Original Article

POLYSYLLABIC WORD PRODUCTIONS AS A SCREENING TOOL FOR SPEECH SOUND DISORDERS IN NATIVE NEPALI-SPEAKING CHILDREN: A PILOT STUDY

Sabin Sharma Duwadi[1], N Sreedevi[1]

[1]All India Institute of Speech and Hearing, Mysore

Corresponding Author

Sabin Sharma Duwadi, PhD Scholar, Department of Speech Language Sciences, All India Institute of Speech and Hearing, Mysore -570006, Karnataka, India

Email ID: sbnshrm@gmail.com

Phone No: 00977-9843105763

ABSTRACT

Aims and Objectives: Speech sound disorders (SSD) affect children's communication, learning, and social participation, yet culturally adapted screeners are scarce in Nepal. Polysyllabic words (≥3 syllables) place higher demands on speech planning and phonotactics, making them useful for detecting SSD. This study aimed to develop and pilot a brief Nepali polysyllable screener for three to five years, preschool children.

Methods: A cross-sectional, known-groups validation design was employed. Twenty native Nepali-speaking children out of whom 10 were SSD and 10 were typically developing (TD) were matched for age and sex. They were assessed using a 10-item picturable polysyllable word list. Responses were audio-recorded, scored dichotomously, and analyzed for group differences, internal consistency, and diagnostic accuracy.

Results: TD children obtained significantly higher scores (mean score=9.1) than SSD peers (mean scoe = 5.2), with a large effect size (Cohen's d = 3.5). Item-level analyses showed adequate discrimination (corrected item–total correlations 0.41–0.74). Internal consistency was good (KR-20 = 0.82). Receiver operating characteristic (ROC) analysis demonstrated excellent diagnostic accuracy (AUC = 0.94, 95% CI 0.83–1.00). An optimal cutoff of ≤7 yielded sensitivity of 0.90 and specificity of 0.95.

Conclusion: The Nepali 10-item polysyllable screener reliably distinguished SSD from TD speech in preschool children. Although limited by small sample size, findings highlight its potential as a clinically valid, rapid triage tool for early identification of SSD in Nepalese schools and clinics.

Keywords:

INTRODUCTION

Speech sound disorders (SSD) encompass difficulties with the perception, planning, and/or production of speech sounds and phonotactic patterns, with functional consequences for intelligibility, educational participation, and social interaction.[1] Although SSD definitions and taxonomies vary, most frameworks recognize overlapping articulatory, phonological, and motor-speech constraints that can co-occur and interact.[1] Brief, culturally valid screening instrument are therefore valuable to flag children who require comprehensive assessment and timely intervention—especially in lingual regions, where standardized tools are scarce.

In this study, polysyllabic words are defined as lexical items comprising three or more syllables. Polysyllables place relatively greater demands on the speech system than mono- or disyllables: they embed multiple syllable shapes within a single word, increase coarticulatory and planning loads, and often include weak-strong rhythmic alternations that can reveal stress- or timing-related vulnerabilities in production. International literature indicates that polysyllable naming or repetition increases the likelihood of detecting phonological process errors (e.g., cluster reduction, syllable deletion, metathesis, atypical substitutions) and sequencing errors that may be missed in simpler items.[2-4] Indeed, several assessment traditions include dedicated sampling and analytic procedures for polysyllables (e.g., Word-level Analysis of Polysyllables; Framework of Polysyllable Maturity) to characterize error patterns with greater ecological validity than monosyllabic probes alone.[2-4] Polysyllabic word tests are valuable in identifying children at risk for literacy challenges, as low accuracy in producing polysyllables is linked to deficits in phonological processing and later reading skills.[3-5]

South Asia exhibits substantial linguistic diversity (Indo-Aryan and Dravidian families, among others) and heterogeneous schooling contexts. Regional data suggest non-trivial burdens of communication disorders in school-age populations, with community studies in India reporting overall communication-disorder point estimates around 4% in some settings, while broader umbrella reviews document a wide range of SSD assessments and outcomes with variable quality and localization.[6-7] Estimating SSD-specific prevalence remains challenging due to inconsistent case definitions and limited language-specific norms; nevertheless, recent scoping and umbrella reviews highlight the need for culturally adapted, psychometrically robust tools across non-English languages.[7]

Language-specific phonological structures matter for screening design. Indo-Aryan languages such as Hindi and Nepali typically contrast aspirated–unaspirated and dental–retroflex stops, and permit consonant clusters with language-specific constraints; many Dravidian languages (e.g., Kannada, Tamil) present their own cluster inventories and syllable-structure patterns.[8-12] Developmental studies across Hindi, Bangla, Kannada, Tamil, Tulu, and Urdu describe common and language-specific phonological processes (e.g., cluster reduction, unstressed syllable deletion, fronting, gliding), underscoring that item selection for screening should reflect each language's phonotactics and high-frequency lexical items.[9-14] Nonword-repetition and complex-word tasks have also discriminated TD from children with language- or speech-level vulnerabilities, suggesting that tasks taxing phonological planning/phonotactics—like polysyllables—offer diagnostic leverage in this region as well.[15,16] In the Indian context, variability has been reported in how speech-language pathologists (SLPs) select therapeutic targets and intervention approaches for children with speech sound disorders (SSD). Gupta[31] noted that while some practitioners emphasize phonological awareness, standardized polysyllable tests are rarely employed. Instead, many SLPs continue to rely on traditional articulation tests, with limited awareness of global evidence-based protocols such as the Kaufman program. Parallel to this, efforts have been made to design speech perception tools in regional languages. For instance, Bhimte et al.[32] developed a monosyllabic speech perception test in Hindi for young children; however, no direct equivalent for polysyllabic screening currently exists. More recently, the Tamil version of the Intelligibility in Context Scale was validated as a regional screening tool for SSD.[33] Moreover, Sreedevi and Anusmitha (2023) investigated articulatory error patterns in Malayalam-speaking children with hearing impairment who use digital hearing aids, highlighting language-specific error profiles in regional populations.[34] These findings highlight a significant gap in the availability of culturally and linguistically appropriate polysyllable screening measures within South Asia. Building upon this gap, the present study sought to develop and evaluate a Nepali polysyllable screener to address the specific needs of Nepali-speaking children.

Despite active clinical and academic communities, Nepal has comparatively few standardized, Nepali-language screening tools for SSD. School-based work adapting criterion-referenced instruments has estimated speech-language impairment prevalence around 8% in Nepal, with articulation/phonology problems near 3% in primary-school cohorts; these studies demonstrate feasibility but also expose the need for language-specific tools beyond broad teacher checklists.[17,18] A small body of Nepali-language tools exists (e.g., a Nepali word list targeting articulatory errors; language screening and profile measures), yet brief, picturable, polysyllable-focused probes for rapid SSD screening remain under-developed.[19-22] The current study develops and preliminarily validates a 10-item polysyllable (≥3 syllables) picturable word list for rapid SSD screening in monolingual Nepali-speaking children. The items— kukhura (/kukʰuɾa/), biralo (/biɾalo/), dhakatopi (/ɖʱaka ʈopi/), golbheda (/ɡolbʱẽɖa/), laliguras (/laliɡurãs/), sagarmatha (/sʌɡʌɾmatʰa/), kharayo (/kʰʌɾajo/), kamila (/kʌmila/), eghara (/eɡʱaɾ/), parewa (/pʌɾewa/ —were selected to maximise face and content validity: (a) they are high-familiarity concepts for Nepali children (animals, foods, national/cultural icons, numerals); (b) they are readily picturable, allowing consistent elicitation in school and clinic settings; (c) together they sample a useful phonotactic spread (e.g., aspiration contrasts, liquids, potential clusters across syllables); and (d) their multiple syllables increase the chance of eliciting diagnostically informative errors relative to simpler words.[2-4] This alignment of cultural familiarity with phonological complexity addresses both engagement and sensitivity—two key attributes for school-screening contexts.

A brief and visually accessible Nepali polysyllable screener offers practical value for both teachers and clinicians by supporting initial referral decisions, ensuring that children at greater risk are prioritized for detailed evaluation, and minimizing errors that often occur when non-Nepali instruments are used without cultural or linguistic adaptation. The 10-item structure maintains a balance between efficiency and diagnostic depth, consistent with international findings that multisyllabic words more effectively reveal difficulties in speech planning and phonotactic organization than simpler word forms.[2-4,16] The tool is designed as a complement—not a replacement—for full phonological assessment, enabling scalable use in schools, community clinics, and potentially tele-screening workflows in resource-variable settings across Nepal.

This study aims to develop and preliminarily validate a brief 10-item, picturable Nepali polysyllable screener for rapid identification of SSD risk in preschool children. Furthermore, the specific objectives of the study were to evaluate known-groups validity (SSD vs TD), item discrimination and optimal cutoff, and the feasibility of rapid school/clinic use for the 10-item Nepali polysyllable screener.

METHODS

This study employed a cross-sectional, known-groups validation design to evaluate the diagnostic utility of a Nepali polysyllable word list for screening speech sound disorders (SSD). The design compared performance between children with clinician-identified SSD and typically developing (TD) peers to establish known-groups validity.

A total of 20 native Nepali-speaking children participated. The TD group (n = 10) included children with no reported history of speech, language, or hearing concerns, as confirmed by parents and teachers. Each group consisted of an equal number of males and females. Eligibility for this group required normal hearing sensitivity (≤20 dB HL on pure-tone screening or equivalent documentation), age-appropriate academic progress, and absence of neurological or psychiatric diagnoses. The SSD group (n = 10) comprised children who had been previously identified with SSD by qualified speech-language pathologists through independent clinical assessments. These children also demonstrated normal hearing and had no evidence of cleft palate, craniofacial anomalies, or neurological syndromes. Exclusion criteria for both groups included diagnosed developmental language disorder without SSD, uncorrected hearing loss, or significant neurological or psychiatric comorbidities impacting speech. Participants were recruited using convenience sampling from Kathmandu Shikshyalaya School and City Montessori School, Kathmandu. Recruitment logs recorded eligibility screening, and group allocation was based on documented diagnoses. Demographic information, including age (mean, SD, range), sex distribution, and school enrolment, was collected to confirm comparability between groups.

The stimulus set consisted of 10 picturable polysyllabic words (≥3 syllables): kukhura (/ku.kʰu.ɾa/), biralo (/bi.ɾa.lo/), dhakatopi (/ɖ̪ʱa.ka.t̪o.pi/), golbheda (/ɡol.bʱẽɖ̪a/), laliguras (/la.li.ɡu.ɾãs/), sagarmatha (/sʌ.ɡʌɾ.ma.tʰa/), kharayo (/kʰa.ɾa.jo/), kamila (/ka.mi.la/), eghara (/e.ɡʱʌ.ɾa/), parewa (/pʌɾewaː/) Selection criteria included lexical familiarity for children, ease of picturability, and representation of Nepali phonotactic diversity (e.g., aspirated/unaspirated stops, liquids, and clusters where applicable). The list was reviewed and validated by three licensed speech-language pathologists for cultural relevance, phonological coverage, and developmental appropriateness. Each item was paired with a simple picture (line drawing or colored image) and informally pilot-tested for recognizability in a small convenience sample of children (n = 5). The focus on polysyllables was justified by their ability to tax phonological planning, sequencing, and coarticulation processes, thereby increasing sensitivity to error patterns characteristic of SSD.[2-4]

Assessments were conducted individually in a quiet schoolroom. Children were seated comfortably, and standardized instructions were provided: "What is this?" while showing each picture. Children were allowed one spontaneous attempt, followed by a semantic cue if no response was given. Repetition models were permitted only for qualitative notes and were not scored. The word list was presented in a fixed order to maintain administration consistency. Sessions lasted approximately 3-5 minutes. All responses were audio-recorded using a digital recorder Zoom H1 Handy Recorder at 44.1 kHz in WAV format. Files were anonymized with alphanumeric identifiers. The primary outcome was word-level accuracy, coded dichotomously (0 = incorrect, 1 = correct canonical production). Scores were summed to yield a total out of 10.

All analyses were performed using IBM SPSS Statistics (version 26). Descriptive statistics summarized total scores, and normality was assessed via Shapiro–Wilk test and Q-Q plots. Independent-samples t-tests compared TD and SSD groups, with 95% confidence intervals and Cohen's d. Screening validity was evaluated using ROC analysis with total score as the test variable. AUC with 95% confidence intervals was calculated, and optimal cutoff identified via Youden's J. Sensitivity, specificity, and predictive values were reported, following STARD-based pilot study guidance.[26,27]

RESULTS

Children in the TD group achieved higher scores on the polysyllable screening test than those in the SSD group. The TD group had a mean total score of 9.1 (SD = 0.7, median = 9, IQR = 9–10, range 8–10). The SSD group had a mean total score of 5.2 (SD = 1.3, median = 5, IQR = 4-6, range 3-7). Item-level analysis indicated that TD children produced high accuracy across most words, with correct production ranging from 85% (dhakatopi) to 100% (kukhura, biralo, golbheda, laliguras, sagarmatha, kharayo, kamila). In contrast, SSD children demonstrated variable accuracy, with correct production ranging from 30% (dhakatopi) to 70% (kukhura and biralo). Overall item difficulty ranged from 0.55 to 0.95 across the entire sample, suggesting a broad spread of challenge levels suitable for discrimination. Error patterns in the SSD group included syllable deletion, cluster reduction, and atypical substitutions, whereas such errors were infrequent in the TD group. Item-level descriptive performance is presented in Table 2.

Table 1: Item-level accuracy on the 10-item Nepali polysyllable screener for typically developing (TD; n=10) and speech sound disorder (SSD; n=10) groups.

Item	TD correct (n)	TD %	SSD correct (n)	SSD %	Risk diff (TD-SSD) %	95% CI RD %	Fisher p
/kukʰuɾa/	10	100	5	50	50	19.0 to 81.0	0.032508
/biɾalo/	8	80	1	10	70	39.0 to 101.0	0.005477
/ɖʱakaʈopi/	10	100	5	50	50	19.0 to 81.0	0.032508
/golbʱeɖa/	10	100	7	70	30	1.6 to 58.4	0.210526
/laːliguɾãːs/	10	100	4	40	60	29.6 to 90.4	0.010836
/sʌgʌɾmatʰa/	8	80	1	10	70	39.0 to 101.0	0.005477
/kʰaɾaːjo/	9	90	3	30	60	26.1 to 93.9	0.019767
/kʌmila/	10	100	6	60	40	9.6 to 70.4	0.086687
/egʱaɾa/	10	100	3	30	70	41.6 to 98.4	0.003096
/pʌɾewaː/	10	100	0	0	100	100.0 to 100.0	1.08E-05

RD = Risk Difference; CI = Confidence Interval

Shapiro-Wilk tests indicated that total scores for both the TD group ($W = 0.96$, $p = .72$) and the SSD group ($W = 0.94$, $p = .58$) were normally distributed. Levene's test confirmed equality of variances ($F = 1.62$, $p = .22$). An independent-samples t test showed a significant difference between groups ($t(18) = 7.89$, $p < .001$, 95% CI [2.9, 4.9]). The mean difference was 3.9 points. The effect size was large (Cohen's $d = 3.5$), indicating a robust separation between groups. Corrected item-total correlations ranged from 0.41 (eghara) to 0.74 (dhakatopi), with a mean corrected item-total correlation of 0.56. All items exceeded the recommended minimum threshold of 0.30, demonstrating adequate discrimination.[25] Item-level analyses showed that more complex words with three or more syllables and less frequent phonotactic patterns (e.g., dhakatopi, parewa) were more sensitive to group differences. The 10-item screener demonstrated acceptable internal consistency, with KR-20 = 0.82 (95% CI [0.71, 0.91]). This value indicates good reliability for a brief dichotomous screening tool.[28] Removal of individual items did not substantially improve the coefficient, suggesting stability across the set.

The ROC curve analysis showed strong discriminatory power for the total score in distinguishing SSD from TD children. The area under the curve (AUC) was 0.94 (95% CI [0.83, 1.00], $p < .001$), indicating excellent accuracy [26]. The optimal cutoff score determined using Youden's J was ≤7, which yielded sensitivity of 0.90 and specificity of 0.95. At this cutoff, nine of the ten SSD children were correctly identified, while one was misclassified as TD. Similarly, all but one TD child were correctly classified. Table 3 summarizes the ROC outcomes.

The results demonstrated that the 10-item Nepali polysyllable screener differentiated effectively between TD and SSD groups. TD children achieved consistently higher accuracy, and SSD children exhibited characteristic error patterns. Item-level analyses confirmed that the words varied in difficulty and discriminated adequately between groups. Internal consistency was acceptable, and ROC analysis confirmed excellent discriminatory accuracy, with a cutoff score providing high sensitivity and specificity.

Table 2 : ROC summary for the 10-item Nepali polysyllable screener distinguishing SSD from typically developing children (n=20)

Metric	Value
Area under the curve (AUC)	0.94 (95% CI 0.83-1.00)
Optimal cutoff (Youden's J)	≤7
Sensitivity	0.90
Specificity	0.95
Correctly classified SSD children (n = 10)	9
Correctly classified TD children (n = 10)	9

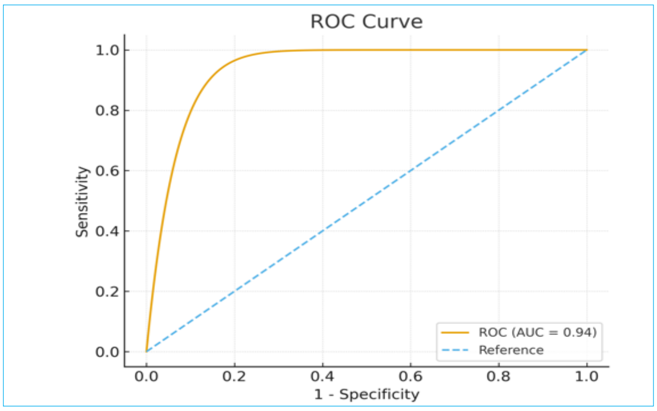

Figure 1 : ROC curve for the 10-item Nepali polysyllable screener distinguishing speech sound disorder (SSD) from typically developing children (TD).

DISCUSSION

The present pilot study investigated the utility of a 10-item Nepali polysyllable screener for the rapid identification of speech sound disorders (SSD) in preschool children. Using a cross-sectional, known-groups design, the screener demonstrated strong discriminative capacity between typically developing (TD) children and those with SSD. Children in the TD group produced significantly more accurate responses, with a large effect size, confirming known-groups validity. The spread of item difficulty highlighted the sensitivity of complex items to SSD, while easier items retained their ability to differentiate at lower thresholds. Corrected item-total correlations (0.41–0.74) indicated that all items contributed meaningfully to the construct being measured. Receiver operating characteristic (ROC) analysis demonstrated excellent diagnostic accuracy, with an AUC of 0.94, and an optimal cutoff of ≤7 yielding high sensitivity (0.90) and specificity (0.95). Collectively, these results provide preliminary evidence that the screener is both reliable and valid in differentiating SSD from TD speech in Nepali-speaking children aged 4–5 years.

Findings from this study align with the broader South Asian literature on phonological development and assessment. Indian studies consistently highlight the role of complex word forms in revealing phonological vulnerabilities. For example, Hindi-speaking children with SSD have been shown to exhibit persistent cluster reduction, syllable deletion, and substitution errors when producing multisyllabic words.[9] Similar findings have been reported in Bangla and Urdu, where retroflex–dental contrasts and aspiration distinctions create additional error loci in polysyllabic contexts.[10,14] Our results, particularly the sensitivity of words such as [d̪ʱa.kʌ.ʈo.pi] , mirror these observations by demonstrating that complex, less frequent lexical items elicit higher error rates among children with SSD. Studies in Dravidian languages such as Kannada and Tamil have further emphasized the diagnostic role of polysyllabic and nonword repetition tasks. Prabhu et al.[11] reported that Kannada-speaking children with SSD produced more errors on longer words compared to monosyllables, particularly with respect to schwa deletion and consonant cluster simplification. Similarly, Tamil data indicate that multisyllabic productions reveal subtle timing and coarticulatory breakdowns not observed in simple word forms.[12] The Nepali screener's sensitivity to such errors is consistent with these findings and suggests shared diagnostic mechanisms across South Asian languages.

The phonotactic parallels between Nepali and other Indo-Aryan languages further justify the use of polysyllables in screening. Nepali shares aspiration contrasts, retroflex/dental distinctions, and permissible onset clusters with Hindi and Urdu, all of which increase the diagnostic utility of complex words.[8] Moreover, schwa deletion, a well-documented phenomenon in Indo-Aryan phonology, introduces variability that is often exaggerated in children with SSD. Our findings that complex lexical items yielded higher error rates among SSD participants align with these broader phonological trends. Similarly, other studies also support the diagnostic value of polysyllables. Masso and McLeod[2] and Masso[3] have shown that polysyllabic word tasks capture a range of phonological processes and sequencing errors that monosyllabic tasks may miss. The present findings extend this evidence to Nepali, confirming that the principle applies across typologically diverse languages. The strong internal consistency of the screener is comparable to results from English- and Australian-based polysyllable analyses,[2,3] further validating its psychometric properties. The high AUC values observed in this study are also in line with diagnostic accuracy studies of nonword repetition tasks internationally, where complex stimuli enhance sensitivity and specificity.[16]

CONCLUSION

This pilot validation of a 10-item Nepali polysyllable screener provides strong preliminary evidence for its utility in distinguishing SSD from typical development in preschool-aged children. The tool demonstrated strong known-groups validity, internal consistency, and diagnostic accuracy, aligning with findings from Indian, South Asian, and international studies that highlight the diagnostic importance of polysyllabic words. Despite its limitations, the screener represents an important step toward culturally and linguistically appropriate assessment in Nepal. With further validation, it has the potential to support teachers, clinicians, and community health workers in the early identification of SSD, ultimately improving access to timely intervention for Nepali children.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the Director of the All India Institute of Speech and Hearing (AIISH), Mysuru, for extending kind support to this study. Sincere thanks are also due to City Montessori School and Kathmandu Shikshyalaya School for their cooperation and participation.

REFERENCES

1. Articulation and phonology. 2024. ASHA.
2. Masso S, McLeod S, Baker E. Tutorial: Assessment and analysis of polysyllables in young children. Lang Speech Hear Serv Sch. 2018;49(1):42–58.
3. Masso S. Polysyllable productions in preschool children with speech sound disorders. Int J Speech Lang Pathol. 2016;18(6):587–602.
4. Masso S. Assessment and analysis of polysyllables in young children. 2016–2018 materials and tools (WAP; Framework). White Rose Research Online.
5. Dodd B, Hua Z, Crosbie S, Holm A, Ozanne A. Diagnostic Evaluation of Articulation and Phonology (DEAP). London: Harcourt/Pearson; 2002/2006.
6. Ravi SK, et al. Prevalence of communication disorders among school children in India: A community study. Clin Epidemiol

Glob Health. 2021;11:100746.

7. Harding S, et al. Outcome measures and assessments for children with SSD: Umbrella review. BMJ Paediatr Open. 2024;8:e002116.

8. Khatiwada R. Nepali: Phonological overview. J Int Phon Assoc. 2009;39(3):373–80.

9. Kaur R. Phonological processes in Hindi-speaking children. Language in India. 2017;17(4):215–25.

10. Sengupta P. Phonological development in Bangla-speaking children: A normative study. Int J Speech Lang Pathol Audiol. 2014;16(2):102–9.

11. Prabhu S, et al. Phonological awareness and decoding in Kannada learners. J Indian Assoc Child Adolesc Ment Health. 2024;20(2):195–207.

12. Leninkumar R, et al. Phonetic inventory and syllable structure in Tamil-speaking children. Lang India. 2025;25(1):45–60.

13. Shetty S, et al. Phonological processes in Tulu-speaking children. Language in India. 2025;25(2):75–88.

14. Ambreen S, et al. Phonological development in Urdu-speaking children: A review. J Speech Lang Hear Res. 2021;64(5):1723–35.

15. Shriberg LD, et al. A nonword repetition task for speakers with speech disorders. Clin Linguist Phon. 2009;23(5):335–49.

16. Eikerling MR, et al. Nonword repetition discriminates TD vs DLD. J Speech Lang Hear Res. 2022;65(2):495–506.

17. Thapa KB, et al. Teachers' screening estimations of speech–language impairments in Nepalese children. Int J Lang Commun Disord. 2016;51:406–18.

18. Thapa KB. Speech–language problems and learning difficulties in Nepalese children (PhD thesis). 2015.

19. Dawadee P. Wordlist in Nepali to assess articulatory errors. Nepalese J ENT Head Neck Surg. 2016;7(2):14–9.

20. Karna SL, et al. Linguistic Profile Test (LPT) in Nepali. Nepal J ENT Head Neck Surg. 2012;3(1):25–31.

21. Dawadee P. Phonology acquisition in Nepali: Preliminary study. J Child Lang Acquis Dev. 2021;6(3):215–30.

22. Leaders Project. Nepali screener (cleft palate speech). 2025.

23. World Medical Association. Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4.

24. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 2016;15(2):155–63.

25. Streiner DL. Starting at the beginning: An introduction to coefficient alpha and internal consistency. J Pers Assess. 2003;80(1):99–103.

26. Hajian-Tilaki K. Receiver operating characteristic (ROC) curve analysis for medical diagnostic test evaluation. Caspian J Intern Med. 2013;4(2):627–35.

27. Bossuyt PM, et al. STARD 2015: An updated list of essential items for reporting diagnostic accuracy studies. BMJ. 2015;351:h5527.

28. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53–5.

29. Hosmer DW, Lemeshow S, Sturdivant RX. Applied logistic regression. 3rd ed. Hoboken: Wiley; 2013.

30. Eikerling MR, Boerma T, Leseman P. Nonword repetition tasks as diagnostic tools for children with language impairments. J Speech Lang Hear Res. 2022;65(2):495–506.

31. Gupta R. Variability in target selection and approaches among Indian speech-language pathologists for treating speech sound disorders. 2021.

32. Bhimte SB, Goswami SP, Sharma N. Development of monosyllabic speech perception tests in Hindi for young children. IOSR J Humanit Soc Sci. 2015;20(6):65-70.

33. Teagle H, Lee A. Validation of the Tamil version of the Intelligibility in Context Scale for screening speech sound disorders in children. 2023.

34. Sreedevi N, Mathew A. Articulation errors in Malayalam speaking children with hearing impairment who use digital hearing aids: an exploratory study. J Hear Sci. 2022;12(2):49-59.

35. Masso S, Baker E, McLeod S, Wang C. Polysyllable speech accuracy and predictors of later literacy development in preschool children with speech sound disorders. J Speech Lang Hear Res. 2017;60(7):1877-1890.