Chapter 6: Morphophonology of Tone in Chokri

6.1. General Introduction

In the previous chapter, we have discussed how tones in Chokri can encode lexical as well as grammatical meanings. In this chapter, we will examine the behaviour of tone in morphologically derived environments such as affixation, compounding and reduplication. In addition to that we will also examine the nature of the different suffixes in Chokri.

The term *morphophonology* broadly refers to the interaction between morphology and phonology – two key components of linguistics (Basbøll, 2015). This interaction can result to phonological or morphological changes. It focuses on how these two linguistic domains influence each other and how this interaction can lead to changes in the form and structure of words. The changes are often sensitive to the environment in which the morpheme or phoneme is situated. Specifically, morphophonological changes occur when the pronunciation of a word or morpheme is altered depending on the phonological environment in which it appears. This can include changes in sound due to neighbouring sounds, shifts in stress patterns, or even alterations in the tone of a word.

Morphology, as discussed by Spencer and Zwicky (1998), deals with the structure of words and words are at the interface between phonology, syntax and semantics, while phonology, as described by Goldsmith (1995), focuses on sound systems. Morphophonology examines how these two modules influence each other, such as how phonological rules apply to morphological structures. Yip (2002) highlights that morphological structure often dictates tonal behaviour, making the study of morphophonology particularly relevant in tonal languages.

In tonal studies, it is thus crucial to investigate how morphological structures influence tonal behaviour, as word formation processes such as compounding and affixation can lead to tonal modifications/alternations. These changes may not be arbitrary but follow specific phonological/morphological rules that shape the tonal system of a language. For instance, African languages[12] have been largely documented to exhibit tonal polarity wherein a toneless

[12] African languages such as Afro-Asiatic: Hausa (Newman, 1995), Margi (Hoffmann, 1963, Pulleyblank, 1983), Ngizim (Schuh, 1971); Niger-Congo: Dagbani (Olawsky, 1996), Dagaare (Anttila and Bodomo, 2000), Kɔnni (Cahill, 2004), Lama (Kenstowicz et al., 1988), Mòoré (Kenstowicz et al., 1988), Bambara (Dwyer, 1976; Creissels and Grégoire 1993), Mono (Olson, 2001), Gokana (Hyman,

syllable receives the opposite of the tone on the preceding syllable. This phenomenon however is not unique to African languages, Sylheti, an Indo-Aryan language with two tones, spoken in the Eastern part of India also reported to exhibit tonal polarity where in the affixes are toneless and receives an opposite tone to the word it is attach to. Specifically, in Sylheti, affixes do not have that inherent tone and gets the opposite of the root word. Additionally, in some verbal forms, some suffixes (3 perfective suffix and 1 present indefinite) can appear with a high tone and alter the tone of the root word with high tone to low tone. (Gope, 2016; Mahanta and Gope, 2018). Apart from these, Tibeto-Burman languages have reported the instances of tonal polarity: Anál (Ozerov, 2018), Myebon Sumtu Chin (Watkins, 2013), Kuki-Thadou (Hyman, 2007) and Tenyidie (Meysae, 2021). Polarity has previously been viewed as a feature of two-way tone system. Meyase (2021) extends this analysis by demonstrating that polarity can function beyond two-tone systems, providing evidence from Tenyidie, a four-tone Tibeto-Burman language. Traditionally, tone polarity has been understood as a phenomenon restricted to binary tone systems, where a high tone alternates with a low tone and vice versa. However, the presence of polarity in Tenyidie challenges this assumption, suggesting that polarity is not necessarily tied to the number of tonal categories but rather to the underlying tonal features that structure the system.

On the other hand, in various languages, affixes often carry their own inherent tones, which may or may not alter the tone of the root word. For instance, in Hausa (Newman, 1986), affixes are categorized based on their tonal behaviour:

(i) Tone integrating affixes (TIA's): this type of affixes when added to a stem deletes the tone of the lexical word and the tone of the affix spreads to the stem.

E.g.: nominal plural in Hausa

(taatsuuniyaa)^{LHLH} + oocii) ^{HH} → (táattsúuníyóoíi)^{HH} 'folktales'

(riigaa)^{LH} + unna)^{HL} → (ríigúnàa)^{HL} 'gowns'

1985), Igbo (Welmers and Welmers, 1968), Yoruba (Akinlabi and Liberman, 2000); Kanuri (Cyffer, 1991, Trommer 2005); Bangime (Hantgan, 2009) reported to exhibit tonal polarity.

(ii) Tone Non-Integrating Affixes (TNI's): this type of affix, the does not delete or alter the tone of the root word. The root and the affixes are juxtaposed together form a word without affecting each other.

E.g.: Referential marker

(harsunaa)^{HL} + (n)^{L} → hársúnàn 'the languages'

(zoomaayee)^{HLH} + (n)^{L} → zóomàayên 'the hares' (Newman, 1986).

These interactions between morphology and tone are governed by phonological principles that vary across languages, shaping their overall tonal systems. Similarly, compounding plays a crucial role in tonal restructuring. It often results in tone neutralization or reorganization to maintain prosodic balance and ensure smooth transitions between elements (Downing, 2006). Tonal modification in compounding is a well-documented phenomenon across many tonal languages, including Chinese varieties such as Shanghainese. Hyman (2014) notes that in Shanghainese, all but the tone of the first word in a compound are neutralized to a default Low (L) tone, as observed in earlier studies (Zee, 1987; Selkirk and Shen, 1990, as cited in Hyman, 2017).

(i) ɛɪŋ + vəŋ → ɛɪŋ vəŋ 'news' < ɛîŋ 'new' (HL)
HL LH H L

(ii) ɛɪŋ + vəŋ + tɕia → ɛɪŋ vəŋ tɕia 'news reporting circle'

HL LH MH H L L

(iii) ɛɪŋ + ɛɪŋ + vəŋ + tɕi + tsɛ → ɛɪŋ ɛɪŋ vəŋ tɕi tsɛ 'new news reporter'

HL HL LH MH MH H L L L L

As such, one of the key areas of interest in morphophonology is the way tones behave in tonal languages. Yip (2002) identifies and distinguishes three types of interactions between tone and morphology:

(i) Tone itself can function as an independent morpheme. As such, it is governed by the general phonological rules of the language, undergoing processes like association, deletion, and spreading.
(ii) Specific morphological constructions can actively alter or manipulate tonal patterns.
(iii) The internal structure of a word, shaped by its morphology, can influence its tonal behaviour.

Morphophonology explores how the tones change or react when morphemes are combined, or when words appear in different phonological environments. For example, the tone of a word might shift when an affix is added, or it might undergo tonal assimilation when adjacent to another morpheme with a contrasting tone etc.

Examining these interactions is essential for understanding how tonal contrasts are maintained or modified in different morphological environments. By analysing such patterns, we can gain deeper insights into the interface between phonology and morphology, revealing how tonal structure adapts within a given linguistic system. This approach is particularly important in under-documented languages like Chokri, where tone plays a significant grammatical and lexical role.

There are numerous ways morphology and phonology interact, such as affixation, assimilation, dissimilation, and stress shift, among others. To better understand how lexical tones interact with different affixes in Chokri, we analysed five contrastive nominal roots with two types of suffixes: the dual marker [-ni] and the plural marker [-kɔ]. Additionally, we examined contrastive verbal roots with four types of affixes: the negation suffix marker [-hi], the progressive suffix marker [-va], the causative prefix marker [mɛ-], and the nominalizer prefix [t^hɛ-]. We also look into the process of word derivation through compounding and reduplication and how that affects the tone of the lexical words.

6.2. Analysis of Tone in Affixes Paradigm

6.2.1. Production Recording

An experiment was conducted to investigate how lexical tones in Chokri interact with various affixes. The study focused on two main objectives:

(i) Analyzing the tonal properties of the suffix when attached to roots with contrastive tones.

(ii) Examining how contrastive tones of the roots behave when combined with an affix carrying the same tone.

To achieve these objectives, we conducted a production experiment in which five native speakers (three females and two males, aged 20–40) from Thipüzu village participated. The experiment involved a three-step process:

1. Participants produced the root words in isolation

2. Participants produced the root words with the intended suffix in a priming sentence to ensure correct production
3. Participants produced the target word with the suffix embedded in the sentence frame 'vapü X si sasö te' (say X again).

A total of 18 words, comprising 5 nominal roots and 13 verbal roots with contrastive tones, were carefully selected for the study. The selected nominal roots and verbal roots are combined with different types of suffixes and prefixes (see Table 6.1 - 6.3 for details). These roots were tested with affixes associated with different grammatical functions, such as nominalization (/tʰɛ-/), pluralization and dual (/-kɔ/ and /-ni/), causativization (/mɛ-/), negation (/-hi/), and progressive aspect marking (/-va/). The dataset was randomly organized, and each subject repeated the whole set five times. Thus, a total of 900 tokens are examined in this production experiment [(5 nominal roots x 2 suffixes x 5 subjects x 5 repetitions) + (5 verbal roots x 2 suffixes x 5 subjects x 5 repetitions) + (8 verbal roots x 2 prefixes x 5 subjects x 5 repetitions).

Nominal roots	**Gloss**	**Suffix**	**Gloss**
[tʃə̌]	'bangle'	[-kɔ]	'plural marker'
[pə̋]	'fat' (N)	[-kɔ]	'plural marker'
[sə́]	'tree'	[-kɔ]	'plural marker'
[mə̄rā]	'bird'	[-kɔ]	'plural marker'
[pʰɛ̄pfə̀]	'shoe'	[-kɔ]	'plural marker'
[tʃə̌]	'bangle'	[-ni]	'dual marker'
[pə̋]	'fat' (N)	[-ni]	'dual marker'
[sə́]	'tree'	[-ni]	'dual marker'
[mə̄rā]	'bird'	[-ni]	'dual marker'
[pʰɛ̄pfə̀]	'shoe'	[-ni]	'dual marker'

Table 6.1: Dataset containing nominal roots and the suffixes considered in this study.

Verbal roots	**Gloss**	**Suffix**	**Gloss**
[tā̋]	'to splash water'	[-va]	progressive aspect
[tá]	'to run'	[-va]	progressive aspect
[tā]	'to chew'	[-va]	progressive aspect
[tà]	'to walk'	[-va]	progressive aspect
[mɛ̄tə̄]	'to suck'	[-va]	progressive aspect

[tə̋]	'to splash water'	[-hi]	Negation
[tá]	'to run'	[-hi]	Negation
[tə̄]	'to chew'	[-hi]	Negation
[tà]	'to walk'	[-hi]	Negation
[mɛ̄tə̄]	'to suck'	[-hi]	Negation

Table 6.2: Dataset containing verbal roots and the suffixes considered for the production experiment.

[dʒɔ́]	'to bless'	[t^hɛ-]	Nominalizer
[ʙə́]	'to defecate'	[t^hɛ-]	Nominalizer
[ɻ̥ɔ̄]	'to respect'	[t^hɛ-]	Nominalizer
[bá]	'to sit'	[t^hɛ-]	Nominalizer
[tɾə̋]	'to drink'	[mɛ-]	Causative
[tá]	'to run'	[mɛ-]	Causative
[bá]	'to sit'	[mɛ-]	Causative
[tì]	'to eat'	[mɛ-]	Causative

Table 6.3: Dataset containing verbal roots and the prefixes considered for the production experiment.

6.2.2. Data Annotation

After the recording, the target tokens occurring in the fixed sentence frames were extracted from the sentences and saved as individual audio files. It must be noted that we only considered the tokens that occurred in the fixed sentence frame and ignored the rest from the final analysis. The individual sound files of the target tokens were then manually segmented using Praat. After segmentation, the pitch values were automatically extracted using VoiceSauce (Shue et al., 2011) at eleven timepoints (0-100%), each point representing 10% of the total length of the pitch track.

6.3. Results and Discussion

6.3.1. Verbal Suffixes

6.3.1.1. Progressive Aspect Suffix [-va]

In Chokri, the progressive aspect is indicated by the suffix [-va], which is used to denote ongoing or continuous actions. To investigate how this suffix interacts with tonal contrasts in verbal stems, it was attached to five verbal roots with varying tones: [tə̋] (to splash water), [tá]

(to run), [tā] (to chew), [tà] (to walk), and [mɛ̄tɔ̄] (to suck). Each of these roots represents a different tonal category, offering a comprehensive perspective on the tonal behaviour of the progressive suffix.

Our analysis reveals that the progressive suffix [-va] carries its own inherent tone, which is consistently a High tone as seen in Figure 6.1. This tone is independent and stable, maintaining its identity regardless of the tonal properties of the root word to which it is attached. Unlike toneless affixes, which adopt their tonal characteristics from the root, the progressive suffix [-va] demonstrates tonal autonomy, signaling its grammatical function unambiguously.

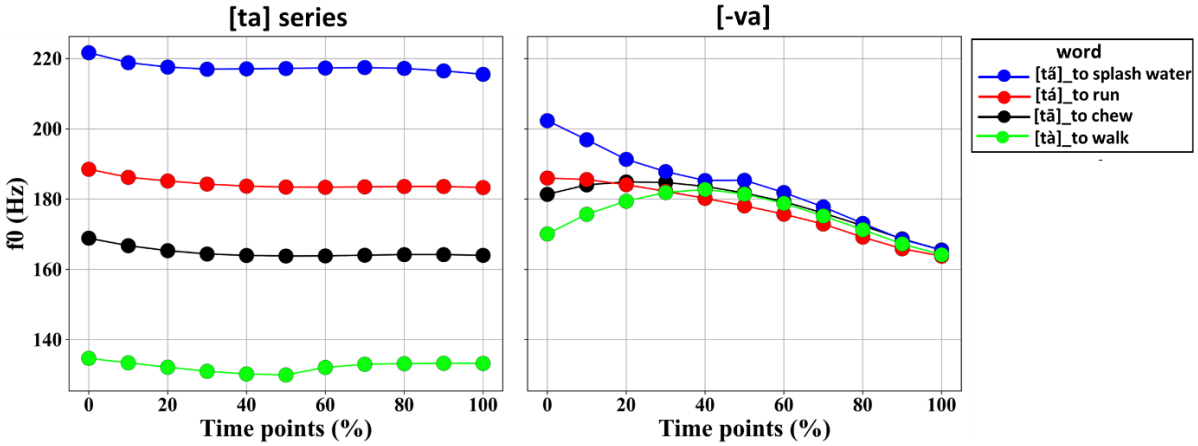

Figure 6.1: Averaged pitch tracks of the verbal roots [tā́] ‘to splash water’, , [tá] ‘to run’, [tā] ‘to chew’ and [tà] ‘to walk’ combined with the progressive suffix [-va].

Figure 6.1 indicates that the progressive suffix inherits a high tone. The four contrastive roots with extra high [tā́] ‘to splash water,’ high [tá] ‘to run,’ mid [tā] ‘to chew,’ and low [tà] ‘to walk’ maintain their underlying tonal properties, while the suffix also maintains it’s inherent tonal property. Since the monosyllabic verbal roots are not specified for a mid-rising tone (already discussed in chapter 4), we chose a bisyllabic verb [mɛ̄tɔ̄] ‘to suck’ which carries a rising tone on its final syllable to see if the progressive suffix still maintains its inherent tonal specification.

Findings from chapter 4 indicate that the final syllable functions as the primary tone-bearing unit, as lexical tone in Chokri consistently associates with the final syllable of the root. By observing the tonal behaviour of the final syllable in [mɛ̄tɔ̄] when combined with the progressive suffix, we can assess whether the suffix exerts any tonal influence or whether the lexical tone remains stable in the derived form.

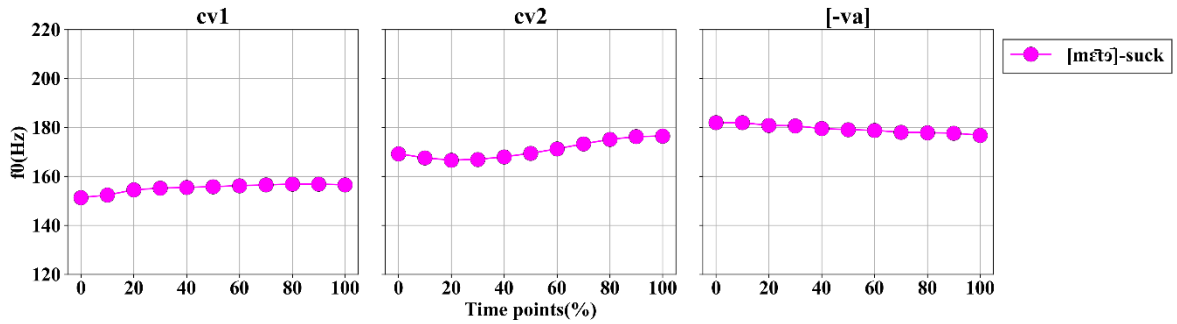

Figure 6.2: Averaged pitch tracks of the verbal roots [mɛ̄tɔ̋] 'suck' with an underlying mid-rising tone (to suck) with the progressive suffix [-va]

Interestingly, the inherent tonal specification of the [-va] suffix does not interfere with or modify the tone of the root word. Similarly, the root tone does not affect the High tone of the suffix. This mutual independence highlights a clear separation between the inherent tonal specification of roots and suffixes in Chokri. The progressive marker consistently retains its High tone, ensuring that its grammatical meaning remains perceptually distinct, irrespective of the tonal environment of the root

6.3.1.2. Imperative Negation Suffix [-hi]

In Chokri, negation is marked using the suffix [-hi]. To examine the tonal behaviour of this suffix, it was attached to the same set of verbal stems previously analysed with the progressive marker.

The results of this analysis revealed that, much like the progressive suffix, the negation suffix [-hi] is not toneless. Instead, it is consistently realized with its own distinct tone, which is identified as a Low tone. This tonal specification of the negation marker remains stable and independent, regardless of the tonal characteristics of the verbal stem to which it is attached demonstrating a clear boundary between the tonal properties of the stem and the suffix as seen in Figure 6.3 and 6.4.

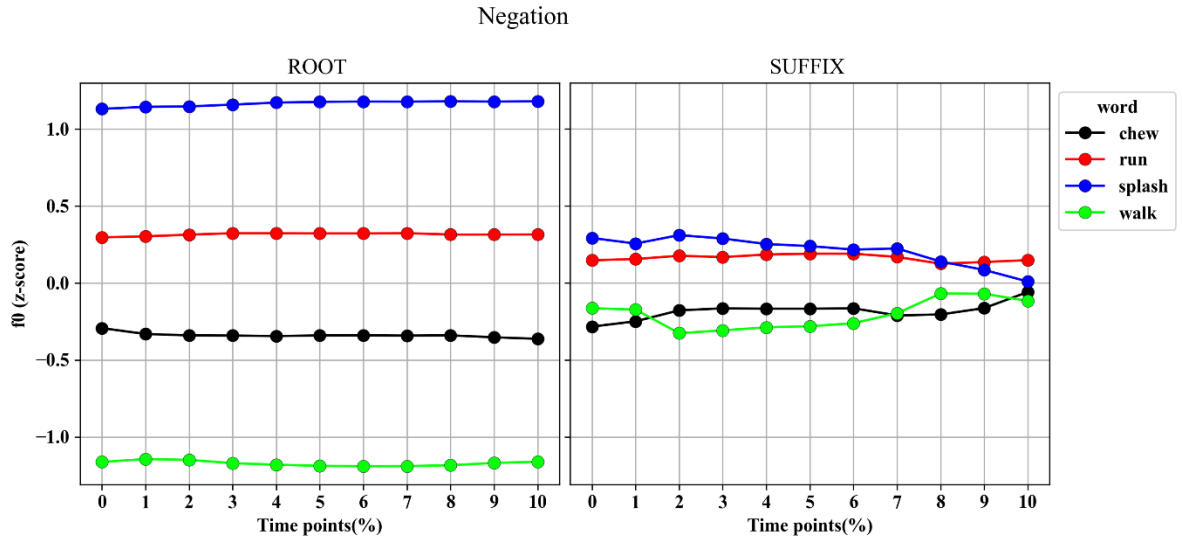

Figure 6.3: Averaged pitch tracks of the verbal roots [tấ] 'to splash water', , [tá] 'to run', [tā] 'to chew' and [tà] 'to walk' combined with the progressive suffix [-hi].

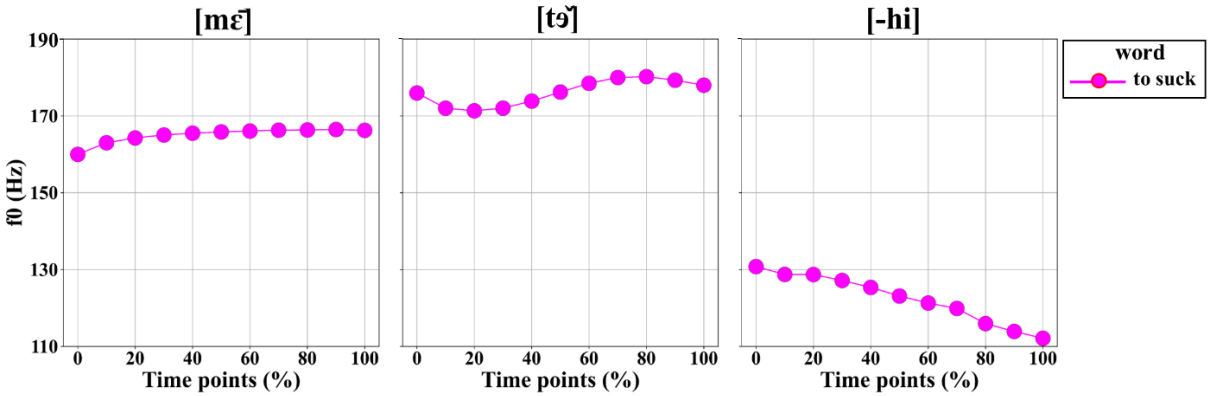

Figure 6.4: Averaged pitch tracks of the verbal roots [mɛ̄tɘ̄] 'to suck' combined with the imperative negation suffix [-hi].

6.3.1.3. Causative Prefix /mɛ-/

In Chokri, the causative marker is expressed using the prefix [mɛ-]. To explore its tonal behaviour and interaction with stems of varying tones, the prefix was applied to five words representing three tonal categories: [trá] (drink) with an Extra High tone, [bá] (sit) with a High tone, tá ('run') with a High tone, [thà] (stand) with a Low tone, and [tì] (eat) with a Low tone. While these examples provide valuable insights, we could not identify suitable words with Mid and Rising tones that could take the causative prefix. This limitation should not be interpreted that such combinations are impossible, but rather reflects the constraints of the available lexical data.

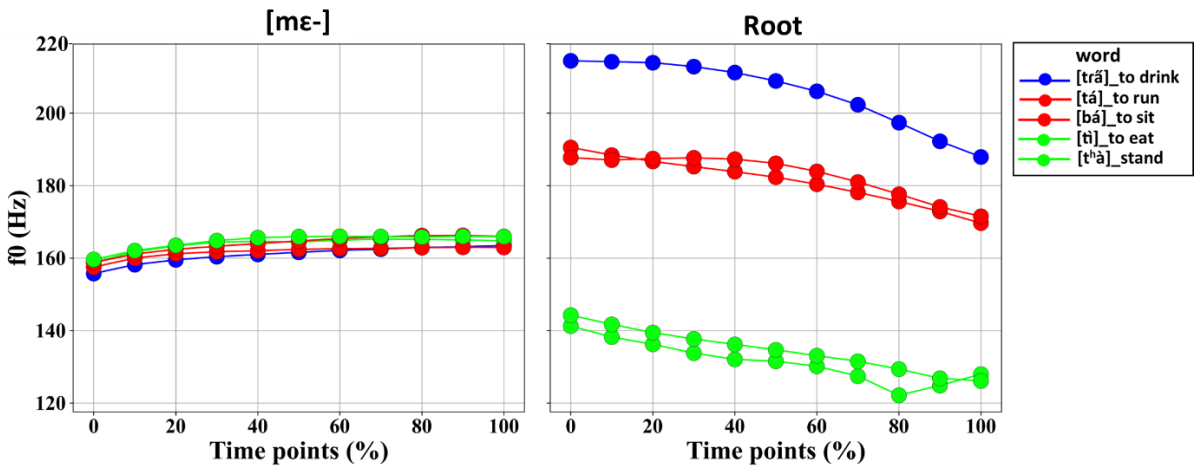

Figure 6.5: Averaged pitch tracks of the verbal roots words [trə̋] ‘to drink’, [tá] ‘to run’, [bá] ‘to sit’, [thà] ‘stand’, and [tì] ‘eat’ combined with the causative prefix [mɛ-].

Our analysis reveals that the prefix [mɛ-] has a distinct and stable Mid tone, independent of the tonal characteristics of the root word it modifies. Crucially, the tone of the prefix remains unchanged regardless of the tone of the following root. Similarly, the tone of the root is not altered or influenced by the prefix. This again indicates a clear tonal demarcation between the affix and the root, emphasizing the autonomy of the prefix’s tone in Chokri morphology.

6.3.1.4. Nominalizer Prefix [tʰɛ-]

In Chokri, verbs can be nominalized using the nominalizer prefixes [kə-] and [tʰɛ-]. For this analysis, we focused on the nominalizer [tʰɛ-], which derives nouns from verbal roots. This prefix was applied to four verbal stems representing two tonal categories: [bá] (sit) with a High tone, [bə́] (to defecate) with a High tone, [dʒɔ́] (bless) with a High tone, and [ɾ̥ɔ̄] (to respect) with a Mid tone. Due to data limitations, additional words with other tonal categories could not be included in this study.

Our analysis reveals several important tonal patterns when the [tʰɛ-] prefix is attached to verbal stems. Firstly, the prefix exhibits a consistent Mid tone, regardless of the tonal properties of the root word. This distinct tone highlights the tonal stability of the nominalizer, which retains its tonal identity across varying tonal environments.

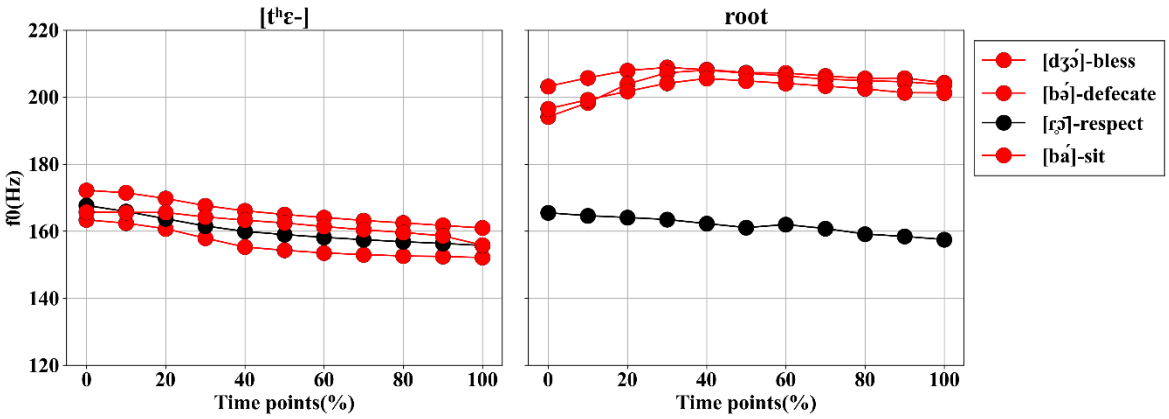

Figure 6.6: Averaged pitch tracks of the nominal roots [dʒɔ́] 'to bless', [ʙə́] 'to defecate', [ɾ̥ɔ̄] 'to respect', [bá] 'to sit' combined with the plural suffix [tʰɛ-].

Interestingly, the tonal interaction between the prefix and the verbal root leads to a predictable tonal adjustment in the root. Specifically, when [tʰɛ-] with mid-tone is prefixed to a verbal stem with a High tone, the High tone of the root is raised to an Extra High tone. In contrast, when the root is a Mid tone, it remains unchanged.

A similar pattern is also observed with the nominalizer prefix [kə-], which also has an underlying mid tone (M). When [kə-] is prefixed to a verbal root with H tone, it changes the tone of the verbal root to Extra High tone as seen in the following examples:

(i) [pɔ́] (tell) → [kə̄-pɔ̋] (discussion)
(ii) [pʰú] (search) → [kə̄-pʰű] (search)

However, unlike the nominalizer [tʰɛ-], where the root with mid tone remains unchanged, when the nominalizer prefix [kə-] is added to verbal roots with underlying Mid tone, it changes the tone of the root to Mid-Rising tone.

(iii) [tʰī] (to hurt/pain) → [kə̄thǐ] (disease)
(iv) [pʰrī] (to read) → [kəpʰrǐ] (read)
(v) [sā] (to die) → [kə̄sǎ] (death)

On the other hand, when the nominalizer prefix [kə-] is attached to verbal stems with underlying EH tone and L tone, the tone of the root does not undergo any changes.

(vi) [və̋] (beat) → [kə̄və̋] (fight)
(vii) [trə̋] (to drink) → [kə̄trə̋] (drinks)
(viii) [pālǐ] (argue) → [kə̄pālǐ] (argument)

(ix) [kʰɾə̋] (to love) → [kəkʰɾə̋] (love)
(x) [tì] (to eat) → [kətì] (eat N)
(xi) [ɾəgə̀] (steal) → [kəɾəgə̀] (theft)

Similar tonal pattern is seen when the same suffix is attached to adjectival root words to derive nominal words.

(xii) [lə̄] (warm) → [kələ̋] (warmth)
(xiii) [vɛ̄] (bright) → [kəvɛ̋] (brightness)
(xiv) [tʃʰɔ̄](long) → [kətʃʰɔ̄] (length)
(xv) [vɛ̋] (good) → [kəvɛ̋] (goodness)
(xvi) [ʃə̀] (bad) → [kəʃə̀] (bad N)

Thus, the nominalizer prefix [kə-] with underlying mid tone, when added to the different contrastive tones yield the following result:

Nominalizer prefix	Lexical tone	Output
Mid	Extra High	Mid-Extra High
Mid	High	Mid-Extra High
Mid	Mid	Mid- Mid Rising
Mid	Low	Mid-Low

Table 6.4: Interaction between nominalizer prefix and the verbal roots with varying tonal specifications

However, this tonal modification process holds true for only monosyllabic roots. When the same prefix is attached to bisyllabic roots it does not trigger any tonal changes:

(xvii) [məprə́] (afraid) → [kəməprə́] (fear)
(xviii) [mələ̄] (believe) → [kəmələ̄] (faith)
(xix) [rətʰī] (converse) → [kərətʰī] (conversation)

6.3.2. Nominal Suffixes

6.3.2.1. Plural Suffix [-kɔ]

The plural number in Chokri is marked by the suffix [-kɔ]. This suffix was added to five nominal words with 5 contrastive tones: [pə̋] (fat [N]) with underlying Extra High tone, [sə́] (tree) with underlying high tone, [mərā] (bird) with underlying Mid tone, [pʰɛ̄pfə̀] (shoe) with

underlying Low tone and [tʃʰə̄] (bangle) with underlying Rising tone. As discussed in previous chapter, the lexical tone is attested in the final syllable of the word. So, in the above bisyllabic data the underlying tone is based on the final syllable of the word.

Our analysis of nominal stems with the plural suffix [-kɔ] indicates that the suffix possesses an inherent and distinct underlying tone, which remains independent of the tone of the stem to which it is attached. Unlike toneless suffixes, which rely on the hosting morpheme for their tonal realization, the [-kɔ] suffix carries its own tonal specification. This means that the tonal identity of the plural suffix does not derive from the tonal properties of the root or stem; instead, it is encoded within the suffix itself. Specifically, the plural marker is consistently realized with a mid-tone, regardless of the tonal properties of the stem to which it is attached.

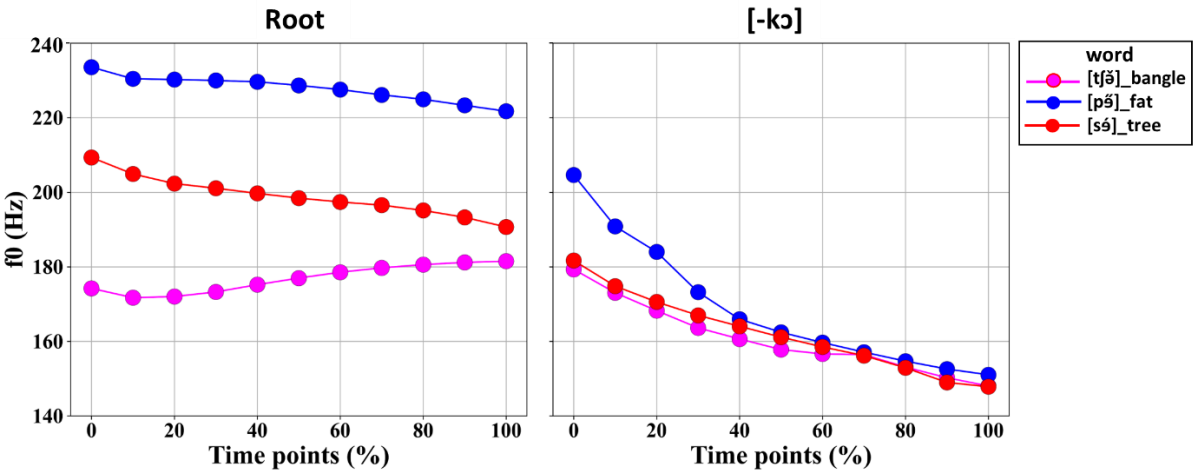

Figure 6.7: Averaged pitch tracks of the nominal roots [tʃʰə̄] ‘bangle’, [pə́] ‘fat’, [sə́] ‘tree’ combined with plural suffix [-kɔ].

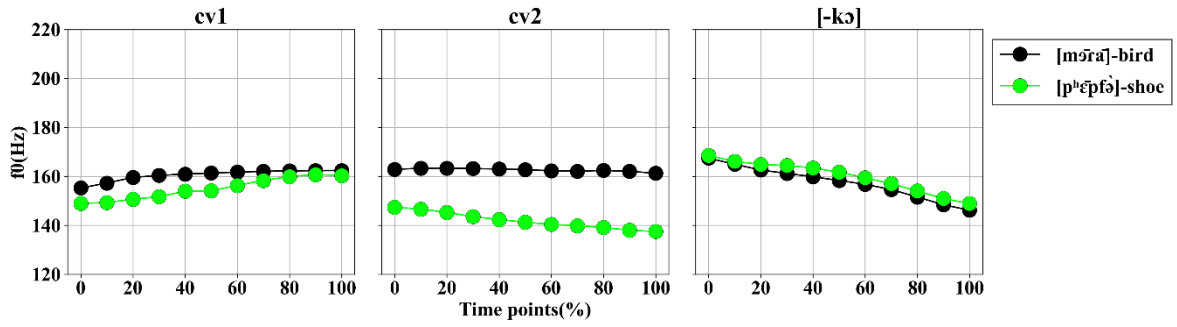

Figure 6.8: Averaged pitch tracks of the nominal roots [mɔ̄rā] ‘bird’ and [pʰɛ̄pfə̀] ‘shoe’ combined with the plural suffix [-kɔ].

When [-kɔ] is attached to a nominal stem, its underlying tone is realized as a separate tonal entity, contributing to the tonal structure of the resulting word without being influenced by the tone of the stem. The mid tone of the suffix does not interact with the lexical tone of the root in a way that alters either element; instead, the mid tone remains stable and distinct. By having its own tone, [-kɔ] ensures consistent tonal representation in plural forms, irrespective of variations in the tone of the nominal root. This property differentiates it from toneless affixes, which depend on tonal assimilation or default tonal assignment from the hosting morpheme.

6.3.2.2. Dual Suffix [-ni]

Chokri marks the dual number with the suffix [-ni]. For the experiment the dual marker is used in the same morphological contexts as the plural suffix [-kɔ]. Similar to the plural suffix, the dual suffix [-ni] exhibits an inherent and distinct underlying tone, independent of the tone of the stem to which it is affixed. According to our analysis, this underlying tone of the dual suffix is a High (H) tone. When is the suffix attached to a nominal stem, the tone (H) of the suffix remains constant and does not assimilate to or blend with the tone of the root. The retention of the H tone across different stems indicates that the dual suffix is again not a toneless morpheme dependent on the hosting morpheme for its tonal properties. Instead, it has its own distinct underlying tone which contributes a distinct tonal feature to the resulting word, ensuring that the dual marking is phonologically and grammatically salient.

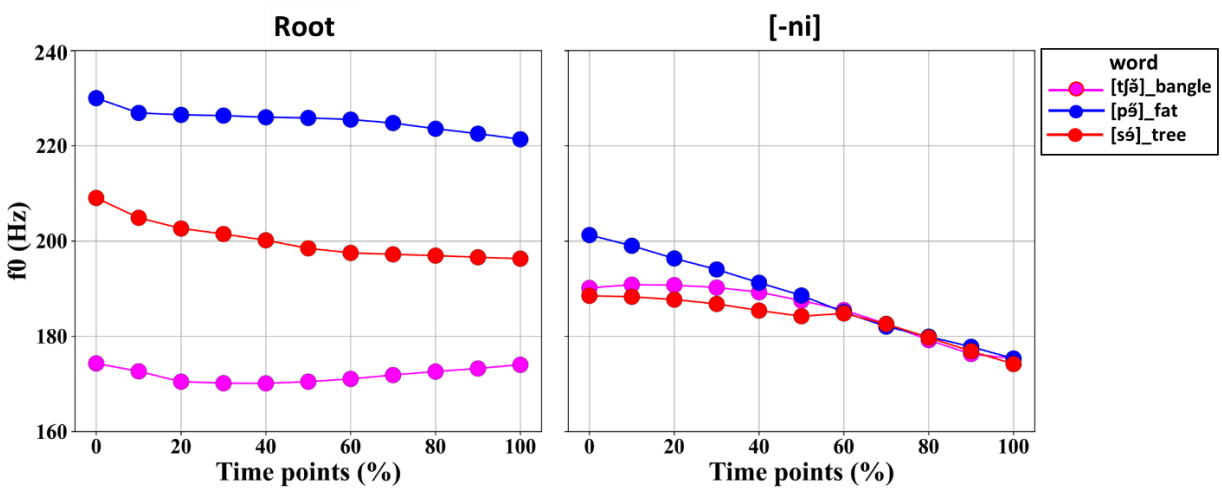

Figure 6.9: Averaged pitch tracks of the nominal roots [tʃʰə̃] ‘bangle’, [pə̋] ‘fat’, [sə́] ‘tree’ combined with dual suffix [-ni].

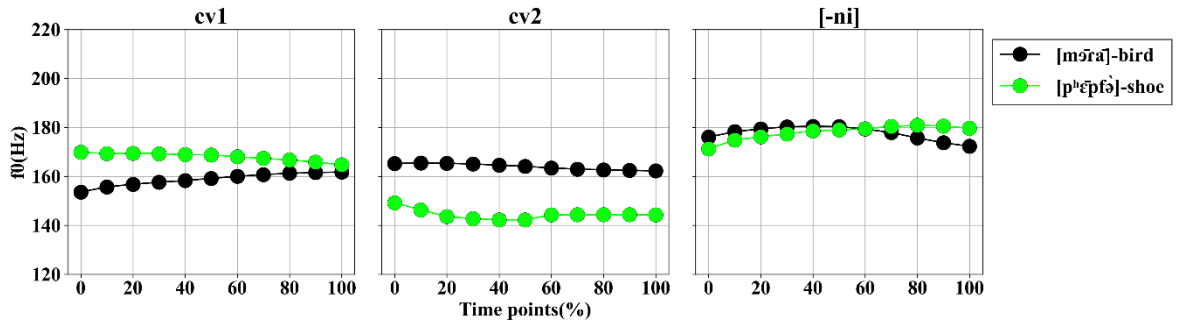

Figure 6.10: Averaged pitch tracks of the nominal roots [mɔ̄rā] 'bird' and [pʰɛ̄pfə̀] 'shoe' combined with the plural suffix [-ni].

6.4. Analysis of Tone in Compounding Paradigm

Compounding is a common word formation process in Chokri, and it plays a crucial role in shaping the tonal system of the language. This section explores how tones in Chokri behaves when words are combined to derived new words.

6.4.1. Noun + Noun

In nominal compounds where noun and noun combine to form nominal word, the tone of the first element is always neutralized to mid- tone while the tone of the second element remains unchanged and carries its underlying lexical tone

(xx)	[mɛ̄fə̄] (plate)	+	[pʰɛ̄] (leg)	= fə̄phɛ̄ (plate with stand)
	[utā] (mouth)	+	[má] (hair)	= tāmá (moustache/ beard)
	[unə̀] (breast)	+	[dʒə́] (water)	= nə̄dʒə́ (breastmilk)
	[m̥ʰə̀] (eye)	+	[dʒə́] (water)	= m̥ʰə̄dʒə́ (tears)
	[sə́] (tree)	+	[mɛ̄] (root)	= sə̄mɛ̄ (tree root)

6.4.2. Noun + Verb

Unlike the noun + noun compounds, where tonal pattern of the second elements are retained, noun + verb compounds in Chokri exhibit systematic tonal modifications. In these constructions, the tone of the first element (the noun) is always neutralized to mid tone. Additionally, the tone of the second element (the verb) undergoes predictable shifts: verbs with an underlying Extra High and Low tone are levelled to Mid tone, those with an underlying High tone shift to an Extra High tone, while verbs with an underlying Mid tone retain their original tone.

(xxi)	[tʰɛ̄zí] (bed)	+	[tʰɾā́] (to spread out)	= [zītʰrā] (bedsheet)
	[ʒɔ́] (day)	+	[tɾā́] (earn)	= [ʒɔ̄tɾā] (wage)
	[tʃʰé] (waist)	+	[pʰá] (to tie)	= [tʃʰɛ̄pʰā́] (belt)
	[mé] (fire)	+	[tɔ̄́] (burn)	= [mɛ̄tɔ̄] (flame)
	[tʰɛ̄dī] (weaving loom)	+	[dɔ̀] (weave)	= [dīdɔ̄] (weaving)
	[lí] (folk song)	+	[zɔ̄] (compose)	= [līzɔ̄] (composition)

This tonal pattern is also evident in N+V+N nominal compounds, where the first noun is consistently neutralized to Mid tone. The verb undergoes systematic tonal adjustments: verbs with an underlying Extra High or Low tone are levelled to Mid tone, those with a High tone are raised to Extra High, and verbs with a Mid tone remain unchanged. Meanwhile, the final noun retains its underlying tonal specification.

(xxii) [lɛ́] (pot) + [tʃʰɔ́] (cook) + [tʃɛ̌] (house) = [lɛ̄tʃʰɔ̋tʃɛ̌] (kitchen)
[dʒə́] (water) + [ɾəlɔ̋] (bath) + [tʃɛ̌] (house) = [dʒəlɔ̄tʃɛ̌] (bathroom)
[tʰɔ̄mà] (human) + [tɔ̋] (capture) + [mì] (person) = [mātɔ̄mì] (kidnapper)

6.4.3. Noun + Adjective

(xxiii) [pɔ̄] (father) + [tsā] (aged) =[pɔ̄tsā́] (grandfather)
[zṹ] (mother) + [tsā] (aged) = [zṹtsā́]
[dʒə́] (water) + [lɔ̄] (warm) = [dʒəlɔ̄]
[dʒə́] (water) + [mɛ̄kɔ̄] (cold) = [dʒəkɔ̄]
[hɔ̋] (apperance) + [vɛ̋] (good) = [hɔ̋vɛ̋] (beautiful)

One notable tonal pattern observed in Chokri compounds is the neutralization of the tone of the first element to a Mid tone. This pattern holds true for most compound structures, except in exocentric compounds and coordinate compounds, where both components retain their original tones.

6.4.4. Coordinate Compound

(xxiv)	[úpɔ̄] (our father)	+ [úzṹ] (our mother)	= [úpɔ̄úzṹ] (parents)
	[tʰɛ̄bā́] (seat)	+ [tʰɛ̄zí] (bed)	= [tʰɛ̄bā́tʰɛ̄zí] (furniture)
	[kʰɾəsā́] (young man)	+ [rəlī] (young woman)	= [kʰɾəsā́rəlī] (youths)
	[tʰɛ̄nɔ̋] (woman)	+ [tʰɛ̄pù] (men)	= [tʰɛ̄nɔ̋tʰɛ̄pù] (husband and wife)
	[mɛ̄fə̄] (plate)	+ [tɛ̄hɛ̋] (cup)	= [mɛ̄fə̄tɛ̄hɛ̋] (utensils)

The systematic tone neutralization of the first element in compounds aligns with our previous findings that in bisyllabic words, the first syllable is always assigned a Mid tone. This suggests that Chokri follows a prosodic rule where the first syllable of a bisyllabic structure, regardless of its lexical tone, adopts a default Mid tone. The motivation for this neutralization could be prosodic stability, ensuring a more balanced tonal structure in compounds and facilitating smooth tonal transitions between elements.

The phenomenon observed in Chokri is not uncommon in tonal languages. Many languages with complex tone systems exhibit tone neutralization or tone sandhi in compounding as a way to maintain phonological harmony (Yip, 2002; Hyman, 2011). In particular, languages such as Mandarin Chinese and certain Bantu languages display similar patterns where tonal modifications occur to preserve rhythmic balance or to distinguish compound words from their individual lexical components (Chen, 2000).

The case of Chokri compounding demonstrates that tone is not always a fixed property of individual morphemes but can be subject to morphophonological adjustments. This highlights the importance of examining tonal behaviour beyond the lexical level and considering its interaction with morphological processes. Future research could explore whether this tone neutralization is primarily phonological, driven by prosodic constraints, or whether it carries any morphological or syntactic significance in Chokri grammar.

6.5. Analysis of Tone in Reduplication Paradigm

Reduplication in Chokri serves various morphological functions, specifically distribution and iteration. The tonal and segmental properties of the reduplicated element remain crucial in distinguishing between these two types.

6.5.1. Distributive Reduplication

Distributive reduplication conveys meanings such as ‘one each’ or ‘two each’. This type of reduplication does not involve any tonal change. The base word is reduplicated and the reduplicated form retain their underlying segmental and tonal properties.

Monosyllabic words in distributive reduplication undergo full reduplication, faithfully copying both the segmental structure and tone of the base word (CV́ → CV́-CV́). In contrast, bisyllabic words typically reduplicate only the final syllable while maintaining the original tone (CVCV́ → CVCV́-CV́), ensuring that the morphological meaning is preserved without phonological alternation.

(xxv) [pə̀] (one) → [pə̀pə̀] (one each)

(xxvi) [ɛ̄nā] (two) → [ɛ̄nānā] (two each)

(xxvii) [dā] (four) → [dādā] (four each)

(xxviii) [tʰɛ̄tʃə̀] (nine) → [tʰɛ̄tʃə̀tʃə̀] (nine each)

This indicates that distributive reduplication operates within a strictly segmental framework, reinforcing its role as a morphological rather than a phonological process.

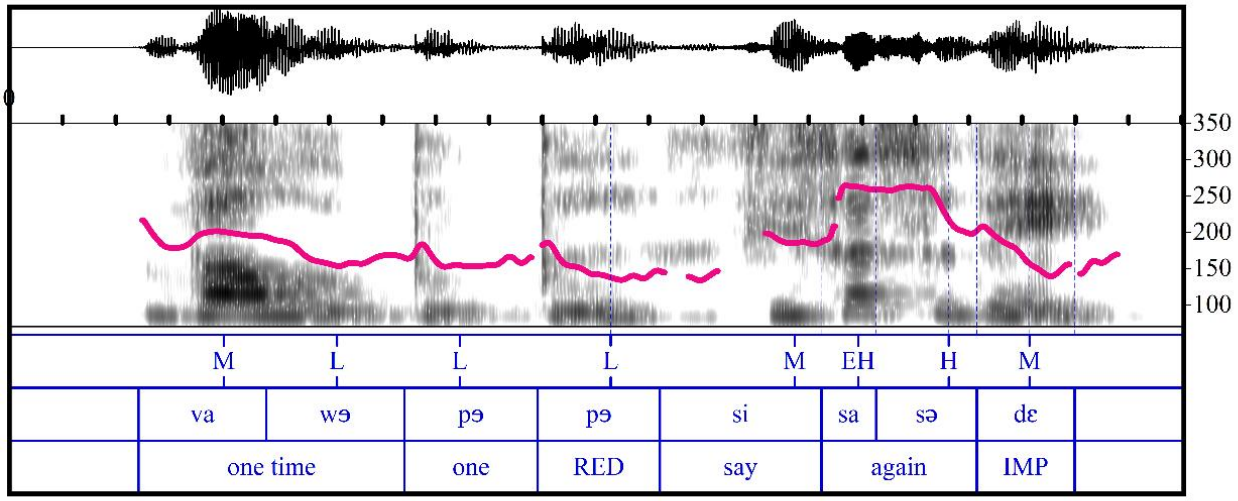

Figure 6.11: Pitch track of distributive reduplication [pə-pə] (one each) with underlying Low tone in fixed sentence frame ‘vapü X si sa sü te’

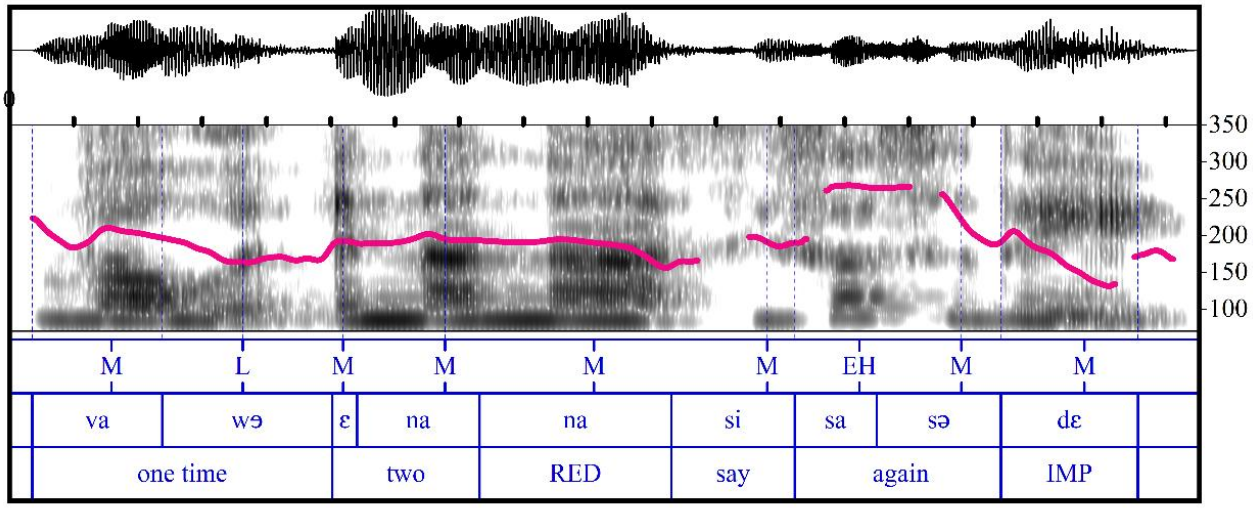

Figure 6.12: Pitch track of distributive reduplication [ɛna-na] (two each) with underlying Mid tone in fixed sentence frame ‘vapü X si sa sü te’

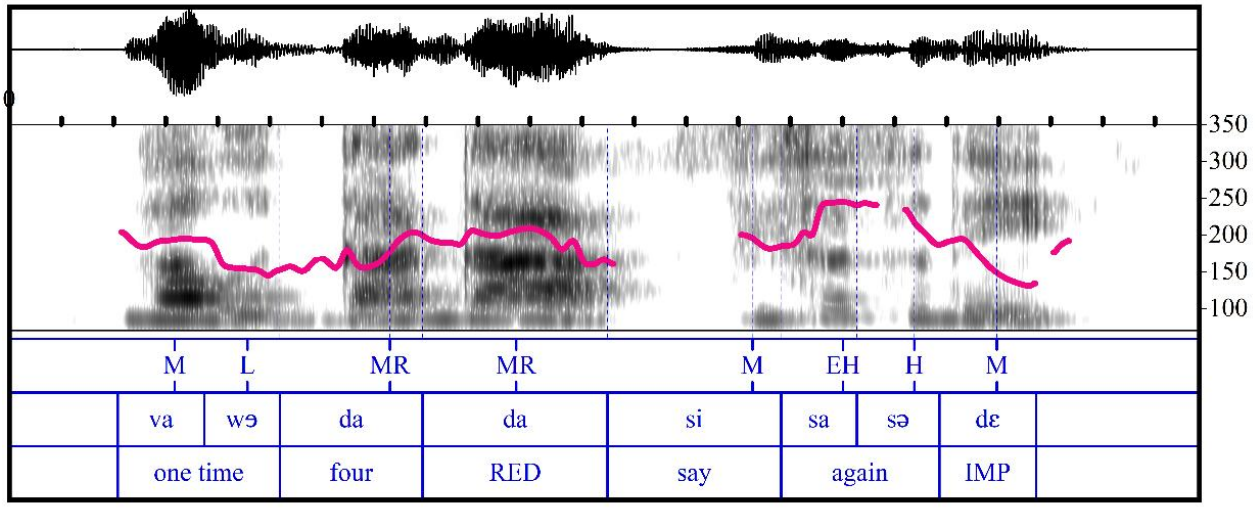

Figure 6.13: Pitch track of distributive reduplication [da-da] (four each) with underlying Mid Rising tone in fixed sentence frame ‘vapü X si sa sü te’

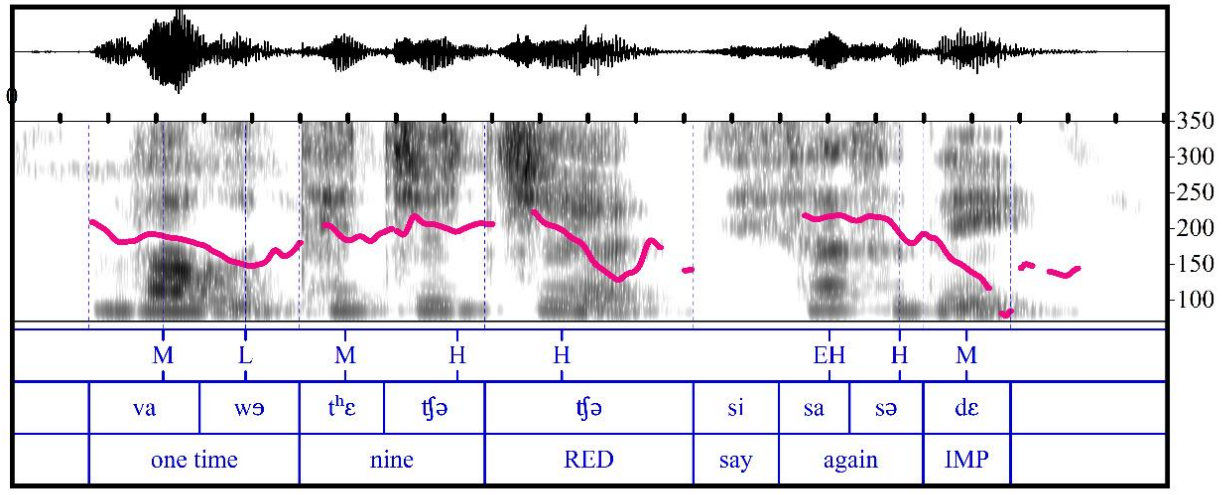

Figure 6.14: Pitch track of distributive reduplication [tʰɛtʃə-tʃə] (nine each) with underlying High tone in fixed sentence frame ‘vapü X si sa sü te’

6.5.2. Iterative Reduplication

Iterative reduplication conveys repetition or intensity of action and exhibits specific tonal and segmental modifications. In iterative reduplication, the base form undergoes systematic phonological changes.

In this type of reduplication, the first base form is lengthened, and its tone is raised to Extra High (EH), while the reduplicated form retains its original tone.

(xxix) [t^hő] (write) → [t^hő:t^hő] (write and write)
(xxx) [p^hú] (search) → [p^hű:p^hú] (search and search)
(xxxi) [p^hɾī] (read) → [p^hɾ́ī:p^hɾī] (write and write)
(xxxii) [tì] (eat) → [tí̋:tì] (eat and eat)
(xxxiii)[mɛ̄tə̋] (suck) → [mɛ̄tə̋:mɛ̄tə̋] (suck and suck)

Unlike the distributive reduplication where the final syllable of the bisyllabic word is reduplicated, in iterative reduplication, both syllables are fully reduplicated rather than just the final one. The lengthening of the base indicates the intensity of the action.

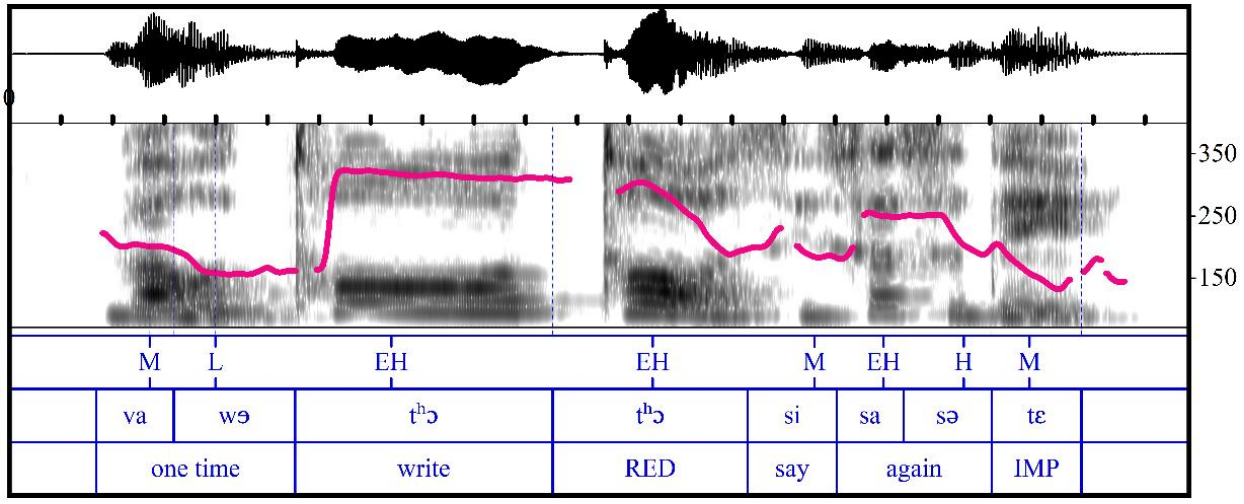

Figure 6.15: Pitch track of iterative reduplication [t^hɔ-t^hɔ] (write and write) with underlying EH tone in fixed sentence frame ‘vapü X si sa sü te’

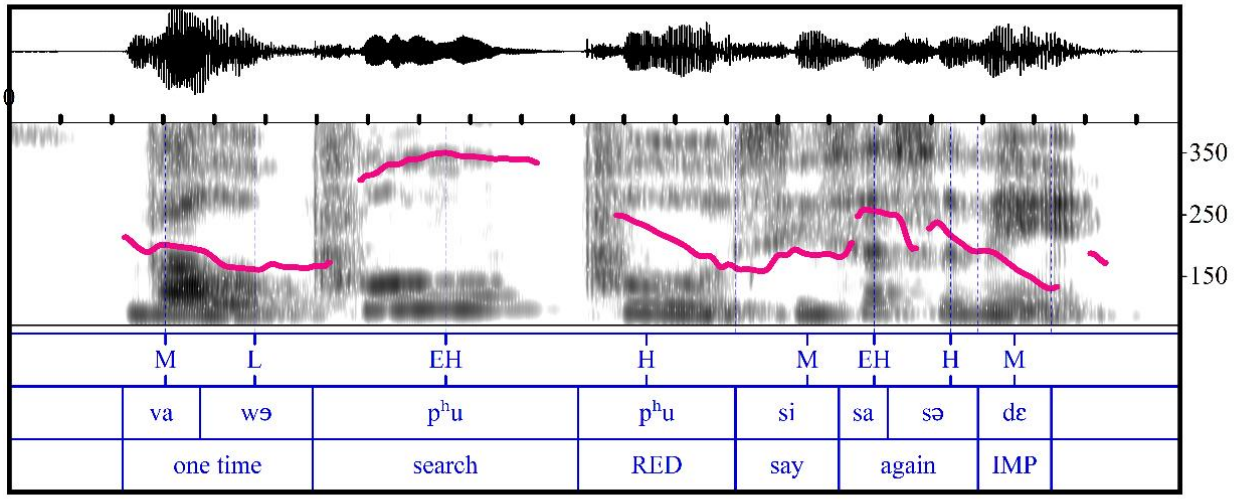

Figure 6.16: Pitch track of iterative reduplication [pʰu-pʰu] (search and search) with underlying H tone in fixed sentence frame 'vapü X si sa sü te'

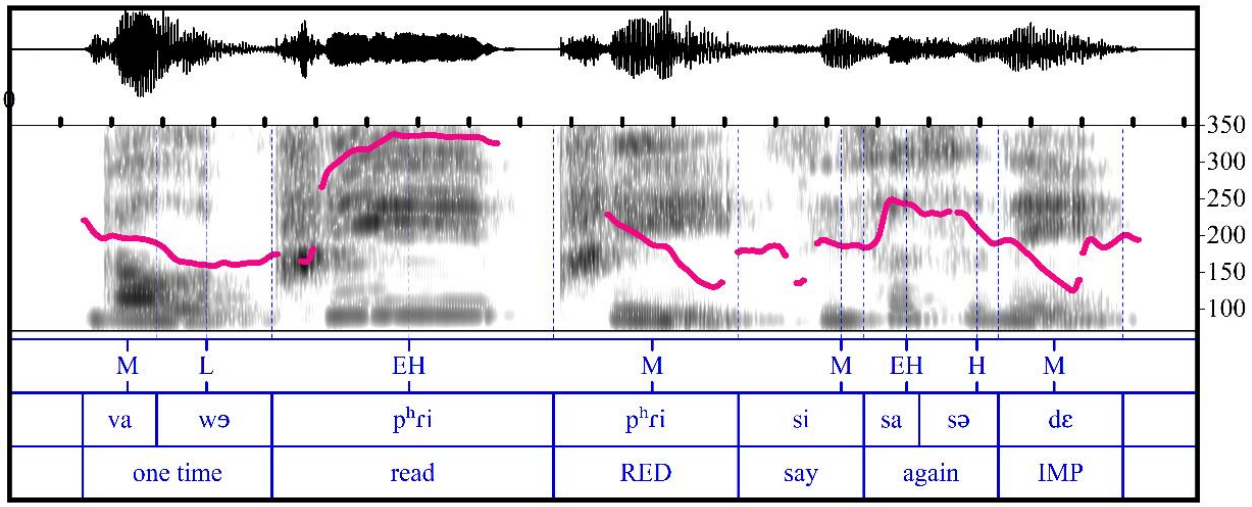

Figure 6.17: Pitch track of iterative reduplication [pʰɾi-pʰɾi] (read and read) with underlying M tone in fixed sentence frame 'vapü X si sa sü te'

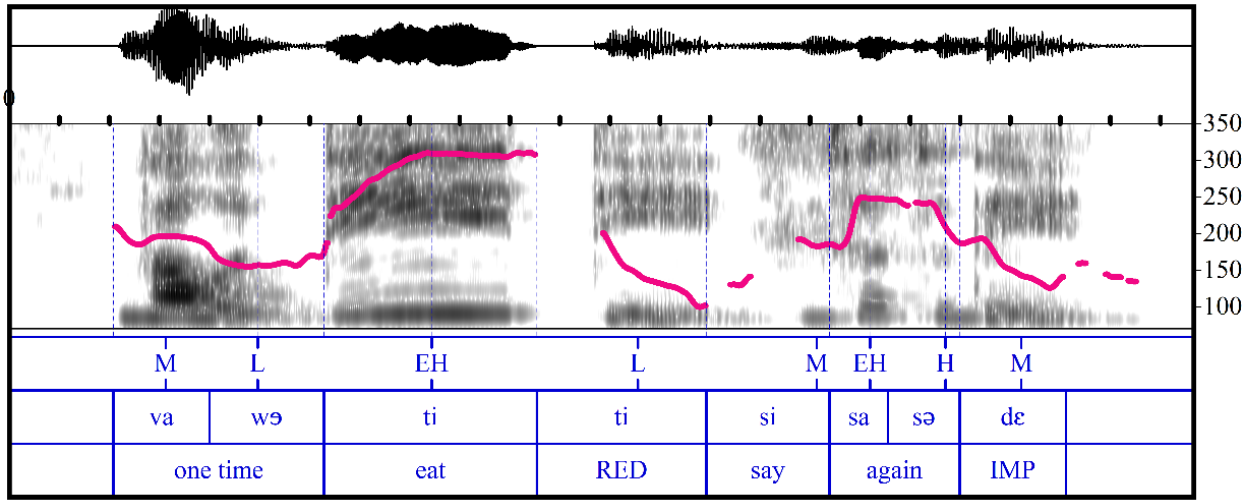

Figure 6.18: Pitch track of iterative reduplication [ti-ti] (eat and eat) with underlying L tone in fixed sentence frame 'vapü X si sa sü te'

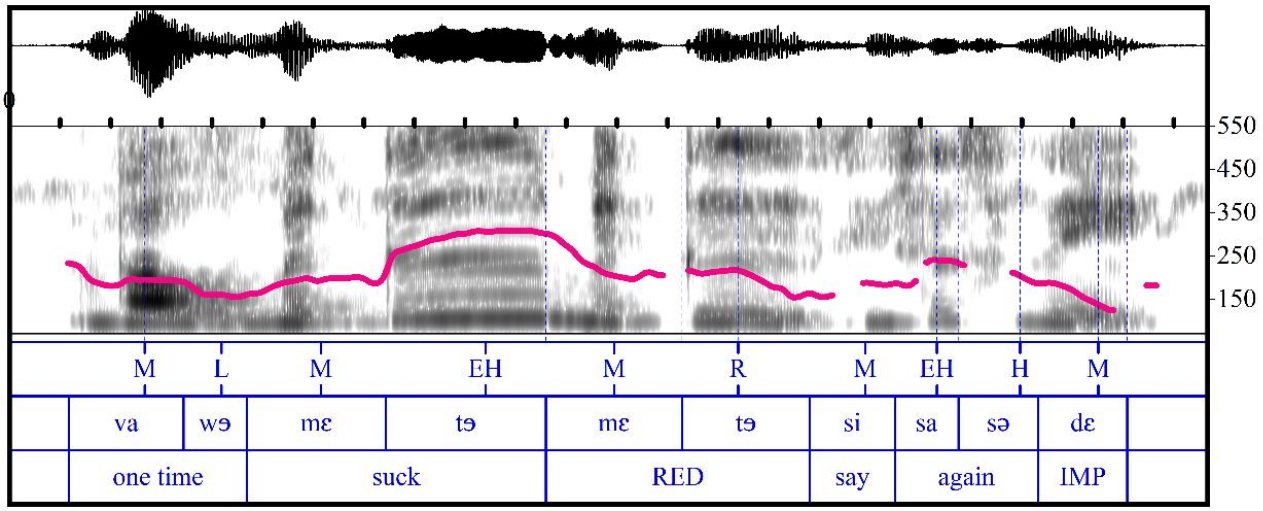

Figure 6.19: Pitch track of iterative reduplication [mɛtɔ-mɛtɔ] (suck and suck) with underlying MR tone in fixed sentence frame 'vapü X si sa sü te'

Feature	Iterative Reduplication	Distributive Reduplication
Function	Repetition, intensity	Distribution ('each')
Lengthening	First syllable is lengthened	No lengthening
Tone Change	Base form tone shifts to EH	No tone change

Monosyllabic Reduplication	Full reduplication	Full reduplication
Bisyllabic Reduplication	Full reduplication	Partial reduplicated

Table 6.5: Reduplication system in Chokri

6.6. Discussion/Conclusion

The results presented above indicate that affixation in Chokri presents a simple tonal morphology. In contrast to many tonal languages where affixes lack inherent tone and adopt the tone of their root word, our study reveals that Chokri affixes possess their own distinct tones, independent of the tones of the root word they attach to.

It has also been observed that when an inflectional suffix is added, the tone remains the same. However, when derivational suffix like the nominalizer prefix is added it changes the tone of the root word under certain condition. i.e., when the root word has underlying mid tone and high tone, the tone is changed.

The findings presented in this study indicate that suffixation in Chokri follows a relatively straightforward tonal morphology. Unlike many other tonal languages, where affixes are toneless and acquire the tone of the root word, Chokri suffixes exhibit their own distinct underlying tones. This suggests that Chokri affixes operate as independent tonal units, maintaining tonal stability regardless of the tonal properties of the root word to which they are attached.

In many tonal languages, affixes tend to be phonologically dependent on the root and often lack inherent tonal specification. In such cases, the affix either adopts the tone of the root word or receives a default tone through phonological processes (Hyman, 2007; Yip, 2002). However, in Chokri, affixes carry their own distinct tonal values, and their addition to a root word does not result in tonal assimilation or neutralization. This characteristic places Chokri among tonal languages where affixes exhibit independent tonal behaviour, a phenomenon observed in languages such as Cantonese (Chen, 2000) and Yoruba (Connell, 2000), where certain morphemes retain distinct tonal specifications rather than conforming to the tone of the base word.

The tonal stability of Chokri suffixes is particularly evident in inflectional morphology. When an inflectional suffix is attached to a verb or noun, the tone of the root word remains unchanged, demonstrating that the affix's tone does not interfere with or modify the existing lexical tone.

This behaviour contrasts with tonal languages where affixation often triggers tonal alternations or tone spreading (Hyman, 2011).

However, an interesting contrast emerges in derivational morphology. When derivational affixes, such as the nominalizer prefix, are attached, tonal modifications occur under specific conditions. Our study shows that when the root word carries an underlying mid or high tone, the addition of the nominalizer results in a tonal shift. For instance, a high-toned root may be raised to an extra-high tone, while a mid-toned root may shift to a mid-rising tone. This suggests that derivational affixation in Chokri interacts with the tonal system in a way that differs from inflectional affixation, pointing to a phonological process that systematically modifies tone in derived forms.

Similar tonal interactions between derivational morphology and root tone have been documented in other languages. For example, in Vietnamese, tonal shifts occur when certain prefixes or suffixes are added to a base word (Michaud, 2004). In African languages such as Shona, derivational affixation may also induce tonal changes in the root word, particularly when forming agentive or causative constructions (Myers, 1998). The phenomenon of affix-induced tonal modification in Chokri suggests that the tonal system operates beyond simple lexical contrast and extends into morphological processes, reinforcing the idea that tone in Chokri serves both lexical and grammatical functions.

Overall, the tonal behaviour of Chokri suffixation highlights the complex interplay between morphology and phonology in the language. While inflectional affixes maintain tonal independence without altering the tone of the root, derivational affixes introduce systematic tonal modifications under certain conditions. This finding contributes to our broader understanding of how tone interacts with morphology in tonal languages and situates Chokri within the typological spectrum of languages where affixation plays an active role in tonal alternation.

Additionally, compounding also affects tonal patterns, particularly in Noun + Verb (N+V) and Noun + Adjective (N+A) compounds, where the second element undergoes tonal modification. However, in Noun + Noun (N+N) compounds, the tone of the second element remains stable, suggesting that nouns are less prone to tonal alternations than verbs and adjectives. Furthermore, in most compounds, the first element's Mid tone is neutralized to a default Mid tone, reinforcing the observation that bisyllabic words in Chokri typically receive a Mid tone on the first syllable unless otherwise constrained.

In summary, the morphophonological analysis of tone in Chokri reveals that tone is not merely a lexical property but an active component of word formation. The inherent tone of affixes plays a crucial role in tonal alternations, particularly in derivational processes, whereas inflectional affixes remain tonally neutral. The systematic nature of these tonal interactions highlights the structured and predictable role of tone within Chokri morphology.

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