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Case Report

Phonological skills of a native Nepali speaking preschooler with developmental speech sound disorder

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ABSTRACT

Speech sound disorder (SSD) is a common developmental difficulty in children, yet its manifestation in Nepali remains underexplored. Owing to the language's unique phonological structure, including retroflex–dental contrasts, aspirated stops, and rhotic trills or flaps, speech errors are expected to differ from those reported in English. This case study describes the phonological profile of a 5;0-year-old Nepali-speaking child with SSD. Speech samples were collected through picture naming and sentence imitation tasks (152 tokens, 98 words), transcribed in the International Phonetic Alphabet (IPA), and analyzed for error patterns, stimulability, consistency, whole-word accuracy, and intelligibility. The child's speech revealed a systematic but restricted phonological system: the rhotic/r/ was consistently replaced by (/rukʰ/"tree" → [lukʰ],/gʱar/"house"→[gʱal]); retroflexes were neutralized into dentals (/t̠opi/"cap"→[t̪opi],/t̠ʰulo/"big" →[t̪ulo]); and velars were substituted by dental counterparts (/kamila/"ant"→[t̪amila],/kʰarajo/"hare"→[t̪arayo]). None of these sounds were stimulable despite repeated cueing, with 85% consistency in errors, whole-word accuracy of 0.68, and connected-speech intelligibility rated 3/5. These results indicate a systematic reorganization of the phonological system, marked by the loss of major contrasts and reduced intelligibility. The lack of stimulability highlights the need for direct motor-based therapy, while the findings emphasize the importance of developing Nepali-specific assessment frameworks for accurate diagnosis and intervention.

Keywords: Speech sound disorder, Nepali phonology, Rhotics, Retroflex, Velar neutralization, Stimulability, Intelligibility

INTRODUCTION

Speech sound disorder (SSD) is one of the prevalent developmental communication disorders, affecting 2% to 13% of children between the ages of 3;0 and 6;0 years worldwide.[1] SSD is characterized by difficulty in the proper production of speech sounds due to constraints in articulatory accuracy, phonological organization, or both. The difficulty can significantly affect intelligibility, leading to social, emotional, and academic issues.[2] Early assessment and intervention are thus necessary, as long-term SSD can negatively affect later literacy proficiency and communication skills.[3] Considerable research has documented phonological development, error patterns, and treatment outcomes in English and other thoroughly researched languages.[4] The research is still scarce in the South Asian perspective and almost nonexistent in Nepali language. This lacuna is particularly important because phonological development is not a universal phenomenon but is influenced by the phonemic inventory, phonotactic structure, and prosody of a particular language.[5] Consequently, models and norms established for English cannot be applied to Nepali children directly.

Nepali, an Indo-Aryan language spoken by over 16 million people in Nepal and diaspora communities, has a complex and rich phonology.[6] Its consonant system has voiced and voiceless stops in bilabial, dental, retroflex, velar, and glottal places of articulation, with aspirated and unaspirated contrasts.[7] Retroflex sounds, in particular, are a salient feature of Nepali phonology that distinguishes it from English and other European languages. In addition to this, Nepali also possesses nasals, fricatives, affricates, laterals, a rhotic trill or flap/r/, and semivowels. It has a six-vowel oral and nasal system and a set of diphthongs. The rhotic /r/ in Nepali is variably trill or flap realization, conditioned by phonetic environment.[7] Cross-linguistically, trills are late-acquired, being substituted by glides or laterals in early acquisition and remaining vulnerable in SSD populations.[4] Similarly, dental and retroflex stops are hard to acquire, with error patterns sometimes involving place-neutralization to alveolars.[2] These facts lead us to predict that Nepali-speaking children will show contrasting developmental patterns and error profiles to those seen in English-speaking children.

Evidence from Indian languages underscores both shared vulnerabilities and language-specific profiles in phonological acquisition. In Tamil, a large cross-sectional study (n=450) documented high rates of syllable-structure and substitution processes between 2–5 years especially liquid substitutions and fronting/backing providing age-graded norms that differ from English.[19] For Kannada, frequency-of-occurrence analyses of phonemes offer distributional baselines to interpret error "pressure points" in assessment, while similar distributional work in Hindi highlights the functional load of coronal and rhotic categories that are often implicated in SSD.[20,21] Hindi-focused studies further show that, across 3½–6½ years, the inventory and process profile shift toward fewer, more stable processes with age, though coronal place contrasts (including retroflex versus dental) remain comparatively fragile.[22,23]

In bilingual and Dravidian contexts, reports from Tamil Telugu samples and Telugu cohorts describe robust fronting of velars toward dentals/alveolars and persistence of cluster reduction and glide/liquid substitutions around school entry.[24,25] Taken together, these Indian data spanning Tamil, Kannada, Hindi, and Telugu suggest that rhotics and coronal place contrasts carry a high functional load and are late-stabilizing, aligning with our a priori prediction for Nepali and motivating language-specific assessment protocols. While SSD in English has been studied extensively, evidence-based assessment protocols in Nepali are lacking.

Published case studies or normative data are scant, and clinicians must rely on instruments normalized in other languages. Such reliance may result in misdiagnosis, setting inappropriate goals, or culturally incongruent treatment. Importantly, no prior clinical study has systematically documented the phonological error patterns, stimulability, or intelligibility benchmarks of a Nepali child with SSD. With such gaps, clinical case reporting is crucial to building a foundation for evidence-based practice in Nepal. This study tries to provide such reporting through the examination of phonological skills of a 5;0-year-old Nepali-speaking child with SSD. Specifically, the study integrates SODA error analysis, stimulability testing, whole-word measures, and intelligibility ratings into a single framework. By doing so, it attempts to demonstrate a methodologically feasible approach to Nepali speech Language pathology researchers and clinicians to profile SSD in a general sense.

CASE REPORT

A single-case descriptive design was used in this study, a design commonly used in clinical phonology for intensive linguistic and clinical description of the child with SSD.[9] Case studies are particularly appropriate in less documented languages like Nepali, where normative standards are limited. The purpose was to sample the child's phonological skills through a variety of elicitation tasks and analyze them through complementary frameworks. The participant was a 5;0-year-old Nepali-speaking female native child who was in attendance at a preschool City Montessori in Kathmandu. Developmental history and medical history were obtained from her parents and teachers with the use of structured interview. No neurological, cognitive, or hearing impairment was known to exist, and receptive language skills appeared to be at age-appropriate level as rated by teacher/caregiver report. SSD diagnosis was made by a speech-language pathologist certified by Nepal Health Professionals Council, Nepal.

A set of 98 stimuli colored picture stimuli was prepared that would elicit all Nepali consonants and vowels in initial, medial, and final word position according to Nepali phonotactic rules.[7] High-frequency target words were children's known words, and culturally suitable words. The word list was examined for face validity and phoneme coverage by three speech-language pathologists. One task at a time was administered in a vacant preschool classroom. Rapport was established prior to testing through casual play. The child was d first introduced to the picture cards to familiarize them with the target words. In the Picture-naming task pictures were administered one at a time. For connected speech task, a set of ten sentences were prepared resembling a familiar story suitable to the age group, validated by three speech language pathologists. The audio sample of the participant was recorded using a high-quality digital recording Zoom H1 Handy recorder (44.1 kHz sampling rate, 16-bit resolution) kept at a distance of ~20 cm from the child. The following domains were considered for data analysis.

SODA analysis

Classified into substitutions, omissions, distortions, and additions for each consonant in different positions in words. This method remains a benchmark of clinical phonology for initial screening.[11]

Stimulability testing

Each error sound was tested in isolation and in consonant–vowel (CV) syllables. The child was provided with direct modeling, tactile cues, and visual feedback. A sound was considered stimulable (or “achieved”) if the child produced at least 2 or more correct attempts out of 3 trials.[9]

Consistency and variability

Three instances of the production of the same word were compared on consistency of errors. Variability was established as a percentage of words produced differently during repeated attempts.[2]

Whole-word analysis

Proportion of whole word correctness (PWC) was established as a ratio of correctly produced words to the total number of words attempted in the sentence repetition task.[12]

Intelligibility rating

Overall speech intelligibility was rated by a non-familiar listener (graduate linguistics student) on Bowen’s 5-point scale (1=always understood, 5=rarely understood).[13] Subjective ratings were complemented by objective measures (PWC) to provide a complete profile.

The assessment generated a rich sample of the child’s speech productions across two different elicitation contexts: single-word naming and sentence imitation. In total, 152-word tokens were collected, representing 98 different lexical items. When analyzed together, the data revealed a highly patterned and internally consistent phonological system. The errors were not random slips of the tongue but instead pointed to well-established rules that shaped how the child organized her speech.

Errors in rhotics

The rhotic/r/ was consistently replaced with the lateral /l/ across all word positions, demonstrating a blanket substitution process. For instance, /ruk^h/(“tree”) was produced as [luk^h] in initial position, /biralo/(“cat”) as [bilalo] in medial position, and /g^{ɦ}ar/ (“house”) as [g^{ɦ}al] in final position. This categorical pattern indicates that the trill was absent from the child’s active phonological system and had been reorganized as a lateral across contexts.

Errors in retroflex stops

The retroflex stops (/t, d, t^h, d^h/) were consistently realized as their dental counterparts, accompanied by a regular loss of aspiration where applicable. For example, /t̪opi/ (“cap”) was produced as [t̪opi], and /t̪^{h}ulo/ (“big”) was realized as [t̪ulo].

These substitutions led to neutralization of the retroflex–dental contrast, collapsing two distinct coronal places of articulation into a single dental category.

Errors in velar stops

The velar series (/k, k^h, g, g^ɦ/) showed a striking pattern of collapse into the dental place of articulation. For example, /kamila/ (“ant”) was produced as (t̪amila), and /k^{h}arayo/ (“hare”) was realized as (t̪arayo). This process occurred in more than 75% of velar tokens across tasks, reflecting a systematic place neutralization in which velar contrasts were assimilated to the coronal (dental) area.

Stimulability findings

One of the most clinically significant results concerned stimulability. All of the erred sounds—/r/, the retroflex stops, and the velars—were tested in isolation and in simple syllables with extensive support, including auditory models, visual cues, and tactile prompts. Despite these multiple forms of scaffolding, the child was unable to produce any of the targeted sounds correctly. Stimulability success was therefore 0% across all affected phonemes. This indicates that the errors are not due to performance variability or a lack of attention in the moment but are instead deeply rooted and resistant to immediate cueing. For clinicians, this signals that these sounds are unlikely to be acquired without sustained, targeted therapy, and that motor-based approaches will likely be necessary.[9]

Consistency of error patterns

When the same word was elicited more than once, the child demonstrated remarkable consistency. Words such as /biralo/and/kamila/ were always produced with the same substitutions, regardless of task or repetition. A set of 20 words tested in multiple contexts showed an 85% consistency rate, with only minor variability (15%) related to features such as aspiration. This level of consistency supports the conclusion that the child’s difficulties are not the result of inconsistent planning errors or apraxia of speech but rather reflect a systematic phonological disorder in which a smaller, reorganized set of rules is applied with stability across contexts.[2]

Whole-word accuracy (PWC)

At the whole-word level, analysis of the connected speech sample from the story retelling task showed a Proportion of whole word correctness (PWC) of 0.68. This suggests that just over seven out of ten words were produced without internal errors approximately. However, it is important to interpret this number cautiously. While many words were formally correct, the systematic substitutions in the remaining words had a disproportionate effect on intelligibility.

Intelligibility ratings

Speech intelligibility was assessed by an unfamiliar native nepali speaking adult listener using the 5-point scale described by Bleile and Bowen.[11,13] The child’s connected speech received a rating of 3/5, indicating that she was understood only about half of the time and that considerable effort was required from the listener. This functional measure underscores the impact of her phonological errors on day-to-day communication and provides a sharper perspective than whole-word accuracy alone. In comparison with developmental norms, the score is markedly low for a 5-year-old child. Coplan and Gleason reported that most children are already about 75% intelligible to unfamiliar listeners by 37 months and nearly fully intelligible (~100%) by 47 months.[14] Similarly, Hustad et al estimate the 75% intelligibility threshold around 49 months, with 90% expected by approximately 83 months.[15] The study on Kannada-speaking children demonstrated a linear progression in speech intelligibility, with children reaching ~85% intelligibility by 3.3 years and approaching near-adult levels (≈100%) by four years of age.[8] These findings provide a critical normative benchmark, underscoring that reduced intelligibility at four years is clinically significant. Against these benchmarks, this child's rating places her well below age-appropriate expectations, confirming that her speech sound disorder is clinically significant and requires intervention. The overall results depict a phonological system that is rule-governed but severely restricted. The trill /r/ has been replaced wholesale with /l/, the retroflex and aspirated stops have collapsed into their dental counterparts, and the velar series has also shifted into the dental category. None of these sounds were stimulable, and the error patterns were highly consistent. While word-level accuracy appeared relatively strong (PWC=0.68), functional intelligibility was reduced, with an unfamiliar listener rating it only 3 out of 5.

DISCUSSION

This case study offers one of the first detailed portraits of how a SSD reshapes the phonological system of a Nepali-speaking preschooler. The child's productions did not reflect random articulatory slips but instead revealed a highly structured, rule-governed system that was nevertheless restricted and functionally inadequate for age. By four years, typically developing Nepali children produce a wide range of coronal, velar, and rhotic contrasts, yet in this profile the rhotic category had collapsed into laterals, the retroflex series had merged with dentals, and velars had also shifted to the dental place.[7,8] The result was a restructured but impoverished phonological system that failed to preserve contrasts central to Nepali.

Substitution of rhotics

The consistent replacement of /r/ with /l/ across all word positions points to a categorical substitution process. This finding is not surprising, as rhotics are among the most complex and late-acquired speech sounds cross-linguistically.[4,16] In languages such as Spanish, children often replace trill /r/ with or flaps well into the preschool years.[1,17] What is significant here is the persistence and uniformity of the substitution: /ruk^{h}/ ("tree") became [luk^{h}], /biralo/ ("cat") became (bilalo), and /g^{ɦ}ar/ ("house") surfaced as (g^{ɦ}al). This blanket replacement suggests that the trill had been entirely reorganized as a lateral in the child's system, leaving no evidence of partial mastery or stimulability. Comparable findings are noted in Indian studies: Hindi-speaking children frequently substitute laterals for rhotics, particularly in early preschool years, and Tamil- and Kannada-speaking cohorts show similar rhotic vulnerability, with liquid substitutions persisting even after age five.[18-20]

Neutralization of retroflex and velar contrasts

Equally striking was the loss of the retroflex–dental contrast. In Nepali, the opposition between retroflex and dental stops carry a heavy functional load, yet this child consistently realized retroflexes as dentals Such neutralization effectively erases the retroflex series from the phonological inventory, reducing the child's ability to signal lexical contrasts. The pattern extended even further to velars. Both aspirated and unaspirated velar stops were replaced by dentals: /kamila/ ("ant") → (t̪amila), /k^{h}arajo/ ("hare") → (t̪arajo). In more than 75% of tokens, velars were drawn into the coronal domain. This is not a simple substitution of one sound for another but a systemic reorganization in which entire place categories collapsed into a single dental category. Such place assimilation, though less frequently documented, has been observed in disordered systems where children radically simplify the phonological space.[2,18]

Stimulability and prognosis

The absence of stimulability across rhotics, retroflexes, and velars is clinically significant. Stimulability has long been recognized as a predictor of phoneme acquisition.[9,19] Children who are stimulable for a sound often acquire it without direct intervention, whereas non-stimulable sounds usually require explicit, motor-based therapy. In this case, repeated attempts with auditory models, visual supports, and tactile cues failed to elicit accurate productions. Such a profile suggests that therapy will need to begin with phonetic placement and shaping before progressing to phonological contrasts, and that progress may be slower than in children with more flexible articulatory systems.

Consistency, variability and systematicity

The high degree of consistency observed in this child's errors is another diagnostic marker. Words such as /raamro/ and /kamila/ were always realized with the same substitutions across tasks, yielding an 85% consistency rate. This profile contrasts with children who present inconsistent speech disorder or childhood apraxia of speech, where the same word may be produced in several different ways.[2] The stability here reinforces the interpretation of a systematic phonological disorder characterized by overgeneralization of dental articulations.

Whole-word accuracy and intelligibility

At the whole-word level, the child achieved a Proportion of whole word correctness (PWC) of 0.68. While this measure suggests that just over two-thirds of words were formally correct, the figure is misleading if interpreted in isolation. Because the errors involved systematic collapses of rhotics, retroflexes, and velars into dental realizations, the resulting loss of contrast had a disproportionate effect on functional clarity. This was reflected in the intelligibility rating: an unfamiliar listener judged her connected speech as 3/5, meaning she was only understood about half the time and with considerable effort.

When compared with developmental expectations, this performance falls well below the norm. Coplan and Gleason reported that children are approximately 75% intelligible by 37 months and nearly 100% intelligible by 47 months. Hustad et al likewise place the 75% threshold around 49 months, with 90% expected by roughly 83 months.[14,15] By the age of four, therefore, most children are already reliably understood by unfamiliar listeners. Against these benchmarks, a rating of 3/5 signals a moderate impairment with clear clinical significance.

CONCLUSION

This case illustrates how SSD can restructure an entire phonological system, not simply by delaying acquisition but by collapsing contrasts into fewer categories. Universally, rhotics and retroflexes are vulnerable and late-acquired, but in Nepali the functional consequences of their loss are particularly marked because of the language's reliance on place and aspiration contrasts. Without recognition of such language-specific features, clinicians risk underestimating the severity of the disorder if they apply assessment frameworks developed for English.

Clinically, the findings underscore the value of a multi-component assessment approach. The combination of SODA analysis, stimulability testing, consistency measures, whole-word accuracy, and intelligibility ratings provided a multi-layered view of the child's speech that no single metric could capture. For intervention, the absence of stimulability points toward the need for direct motor-based approaches targeting dentalized rhotics and re-establishing velar and retroflex contrasts. For research, the study highlights the urgent need for normative data on Nepali phonological development and for larger-scale studies of SSD in Nepali-speaking children.

As with any case study, the findings are not generalizable. They represent the profile of a single child and must be interpreted cautiously. Additional research with larger samples, including longitudinal follow-up and treatment studies, is warranted. Further work should also explore how bilingualism in Nepali–English or Nepali–regional languages influence error patterns, since many children in Nepal are exposed to more than one language.

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