



Original research article

Predictors of quality of life after peroral endoscopic myotomy treatment

Alena Várady^{1,2*}, Ivana Bóriková¹¹ Comenius University in Bratislava, Jessenius Faculty of Medicine in Martin, Department of Nursing, Martin, Slovak Republic² University Hospital Martin, Clinic of Gastroenterological Internal Medicine, Martin, Slovak Republic

Abstract

Introduction: Esophageal achalasia is a chronic motility disorder that impairs quality of life (QoL). The aim of this study was to evaluate changes in QoL after peroral endoscopic myotomy (POEM) and to identify selected socio-demographic and clinical predictors.

Methods: A prospective observational study included 50 patients aged 19–84 years. QoL was assessed using the Patient Assessment of Upper Gastrointestinal Disorders-Quality of Life (PAGI-QOL) before and three months after POEM. Changes and predictors of improvement were analyzed using non-parametric tests and generalized linear mixed models.

Results: Total QoL and all domains improved significantly. The greatest changes were observed in Diet and Food Habits ($r = -0.813$, $p < 0.001$), Daily Activities ($r = -0.726$, $p < 0.001$), and Psychological Well-being and Distress ($r = -0.720$, $p < 0.001$). The total PAGI-QOL score increased significantly from 3.4 to 4.5 ($r = -0.799$, $p < 0.001$). Previous treatment predicted lower improvement in the Diet and Food Habits domain ($\beta = -1.33$, $p = 0.005$), as well as in total QoL ($\beta = -0.668$, $p = 0.046$). Higher age was associated with smaller improvement in the Relationship domain ($\beta = -0.02$, $p = 0.013$). The PAGI-QOL demonstrated excellent reliability for the total score ($\alpha = 0.946$; $\omega = 0.95$).

Conclusion: QoL improved after POEM. Routine QoL assessment should be integrated into achalasia care, particularly in older patients and those with prior treatment.

Keywords: Achalasia; Nursing care; PAGI-QOL; Peroral endoscopic myotomy; Quality of life

Introduction

Esophageal achalasia is a chronic neurogenic disorder characterized by impaired relaxation of the lower esophageal sphincter and loss of peristalsis in the esophageal body due to degeneration of inhibitory neurons within the myenteric plexus. The resulting functional obstruction leads to progressive esophageal dilatation and impaired bolus transit, clinically manifesting primarily as dysphagia (Pesce et al., 2023). Although achalasia is a relatively rare condition, with an incidence of approximately 1–3 per 100,000 population per year, it can occur at any age and most commonly affects adults and older individuals (Evensen et al., 2022). Typical symptoms include progressive dysphagia to both solids and liquids, regurgitation of undigested food, retrosternal chest pain, and unintentional weight loss; in advanced stages, respiratory complications related to aspiration may occur (Vaezi et al., 2020). These symptoms negatively affect daily functioning, limit occupational performance and social participation, and impair psychological well-being. Studies consistently describe prolonged uncertainty, frustration, and psychosocial burden that substantially

compromise quality of life (QoL) (Hanschmidt et al., 2023; Kalantari et al., 2021).

Therapeutic options for achalasia include pneumatic dilation, laparoscopic Heller myotomy, botulinum toxin injection, and modern endoscopic techniques, particularly peroral endoscopic myotomy (POEM). Although these interventions are effective in reducing symptoms, clinical response is heterogeneous and varies across patients (Campagna et al., 2021). Objective parameters such as high-resolution manometry do not necessarily correlate with patients' subjective perception of improvement; associations between physiologic measures and QoL outcomes may be weak (Evensen et al., 2022; Madhanagopalan et al., 2025). These findings highlight the need to incorporate QoL as a key indicator of treatment success and to use patient-reported outcomes capturing psychosocial dimensions (Reed and Dellon, 2018). Several questionnaires have been developed to assess QoL in upper gastrointestinal disorders, including the Patient Assessment of Upper Gastrointestinal Disorders-Quality of Life (PAGI-QOL) and the Gastrointestinal Quality of Life Index (GIQLI). Both instruments demonstrate high reliability and sensitivity to change after therapeutic interventions (De la Loge et al., 2004a; Eypasch et

* **Corresponding author:** Alena Várady, Comenius University in Bratislava, Jessenius Faculty of Medicine in Martin, Department of Nursing, Malá Hora 5, 036 01 Martin, Slovak Republic; e-mail: varady6@uniba.sk
<http://doi.org/10.32725/kont.2026.043>

Submitted: 2026-03-12 • Accepted: 2026-07-06 • Prepublished online: 2026-07-13

KONTAKT 28/x: xxx-xxx • EISSN 1804-7122 • ISSN 1212-4117

© 2026 The Authors. Published by University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences.

This is an open access article under the CC BY-NC-ND license.

al., 1995). Despite their availability, relatively few studies have systematically compared QoL before and after achalasia treatment (Ben-Meir et al., 2001; Garrigues et al., 2010). Evidence on sociodemographic and clinical predictors influencing the magnitude of improvement remains limited; existing studies suggest roles for age, comorbidities, and previous treatment history, although results are inconsistent (Campagna et al., 2021; Evensen et al., 2022). Systematic reviews confirm significant QoL improvements after intervention, particularly after POEM (Zhong et al., 2020). Identification of QoL predictors is relevant to nursing practice, as nurses contribute to symptom monitoring, evaluation of subjective response, and patient education. Person-centred nursing emphasizes individualized care and a holistic understanding of patients' needs (McCormack and McCance, 2016). In gastrointestinal disorders, nursing care influences symptom management, adherence to dietary recommendations, lifestyle measures, and follow-up care, which are linked to QoL outcomes (Linedale et al., 2020).

The aim of this study was to evaluate changes in QoL among patients with achalasia following treatment and to examine the role of selected sociodemographic and clinical variables. We hypothesized that QoL would significantly improve across all assessed domains following achalasia treatment. We further hypothesized that age, body mass index (BMI), comorbidities, and history of previous achalasia treatment would be significantly associated with the magnitude of QoL change. Specifically, we expected that older age and previous treatment experience would be associated with smaller improvements in QoL after treatment.

Materials and methods

Data collection and research instrument

A quantitative prospective observational cohort study with pre-post design was conducted at the Clinic of Gastroenterological Internal Medicine, University Hospital Martin (June 2024 to November 2025). The clinic is one of the regional centres that has been providing interventional treatment of achalasia since 2014. Given the rarity of achalasia and the limited number of POEM procedures performed annually, the sample size reflected the number of consecutive patients treated at the center during the study period. Patients indicated for POEM who were willing to participate in the study (including follow-up assessment after three months) and met the inclusion criteria were invited to participate in the study: age ≥ 18 years, physician-confirmed diagnosis of achalasia based on standard diagnostic criteria, indication for POEM, and ability to complete the questionnaire independently. Exclusion criteria included cognitive impairment, diagnosed psychiatric disorder, inability to complete the questionnaire, or refusal to participate.

The questionnaire was administered in paper format. At baseline (T1), patients received standardized instructions from a nurse and completed the questionnaire prior to POEM. Three months after POEM (T2), patients completed the follow-up questionnaire during a scheduled outpatient visit. QoL was assessed using the PAGI-QOL questionnaire (De la Loge et al., 2004a, b). A validated Slovak version was obtained through the MAPI Research Trust. The instrument comprises 30 items across five domains (Daily activities, Clothing, Diet and food habits, Relationship, Psychological well-being and distress) and provides a total QoL score. Items were reverse coded so that higher scores indicated better QoL. Domain and total scores were calculated as arithmetic means according to

scoring guidelines. The questionnaire was supplemented with sociodemographic variables (sex, age, education, marital status, employment status) and clinical variables (BMI, comorbidities, previous achalasia treatment).

Data analysis

Descriptive statistics were calculated for all study variables. Categorical variables are presented as absolute and relative frequencies. Continuous variables are reported as mean $\pm$ standard deviation (SD) and range. Changes between baseline (T1) and three months after POEM (T2) were evaluated using the Wilcoxon signed-rank test. Effect sizes were expressed as rank-biserial correlation coefficients (r). The level of statistical significance was set at $\alpha = 0.05$. To identify predictors of change in QoL, difference scores $\Delta = T2 - T1$ (change between time points T2 - T1, i.e., post-POEM score minus pre-POEM score for each domain and total score) were entered as dependent variables into generalized linear mixed models (GLMM). Age, BMI, presence of comorbidities (yes/no), and previous therapeutic intervention for achalasia (yes/no) were included as fixed effects, while patient identifier was specified as a random effect. Models assuming Gaussian distribution were fitted using the glmmTMB package (Brooks et al., 2017). Regression coefficients (β), standard errors (SE), z-values, p -values, and 95% confidence intervals were reported. Internal consistency of the PAGI-QOL total score and its domains was evaluated using Cronbach's alpha α (Cronbach, 1951) with Feldt confidence intervals CI (Feldt et al., 1987) and McDonald's omega ω (Stensen and Lydersen, 2022). All statistical and psychometric analyses were performed in R (R Core Team, 2025). Reliability analyses were conducted using the psych package (Revelle, 2025), and graphical outputs were generated using ggplot2 (Wickham, 2016) and patchwork (Pedersen, 2024).

Ethical aspects

The study was approved by the Ethics Committee of the Jessenius Faculty of Medicine, Comenius University in Martin (JFM CU number EK 46/2024) and conducted in accordance with the Declaration of Helsinki (1964 and its later amendments). Participation was voluntary and anonymous. Written informed consent was obtained from all participants.

Results

The sample included 50 patients (44% women and 56% men). The mean age was 55.5 ± 15.7 years (range 19–84). Most participants had secondary education (72%), followed by university education (16%) and primary education (12%). Married or partnered participants represented 46%, single participants 30%, and widowed participants 16%. Employed and retired participants each accounted for 44% of the sample.

The mean BMI was 26.8 ± 7.1 at T1 and 26.8 ± 7.0 at T2 (range 17.6–42.5). Comorbidities were reported by 66% of participants ($n = 33$), most frequently cardiovascular (34%), neurological (16%), musculoskeletal (12%), and respiratory (10%). First-time treatment was reported by 70% of patients ($n = 35$), whereas 30% ($n = 15$) had undergone previous treatment (pneumatic dilation 46.7%, pharmacotherapy 46.7%, Heller myotomy 6.7%).

Reliability and internal consistency of the PAGI-QOL

Internal consistency coefficients for the PAGI-QOL total score and individual domains are presented in Table 1. The total PAGI-QOL demonstrated excellent reliability ($\alpha = 0.946$; 95%

CI 0.92–0.97; $\omega = 0.95$). The domains Daily activities ($\alpha = 0.939$; $\omega = 0.94$) and Psychological well-being and distress ($\alpha = 0.923$; $\omega = 0.93$) showed the highest internal consistency. Diet and food habits also demonstrated very good reliability ($\alpha = 0.910$; $\omega = 0.91$). The Relationship domain showed acceptable reliability ($\alpha = 0.771$; $\omega = 0.77$). The Clothing domain had the lowest coefficients ($\alpha = 0.705$; 95% CI 0.48–0.87; $\omega = 0.71$), likely due to the small number of items ($n = 2$); nevertheless, this domain also reaches the limit of acceptable reliability for research purposes.

Table 1. Internal consistency of PAGI-QOL by domains

Domain	Cronbach's alpha	95% CI	McDonald's omega
Daily activities	0.939	0.91–0.96	0.94
Clothing	0.705	0.48–0.87	0.71
Diet and food habits	0.910	0.87–0.95	0.91
Relationship	0.771	0.66–0.88	0.77
Psychological well-being and distress	0.923	0.89–0.96	0.93
Total PAGI-QOL score	0.946	0.92–0.97	0.95

Changes in individual PAGI-QOL items after POEM

A detailed analysis of individual PAGI-QOL items demonstrated consistent improvement in QoL scores across all evaluated domains between the pre-POEM assessment (T1) and the post-POEM assessment (T2). The largest mean changes were observed in the Diet and food habits domain, particularly for item 14 (avoiding certain types of food; $\Delta = 2.16$), item 16 (reduced enjoyment of food; $\Delta = 2.14$), and item 18 (disappointment due to inability to choose preferred foods; $\Delta = 2.06$). Within the Daily activities' domain, the greatest mean change was observed for item 7 (concerns about experiencing symptoms in public; $\Delta = 2.12$), indicating a reduction in social discomfort and psychological burden associated with gastrointestinal manifestations of the disease. Improvements were also noted in items related to work performance, household activities, and travel, with mean differences ranging from 0.80 to 1.34 points. In the Psychological well-being and distress domain, several items increased by approximately 1 point, indicating better subjective well-being after POEM. Changes in the Relationship domain were smaller (up to 0.50 points). In the Clothing domain, scores increased from 4.4 ± 1.0 at T1 to 4.9 ± 0.4 at T2 ($z = -2.91$; $p = 0.004$; $r = -0.412$), indicating a statistically significant difference.

Changes in PAGI-QOL domains after POEM

Based on paired Wilcoxon signed-rank tests, statistically significant improvements were observed across all PAGI-QOL domains between T1 and T2. Changes across individual domains are illustrated in Chart 1. The largest increase was found in the Diet and food habits domain, where the mean score rose from 2.4 ± 1.4 to 4.3 ± 0.6 ($z = -5.75$; $p < 0.001$; $r = -0.813$), which represents a very large effect of change in this area. Significant improvements were also observed in the Daily activities' domain ($z = -5.14$; $p < 0.001$; $r = -0.726$) and the Psychological well-being and distress domain ($z = -5.09$; $p < 0.001$; $r = -0.720$), where the average score increased by more than 1 point. These results indicate a comprehensive positive impact of the treatment on functional abilities and subjective experience of patients. Smaller but statistically significant changes were identified in the Relationship domain ($z = -2.92$;

$p = 0.004$; $r = -0.412$) and the Clothing domain ($z = -2.91$; $p = 0.004$; $r = -0.412$). The total PAGI-QOL score increased from 3.4 ± 0.9 to 4.5 ± 0.3 ($z = -5.65$; $p < 0.001$; $r = -0.799$), which confirms the significant overall benefit of achalasia treatment on the QoL of patients.

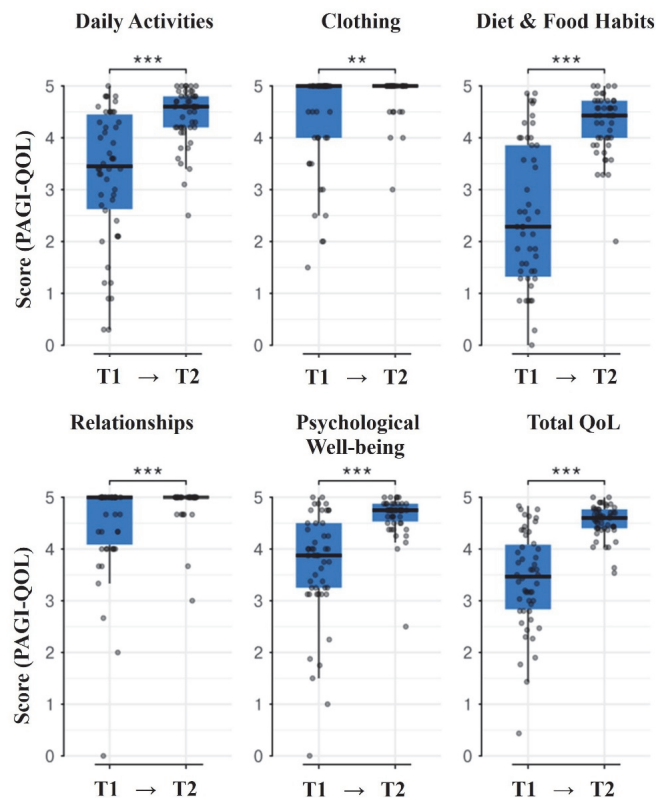


Chart 1. Changes in QoL scores across PAGI-QOL domains before (T1) and 3 months after POEM (T2). Boxplots display median values, interquartile ranges (IQR), and individual data points for the domain's Daily activities, Clothing, Diet and food habits, Relationship, Psychological well-being and distress, and the total PAGI-QOL score.

Predictors of changes in QoL

To identify factors associated with changes in individual PAGI-QOL domains and in the total score between T1 and T2, generalized linear mixed models were applied. The following variables were included as predictors: age, BMI, presence of comorbidities, and previous therapeutic intervention for achalasia (yes/no). Table 2 presents descriptive statistics and comparisons of PAGI-QOL domains at baseline before (T1) and three months after POEM (T2).

The most pronounced statistically significant predictor of a lower magnitude of improvement in the Diet and food habits domain was a history of previous therapeutic intervention for achalasia ($\beta = -1.33$; SE = 0.47; $z = -2.82$; $p = 0.005$), suggesting that patients with prior treatment achieved smaller improvements in QoL in this domain. This variable was also identified as a significant predictor of change in the total QoL score ($\beta = -0.668$; SE = 0.335; $z = -1.99$; $p = 0.046$). In the Clothing domain, the association reached marginal statistical significance ($p = 0.056$). Age demonstrated a statistically significant negative association with change in the Relationship domain ($\beta = -0.02$; SE = 0.009; $z = -2.49$; $p = 0.013$). In the Relation-

ship domain, the model estimated that the predicted change in score decreased with increasing age (Chart 2). Predicted values approached zero at approximately 70–75 years of age.

BMI and the presence of comorbidities were not statistically significant predictors in any of the models. Age did not demonstrate statistically significant effects in the remaining QoL domains.

Table 2. PAGA-QOL domains before (T1) and three months after POEM (T2)

Domain	T1 mean $\pm$ SD	T2 mean $\pm$ SD	z-value	p-value	effect size (<i>r</i>)
Daily activities	3.3 $\pm$ 1.3	4.4 $\pm$ 0.5	-5.14	<0.001	-0.726
Clothing	4.4 $\pm$ 1.0	4.9 $\pm$ 0.4	-2.91	0.004	-0.412
Diet and food habits	2.4 $\pm$ 1.4	4.3 $\pm$ 0.6	-5.75	<0.001	-0.813
Relationship	4.5 $\pm$ 0.9	4.9 $\pm$ 0.3	-2.92	0.004	-0.412
Psychological well-being and distress	3.7 $\pm$ 1.1	4.7 $\pm$ 0.4	-5.09	<0.001	-0.720
Total PAGA-QOL	3.4 $\pm$ 0.9	4.5 $\pm$ 0.3	-5.65	<0.001	-0.799

Note: $p < 0.05$ was considered statistically significant

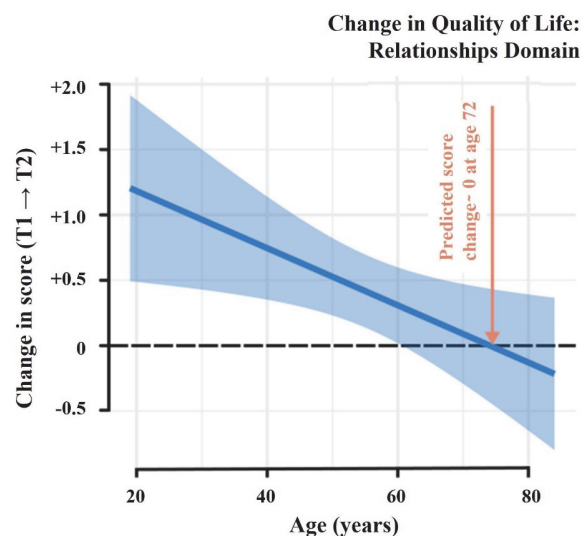


Chart 2. Predicted change in QoL in the Relationships domain as a function of age. The plot shows a significant negative association between age and change in QoL score from baseline (T1) to follow-up (T2). The shaded area represents the 95% confidence interval. The vertical red arrow indicates the age (72 years) at which no change in QoL score is predicted. Individuals younger than 72 are predicted to improve, while those older may experience little to no improvement or even a decline in QoL.

Discussion

The results of this study demonstrate that significant improvements in QoL were evident three months after POEM in patients with achalasia. The most pronounced changes were observed in the domains of Diet and food habits, Daily activities, and Psychological well-being and distress. These findings reflect the fundamental nature of the disease, in which dysphagia represents the dominant symptom affecting food intake, social functioning, and emotional well-being. Eating difficulties frequently lead to food avoidance, social withdrawal, and increased anxiety, all of which substantially reduce QoL (Evensen et al., 2022; Pesce et al., 2023). Both early and sustained benefits of POEM have been reported in clinical studies and systematic reviews (Campagna et al., 2021; Evensen et al., 2022; Zhong et al., 2020). Comparable improvements have

also been documented after surgical Heller myotomy (Asti et al., 2017; Ben-Meir et al., 2001), suggesting that relief of functional obstruction at the level of the lower esophageal sphincter represents a pivotal therapeutic mechanism, regardless of the intervention type. Although physical domains showed marked improvement, psychosocial domains demonstrated a slower trajectory of change. Interpersonal relationships and self-perception are shaped by long-term illness experiences and coping mechanisms, which may not immediately change after removal of mechanical obstruction. A similar discrepancy between rapid physical improvement and slower psychosocial adaptation has been described in other gastrointestinal disorders (Reed and Dellon, 2018). Age emerged as a significant factor influencing the magnitude of improvement, particularly in the Relationship domain. Increasing age was associated with a smaller degree of change, which may relate to reduced social flexibility and more stabilized life roles in older individuals (Hanschmidt et al., 2023; Kalantari et al., 2021).

A history of previous achalasia treatment was also identified as a significant predictor. Patients who had undergone prior therapeutic interventions demonstrated smaller improvements, especially in the Diet and food habits domain. This may reflect longer disease duration, entrenched eating behaviors, and different expectations regarding treatment outcomes. Previous studies have reported more favorable responses among treatment-naïve patients (Garrigues et al., 2010; Vaezi et al., 2020). No significant associations were found between BMI, comorbidities, and changes in QoL. This suggests that subjective improvement is primarily linked to symptom relief rather than overall somatic status (Pesce et al., 2023). The absence of significant associations for BMI and comorbidities may also be related to the relatively small sample size, which may have limited the statistical power to detect weaker effects. Furthermore, disease severity and duration of symptoms, which were not included in the analysis, may have influenced the observed associations. Although the observed improvements in QoL are likely related to the clinical effectiveness of POEM, alternative explanations should also be considered. Patient expectations regarding treatment success and placebo-related effects may have contributed to the perceived improvement in subjective outcomes. This consideration is particularly relevant because QoL was assessed using a patient-reported questionnaire. Future studies should further explore the potential influence of patient expectations on subjective treatment outcomes and evaluate the long-term sustainability of QoL improvements following POEM.

The total PAGI-QOL score provides a comprehensive measure of overall quality of life in patients with achalasia, encompassing functional, nutritional, and psychosocial aspects. The excellent reliability of the total score confirmed in this study ($\alpha = 0.946$; $\omega = 0.95$) supports its suitability for evaluating treatment outcomes in patients with achalasia. The PAGI-QOL questionnaire demonstrated strong psychometric properties in this cohort, consistent with previous validation studies confirming its reliability and construct validity (De la Loge et al., 2004a, b). A minimal clinically important difference of approximately 0.40 points for the total QoL score has been reported, supporting the clinical relevance of the observed changes. The availability of disease-specific instruments for achalasia further emphasizes that QoL is a key outcome parameter in the management of this condition (Urbach et al., 2005).

From a nursing perspective, these findings underline the importance of continuity of care. Education focused on dietary management, support for gradual social reintegration, and facilitation of coping strategies for anxiety and uncertainty may contribute to sustained improvements in QoL. This approach aligns with person-centered nursing care models that emphasize individualized and holistic care (McCormack and McCance, 2016). Integration of structured follow-up and timely intervention for psychological or social distress has also proven beneficial in other gastrointestinal conditions (Linedale et al., 2020). Overall, POEM provides not only physiological benefits but also meaningful functional and psychosocial improvements, and systematic assessment of QoL should be incorporated into routine nursing care for patients with gastroenterological diseases.

Limitations

The study was conducted in a single regional gastroenterology center, which limits the generalizability of the findings. The relatively small sample size may have limited the statistical power to detect weaker associations. The follow-up period lasted only three months after treatment; therefore, long-term changes in QoL and the sustained effectiveness of POEM could not be evaluated. The relatively short follow-up period does not allow conclusions regarding the long-term sustainability of QoL improvements after POEM. It is possible that some benefits may diminish over time or that additional changes may emerge during longer follow-up periods. Disease severity and duration of symptoms were not systematically assessed and therefore could not be included as potential confounding variables. These factors may have influenced the observed changes in QoL. QoL assessment was based on a self-reported questionnaire, which may have introduced subjective bias. Despite these limitations, the study provides insight into short-term changes in QoL following treatment for achalasia.

Conclusion

The findings of this study contribute to a better understanding of the factors influencing changes in QoL among patients with achalasia following treatment. The results demonstrate that assessing QoL provides important information beyond clinical parameters alone, allowing for the capture of functional, nutritional, and psychosocial aspects of a patient's health status. The study highlights the need to systematically integrate QoL assessment into routine clinical practice and follow-up care for patients with achalasia. Particular attention should be given to older patients and those with a history of previous treatment, in whom smaller improvements were observed in cer-

tain QoL domains. Identifying these patient groups may help healthcare professionals tailor symptom monitoring, nursing interventions, and educational support to individual needs. Specific nursing interventions may include regular assessment of QoL using validated instruments, dietary counselling focused on post-treatment eating habits, monitoring of psychosocial well-being, and targeted education aimed at supporting long-term self-management and adherence to follow-up care. A comprehensive, patient-centered approach that addresses not only symptom control but also support in daily functioning, dietary management, and psychosocial well-being may contribute to improved long-term treatment outcomes and enhanced QoL in patients with achalasia.

Author contributions

Conception and design (AV, IB), data collection (AV), data analysis and interpretation (AV, IB), manuscript draft (AV), critical revision of the manuscript (IB), final approval of the manuscript (AV, IB).

Acknowledgments

The authors thank the University Hospital Martin for enabling this research. They also acknowledge Ladislav Naďo for his assistance with statistical data analysis.

Conflict of interest

The authors have no conflict of interest to declare.

References

1. Asti E, Sironi A, Lovece A, Bonavina G, Fanelli M, Bonitta G, Bonavina L (2017). Health-related quality of life after laparoscopic Heller myotomy and Dor fundoplication for achalasia. *Surgery* 161(4): 977–983. DOI: 10.1016/j.surg.2016.10.023.
2. Ben-Meir A, Urbach DR, Khajanchee YS, Hansen PD, Swanson LL (2001). Quality of life before and after laparoscopic Heller myotomy for achalasia. *Am J Surg* 181(5): 471–474. DOI: 10.1016/S0002-9610(01)00596-7.
3. Brooks ME, Kristensen K, van Benthem KJ, Magnusson A, Berg CW, Nielsen A, et al. (2017). glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. *The R Journal* 9(2): 378–400. DOI: 10.32614/RJ-2017-066.
4. Campagna RA, Cirera A, Holmstrom AL, Triggs JR, Teitelbaum EN, Carlson DA, et al. (2021). Outcomes of 100 patients more than 4 years after POEM for achalasia. *Ann Surg* 273(6): 1135–1140. DOI: 10.1097/SLA.0000000000004830.
5. Cronbach LJ (1951). Coefficient alpha and the internal structure of tests. *Psychometrika* 16: 297–334. DOI: 10.1007/BF02310555.
6. De la Loge C, Trudeau E, Marquis P, Kahrilas PJ, Stanghellini V, Talley NJ, et al. (2004a). Cross-cultural development and validation of the PAGI-QOL. *Qual Life Res* 13(10): 1751–1762. DOI: 10.1007/s11136-004-8751-3.
7. De La Loge C, Trudeau E, Marquis P, Revicki DA, Rentz AM, Stanghellini V, et al. (2004b). Responsiveness and interpretation of a quality-of-life questionnaire specific to upper gastrointestinal disorders. *Clin Gastroenterol Hepatol* 2(9): 778–786. DOI: 10.1016/S1542-3565(04)00349-0.
8. Evensen H, Hjermstad MJ, Cvancarova M, Kristensen V, Larssen L, Skattum J, et al. (2022). Quality of life in patients with achalasia after POEM. *Endosc Int Open* 10(12): E1570–E1576. DOI: 10.1055/a-1968-7682.
9. Eypasch E, Williams JI, Wood-Dauphinee S, Ure BM, Schmülling C, Neugebauer E, Trold H (1995). Gastrointestinal Quality of Life Index: development, validation and application

- of a new instrument. *Br J Surg* 82(2): 216–222. DOI: 10.1002/bjs.1800820229.
10. Feldt LS, Woodruff DJ, Salih FA (1987). Statistical inference for coefficient alpha. *Appl Psychol Meas* 11(1): 93–103. DOI: 10.1177/014662168701100107.
 11. Garrigues V, Ortiz V, Casanova C, Bujanda L, Moreno-Osset E, Rodríguez-Téllez M, et al. (2010). Disease-specific health-related quality of life in patients with esophageal achalasia before and after therapy. *Neurogastroenterol Motil* 22(7): 739–745. DOI: 10.1111/j.1365-2982.2010.01515.x.
 12. Hanschmidt F, Tremel J, Deller J, Kreuser N, Gockel I, Kersting A (2023). Psychological burden of achalasia: patients' screening rates of depression and anxiety and sex differences. *PLoS One* 18(5): e0285684. DOI: 10.1371/journal.pone.0285684.
 13. Kalantari M, Hollywood A, Lim R, Hashemi M (2021). Mapping the experiences of people with achalasia from initial symptoms to long-term management. *Health Expectat* 24(1): 131–139. DOI: 10.1111/hex.13160.
 14. Linedale EC, Mikocka-Walus A, Gibson PR, Andrews JM (2020). The potential of Integrated Nurse-Led Models to improve care for people with functional gastrointestinal disorders: a systematic review. *Gastroenterol Nurs* 43(1): 53–64. DOI: 10.1097/SGA.0000000000000379.
 15. Madhanagopalan K, Prabhakaran R, Sugaprakash S, Sugumar C (2025). Clinical outcomes and quality of life following laparoscopic Heller's myotomy for achalasia cardia: an observational study from a tertiary care hospital. *Int Surg J* 12(2): 145–151. DOI: 10.18203/2349-2902.isj20250029.
 16. McCormack B, McCance T (2016). *Person-centred practice in nursing and health care: theory and practice*. 2nd ed. Chichester: Wiley-Blackwell, 288 p.
 17. Pedersen TL (2024). *Patchwork: the composer of plots*. R package version 1.3.0.
 18. Pesce M, Pagliaro M, Sarnelli G, Sweis R (2023). Modern achalasia: Diagnosis, classification, and treatment. *J Neurogastroenterol Motil* 29(4): 419–427. DOI: 10.5056/jnm23125.
 19. R Core Team (2025). *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.
 20. Reed CC, Dellon ES (2018). Patient-reported outcomes in esophageal diseases. *Clin Gastroenterol Hepatol* 16(3): 305–310. DOI: 10.1016/j.cgh.2017.11.049.
 21. Revelle W (2025). *Psych: procedures for psychological, psychometric, and personality research*. R package version 2.5.3.
 22. Stensen K, Lydersen S (2022). Internal consistency: from alpha to omega? *Tidsskr Nor Lægeforen* 142(12). DOI: 10.4045/tidsskr.22.0112.
 23. Urbach DR, Tomlinson GA, Harnisch JL, Martino R, Diamant NE (2005). A measure of disease-specific health-related quality of life for achalasia. *Am J Gastroenterol* 100(8): 1668–1676. DOI: 10.1111/j.1572-0241.2005.50141.x.
 24. Vaezi MF, Pandolfino JE, Yadlapati RH, Greer KB, Kavitt RT (2020). ACG clinical guidelines: diagnosis and management of achalasia. *Am J Gastroenterol* 115(9): 1393–1411. DOI: 10.14309/ajg.0000000000000731.
 25. Wickham H (2016). *Ggplot2: elegant graphics for data analysis*. New York: Springer-Verlag, 260 p. DOI: 10.1007/978-3-319-24277-4.
 26. Zhong C, Tan S, Ren Y, Lü M, Peng Y, Fu X, Tang X (2020). Quality of life following peroral endoscopic myotomy for esophageal achalasia: a systematic review and meta-analysis. *Ann Thorac Cardiovasc Surg* 26(3): 113–124. DOI: 10.5761/atcs.ra.19-00273.