucity of data on how the classification of MG severity by the MGFA relates to sleep quality and daytime sleepiness as perceived by patients. Revealing the association of worsening MG severity with increased Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) scores might not only assist clinicians in screening sleep-disordered patients with a higher tendency to experience sleep-related issues but also help with formulating multifaceted care pathways.

So, the purpose of this investigation is to determine if there is a relationship between MGFA severity scores and scores on the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) as subjective measures of sleep-in participants with Myasthenia Gravis.

Methods

Study Design and Setting: This observational cross-sectional study which was hospital-based took place in the neurology department of a tertiary care teaching hospital. It was planned to investigate the association between the clinical severity of myasthenia gravis and the subjective sleep parameters like daytime sleepiness and the quality of sleep. After approval from the Institutional Ethics Committee, the study was performed during a specified study period and all procedures were performed as the ethical principles applicable to medical research involving human subjects.

Study Population: Amyosthenia gravis is a rare neuromuscular disorder that causes severe fluctuations in the strength and fatigue level in individuals diagnosed with the disease. To get a comprehensive understanding of myasthenia gravis symptoms and treatment, we will have to rely heavily on personal accounts of the experiences of the people diagnosed with the said condition. This can provide a valuable source of insight on their physical and psychological challenges as well as possible coping mechanisms which may not be available in official medical reports. Also, these personal narratives may be a form of support and empathy to others facing similar experiences in their daily lives.

Participant Selection: Adult patients who were diagnosed with definite myasthenia gravis and who were medically stable and also were able to comprehend and respond to the study questionnaires were enrolled as subjects. This were among the conditions of exclusion: patients with severe cognitive impairment, major psychiatric disorders, previously diagnosed primary sleep disorders that are not a result of myasthenia gravis,

and others with significant neurological or systemic diseases that are known to independently impact sleep quality or daytime sleepiness. These exclusions were made to get rid of potential confounding factors.

Clinical Assessment: Demographic and clinical data were collected in detail from each participant through interview and consultation of their medical charts. Variables like age gender duration of illness, current management, comorbidities, and history of myasthenic crisis were captured. The Myasthenia Gravis Foundation of America (MGFA) scale of the disease severity was applied clinically in the present study. It is a tool through which patients are classified based on their extent and pattern of muscle weakness and loss in functional capabilities. The MGFA score was used mainly because of its universal acceptance as the standard scale of disease severity in clinical and research contexts. It is, in addition, known to be helpful in evaluating the disability caused by myasthenia gravis.

Assessment of Daytime Sleepiness: Subjective daytime sleepiness was measured with the help of the Epworth Sleepiness Scale (ESS). The ESS is a questionnaire that a person can fill out themselves which has eight items that evaluate the possibility of a person dozing off in regular daily contexts. Each one of the eight items is rated on a scale of 0 to 3 so that the overall score can range from 0 to 24. Higher scores mean more sleepiness during the day. In the situation when there was no necessity for any interpretation or translation the subjects themselves filled up the questionnaires in all aspects independently; but when it became necessary to clarify some of the questionnaire item, the participants were helped without influencing their views.

Assessment of Sleep Quality: Sleep quality was measured with the Pittsburgh Sleep Quality Index (PQSI) and the score was the sum of the seven components of which they were made up. The components were subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. This score can range from 0 to a maximum of 21, the higher the score is the worst a person's sleep is.

Data Collection Procedure: All the evaluations were carried out at the same study visit. Written informed consent was first obtained before participants were examined clinically. Following the examination, they completed the Epworth Sleepiness Scale (ESS) and the Pittsburgh Sleep Quality Index (PSQI) questionnaires. The questionnaire completion was part of a standardized process, as all trained investigators who carried out the procedure were familiar with the study protocol, which enabled consistency in data collection. Throughout the study, a confidentiality guarantee of patients' personal data was provided, as all information was identified only through anonymized codes and no one except the study team having authorized access to the data.

Outcome Measures: The main evaluation parameter was the relationship or degree of association that exists between the MGFA severity score and ESS score as well as the relationship between the MGFA severity score and PSQI global score. Other outcomes of interest were the distribution of sleep quality and daytime sleepiness at different levels of MGFA severity as well as an understanding of the demographic and clinical features of the study population.

Statistical Analysis: The collected data were typed into an electronic form and then the results were subjected to different kind of statistical soft. Continuous data were presented as means ± standard deviation or medians with interquartile range based on the underlying distribution of variable, and categorical variables were reported as frequencies and percentages. Before performing inferential statistics test, the normality of the distribution of the numerical variables was checked. Since MGFA is an ordinal clinical classification, we used Spearman's rank correlation coefficient to determine associations between MGFA severity and ESS and PSQI scores respectively. The choice of a parametric or a non-parametric statistical test depended First and foremost on the distribution features of the data. In any case, the statistical level of significance was $p < 0.05$.

Ethical Considerations: Ethical clearance from the institutional board was obtained before the study start. After being fully explained the study objectives and procedures in their own language, all recruited participants were presented with written consent forms and allowed to ask questions. Participation was optional with participants being told that non-participation would not in any way interfere with their usual course of medical treatment. Participants were also reminded that they could decide not to be part of the study or even stop participating any time without any consequences for their health. Confidentiality was absolutely assured for all data and it was only for scientific research that the data were used.

Results

A group of 60 myasthenia gravis patients confirmed their condition through diagnostic tests and were included in the study. All these people filled out the MGFA, ESS, and PSQI tests completely. The average age of participants was

42.8±13.6 years, and there were more women participating than men.

A lot of patients, most of whom were classified in generalized MGFA classes II or III, were found to be suffering from mild to moderate generalized myasthenia gravis.

Demographic and Clinical Characteristics: Table 1 presents a short summary of the demographic and clinical features of the participants in the baseline setting of the study. The group of patients aged 31, 50 years was the biggest contributor with a percentage of 43.3%. Female participants formed about 56.7% of the study population. For disease severity, the MGFA Class II was the most common with 36.7%, while Class III was the second most common with 33.3%. Besides that, on average, the duration of myasthenia gravis was 4.7±3.1 years.

Table 1: Demographic and clinical characteristics of the study population (n = 60)

Variable	Frequency (%)
Age group (years)	
18–30	14 (23.3)
31–50	26 (43.3)
51–70	20 (33.3)
Gender	
Male	26 (43.3)
Female	34 (56.7)
MGFA Class	
Class I	8 (13.3)
Class II	22 (36.7)
Class III	20 (33.3)
Class IV	10 (16.7)
Duration of disease	
<2 years	18 (30.0)
2–5 years	24 (40.0)
>5 years	18 (30.0)

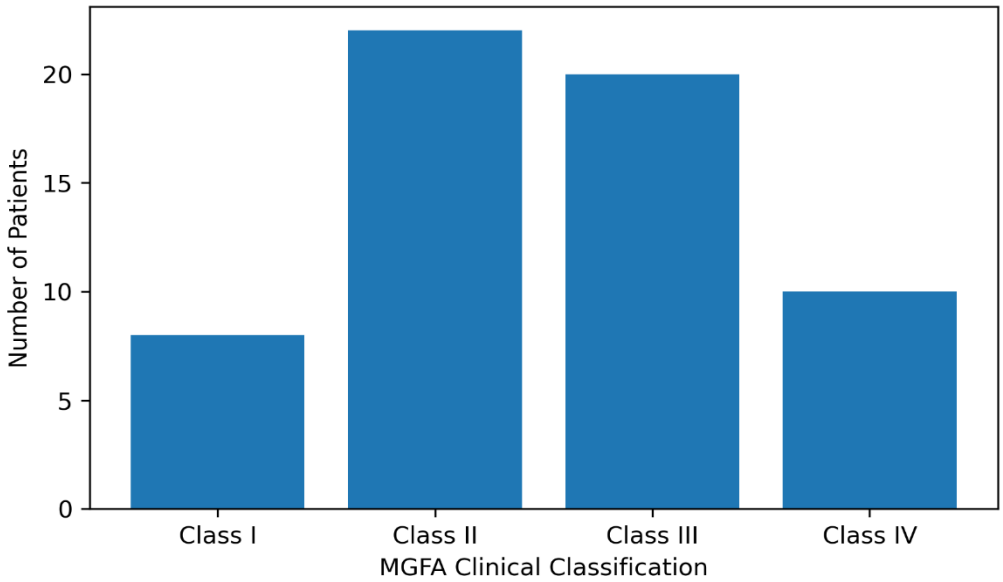

Figure 1: Distribution of patients according to MGFA clinical classification

The distribution demonstrated that the majority of patients were clustered in MGFA Classes II and III, reflecting a predominance of mild to moderate generalized myasthenia gravis in the present study. Sleep Quality and Daytime Sleepiness. The PSQI and ESS were used to evaluate subjective sleep quality and daytime sleepiness, respectively. The results are displayed in Table 2. 71.7% of the patients had poor sleep quality (PSQI >5), while 41.7% had excessive daytime sleepiness (ESS≥10). The average global PSQI score was 8.9±3.4 and the average ESS score was 9.8±4.1.

Table 2: Distribution of ESS and PSQI scores among study participants (n = 60)

Sleep parameter	Frequency (%)
ESS score	
<10 (normal)	35 (58.3)
10–15 (mild–moderate sleepiness)	19 (31.7)
>15 (severe sleepiness)	6 (10.0)
PSQI score	
≤5 (good sleep quality)	17 (28.3)
6–10 (moderately impaired sleep quality)	28 (46.7)
>10 (severely impaired sleep quality)	15 (25.0)

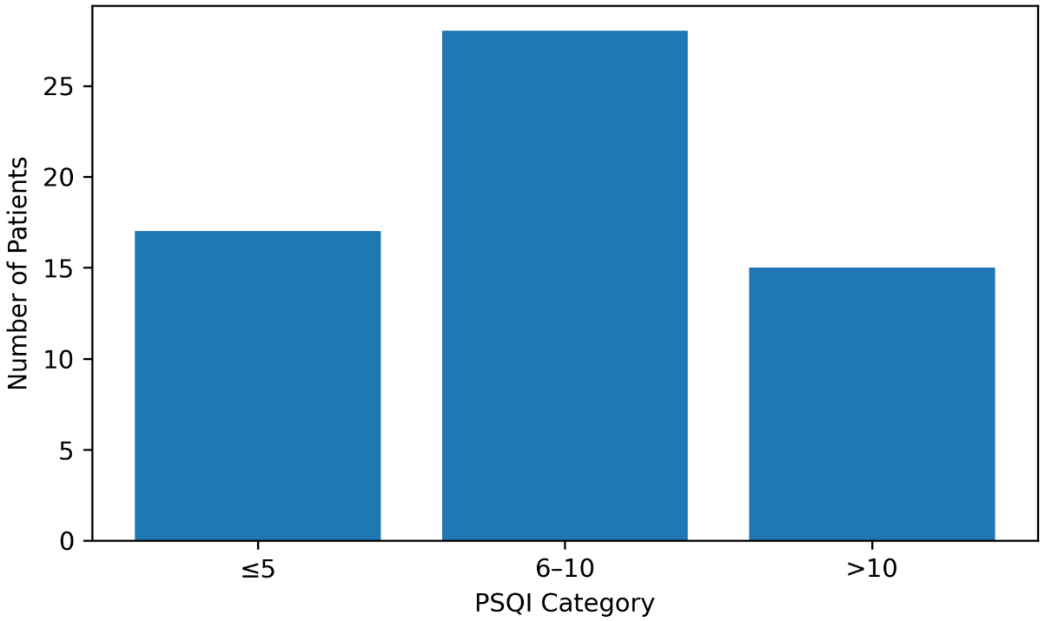

Figure 2: Distribution of PSQI categories among patients with myasthenia gravis

The graph illustrates that moderately impaired sleep quality (PSQI 6–10) constituted the largest subgroup, while one-fourth of patients experienced severely impaired sleep quality.

Correlation between MGFA Severity and Subjective Sleep Scores: To find out how disease severity was linked to the sleep parameters, the MGFA classifications were cross-checked with the levels of ESS and PSQI scores. Based on Table 3, ESS and PSQI scores got higher when MGFA classes moved to upper levels.

People in MGFA class IV had the highest ESS (14.2±3.5) and PSQI (12.1±2.8) means, respectively.

Table 3: Correlation of MGFA severity with ESS and PSQI scores

MGFA Class	n	Mean ESS ± SD	Mean PSQI ± SD
I	8	5.1 ± 2.0	4.8 ± 1.6
II	22	7.8 ± 2.9	7.2 ± 2.4
III	20	10.6 ± 3.7	9.6 ± 2.9
IV	10	14.2 ± 3.5	12.1 ± 2.8

Table 4: Spearman correlation analysis

Correlation	r	p value
MGFA vs ESS	0.58	<0.001
MGFA vs PSQI	0.71	<0.001

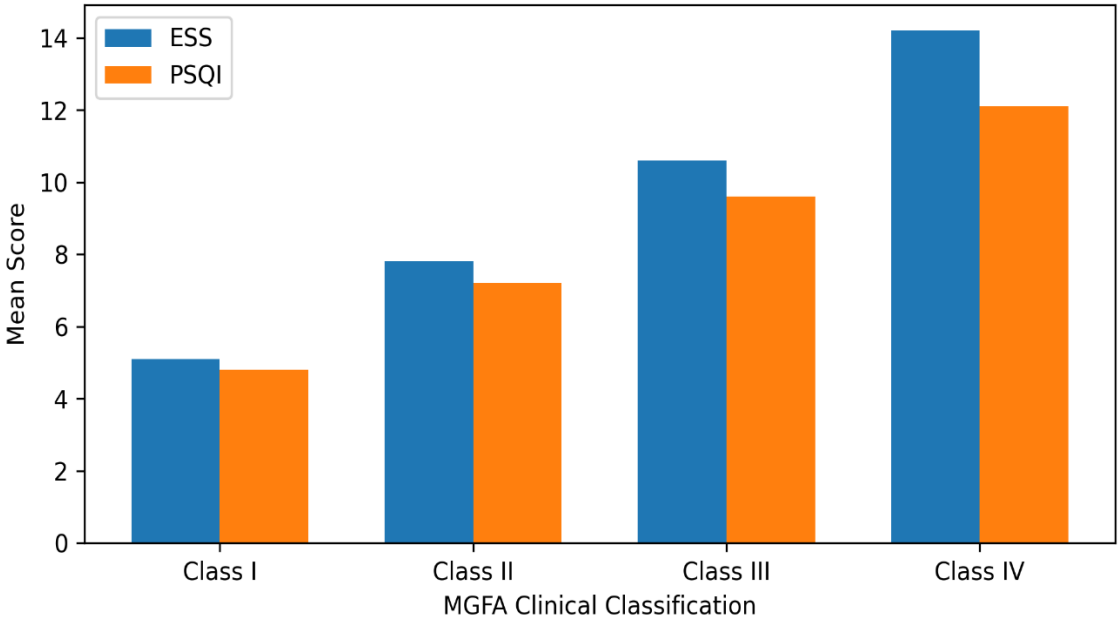

Figure 3: Correlation of MGFA severity with mean ESS and PSQI scores

The graph demonstrates a progressive increase in both ESS and PSQI scores with advancing MGFA class, indicating worsening daytime sleepiness and poorer sleep quality with greater disease severity.

Summary of Findings: In our study, we found a high prevalence of subjective sleep disturbances in patients with MG. Our findings revealed that more than two-thirds of the subjects had poor sleep quality, and about two-fifths of them experienced excessive daytime sleepiness. Correlational analysis revealed that both the ESS and PSQI scores had statistically significant positive correlations with the MGFA severity; So, the increasing clinical severity of MG was linked to poorer sleep quality and higher excessive daytime sleepiness.

Discussion

This study found a significant positive correlation between MGFA clinical severity, and the subjective measures of daytime sleepiness (ESS) and sleep quality (PSQI), in a population of patients with myasthenia gravis. As the disease severity increased as indicated by the higher MGFA classes, patients showed increasing decrements in sleep quality and increasing levels of daytime sleepiness. More than 66 percent of the respondents had the PSQI levels which suggest clinically significant sleep disorder, so the prevalence of bad sleep quality found in this research was very high. In addition, the number of respondents who reported their sleep was so poor at nighttime that they feel sleepy during the day was also significant. These findings corroborate the increasing body of evidence showing that myasthenia gravis is frequently linked to sleep disruptions and That means the symptoms shouldn't be ignored when assessing the neurological condition. Impairment of sleep can come from the weakness of muscles at night, failure in respiration fatigue the effect of medicine, and the psychological pressure of living a chronic disease; all of these factors often mean sleep deficiency and daytime problems [11,12].

One key finding of the present study is that both ESS and PSQI scores increase progressively with MGFA classes I to IV. Compared to patients with mild or purely ocular involvement, those with more severely generalized disease showed very Really worsened sleep outcomes. From a clinical point of view, this observation is relevant since higher MGFA severity indicates more extensive involvement of bulbar, respiratory, and limb musculature that can negatively affect nocturnal ventilation and continuity of sleep. There is recent evidence that sleep disorders in myasthenia gravis are In particular linked to bulbar weakness and may also affect short-term clinical outcomes, underscoring the need for thorough assessment of sleep disturbances in patients suffering from advanced disease [9].

The correlation between the two symptoms is in line with the general idea that non-motor symptoms can be quite influential in the lives of patients with myasthenia gravis. In clinical practice, the examination focuses mainly on muscle weakness and fatigue, whereas problems such as sleep disturbance exhaustion emotional stress, and the feeling of being out of social circles are the ones that most often lead to the patient disability (10). Studies on health-related quality of life indicated that therapeutic interventions in myasthenia gravis

not only have to bring about motor function improvements but also to result in the patient-reported gains for the daily activities and overall quality of life [12].

This work is also expected to provide input for quality-of-life measurement. Tools like the MG-QOL15 are already available to follow changes in physical, emotional, and social states of patients with myasthenia gravis brought about by the illness [13]. Sleep problems are expected to affect multiple areas assessed by these quality-of-life measures such as energy level, ability to perform daily activities, and emotional health. MGA-specific quality of life questionnaire has been validated for reliability and validity across populations, thereby confirming their value in patient comprehensive evaluation [15]. This way, including evaluation of sleep alongside the MG-specific quality of life measures will give a fuller picture of the patient's disease status.

Other studies previously exploring the effect of self-reported sleep quality on patients with myasthenia gravis also demonstrated change in the perception of sleep and experiences of dreams. For example, Happe et al. showed that patients suffering from myasthenia gravis were generally sleeping worse than healthy controls, indicating that the disturbance of sleep can actually be a part of the symptomatology of the disease rather than a byproduct of the physical impairment [14]. Our work builds upon these findings and demonstrates further that not only is the subjective worsening of sleep quite common but it also mirrors very closely the level of a patient's condition that is assessed as the MGFA classification.

This correlation between MGFA and PSQI in the current study was greater than that between MGFA and ESS. This may show that general sleep patterns have stronger links for severity of disease compared to only daytime sleepiness. As factors like sleep duration medications mood disorders, and lifestyle have the influence of sleepiness during the daytime, then again, PSQI measures a more comprehensive group sleep-related change. This conclusion suggests that assessing sleep problems is vital to the clinical work-up of a patient with myasthenia, mainly those with generalized form of the disease.

Although this paper contributes significant information, some drawbacks have Even so to be accepted. The dependence on the subjective assessment could be subject to recall inaccuracies and That means may not adequately capture objective disruptions in sleep measurable via the polysomnography. It is also worth noting the cross-sectional study design is a barrier to a direct cause-effect relationship between deterioration of the MGFA severity level and sleep deterioration. Also, variables like the use of corticosteroids obesity anxiety, depression, and other sleep disorders not treated separately could have biased ESS and PSQI scores. It is suggested that longitudinal researches be carried out in the future using sleep recordings, respiratory evaluation, and disease-related quality-of-life tools to better understand the underlying causes connecting the severity of illness and the sleep disturbance.

To wrap up, the current study substantiates that increased MGFA severity is linked to worse sleep quality and increased daytime sleepiness in patients with myasthenia gravis. These findings emphasize the necessity to systematically screen myasthenia gravis patients for sleep abnormalities using brief subjective measures like the PSQI and the ESS. Identification and treatment of sleep problems early could bring better quality of life, minimize disability and loss of function and facilitate holistic care to the patients [9,11-15].

Conclusion

The current study showed a statistically significant positive correlation between MGFA clinical severity and the subjective parameters of sleep (PSQI) and daytime sleepiness (ESS) in myasthenia gravis subjects. Patients with higher MGFA classes score more poorly in sleep quality and have increased daytime somnolence. An overwhelming number of respondents were affected by sleep disturbance of clinical significance and so this highlights the importance of sleep disturbances as a prevalent and significance non-motor feature of MG. Of the two subjective sleep assessments, the relationship between MGFA severity and PSQI seemed to be a stronger association and meaning general sleep quality was perhaps more generalized to the neurological burden than a more global indicator of sleep disturbance like daytime sleepiness. This is to emphasize how necessary it is to include assessment of sleep in routine evaluations of patients who have myasthenia gravis.

Simple methods such as the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale which are questionnaires will probably pick out those patients who have severe sleep disorders, including those with generalized myasthenia gravis or more severe myasthenia gravis. If sleep disturbances are picked up early and managed properly, it may have positive effects not only in the daily living and work activities of the patient, but also in the overall happiness of patients. And, it may be seen as a step towards better, a patient and holistic way of managing myasthenia gravis. Further large-scale longitudinal studies incorporating objective sleep investigations are recommended to confirm these findings and to better understand the mechanisms linking disease

severity with sleep dysfunction in myasthenia gravis.

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