International Journal Of Literature And Languages

VOLUME Vol.06 Issue02 2026
PAGE NO. 79-85
DOI 10.37547/ijll/Volume06Issue02-18

Vowel Acquisition Order in L1 from 18-36 months old Babies in Pakistani Context

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Received: 19 December 2025; **Accepted:** 10 January 2025; **Published:** 16 February 2026

Abstract: This study investigates the order of vowel acquisition in first language (L1) Urdu among infants aged 18 to 36 months in the Pakistani context. The number and classification of Urdu vowels remain debated in previous literature, resulting in limited empirical evidence regarding their developmental sequence. To address this gap, the study adopts an acoustic-phonetic approach to systematically record and analyze vowel production in early childhood. Four Urdu-speaking infants aged 18, 24, 30, and 36 months were selected through purposive sampling, ensuring that Urdu was the primary language used at home. Speech samples were recorded in naturalistic settings using an Android device and analyzed through Praat software. Acoustic analysis focused on formant frequencies (F1, F2, and F3) to identify and verify vowel sounds, which were then compared with standard phoneme charts for validation. The findings reveal a developmental pattern in vowel acquisition: back vowels are acquired earlier than front vowels; long vowels precede short vowels; and low vowels are acquired at later stages. The results contribute to the understanding of phonological development in Urdu-speaking children and provide empirical evidence for vowel acquisition hierarchy in L1 Urdu. This research offers valuable insights for linguists, speech-language pathologists, and early childhood language development studies in the Pakistani context.

Keywords: L1 acquisition, Urdu phonology, vowel acquisition order, acoustic analysis, formant frequencies, early childhood language development, Pakistani context, phonological development, Praat analysis.

Introduction: The current study aims to investigate the order of vowel acquisition in Urdu language. It has been disputable how many vowels include in Urdu language. All previous data verifies claiming different number of phonemes and vowels in Urdu. There is no strong evidence that could be taken valid and reliable to agree upon one statement. If numbers of phonemes are not authentic, then no strong data is available to justify order of vowel acquisition. With gap of 6 months, four babies were selected with condition that their parents must speak with them Urdu normally. After frequent visits, as suitable condition appeared; children were ready to utter voices for few minutes after they had been given some favourite toys. The speech of each child was recorded on android mobile phone practicing Praat software. Through Acoustic Analysis, all data was analysed giving focus on dense bands that definitely lead to expected vowels. Voice of noticed vowel was tested on British Council Phoneme chart's pattern. After it matched with said pattern, it was converted into table along with F1, F2 and F3. Data was also discussed referring authentic theories. It was also evaluated which vowels were repeated and which vowels couldn't utter even once by all four children. The whole data was accumulated in different tables for results. It was justified which vowels were spoken at different phases of infancy. Results were mentioned according to objectives and question of research.

Language acquisition is a fundamental and natural process that leads straight from innocence to mastery (Cowie 2008). Many research, examinations, and inquiries give details about what order is in practice while uttering the most basic sounds of phonemes of the native language, Urdu. Still, there is a need that infants ranging in age from 18 months to 36 months (about 3 years) first language in Pakistani context to be observed. There is also a need that some valid tools to be in practice to record the order of sequence adopted by infants. In fact, when a baby starts using its language, it includes false starts, broken phrases, and other variations that reflect language acquisition and linguistic input. This process comes into being without

intention, teaching, and mastery moving into society (Tomasello 2000).

1.1 Language Acquisition from Early Childhood to 36 months

At the age of 6 months, infants use a crude form of language and make vocal sounds get attraction and this form consists of syllable-like vocalization (Henderson 1997). The infant also babbles to self. At this initial stage, random reduplication of speech sounds with insignificant semantic meanings is present. The pre-verbal stage determines that the child will lead the stage where he can make longer utterances in his coming life. It also manifests that the infant has acquired the knowledge between human and human sounds and by starting babbling, he acknowledges his position as a member of the human species (Locke 1989). Universally, children start with the same template consonant -vowel template, upon which a complex template will be formed later. 'Baba','dada'and'mama'is an example to see C.V templates which are common among children of the same age globally. Werker & Tees, (1984) and Best, (1994) state that at this particular time, infants have a universally unique discriminatory nature to distinguish consonantal contrasts or even vowels and it was experimented with success in English. (All the same was also recorded in other languages e.g. Japanese and Urdu. The earliest stable produced supraglottal consonants; these are the nasals and stops because both are the results only of raising and lowering jaws. The alveolar stop co-occurs with front vowels e.g. [di], velar stop with back vowels e.g. [bo], and bilabial stop with central vowels e.g. [ka]. There is another belief that until 6 months, infants learn not speech sounds separately but they learn words as a whole. Later, the same category words become more familiar with time. Research by Storkel (2001) Edwards, Beckman, and Munson (2004), shows that youngsters between the ages of three and six can acquire new words more easily when they are exposed to well-known phonotactic sequences.

As months go on until 1st year of life, the infant uses sounds to communicate with adults carrying the same CV template but now he stops babbling when he hears a familiar adult voice (Karpf 2011). He also uses gestures of waving for pointing to communicate. The ability to produce a core syllabus (basic to all human languages) identifiable as the basic to adult-like vocalization from 6- 8 months. Within months, the emergent ability to represent, recall, and create words with word form recognition which frequently comes before complete word comprehension and gives rise to this special characteristic of human language (Roberts, Christo et al. 2011). An infant may construct phonological categories from a denser cluster of categories up until the age of one year. He will continue to fail to hold attention outside of these categories. He tries to form only identical sounds that vary from language to language. In case of similar sounds, these may be diffusely distributed. For example, newborn Japanese cannot tell the difference between English.

Similarly, babies learning Arabic are no longer able to distinguish between /p/ and /b/.The same is the case with Urdu-learning infants who can no longer find any difference from /v/ to /w/. The emergence of infants' first C.V. syllables is [bababa, dadada, ŋaŋaŋa]. Variegated babbling begins and combines different syllables in vocal play. The study found that infants start uttering the same sounds that they find legal constraints in their native language and exclude those sounds that are part of the phonology of their language and this process is carried out after occurrence of babbling.

Between one and one and half years, infants use sentence-like intonation and between 15-16 months, means in early years, infants learned consonants that include pattern /manner of articulation of labial, coronal stops, the glide /j/, and/s/.

From 18 to 24 months, the infant can speak two-word mini sentences about semantics. As Formkin (1983: 329) states infants start speaking two words in relation with syntactic and semantic overall not pausing between these two words. A baby at this early age is destined to utter consonant sounds like [n], [p], [b], [d], [t], [m], and [j].

By the time the child is 24 months old, he can generate words that contain glides, some voiceless fricatives, labial and alveolar nasals, and voiced and voiceless velar stop consonants. Here, syllables are in the form of open syllables and closed syllables proceed to di-syllabic. Moreover, at this stage, the child produces syllables with the initial or at the final position. The vowel repertoire is almost complete excluding lax vowels. This is the telegraphic stage where the infant leaves out no content words as people used to leave in telegraphs, (Formkin, 1983). This time infant begins speaking more than two words and it seems sentence-like having the same hierarchical constituent structure as adults' grammar has. The next stage is called Later multi- word stage where no babbling is present. Sufficient vocabulary completely fulfills communicative purposes.

1.2 Research Objectives

i. To record through an acoustic analysis the order of acquisition of L1 Urdu vowels.

ii.To see which vowels are acquired earlier than the

others.

1.3 Research Questions

i. What is the order of acquisition of L1 Urdu vowels?

ii.Whether or not some vowels are acquired earlier than the others by Urdu speakers?

2. Literature Review

2.1 Phonology Development

2.1.1(0-3 month)

Undifferentiated birth cry, reflexive sound production results in glottal catch and vowels (ah, eh, uh), some variation in non-crying sounds, differentiated cry (true vocal communication begins, coos and gurgles, produces single syllables.

2.1.2 (3-6 months)

The babbling starts VCV, aga - double syllables put lips together - says "m". A nasal tone is here. [The baby] expresses pleasure and displeasure vocally and deters changing sound (consonant into vowels) when someone appears. The baby plays with soft sounds, sometimes converting the sound into light music and laughter. He does not only make voices to himself but this process goes on with others and toys also and there are not only voices but it demonstrates resonance and inflexion.

2.1.3(6- 9 months)

[The baby] babbles multiple syllables with consonants and semi vowel [y].It is not easy to understand what sound and what language a child uses when he feels pleasure and murmurs melodiously in singing tones, inflects vocal play, intonation patterns are audible, commences to mimic speech sounds and intonation from his or her repertory; baba, baba,

2.1.4(9 -12 months)

Vocalizes during play, vocalizes to mirror, jabbers loudly - a wide range of sounds and intonations, uses most sounds (C&V) in vocal play - beginning of phonetic drift

2.1.5(1 – 1½ Year)

Uses sentence-like intonations (jargon), uses some echolalia, employs the majority of vowels and consonants and some Initial consonants, unintelligible with exception of a few words/s, omits final consonants and some initial consonants/s, words produced with CV structure (bo/boat) emerge/s, accurately imitates some words/s

2.1.6(1 ½ - 2 Years)

Words' frequency increases and confused words continue till 24 months of age, with making tone low and high, question around environment he asks and this trait increases difficulty in understanding. After 24 month of age, this difficulty level reaches to 65% and phrases he uses are having intonation to get clarity for him and words carry CVC structure.

2.1.7 (2 -½ Years)

70% understandable,[He] may omit the final consonant, reduce consonant blends, or substitute one consonant for another.

2.1.8 (2½- 3 Years)

Still some consonant substitutions and distortions, continuing to improve intelligibility - now approximately 80% intelligible, consonants learned: p, m, and n, w, h.

2.2 Order of Language Acquisition

Language acquisition is that child learns what he hears in his environment. It is its unique aspect and the order of language acquisition follows a hierarchy of phonology, morphology, syntax, semantics, and pragmatics. Almost all children acquire language almost in the same period and with the same astounding speed regardless of their social, cultural, and economic status. Words, Phonemes, and syllabi, infants do not learn randomly but it is fully structured.

Only certain phonemes, he acquires in a specific period, as defined by Andriana, Brooks, and Hedge (2000). This fully structured language system leads to a hierarchical system that consists of place and manner of articulation. This journey starts with Vowels. Then, infants combine vowels with consonants. Later, the syllable pattern becomes the center of attention as described by O'Grady, Dobrovolsky, and Katamba (1996). After acquiring CV, infants move towards acquiring canonical and variegated babbling.

So far as a place of articulation is concerned, across the globe, there is a hierarchical structure that first follows Labials, followed (by some variations) by alveolar, velars, and alveoli palatals. At last, the infant acquires interdentals in the end as described by O Grady et al (1996).Stops tend to occur first, O Grady (1996) details in Contemporary Linguistics discussing the further sequence of order of articulation. /la/ and /ra/ are acquired late by the infant. Voiced consonants are developed first in this sequence of the manner of articulation. Richtsmeier (2010) that firstly children convert all devoiced initials of words to voiced initials. Secondly, all last voiced consonants change into devoiced though these are part of normal speech. Smit (1979) also agrees with this process of devoicing. Thirdly, children devoice velar more than alveolar and labials.

3.Methodolgy

Four infants were participants in the current research, having different age periods. The first baby was only 18

months old. The second one was 24 months old, and the second last one was 30 months old. Working on parameters of a six-month gap to the next baby, the fourth baby was 36 months old. The condition for choosing suitable sampling was that participants in the research should be native speakers of Urdu. Making the situation clearer, it was given priority that parents of selected babies must speak Urdu to their children.

The nature of sampling was purposive. The requirement for collecting the data was age variation among four children. There was a 6-month gap in the next stage of a child. Living in society, it was not a big deal to find out 4 babies with subsequent age variations. However, contact was made with families and friends so that said requirements of sampling be made possible. All parents of participants cooperated to a great deal and tolerated maxim

Different four babies' houses were visited as parents were requested almost one week earlier to participate in the data collection process of their infants. Android phone was used for recording the speech sounds of different six infants. Their age ranges from 18 months to 36 months. A wave file was used for recording data.

All was a difficult task as before recording speech, infants needed to be invited closer so that he could record the required data. Criteria were speech sounds be recorded for at least 3 minutes and a maximum of 5 minutes. However, it seemed too difficult to record as infants usually speak for 1 to two minutes when they are in a pleasant mood. Normally, when they feel silent around themselves for a while, they get scared and start stopping for further recording.

After many attempts, a satisfactory limit of data was made possible. In almost all recordings, parents convinced their children to speak, giving them their favourite toys. They guided their children on what story to tell for example.

Later, with the help of the software Praat, the whole data was analyzed. First, segmentation was made possible of vowels and consonants and results were prepared.

4.Data Collection

Table 1

4.1 Formant frequencies of 18month old Baby

Vowels	F1 (Hz)	F2 (Hz)	F3 (Hz)
/ʌ/	547	1637	2749
/u:/	683	1241	2197
/ʊ/	659	1366	2099
/e/	492	2050	2370
/ɜ:/	637	1370	2871
/ɔ: /	759	1641	2886
/ ɒ/	997	1775	3235

Table 2

4.2 Formant frequencies of 24 old month old Baby

Vowels	F1 (Hz)	F2 (Hz)	F3 (Hz)
/ʌ/	1035	1874	1972
/ ə /	888	1375	2599
/a: /	1097	1512	2074

/i: /	601	1832	3389
/ɔ: /	1153	1751	3578
/ɜ: /	1075	1532	2198
/u: /	685	939	2020

Table 3

Formant Frequencies of 30-months-old Baby

Vowels	F1	F2	F3
/Ə/	1289	2110	2326
/i: /	648	1878	3300
/Λ/	1183	1458	2418
/ʊ/	1072	1320	3408
/u: /	450	1826	2716
/e/	116	1129	2228
/æ/	1419	2024	2655
/a:/	1139	1890	2320

Table 4

4.1.4Formant Frequencies of 36 old Baby

Vowels	F1 (Hz)	F2 (Hz)	F3 (Hz)
/e/	731	1892	3208
/Λ/	1186	1195	2359
/ a:/	1278	1733	2720
/ə/	640	2191	475
/ɒ/	1023	1861	2682
/ ɔ:/	813	1400	2687
/ ʊ/	858	1488	2117
/i:/	907	2293	3443
/æ/	842	1385	2273

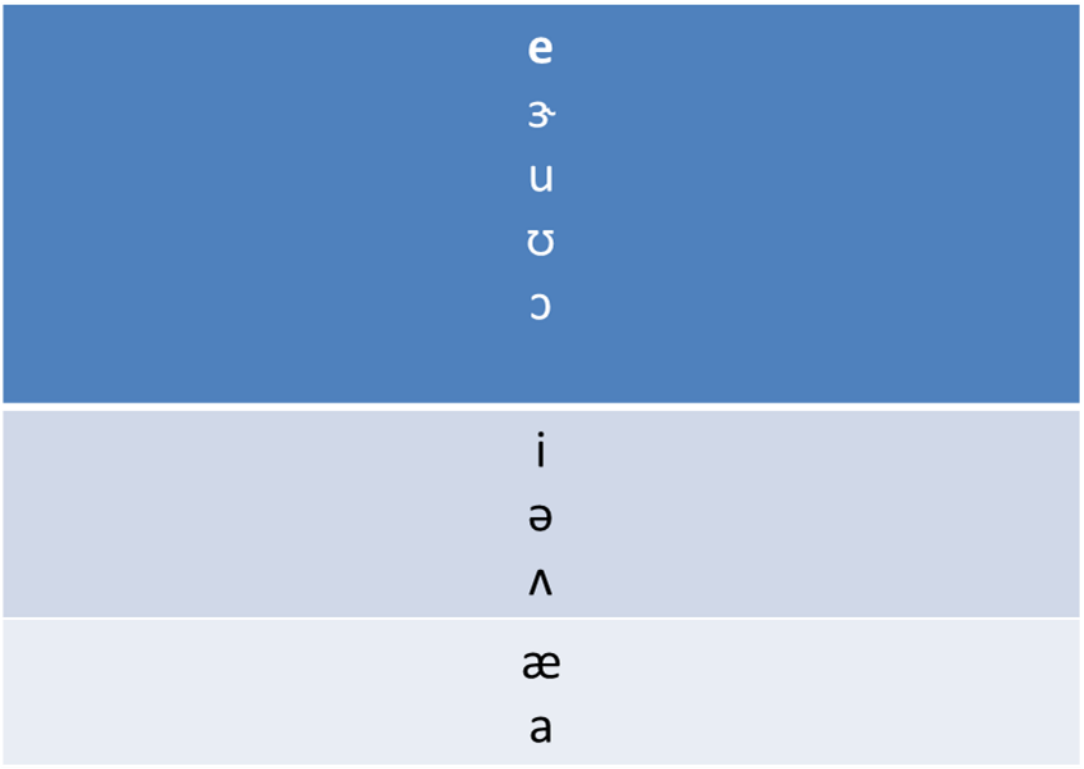
Table 5

Vowels of the Urdu language (Monophthongs and Diphthongs) acquired by infants from 18 months to 36 months being its natives

Sampling	No. of vowels (mono- thongs) Acquired	Front Vowels	Central Vowels	Back Vowels	No. of Diphthongs acquired
18 months	**7**	**/e/**	**/ɜ: /,/ ʌ/**	**/u:/, /ʊ,//ɔ:/,/ɒ/**	**1**
24 months	**7**	**/ i/**	**/ə/, /ʌ/, /ɜ: /**	**/ɔ:/, /u:/,/ɒ/**	**2**
30 months	**8**	**/ i/, /æ/,/e/ /a: /**	**/ʌ/, /ə/**	**/ʊ/, /u:/**	**3**
36 months	**9**	**/i/, /e/,æ/ /a: /**	**/ʌ/, /ə/, /ɜ: /**	**, /ʊ/, /ɔ: /**	**2**

Table 7

The Order of Acquisition of Vowels Sounds



(I) Blue Category represents that back vowels are acquired earlier than front vowels.(ii) Grey category reflects that long vowels are acquired earlier than short vowels.(iii) Light Grey category explains that low vowels are acquired at the most advanced level.

5. Results

Back vowels are acquired earlier than front vowels. Long vowels are acquired earlier than short vowels. Low vowels are acquired at the most advanced level.

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