ORIGINAL ARTICLE

Diagnostic Study of Indonesian Version of Dysphagia Handicap Index in Oropharyngeal Dysphagia Patient

Rusfanisa[1], Ira Mistivani[1], Elvie Zulka Kautzia Rachmawati[2], Dewi Friska[3]

[1]Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia,
[2]Department of Otorhinolaryngology-Head and Neck Surgery, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia,
[3]Department of Community Medicine, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia.

ABSTRACT

Introduction: Dysphagia significantly affects patients' quality of life, and its early detection is crucial. The Fiberoptic Endoscopic Evaluation of Swallowing (FEES) is limited to referral hospitals. Accordingly, the Indonesian version of the Dysphagia Handicap Index (DHI-INA) was investigated as a potential screening instrument for identifying dysphagia among patients in community-based settings with restricted access to advanced diagnostic modalities.

Methods: A cross-sectional study was conducted involving patients with oropharyngeal dysphagia. Each participant completed the DHI-INA questionnaire, and FEES was conducted to assess swallowing function using the Penetration-Aspiration Scale (PAS). Data were analyzed using ROC curve analysis to determine the Area Under the Curve (AUC), sensitivity, specificity, and optimal cut-off values.

Results: A total of 100 patients were enrolled in the study, with a mean age of 52.62 ± 9.61 years; with 58% male and 42% female. The primary etiologies included neurological disorders, head and neck pathologies, reflux disease, and other medical conditions. The optimal DHI-INA cut-off score of 21 yielded a sensitivity of 90.24% and specificity of 84.74%, with an AUC of 86.30%, indicating good diagnostic accuracy. A significant correlation was found between DHI-INA domain scores and PAS results ($p < 0.001$).

Conclusion: The DHI-INA demonstrated strong diagnostic performance and a significant correlation with FEES outcomes. It represents a valid and practical screening instrument for identifying patients at risk of penetration or aspiration, particularly in community settings with limited access to advanced swallowing diagnostics.

Keywords: diagnostic, dysphagia, dysphagia handicap index, DHI, Indonesia version

Correspondence Author:
Rusfanisa, MD.
Department of Physical Medicine and Rehabilitation, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia,
Email: rusfanisadr@gmail.com

INTRODUCTION

Oropharyngeal dysphagia is a swallowing disorder resulting from physiological abnormalities of the oropharynx that impair the safety and efficiency of swallowing. This dysfunction may lead to airway penetration or aspiration and incomplete bolus clearance, causing residue in the oral cavity or pharynx. The condition is associated with serious complications, including aspiration pneumonia, malnutrition, and dehydration, which may increase morbidity and mortality.[1] The prevalence of oropharyngeal dysphagia in the general Dutch population was 12.1%, highlighting its significance as a public health concern.[2]

Diagnosis of dysphagia relies on comprehensive symptom assessment and physical examination. Common symptoms include coughing, choking, a sensation of food sticking in the throat, voice changes, regurgitation, and unintended weight loss.[3] Clinical evaluation typically involves assessment of consciousness, nutritional, and respiratory status. In patients with compromised clinical conditions, further swallowing trials must be conducted cautiously or deferred.[4]

Several patient-reported outcome measures (PROMs) have been developed to assess the symptoms and impact of dysphagia, including the MD Anderson Dysphagia Inventory (MDADI), Swallowing Quality of Life Questionnaire (SWAL-QOL), and the Dysphagia Handicap Index (DHI).[5] The DHI, developed by Silbergleit et al.,[6] consists of 25 items distributed across physical, functional, and emotional domains. This instrument has been translated and validated in multiple languages, including Korean,[7] Japanese,[8] Arabic,[9] Persian,[10] and Canada.[11] Ramadhany et al. adapted and validated the Indonesian version (DHI-INA) with satisfactory internal consistency and reliability; however, its external validity and diagnostic performance have not yet been established.[12]

Advanced diagnostic examinations, such as the Fiberoptic Endoscopic Evaluation of Swallowing (FEES), remain limited to referral hospitals in Indonesia, restricting access for patients in community-based healthcare settings. This study aimed to determine whether the DHI-INA can accurately detect dysphagia by evaluating its external validity and diagnostic accuracy against Penetration–Aspiration Scale (PAS) from FEES. It also aimed to confirm whether the DHI-INA can be used as a simple screening tool in community settings to identify patients who need referral for further swallowing assessment.

METHODS

This study is a cross-sectional diagnostic design. Data were collected at the Medical Rehabilitation and Otorhinolaryngology (ENT) Polyclinics of Dr. Cipto Mangunkusumo National General Hospital (RSUPN dr. Cipto Mangunkusumo). Participants were recruited using a consecutive sampling method from the accessible population. All eligible individuals who met the inclusion criteria during the study period were invited to participate.

Inclusion criteria were adults aged ≥ 18 years, both male and female, diagnosed with oropharyngeal dysphagia (neurogenic or non-neurogenic), adequate cognitive function, defined as a MoCA-Ina score ≥ 26, ability to read and understand instructions in Bahasa Indonesia, willingness to participate in the study, consent to undergo Fiber optic Endoscopic Evaluation of Swallowing (FEES) examination. Exclusion criteria included patients who were uncooperative during the assessment and those who did not meet the inclusion criteria. There were 100 subjects, conducted after obtaining ethical approval from the Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia. Subjects recruitment took place from April 2023 to March 2024 (KET 400/UN2.F1/ETIK/PPM.00.02/2023).

All participants received a detailed explanation of the study objectives and potential benefits. Those who agreed to participate provided written informed consent prior to enrollment. Sampling was conducted consecutively at the Otorhinolaryngology (ENT) and Medical Rehabilitation Polyclinics of Dr. Cipto Mangunkusumo National General Hospital (RSCM). Eligible participants were selected through medical history taking and physical examination in accordance with the predefined inclusion and exclusion criteria. Each participant completed the Indonesian version of the Dysphagia Handicap Index (DHI-INA) questionnaire under the supervision of the investigator to ensure full comprehension and accuracy of responses.

Subsequently, all participants underwent Fiberoptic Endoscopic Evaluation of Swallowing (FEES) at the ENT Polyclinic, during which the Penetration–Aspiration Scale (PAS) score was recorded. Throughout the study procedures, both participants and researchers adhered strictly to

COVID-19 health and safety protocols, including wearing masks and performing hand hygiene with soap and water or alcohol-based hand sanitizer before and after each examination. All collected data were then analyzed to determine the diagnostic performance of the DHI-INA in comparison with FEES.

Data were analyzed using SPSS version 27 for Windows. Statistics were used to summarize participants' characteristics. The diagnostic accuracy of the DHI-INA was evaluated using receiver operating characteristic (ROC) curve analysis, and the area under the curve (AUC) was calculated to determine the overall discriminatory ability of the instrument. Subsequently, diagnostic performance metrics including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were computed to assess the validity of the DHI-INA in comparison with the FEES findings.

RESULTS

A total of 100 participants were recruited from the Medical Rehabilitation and Otorhinolaryngology (ENT) Polyclinics of Dr. Cipto Mangunkusumo National General Hospital. The mean age was 52.62 ± 9.61 years, with 58 males (58%) and 42 females (42%). Educational attainment varied, with 56% of participants completing senior high school, 15% holding a bachelor's degree, 12% a diploma, 13% junior high school, and 4% elementary school education. Regarding occupation, 38% were employees or civil servants, 28% housewives, 16% laborers, 12% unemployed, and 6% entrepreneur. Characteristics of subjects are presented in Table 1.

Table 1. Characteristic of Subjects

Characteristic	Percentages (n = 100)
Age (year)	52.62 ± 9.61
Gender	
Male	58 (58%)
Female	42 (42%)
Education	
Bachelor	15 (15%)
Diploma	12 (12%)
Senior high school	56 (56%)
Junior high school	13 (13%)
Elementary school	4 (4%)
Occupation	
Unemployed	12 (12%)
Housewives	28 (28%)
Office employee	38 (38%)
Laborer	16 (16%)
Entrepreneur	6 (6%)

The receiver operating characteristic (ROC) analysis for the DHI-INA demonstrated an area under the curve (AUC) 0.863, cutoff value of DHI-INA total score 21, sensitivity 90.24%; specificity 84.74%, indicating good overall diagnostic performance in identifying dysphagia among patients with swallowing difficulties (Figure 1).
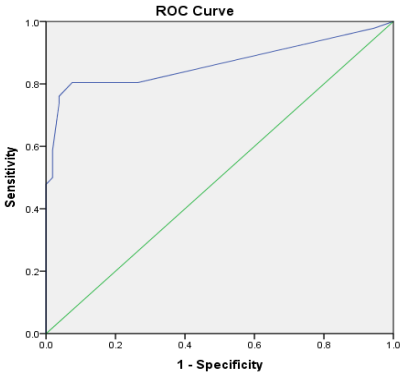

Figure 1. ROC Curve of DHI-INA

ROC curve for DHI-INA total score (solid blue line; cutoff value, 21; AUC, 0.863; sensitivity, 90.24%; specificity, 84.74%, green line; diagonal line of ROC).

ROC (Receiver Operating Characteristic), DHI-INA (Indonesian version of the Dysphagia Handicap Index), AUC (area under the ROC curve)

The distribution of DHI-INA and FEES Results were among all participants, 46% had DHI-INA scores >21 and 54% scored ≤ 21. Based on FEES findings, 59% demonstrated normal swallowing function (PAS = 1), 21% showed penetration (PAS 2–5), and 20% exhibited aspiration (PAS 6–8) (Table 2).

Table 1. Distribution of DHI-INA Score by PAS of FEES

Variable	Frequency (Percentage)
DHI-INA	
Score of DHI-INA >21	46 (46%)
Score of DHI-INA ≤ 21	54 (54%)
FEES	
Normal, PAS (1)	59 (59%)
Penetration, PAS (2-5)	21 (21%)
Aspiration, PAS (6-8)	20 (20%)

DHI-INA (Indonesian version of the Dysphagia Handicap Index) PAS (Penetration–Aspiration Scale), FEES (Fiberoptic Endoscopic Evaluation of Swallowing)

Neurological disorders accounted for the majority of dysphagia cases (54%), including stroke, meningioma, myasthenia gravis, Guillain–Barré syndrome, and Parkinson's disease. Head and neck

tumors constituted 22% of cases, most commonly following surgery or chemoradiation for nasopharyngeal carcinoma, non-Hodgkin lymphoma, thyroid carcinoma, and tongue cancer. Other causes included laryngopharyngeal reflux/gastroesophageal reflux disease (LPR/GERD) (19%) and miscellaneous conditions such as trauma and presbyphagia (5%) (Table 3).

Table 3. Etiological characteristic of FEES and DHI-INA

Etiology	FEES			Total	DHI-INA		Total
	Normal	Penetration	Aspiration		≤ 21	>21	
Stroke	9	12	11	32	5	27	32
Head and neck tumor	9	6	7	22	13	9	22
LPR-GERD	19	0	0	19	14	5	19
Meningioma	3	3	2	8	6	2	8
Myasthenia Gravis	6	0	0	6	5	1	6
Guillain-Barre syndrome	5	0	0	5	5	0	5
Parkinson	3	0	0	3	2	1	3
Others (Trauma, Presbyphagia)	5	0	0	5	4	1	5

According to the receiver operating characteristic (ROC) analysis for the DHI-INA, the optimal cut-off score for detecting penetration or aspiration was 21, sensitivity 90.24%, specificity 84.74%. Thus, positive predictive value (PPV) of 80.43%, and negative predictive value (NPV) of 92.59% (Table 4).

Table 4. Characteristic of DHI-INA to Predict Dysphagia

		FEES		Total
		Penetration-Aspiration	Normal	
DHI-INA	DHI-INA score >21	37	9	46
	DHI-INA score ≤ 21	4	50	54
	Total	41	59	100

DHI-INA (Indonesian version of the Dysphagia Handicap Index)
FEES (Fiberoptic Endoscopic Evaluation of Swallowing)

DHI-INA domains (physical, functional, emotional) were statistically tested for association with PAS scores. Comparative analysis across PAS categories revealed statistically significant differences in all domains ($p < 0.001$, Kruskal–Wallis test). Post-hoc pairwise comparisons using the Mann–Whitney test confirmed significant differences between normal, penetration, and aspiration groups ($p < 0.001$ for all comparisons) (Table 5). Participants with higher PAS scores (indicating penetration or aspiration) reported higher DHI-INA domain scores, suggesting that greater subjective swallowing handicap was associated with more severe objective swallowing impairment.

Table 5. Comparison of DHI-INA Domains dan PAS of FEES

DHI-INA Domains	Normal PAS 1	Penetration PAS (2-5)	Aspiration PAS (6-8)	p value (total)	p value (variable)
Physical	4 (2-12)	10 (4-14)	14 (4-22)	<0,001*	<0,001**
Functional	8 (6-14)	10 (6-18)	18 (8-20)	<0,001*	<0,001**
Emotional	4 (2-6)	4 (2-6)	6 (2-8)	<0,001*	<0,001**

*p value (total): Kruskal Walls test
**p value (variable): Mann-Whitney test

The DHI-INA demonstrated strong diagnostic validity for detecting oropharyngeal dysphagia, showing excellent sensitivity and specificity compared with FEES. Higher DHI-INA scores were positively

correlated with greater swallowing impairment on the PAS, supporting its potential utility as a screening tool in community settings where access to advanced instrumental assessment is limited.

DISCUSSION

Alterations in swallowing function leading to dysphagia can be objectively assessed through Fiberoptic Endoscopic Evaluation of Swallowing (FEES). In this study, a total of 100 participants were enrolled, the proportion of male participants (58%) was higher than that of female participants (42%). These findings differ from the original DHI study by Silbergeit et al.[6] which included a higher proportion of female participants and reported a mean age of 60.3 years. The relatively younger age observed in the present study may reflect differences in population characteristics, as previous DHI validation studies in other countries primarily involved older adults with degenerative swallowing disorders. The mean participant ages reported in other studies were 64 years (Korean DHI), 61.8 years (Persian DHI), and 57 years (Arabic DHI).[7,8,10]

The importance of documenting participant characteristics in dysphagia research, as such data are essential for understanding clinical background, population, and the implications for screening and intervention. Participant demographics also play an important role in guiding education, care quality, and clinical management for individuals with swallowing difficulties. In terms of educational background, the majority of participants in this study had completed senior high school (56%), followed by bachelor's degree (15%), junior high school (13%), diploma (12%), and elementary school (4%). None of the previous DHI studies reported participants' educational levels. Notably, participants with only elementary school education were still able to complete the DHI-INA questionnaire independently and without significant difficulty. Educational level is an important consideration when interpreting patient-reported outcome measures, as it may influence comprehension and accuracy of responses. Adequate understanding of questionnaire items enables participants to more accurately convey their health conditions and perceived swallowing difficulties.[13]

The most common etiology of dysphagia in this study was neurological disorders (54%), head and neck tumors (22%) were the second most frequent cause, particularly among post-operative or post-radiation patients with nasopharyngeal carcinoma, non-Hodgkin lymphoma, thyroid carcinoma, and tongue cancer. Other etiologies included laryngopharyngeal reflux or gastroesophageal reflux disease (LPR–GERD) (19%) and trauma or presbyphagia (5%). These etiological distributions are consistent with those reported in the original DHI study by Silbergeit et al.[6] which identified six major etiologic groups: (1) head and neck tumors (35.5%), (2) neurological disorders (33.6%), (3) GERD (10.7%), (4) respiratory disorders (9.3%), (5) esophageal abnormalities (2.8%), and (6) other causes (13.1%).[6]

Similarly, most patients undergoing hospital evaluation for dysphagia presented with neurological, oncological, or head trauma–related conditions. These findings reinforce the present study's results, highlighting that neurological and neoplastic disorders represent the predominant etiologies among clinical dysphagia populations. In addition, other finding demonstrated a significant correlation between dysphagia etiology and hospitalization, noting that patients with dysphagia had a 1.82-fold higher risk of developing pneumonia. Although disease etiology may not directly affect healthcare costs, the occurrence of dysphagia-related complications can increase the economic burden due to extended care requirements. Therefore, early dysphagia screening using tools such as the DHI-INA is crucial for minimizing potential complications and improving the quality of swallowing rehabilitation services.[13,14]

The diagnostic assessment of the DHI-INA in this study used FEES as the reference standard. After completing the DHI-INA questionnaire, total scores were analyzed against FEES findings. No previous DHI-INA studies have performed diagnostic testing using FEES.[6,12] DHI-INA measures the impact of dysphagia across emotional, physical, and functional domains, which influence patient quality of life according to the medical diagnosis affecting swallowing.[12] The instrument demonstrates good internal consistency (Cronbach's α = 0.75–0.87) and strong test–retest reliability (ICC > 0.8), indicating high stability.[12] The optimal cutoff score for detecting dysphagia was 21, sensitivity 90.24% and specificity 84.74%.[15] ROC curve analysis showed an AUC of 0.863, confirming that DHI-INA has good diagnostic accuracy for distinguishing dysphagia and non-dysphagia cases.[16] An Area Under the Curve (AUC) value greater than 0.5 for the DHI-INA test indicates that the test has diagnostic capability. The AUC represents a summary metric of the ROC curve, reflecting the test's ability to discriminate between individuals with and without disease. AUC values range from 0.5 to 1.0, where a value of 0.5 indicates

that the test performs no better than chance, and a value of 1.0 represents perfect discrimination. An AUC above 0.80 is generally considered clinically useful, whereas values below 0.80 indicate limited clinical utility. ROC analysis can also be applied to determine the optimal cut-off value for the index test, defined as the threshold that maximizes both sensitivity and specificity.[15,16]

High sensitivity indicates that there are few false-negative results; therefore, when the test result is negative, it is highly likely that the subject does not have the disease. High specificity indicates that there are few false-positive results; thus, when the test result is positive, the subject is likely to have the disease. The NPV reflects the proportion of individuals with a negative test result who truly do not have the disease, while the PPV represents the proportion of individuals with a positive test result who actually have the disease. The DHI-INA instrument, which has undergone diagnostic testing, demonstrates good accuracy. Individuals with dysphagia may have varying perceptions of changes in their swallowing function. Another study conducted across five healthcare facilities showed that screening can increase individuals' awareness of swallowing function changes and encourage them to seek further examination. The coverage of dysphagia screening before accessing hospital care was approximately 20% of subjects screened prior to visiting a healthcare facility. The study also showed that only one facility routinely performed screening, resulting in 50% of patients with dysphagia presenting after a referral following prior screening.[13]

Accurate patient-reported instruments require psychometric validity, patient-centered relevance, responsiveness, and clinical applicability.[6,18] The findings of this study demonstrate that the DHI-INA has good diagnostic validity when compared with FEES, establishing its usefulness as a practical screening tool for dysphagia in clinical settings where instrumental examinations are limited. With high sensitivity (90.24%), high specificity (84.74%), and good overall diagnostic accuracy (AUC = 0.863), the DHI-INA enables clinicians to reliably identify individuals at risk of dysphagia based solely on patient-reported symptoms. This supports earlier detection and timely referral for FEES or further evaluation, especially in community-based or primary care facilities where advanced diagnostic tools are not routinely available.

The instrument's ability to capture functional, emotional, and physical impacts of swallowing impairment also enhances patient-centered care by integrating subjective experiences into clinical decision-making. Implementing the DHI-INA in routine practice may increase dysphagia screening coverage, promote patient awareness of swallowing difficulties, and ultimately reduce delays in diagnosis and management. However, the use of DHI-INA as a screening tool is limited by the requirement to calculate the total DHI-INA score. Individual domain scores (physical, functional, and emotional) cannot be used independently to determine dysphagia risk, which may reduce practicality in settings where rapid domain-level interpretation is needed.

CONCLUSION

The Indonesian version of the Dysphagia Handicap Index (DHI-INA) demonstrated strong diagnostic accuracy and a significant correlation with FEES findings. With high sensitivity, specificity, and internal consistency, DHI-INA is a valid, reliable, and practical self-reported instrument for identifying patients at risk of penetration or aspiration. It can serve as an effective screening tool for dysphagia in clinical and community settings where access to advanced instrumental diagnostics is limited.

REFERENCES

1. Ninfa A, Crispiatico V, Pizzorni N, Bassi M, Casazza G, Schindler A, et al. The care needs of persons with oropharyngeal dysphagia and their informal caregivers: A scoping review. PLoS One. 2021;16:1–20.

2. Kertscher B, Speyer R, Fong E, Georgiou AM, Smith M. Prevalence of oropharyngeal dysphagia in the netherlands: a telephone survey. Dysphagia. 2015;30(2):114–20.

3. Bahareh Bakhshaie P. Dysphagia - Pathophysiology of swallowing dysfunction, symptoms, diagnosis and treatment. J Otolaryngol Rhinol. 2019;5(3):1–4.

4. Mccullough GH, Martino R. Manual of diagnostic and therapeutic techniques for disorders of deglutition. New York: Springer. 2013. p. 11-30.

5. Yang L, Zhang Z, Gao H, Wu Y, Wei H, Kong J, et al. Cultural adaptation and validation of questionnaires for evaluation of health-related quality of life with dysphagia in different countries: a systematic review. Dysphagia. 2022;37(4):812–23.

6. Silbergleit AK, Schultz L, Jacobson BH, Beardsley T, Johnson AF. The dysphagia

handicap index: development and validation. Dysphagia. 2012;27(1):46–52.

7. Kim TY, Park D, Lee SE, Kim BH, Son S Il, Choi SH. Clinical usefulness of the korean version of the dysphagia handicap index: reliability, validity, and role as a screening test. Dysphagia. 2022;37(1):183–91.

8. Oda C, Yamamoto T, Fukumoto Y, Nakayama K, Sato M, Murata M, et al. Validation of the Japanese translation of the Dysphagia Handicap index. 2017;11:193–8.

9. Farahat M, Malki KH, Mesallam TA, Bukhari M, Alharethy S. Development of the arabic version of dysphagia handicap index (DHI). Dysphagia. 2014;29(4):459–67.

10. Asadollahpour F, Baghban K, Asadi M. Validity and reliability of the persian version of the dysphagia handicap index (DHI). Iran J Otorhinolaryngol. 2015;27.

11. Krishnamurthy R, Balasubramanium RK. Translation and validation of kannada version of the dysphagia handicap index. Am J Speech-Language Pathol. 2020;29(1):255–62.

12. Ramadhany M, Mistivani I, Zulka E, Friska D, Nusdwinuringtyas N. Uji validitas dan reliabilitas dysphagia handicap index versi bahasa indonesia sebagai alat ukur kualitas hidup pasien disfagia (thesis). Jakarta: Universitas Indonesia; 2021.

13. Speyer R, Sandbekkbråten A, Rosseland I, Moore JL. Dysphagia care and management in rehabilitation: a national survey. J Clin Med.

2022;11(19).

14. Karunaratne TB, Clavé P, Ortega O. Complications of oropharyngeal dysphagia in older individuals and patients with neurological disorders: insights from Mataró hospital, Catalonia, Spain. Front Neurol . 2024;15:1–9.

15. Stojanović M, Apostolović M, Stojanović D, Milošević Z, Toplaović A, Lakušić VM, et al. Understanding sensitivity, specificity and predictive values. Vojnosanit Pregl. 2014;71(11):1062–5.

16. Çorbacıoğlu ŞK, Aksel G. Receiver operating characteristic curve analysis in diagnostic accuracy studies: a guide to interpreting the area under the curve value. Turkish J Emerg Med. 2023;23(4):195–8.

17. Beidelschies M, Cella D, Katzan I, D'Adamo CR. Patient-reported outcomes and the patient-reported outcome measurement information system of functional medicine care and research. Phys Med Rehabil Clin N Am. 2022;33(3):679–97.

18. Terwee CB, Prinsen CAC, Chiarotto A, Westerman MJ, Patrick DL, Alonso J, et al. Cosmin methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. Qual Life Res. 2018;27(5):1159–70.