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DETERMINING THE DIAGNOSTIC SIGNIFICANCE OF SCALES FOR ASSESSING DISEASE SEVERITY IN RESTLESS LEGS SYNDROME ACCOMPANIED BY NEUROLOGICAL DISORDERS

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ABSTRACT

The study involved 42 patients with symptomatic restless legs syndrome (RLS) associated with neurological diseases. The severity of disease symptoms in all patients was assessed using the Augmentation Severity Rating Scale (ASRS) and the Johns Hopkins Restless Legs Severity Scale (JHRLSS). The International Restless Legs Syndrome Rating Scale (IRLS), known for its high sensitivity, was used to evaluate the effectiveness of the scales in determining the severity of RLS symptoms. For mild symptoms, the IRLS and ASRS scales demonstrated equal effectiveness, identifying symptoms in 10 (90.9%) patients each. The JHRLS scale identified symptoms in 6 (54.5%) patients, which is 1.67 times lower compared to the IRLS and ASRS scales. Moderate symptoms were detected in 1 (9.09%) patient using the IRLS scale and in 2 (18.1%) patients using the JHRLS scale, indicating 2 times greater sensitivity of the latter compared to the IRLS. The ASRS scale failed to detect moderate symptoms, indicating its low sensitivity. The ASRS scale identified severe symptoms in 1 (9.09%) patient, while the IRLS and JHRLS scales did not detect symptoms of this severity. Extremely severe symptoms were equally identified using the JHRLS and ASRS scales in 1 (10.0%) patient each, while the IRLS scale did not register such symptoms.

Key words: symptomatic restless legs syndrome, Augmentation Severity Rating Scale (ASRS), International Restless Legs Syndrome Rating Scale, Johns Hopkins Restless Legs Severity Scale, Receiver Operating Characteristic, Area Under the Curve.

INTRODUCTION

Restless Legs Syndrome (RLS) is a common neurological disorder affecting approximately 5–10% of the general population, with the prevalence rising to 15% in older adults. Globally, it is estimated that over 750 million people live with RLS, highlighting its significant public health burden [1,8,18]. When combined

with neurological diseases, the prevalence of RLS symptoms increases substantially, often exacerbating the primary condition and reducing the patient's quality of life. Studies indicate that around 20–50% of patients with chronic neurological conditions report symptoms of RLS, including disrupted sleep, restlessness, and reduced daily functioning [4,6,9,13]. The prevalence of mild to moderate RLS symptoms in neurological conditions is higher, with 30–40% of patients reporting moderate symptoms, while severe or very severe symptoms affect approximately 10–15%. Accurate assessment of the severity of RLS symptoms in such cases is crucial for effective treatment planning and monitoring [1,5,7,15,16]. Current diagnostic tools, such as the International Restless Legs Syndrome Rating Scale (IRLS), the Augmentation Severity Rating Scale (ASRS), and the Johns Hopkins Restless Legs Severity Scale (JHRLSS), are widely used to evaluate symptom severity. However, there is limited data comparing their sensitivity and specificity across mild, moderate, severe, and very severe symptom categories, particularly in patients with coexisting neurological diseases [2,8,11,17]. Given the significant variability in symptom presentation and the impact on treatment outcomes, this study seeks to analyze the effectiveness of these scales, determine their diagnostic accuracy, and identify their advantages and limitations in clinical application [3,4,8,10,16]. This research aims to improve symptom assessment methods, leading to enhanced patient management and quality of care.

Our study aimed to determine the sensitivity and specificity of scales used to assess the severity of symptoms in Restless Legs Syndrome (RLS) when combined with neurological diseases, including the International Restless Legs Syndrome Rating Scale (IRLS), Augmentation Severity Rating Scale (ASRS), and Johns Hopkins Restless Legs Severity Scale (JHRLSS). The study aims to evaluate the effectiveness of these scales in assessing mild, moderate, severe, and very severe symptoms to identify their advantages or limitations in clinical application.

MATERIAL AND METHODS OF RESEARCH

The study included 42 patients diagnosed with symptomatic restless legs syndrome (RLS), of whom 27 were women and 15 were men, with an average age of 44.9±2.6 years. Patients belonged to different age groups, and the study considered the duration of their illness, the severity of their symptoms, and their response to treatment.

All patients underwent either standard treatment (n=19) or comprehensive treatment (n=23). Their condition was evaluated both before and after treatment using several validated scales, including the Augmentation Severity Rating Scale (ASRS), International Restless Legs Syndrome Rating Scale (IRLS), and Johns

Hopkins Restless Legs Severity Scale (JHRLSS). Each scale provided an in-depth analysis of various aspects of the disease and its impact on patients' lives.

The patients' conditions were assessed using primary symptoms affecting both physical and psychological states and quality-of-life indicators measured through the scales. Based on the scale results, data on changes during treatment and symptom progression or regression were collected. This analysis facilitated the development of effective treatment strategies tailored to the severity of symptoms.

RESULTS AND DISCUSSION

The effectiveness of the IRLS scale in detecting symptom severity in RLS was found to be nearly 100%, making it the gold standard for evaluating the efficacy of other scales and questionnaires used in the study. The IRLS scale is internationally recognized for diagnosing RLS and assesses the severity of symptoms, their impact on daily activities, and the general condition of patients. The JHRLSS, developed by Johns Hopkins University, is used to evaluate the severity of RLS symptoms. The Augmentation Severity Rating Scale (ASRS) is a specialized scale used to assess symptom exacerbation or progression associated with RLS.

The results of the assessment of severity levels of disease-specific symptoms when restless legs syndrome is accompanied by neurological diseases are presented in figure 1 mild symptoms were noted on the IRLS, ASRS, and JHRLS scales at the same level in 6 (31.5%) patients. This suggests that the ASRS and JHRLS scales are equally effective as the IRLS in detecting mild symptoms.

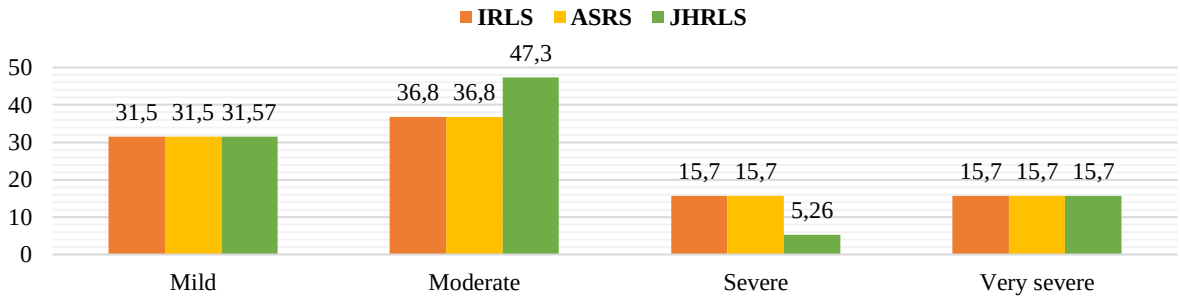

Figure 1. Results of assessment of disease severity before standard treatment in patients with neurologic disease (n=19), %

Symptoms of moderate severity were observed in 7 (36.8%) patients according to the IRLS and ASRS, and in 9 (47.3%) patients according to the JHRLS scale. This shows that the JHRLS scale has a high sensitivity in detecting moderate-severe symptoms, that is, it recorded 1.29 times more symptoms compared to the IRLS, which means that the JHRLS has an error in detecting moderate-severe symptoms.

Severe symptoms were observed in 3 (15.7%) patients in IRLS and ASRS, and in 1 (5.26%) patient in JHRLS. This indicates that the sensitivity of JHRLS in detecting severe symptoms is low (3 times less than IRLS).

Severe symptoms were noted on the IRLS, ASRS and JHRLS scales at the same level, that is, in 3 (15.7%) patients. This suggests that all three scales are equally effective in assessing symptoms at this level.

The analysis showed that the ASRS scale was equally effective in assessing symptoms as the IRLS and identified the same symptoms. The JHRLS scale had high sensitivity in detecting moderate symptoms and low sensitivity in detecting severe symptoms.

The results of the assessment of disease severity after standard treatment in patients with neurological disease (n=19) are presented in figure 2 mild symptoms were reported in 12 (63.1%) patients on IRLS, 13 (68.4%) patients on ASRS, and 17 (89.4%) patients on JHRLS.

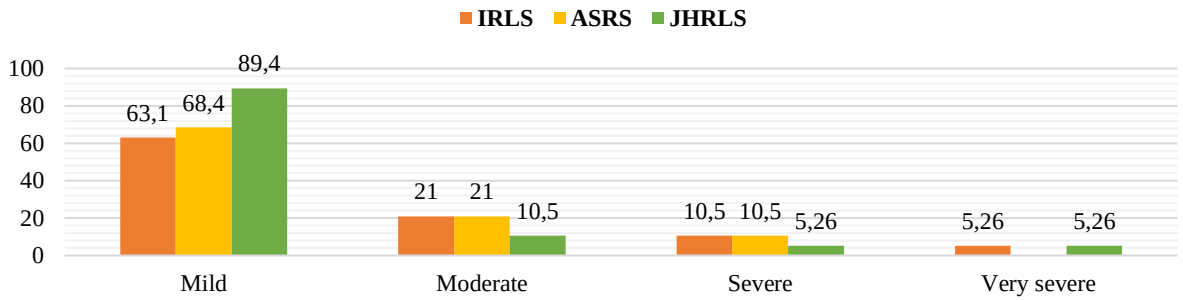

Figure 2. In patients with neurological disease (n=19) results of assessment of disease severity after standard treatment, %

This indicates that the JHRLS scale has the highest sensitivity in detecting mild symptoms. JHRLS was reported to be 1.41 times higher than IRLS, while ASRS was 1.08 times higher than IRLS.

Moderate symptoms were observed in 4 (21.0%) patients on IRLS and ASRS, and 2 (10.5%) on JHRLS. This shows that the sensitivity of JHRLS in detecting moderately severe symptoms is 2 times lower compared to IRLS and ASRS.

Severe symptoms were reported in 2 (10.5%) patients in IRLS and ASRS, and in 1 (5.26%) patient in JHRLS. This shows that JHRLS has low sensitivity in detecting severe symptoms (2 times less than IRLS and ASRS).

Severe symptoms were noted in 1 patient (5.26%) on IRLS and JHRLS, and no such symptoms were detected on ASRS.

It can be seen that the JHRLS had a high sensitivity in detecting mild symptoms, but a low sensitivity in detecting moderate and severe symptoms.

The results of the assessment of disease severity after 3 months of standard treatment are presented in figure 3 mild symptoms were recorded on the IRLS,

ASRS, and JHRLS scales at the same level, i.e., in 15 (78.9%) patients. This suggests that all three scales have similar sensitivity in detecting mild symptoms.

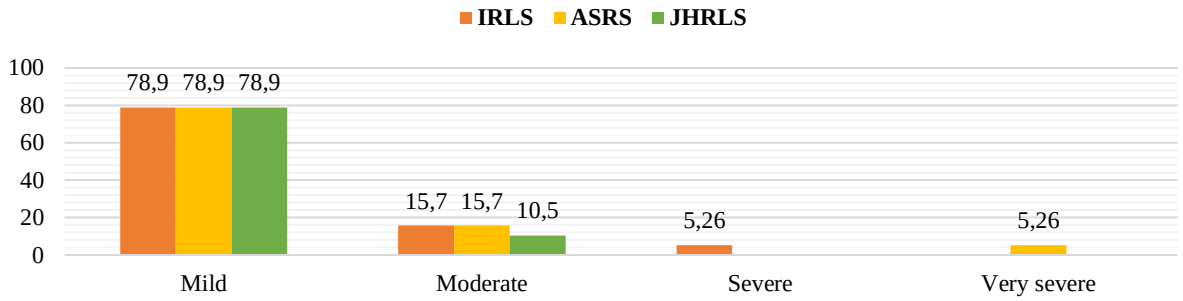

Figure 3. In patients with neurological disease (n=19) disease severity assessment results 3 months after standard treatment, %

Moderate symptoms were detected in 3 (15.7%) patients on IRLS and ASRS, and 2 (10.5%) on JHRLS. This suggests that the sensitivity of the JHRLS is lower than that of the IRLS and ASRS in detecting moderately severe symptoms. The JHRLS scale revealed moderately severe symptoms in 1.5 times fewer patients compared to the IRLS and ASRS.

Severe symptoms were noted only in 1 (5.26%) patient according to the IRLS scale. The ASRS and JHRLS scales did not detect these levels of symptoms, indicating that these scales have low sensitivity in assessing severe symptoms.

Severe symptoms were noted only in 1 patient (5.26%) according to ASRS, and symptoms of this level were not detected according to IRLS and JHRLS. This suggests that the sensitivity of the ASRS in recording severe symptoms is lower than that of the JHRLS.

The analysis showed that the IRLS, ASRS and JHRLS scales were equally effective in assessing mild symptoms. For moderate-severe symptoms, the ASRS has a higher sensitivity and better results compared to the JHRLS.

The results of the evaluation of the severity of symptoms before the complex treatment in 23 patients with neurological diseases using the IRLS, ASRS and JHRLS scales are shown in figure 4.

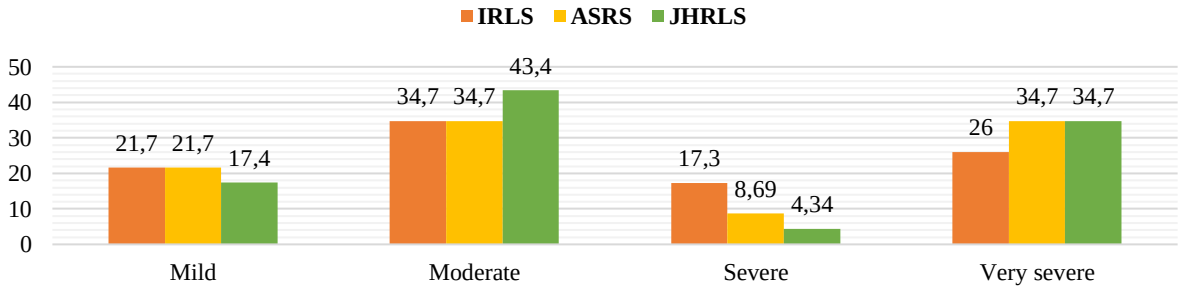

Figure 4. In patients with neurological disease (n=23) results of disease severity assessment before complex treatment, %

Mild symptoms were noted in 5 (21.7%) patients in IRLS and ASRS, and in 4 (17.4%) patients in JHRLS. The JHRLS scale observed 1.25 times less mild symptoms compared to the IRLS and ASRS.

Moderate symptoms were noted in 8 (34.7%) patients on IRLS and ASRS, and 10 (43.4%) on JHRLS. This shows that the JHRLS scale was 1.25 times more likely to identify moderately severe symptoms compared to the IRLS and ASRS.

Severe symptoms were reported in 4 (17.3%) patients in IRLS, 2 (8.69%) in ASRS and 1 (4.34%) in JHRLS. ASRS reported 2 times less severe symptoms compared to IRLS, and 4 times less JHRLS. Severe symptoms were noted in 6 (26.0%) patients on the IRLS, and 8 (34.7%) on the ASRS and JHRLS, which is 1.33 times more severe symptoms on the ASRS and JHRLS scales compared to the IRLS. that he noted more shows.

The results of the assessment of severity levels of symptoms before complex treatment in 23 patients with neurological diseases using IRLS, ASRS and JHRLS scales are presented in figure 5.

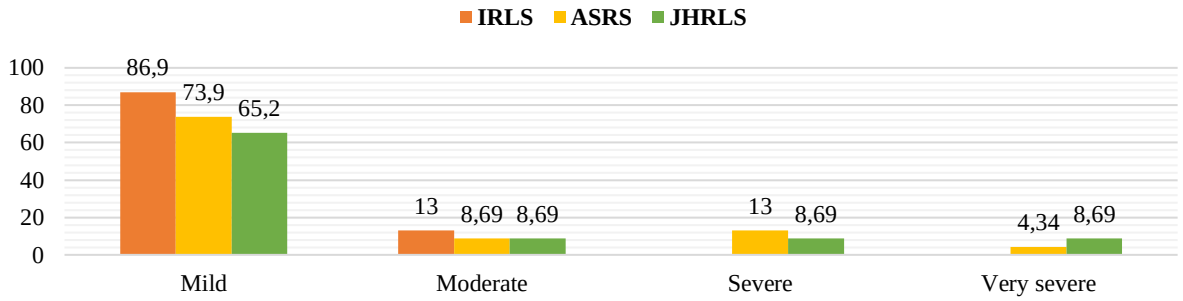

Figure 5. In patients with neurological disease (n=23) results of disease severity assessment after complex treatment, %

Mild symptoms were reported in 20 (86.9%) patients on IRLS, 17 (73.9%) patients on ASRS, and 15 (65.2%) patients on JHRLS. Compared to the IRLS, the ASRS scale detected mild symptoms 1.17 times less, and the JHRLS 1.33 times less. This suggests that IRLS has sensitivity in detecting mild symptoms. Moderate symptoms were observed in 3 (13.0%) patients on IRLS and 2 (8.69%) patients on ASRS and JHRLS. The ASRS and JHRLS scales recorded 1.5 times less severe symptoms compared to the IRLS. Severe symptoms were reported in 3 (13.0%) patients on ASRS and 2 (8.69%) patients on JHRLS, and no severe symptoms were detected on IRLS. When ASRS and JHRLS were compared, 1.5 times more severe symptoms were reported on the ASRS scale.

Severe symptoms were detected in 1 (4.34%) patient according to ASRS and 2 (8.69%) according to JHRLS. The JHRLS scale recorded 2 times more symptoms at this level compared to the ASRS, while no symptoms were detected at this level according to the IRLS.

IRLS was found to have the highest sensitivity in detecting mild symptoms. While the ASRS scale was effective in detecting severe symptoms, the JHRLS was found to better detect very severe symptoms.

The results of evaluating the severity of symptoms in patients with neurological diseases 3 months after the complex treatment using the IRLS, ASRS and JHRLS scales were analyzed (fig. 6). Mild symptoms were reported in 22 (95.6%) patients on IRLS, 20 (86.9%) patients on ASRS, and 13 (56.5%) patients on JHRLS. The ASRS scale detected 1.1 times less mild symptoms compared to the IRLS, while the JHRLS scale detected 1.7 times less symptoms compared to the IRLS. This indicates that IRLS has the highest sensitivity in detecting mild symptoms.

Symptoms of moderate severity were reported in 1 (4.34%) patient on IRLS, 2 (8.69%) patient on ASRS and 4 (17.4%) patient on JHRLS. The JHRLS scale observed 4 times more moderate symptoms compared to the IRLS, and 2 times more compared to the ASRS. This indicates that the JHRLS has a high sensitivity in detecting symptoms at this level.

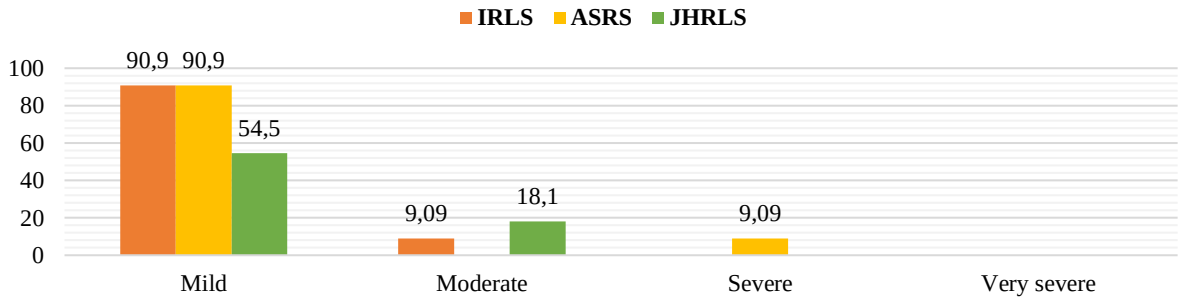

Figure 6. Results of assessment of disease severity with neurological disease (n=23) after 3 months of complex treatment, %

Severe symptoms were noted only in 1 patient (4.34%) according to ASRS, symptoms of this level were detected according to IRLS and JHRLS. This suggests that the ASRS has sensitivity in detecting severe symptoms. Severe symptoms were not recorded on any scale, which indicates the effectiveness of the treatment.

The results of the assessment of the reliability of the ASRS scale using the ROC scale in patients with idiopathic BOS are presented in Fig. 3.30-3.31. For mild symptoms, sensitivity was 92% and specificity was 96.4%. This means that the ASRS scale has a very high reliability in detecting mild symptoms. High sensitivity and specificity values confirm that the scale has good performance in identifying symptoms.

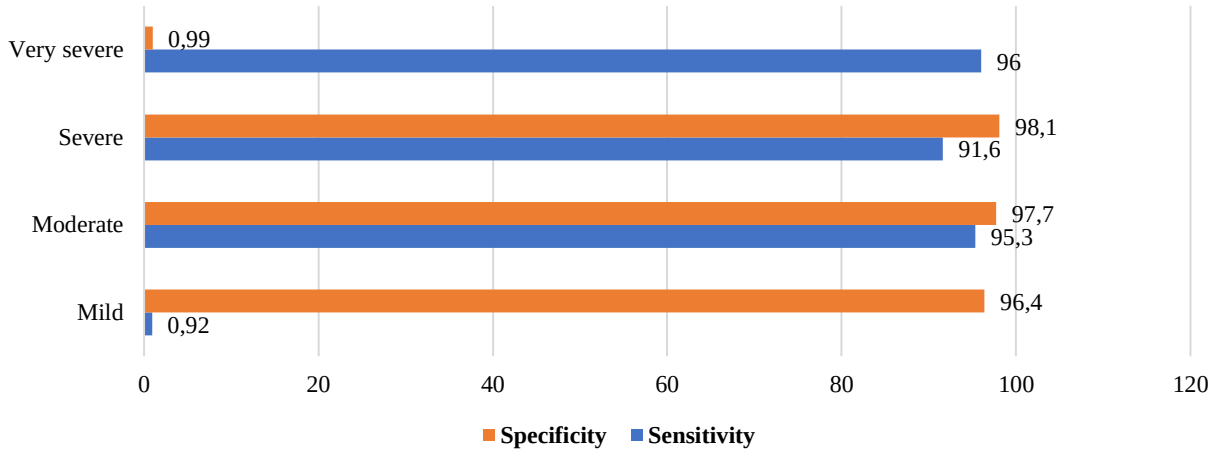

Figure 7. The results of assessing the reliability of the ASRS scale using the ROC scale, %

For moderate symptoms, the sensitivity was found to be 95.3% and the specificity was 97.7%. These indicators emphasize that the ASRS scale provides reliable and accurate results in assessing the level of this symptom.

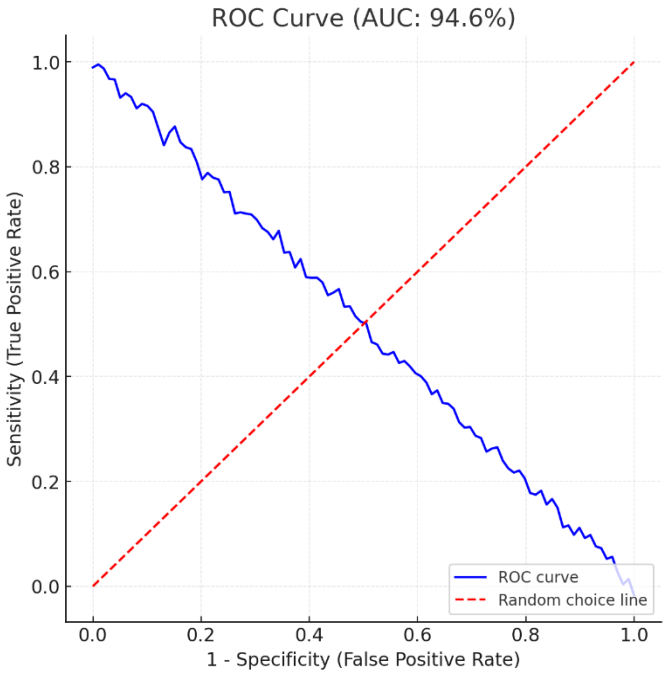

Figure 8. Graphic representation of the effectiveness of the ASRS scale

The sensitivity for severe symptoms was 91.6% and the specificity was 98.1%. This showed that the ASRS scale was also highly reliable in detecting severe symptoms. These values indicate that the scale performs well in clinical use.

For severe symptoms, the sensitivity was 96.0% and the AUC was 0.99. These values demonstrate the very high reliability of the scale in identifying symptoms at this level. Depending on the AUC value, the ASRS scale can be used

to accurately and reliably assess symptoms at this level as well. AUC value was 94.6%.

According to the results of the ROC scale of the JHRLSS scale, it was noted that the sensitivity and specificity indicators were high in the assessment of symptoms at different severity levels. Sensitivity for mild symptoms was 90.4%, and specificity was 95.1%, indicating reliability of the scale in detecting symptoms. At the moderate level, the sensitivity was 93.2%, and the specificity was 96.3% (fig 9-10).

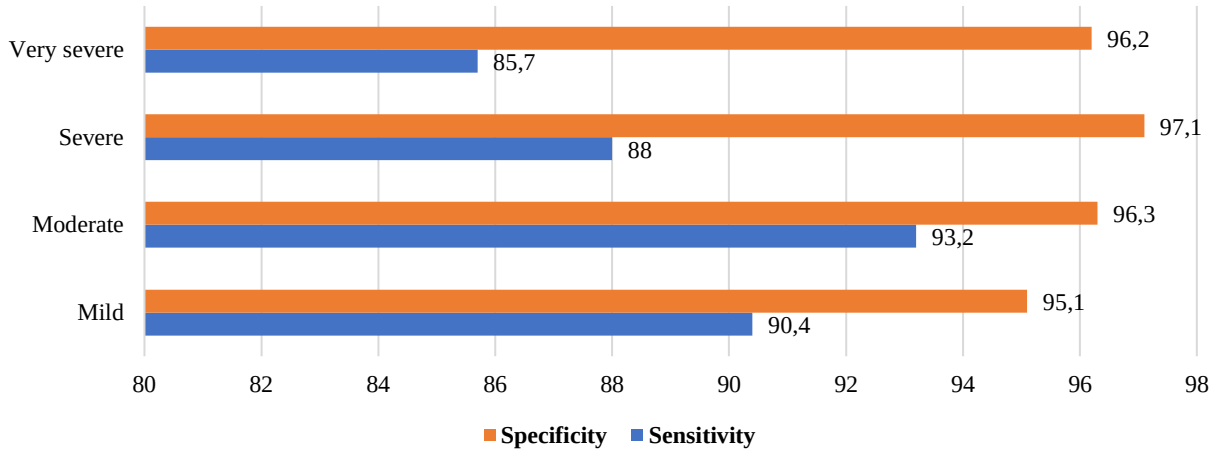

Figure 9. Results of assessment of the reliability of the JHRLSS scale using the ROC scale, %

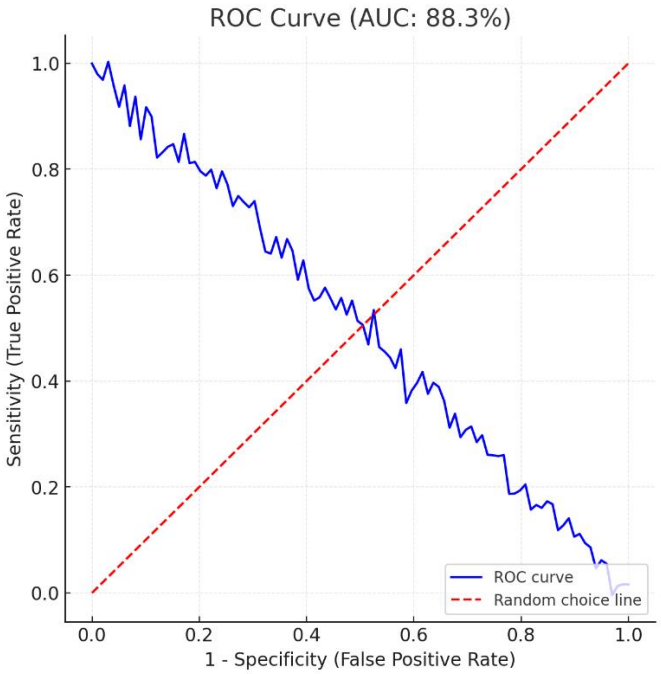

Figure 10. Graphic representation of the effectiveness of the JHRLSS scale

In severe cases, the sensitivity was 88%, and the specificity was 97.1%. This shows the high reliability of the scale in confirming severe symptoms and the low

probability of false positive results. At the extreme level, the sensitivity was 85.7% and the specificity was 96.2%, indicating that the scale has high reliability in assessing symptoms. The sensitivity of the JHRLSS scale was high at mild to moderate severity levels, with a slight decreasing trend as severity level increased. AUC was equal to 88.3%. But the specificity was high at all levels, indicating a low likelihood of misdiagnosis of symptoms. Also, the high level of specificity at the extreme level confirms the importance of the scale in clinical use. These results indicate that the JHRLSS scale is effective and reliable in assessing symptom severity.

CONCLUSIONS:

1. For detecting mild symptoms, the IRLS and ASRS scales demonstrated equal effectiveness, identifying symptoms in 10 (90.9%) patients each. In contrast, the JHRLS scale recorded mild symptoms in only 6 (54.5%) patients, which is 1.67 times lower in sensitivity compared to the IRLS and ASRS scales. Therefore, the IRLS and ASRS scales are preferred for clinical use in assessing mild symptoms, as they exhibit superior sensitivity, while the JHRLS scale shows comparatively lower sensitivity in detecting these symptoms. Moderate symptoms were identified in 1 (9.09%) patient using the IRLS scale and in 2 (18.1%) patients using the JHRLS scale, indicating 2 times greater sensitivity for the JHRLS compared to the IRLS. However, the ASRS scale failed to detect moderate symptoms entirely, reflecting its low sensitivity in this category.
2. For evaluating moderate symptoms, the IRLS scale identified 1 (9.09%) patient, whereas the JHRLS scale detected symptoms in 2 (18.1%) patients, which is 2 times more than the IRLS. The ASRS scale, on the other hand, did not record any moderate symptoms, highlighting its lack of reliability in assessing this category of symptoms. Thus, while the JHRLS scale demonstrates higher sensitivity for moderate symptoms, its clinical reliability remains questionable when compared to the IRLS scale.
3. Severe symptoms were identified in 1 (9.09%) patient using the ASRS scale, while the IRLS and JHRLS scales did not detect any severe symptoms. This highlights the ASRS scale’s advantage in identifying severe symptoms. When compared to the IRLS and JHRLS scales, the ASRS emerges as an effective tool for detecting symptoms of this severity.
4. Extremely severe symptoms were identified equally by the JHRLS and ASRS scales, with both detecting symptoms in 1 (10.0%) patient. However, the IRLS scale did not record any symptoms in this category, indicating its lower sensitivity for extremely severe symptoms. This demonstrates that the ASRS and

JHRLS scales have equal sensitivity in assessing extremely severe symptoms, whereas the IRLS scale is less sensitive at this level.

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