

Evaluating the Effectiveness of Psychometric Tests in the Early Diagnosis of Minimal Hepatic Encephalopathy

Bekmuradova Makhsuda Salkhidinovna

PhD, Assistant at the Department of Propaedeutics of Internal Diseases, Samarkand State Medical University, Uzbekistan

Tairov Doston Rustamovich

PhD, Assistant at the Department of Propaedeutics of Internal Diseases SamSMU, Uzbekistan

Khaydarova Zarrina Erkinovna, Vafoyeva Nigora Abrorovna

Assistant at the Department of Propaedeutics of Internal Diseases SamSMU. Uzbekistan

Received: 2024 15, Sep

Accepted: 2024 21, Sep

Published: 2024 21, Oct

Copyright © 2024 by author(s) and BioScience Academic Publishing. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).



Open Access

<http://creativecommons.org/licenses/by/4.0/>

Annotation: Hepatic encephalopathy (HE) is a neuropsychiatric syndrome prevalent among patients with liver cirrhosis, often undiagnosed in its minimal form (MHE). This study aims to evaluate the effectiveness of psychometric tests in diagnosing MHE.

A prospective observational study was conducted with 100 cirrhotic patients aged 35-70 years. Psychometric assessments, including the Psychometric Hepatic Encephalopathy Score (PHES), Number Connection Test-A (NCT-A), and Stroop Test, were performed at baseline and three-month intervals. Statistical analysis included descriptive statistics and correlation studies.

MHE was diagnosed in 45% of patients. The PHES demonstrated a sensitivity of 84% and specificity of 90%. Significant differences in psychometric scores were observed between patients with and without MHE, with lower scores correlating with higher Child-Pugh and MELD scores.

Psychometric testing is a valuable tool for early diagnosis of MHE in cirrhotic patients. Early detection can improve patient outcomes and

quality of life, emphasizing the need for its integration into routine clinical practice. Future research should validate these findings in larger cohorts and assess the long-term impacts of early diagnosis and intervention.

Keywords: Minimal Hepatic Encephalopathy, Liver Cirrhosis, Psychometric Testing, Psychometric Hepatic Encephalopathy Score (PHES), Cognitive Impairment, Early Diagnosis, Child-Pugh Score, MELD Score, Neuropsychiatric Syndrome, Clinical Practice.

Introduction

Hepatic encephalopathy (HE) is a neuropsychiatric syndrome that affects patients with advanced liver disease or liver cirrhosis. It results from the accumulation of neurotoxins, primarily ammonia, that the liver is unable to properly detoxify due to impaired liver function. These toxins cross the blood-brain barrier, causing cognitive and motor impairments. Minimal hepatic encephalopathy (MHE), a subclinical stage of HE, affects nearly 30-50% of cirrhotic patients and is characterized by cognitive dysfunction that is not readily detectable through routine clinical examination. Despite the absence of overt symptoms, MHE significantly impacts patients' quality of life and increases their risk of progressing to overt hepatic encephalopathy (OHE).

: The early detection of MHE remains a clinical challenge, as routine physical examinations often fail to identify subtle cognitive impairments. However, psychometric tests have emerged as valuable tools in diagnosing MHE. These tests are designed to detect specific cognitive deficits, such as impaired attention, psychomotor speed, and executive function, which are typically the first signs of MHE. Despite their importance, psychometric tests are not universally standardized, and there is a need for further validation to ensure their efficacy in various clinical settings.

The purpose of this study is to evaluate the effectiveness of psychometric tests in the early diagnosis of minimal hepatic encephalopathy. By examining the sensitivity and specificity of these tests, this study aims to highlight their clinical utility in detecting cognitive impairments before they progress to more severe stages. Early detection and intervention can prevent the progression to overt hepatic encephalopathy and improve the quality of life for cirrhotic patients.

This study will address the following key research questions:

1. Which psychometric tests are most effective in detecting minimal hepatic encephalopathy in cirrhotic patients?
2. What is the impact of early diagnosis of MHE through psychometric tests on patient outcomes, particularly in preventing progression to overt hepatic encephalopathy?
3. Can the integration of these tests into routine clinical practice improve early intervention strategies and patient management?

Methods

This is a prospective observational study conducted over 12 months, aiming to evaluate the effectiveness of psychometric tests in diagnosing minimal hepatic encephalopathy (MHE) in patients with liver cirrhosis.

A total of 100 patients with liver cirrhosis, aged 35-70 years, are included in the study. Patients with overt hepatic encephalopathy or neurological/psychiatric conditions are excluded.

- Cirrhotic patients (Child-Pugh B/C), no history of overt hepatic encephalopathy, aged 35-70 years, consent provided.
- Overt hepatic encephalopathy, neurological/psychiatric conditions, use of sedatives or psychoactive drugs.

Psychometric testing includes the Psychometric Hepatic Encephalopathy Score (PHES), the Number Connection Test-A (NCT-A), and the Stroop Test, administered at baseline and three-month intervals. These tests assess cognitive function, attention, and psychomotor speed.

Descriptive statistics and paired t-tests are used to evaluate changes in test scores over time. Correlation analysis explores the relationship between psychometric results and liver disease severity (Child-Pugh, MELD scores). Statistical significance is set at $p < 0.05$.

Results

Of the 100 patients enrolled in the study, 45 (45%) were diagnosed with minimal hepatic encephalopathy (MHE) at baseline using psychometric testing. The most commonly utilized tests were the Psychometric Hepatic Encephalopathy Score (PHES), which indicated cognitive impairment in 38 patients (84.4% of those diagnosed with MHE), followed by the Stroop Test and Number Connection Test-A (NCT-A).

- The mean PHES score for patients with MHE was significantly lower (-2.5 ± 1.2) compared to patients without MHE (0.5 ± 1.0), indicating a strong correlation between lower scores and the presence of MHE ($p < 0.001$).
- Patients with MHE had an average completion time of 75 seconds, compared to 45 seconds for those without MHE ($p < 0.01$).
- A significant delay in reaction time was observed in MHE patients (mean 850 ms) versus controls (mean 600 ms, $p < 0.001$).

Comparison of test results between MHE and non-MHE patients revealed statistically significant differences in cognitive performance. The sensitivity of the PHES was determined to be 84%, while specificity was 90%, affirming its utility as a reliable diagnostic tool for MHE.

A strong correlation was found between the severity of liver disease (Child-Pugh and MELD scores) and the results of psychometric testing. Higher Child-Pugh scores were associated with lower PHES scores ($r = -0.65$, $p < 0.01$), indicating that cognitive impairment worsens as liver disease progresses.

Discussion

The results of this study underscore the critical role of psychometric tests in the early diagnosis of minimal hepatic encephalopathy (MHE) among patients with liver cirrhosis. The high prevalence of MHE (45%) in the study population highlights the importance of routine cognitive assessments in this patient group, as MHE is often underdiagnosed and left untreated.

The significant differences in psychometric test scores between patients with and without MHE confirm that cognitive impairments can be detected using these standardized tools. The PHES demonstrated excellent sensitivity (84%) and specificity (90%), supporting its implementation in clinical practice for the detection of MHE. The correlation between lower PHES scores and higher Child-Pugh and MELD scores suggests that cognitive dysfunction intensifies with the progression of liver disease, reinforcing the need for early intervention.

Early identification of MHE through psychometric testing can have profound implications for patient management. By recognizing cognitive deficits at an early stage, healthcare providers can initiate timely therapeutic interventions aimed at improving liver function and overall quality of life. Furthermore, enhancing patient education about the risks associated with MHE, such as

impaired driving and increased susceptibility to accidents, is vital for promoting safety and well-being.

This study has several limitations that must be acknowledged. The relatively small sample size and single-center design may limit the generalizability of the findings. Additionally, the reliance on psychometric tests for diagnosing MHE may not encompass the full spectrum of cognitive impairments, suggesting a need for further studies incorporating neuroimaging techniques or other diagnostic modalities.

Future research should aim to validate the psychometric tests in larger, multi-center cohorts and explore their integration into standard clinical practice. Investigating the long-term effects of early diagnosis and treatment of MHE on patient outcomes will also be crucial in determining the overall benefit of implementing these tests in routine care.

Conclusion

This study highlights the significant role of psychometric tests in the early diagnosis of minimal hepatic encephalopathy (MHE) in patients with liver cirrhosis. The high prevalence of MHE among the studied population underscores the necessity for routine cognitive assessments in clinical practice. The Psychometric Hepatic Encephalopathy Score (PHES) demonstrated excellent sensitivity and specificity, making it a valuable tool for identifying cognitive deficits before they progress to overt hepatic encephalopathy.

The findings suggest that early detection and intervention can improve patient outcomes and quality of life by addressing cognitive impairments associated with MHE. Furthermore, integrating psychometric testing into routine clinical assessments can aid healthcare providers in recognizing at-risk patients and tailoring appropriate management strategies.

However, the study's limitations, including its sample size and single-center nature, indicate a need for further research to validate these findings in broader populations. Future studies should explore the long-term effects of early MHE diagnosis and treatment on patient health and safety.

In conclusion, incorporating psychometric tests into clinical practice for liver cirrhosis patients is essential for the early identification of MHE, ultimately improving management and patient safety.

List of literatures:

1. Agarwal A., Taneja S., Chopra M., Duseja A., Dhiman R.K. Animal Naming Test—A simple and accurate test for diagnosis of minimal hepatic encephalopathy and prediction of overt hepatic encephalopathy. *Clin. Exp. Hepatol.* 2020;6:116–124. doi: 10.5114/ceh.2019.95105.
2. Allampati S., Duarte-Rojo A., Thacker L.R., Patidar K.R., White M.B., Klair J.S., John B., Heuman D.M., Wade J.B., Flud C., et al. Diagnosis of Minimal Hepatic Encephalopathy Using Stroop EncephalApp: A Multicenter US-Based, Norm-Based Study. *Am. J. Gastroenterol.* 2016;111:78–86.
3. Amodio P., Campagna F., Olinas S., Iannizzi P., Mapelli D., Penzo M., Angeli P., Gatta A. Detection of minimal hepatic encephalopathy: Normalization and optimization of the Psychometric Hepatic Encephalopathy Score. A neuropsychological and quantified EEG study. *J. Hepatol.* 2008;49:346–353.
4. Badea M.A., Drug V.L., Dranga M., Gavrilescu O., Stefanescu G., Popa I., Mihai C., Cijevschi-Prelipcean C. Diagnosis of minimal hepatic encephalopathy in a tertiary care center from eastern Romania: Validation of the psychometric hepatic encephalopathy score (PHES) *Metab. Brain Dis.* 2016;31:1463–1471.
5. Bajaj J.S., Cordoba J., Mullen K.D., Amodio P., Shawcross D.L., Butterworth R.F., Morgan M.Y., International Society for Hepatic E., Nitrogen M. Review article: The design of clinical trials in hepatic encephalopathy—An International Society for Hepatic Encephalopathy and

- Nitrogen Metabolism (ISHEN) consensus statement. *Aliment. Pharmacol. Ther.* 2011;33:739–747.
6. Bajaj J.S., Hafeezullah M., Hoffmann R.G., Saeian K. Minimal hepatic encephalopathy: A vehicle for accidents and traffic violations. *Am. J. Gastroenterol.* 2007;102:1903–1909.
 7. Bekmuradova M. S., Bozorova S. A. USE OF PROTON PUMP INHIBITORS IN PATIENTS WITH LIVER CIRRHOSIS AND THEIR IMPACT ON THE MENTAL STATUS OF PATIENTS //World Bulletin of Public Health. – 2023. – T. 29. – C. 75-79.
 8. Bekmurodova M. S., Maxmudova X. D. PROTON POMPASI INGIBITORLARINING JIGAR SIRROZI BILAN OG'RIGAN BEMORLARNING RUHIY HOLATIGA TA'SIRI //BIOLOGIYA VA KIMYO FANLARI ILMIY JURNALI. – 2023. – T. 1. – №. 1. – C. 24-30.
 9. Coubard O.A., Ober K.M., Gaumet M., Urbanski M., Amato J.N., Chapron V., Weiss N., Kinugawa K., Weissenborn K., Thabut D. Standardization of the psychometric hepatic encephalopathy score in a French population. *PLoS ONE.* 2021;16:e0257136.
 10. Ferenci P., Lockwood A., Mullen K., Tarter R., Weissenborn K., Blei A.T. Hepatic encephalopathy—Definition, nomenclature, diagnosis, and quantification: Final report of the working party at the 11th World Congresses of Gastroenterology, Vienna, 1998. *Hepatology.* 2002;35:716–721.
 11. Khabibovna Y. S., Salkhidinovna B. M. Effects of proton pump inhibitors on hepatic encephalopathy in patients with cirrhosis //World Bulletin of Public Health. – 2022. – T. 9. – C. 230-233.
 12. Khudoyberdievich, Ziyadullaev Shukhrat, Bekmuradova Makhsuda Salkhidinovna, and Toirov Doston Rustamovich. "Effect of Proton Pump Inhibitors on Hepatic Encephalopathy in Cirrhotic Patients with Concomitant Gastroduodenal Disorders." *American Journal of Medicine and Medical Sciences* 13.2 (2023): 112-118.
 13. Kircheis G., Bode J.G., Hilger N., Kramer T., Schnitzler A., Haussinger D. Diagnostic and prognostic values of critical flicker frequency determination as new diagnostic tool for objective HE evaluation in patients undergoing TIPS implantation. *Eur. J. Gastroenterol. Hepatol.* 2009;21:1383–1394.
 14. Labenz C., Beul L., Toenges G., Schattenberg J.M., Nagel M., Sprinzl M.F., Nguyen-Tat M., Zimmermann T., Huber Y., Marquardt J.U., et al. Validation of the simplified Animal Naming Test as primary screening tool for the diagnosis of covert hepatic encephalopathy. *Eur. J. Intern. Med.* 2019;60:96–100.
 15. Nazarov, Feruz Yusufovich, and Zarina Erkinovna Xaydarova. "OSHQOZON VA ICHAK YARA KASALLIKLARI BOR BEMORLARDA SUYAKLAR MINERAL ZICHLIGINING BUZILISHI." *Oriental renaissance: Innovative, educational, natural and social sciences* 2.Special Issue 4-2 (2022): 1037-1044.
 16. Pawar V.B., Surude R.G., Sonthalia N., Zanzwar V., Jain S., Contractor Q., Rathi P.M. Minimal Hepatic Encephalopathy in Indians: Psychometric Hepatic Encephalopathy Score and Inhibitory Control Test for Diagnosis and Rifaximin or Lactulose for Its Reversal. *J. Clin. Transl. Hepatol.* 2019;7:304–312.
 17. Salhiddinovna, B. M., Alisherovna, K. M., Tashtemirovna, E. M. M., & Tatlibayevich, Y. S. (2023). Hepatic Encephalopathy and Quality of Life of Patients With Viral Cirrhosis of the Liver. *Miasto Przyszłości*, 35, 1-5.
 18. Salkhidinovna B. M. Assessment of the dynamics of hepatic encephalopathy in patients with cirrhosis before and after treatment in stationary. – 2022.

19. Salkhidinovna B. M. et al. Challenges and Treatment in Liver Diseases //Miasto Przyszłości. – 2024. – T. 52. – C. 576-582.
20. Salkhidinovna B. M. et al. Psychological Impacts and Treatment Strategies in Patients With Liver Cirrhosis //Research Journal of Trauma and Disability Studies. – 2024. – T. 3. – №. 9. – C. 140-146.
21. Salkhidinovna B. M., Nizomitdinovich K. S. ASSESSMENT OF THE DYNAMICS OF HEPATIC ENCEPHALOPATHY IN PATIENTS WITH CIRRHOSIS BEFORE AND AFTER IN-HOSPITAL TREATMENT.
22. Tapper E.B., Kenney B., Nikirk S., Levine D.A., Waljee A.K. Animal Naming Test Is Associated With Poor Patient-Reported Outcomes and Frailty in People With and Without Cirrhosis: A Prospective Cohort Study. *Clin. Transl. Gastroenterol.* 2022;13:e00447.
23. Toshtemirovna, E. M. M., Alisherovna, K. M., Erkinovna, K. Z., & Xudoyberdiyevich, G. X. (2022). DIAGNOSIS OF CIRRHOTIC CARDIOMYOPATHY. *Spectrum Journal of Innovation, Reforms and Development*, 10, 141-147.
24. Weissenborn K. Hepatic Encephalopathy: Definition, Clinical Grading and Diagnostic Principles. *Drugs.* 2019;79:5–9.
25. Wunsch E., Koziarska D., Kotarska K., Nowacki P., Milkiewicz P. Normalization of the psychometric hepatic encephalopathy score in Polish population. A prospective, quantified electroencephalography study. *Liver Int.* 2013;33:1332–1340. doi: 10.1111/liv.12194.
26. Xudoyberdiyevich, G. X., Alisherovna, K. M., Toshtemirovna, E. M. M., & Totlibayevich, Y. S. (2022). Characteristics Of Neuropeptides-Cytokines in Patients with Cardiovascular Pathology Occurring Against the Background of Anxiety and Depressive Disorders. *The Peerian Journal*, 11, 51-57.
27. Xudoyberdiyevich, Gafforov Xudoyor, and Vafoyeva Nigora Abrorovna. "Jigar Sirrosi Kasalligida Yurakning Sistolik Va Diastolik Disfunktsiyasining Ahamiyati." *Journal of cardiorespiratory research* 2.1 (2021): 67-69.
28. Бекмурадова М. С., Махмудова Х. Д. ВЛИЯНИЕ ИНГИБИТОРОВ ПРОТОННОЙ ПОМПЫ НА МЕНТАЛЬНЫЙ СТАТУС БОЛЬНЫХ ЦИРРОЗОМ ПЕЧЕНИ //World of Scientific news in Science. – 2023. – Т. 1. – №. 2. – С. 128-138.