The phonology of Iranian-Balochi dialects : description and analysis

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Chapter (2)

Segmental Phonology of Iranian-Balochi Dialects

As it has been discussed in the introduction section, phonology is defined as the study of sound systems, how speech sounds structure and function in languages. Also the phonological study refers to the inventory of segments in a language. In the following chapter, a close look will be taken at the IBDs inventory of segments. Both speech sounds which can be used in IBDs to distinguish words of different meaning (phonemes) and other sounds which cannot (allophones) will be identified. Moreover, since speech sounds are the product of human organs, it is not surprising to find similarities across IBDs speech sounds and other languages. For example, finding the segments (both vowels and consonants) which are claimed as universal sounds, like back low vowel [ɑ] and sounds which are more restricted in their distribution in the world's languages as retroflex consonants [ʈ,ɖ, ɻ]. In addition, it will be shown how the allophonic patterns in IBDs can be stated and predicted in terms of violable constraints.

This chapter is organized as follows. Section 2.1 will introduce the phonological inventories in IBDs, consonants and vowels. Section 2.2 will discuss the analysis of IBDs allophonic variations such as the distribution of aspirated stop and affricates, vowel nasalization, and the distribution of velar nasal based on markedness and faithfulness constraints rankings. Finally, section 2.3 deals with the prediction of IBDs retroflex consonants distribution in the OT framework.

2.1 Phonological inventories in IBDs

The whole set of phones found in the data is represented in the following charts. Amongst these phones, the phonemes will be recognized through the analysis. The analysis will thus show which of these sounds are phonemes (which could be all or only some of them), and which of them are allophones. After establishing the phonemes, they will be represented in the final phoneme charts.The allophones will also be charted.

2.1.1 Consonant inventory

The following chart illustrates all consonants which have been found in IBDs.

	bilabial	Alveodental	alveolar	postalveolar	retroflex	palatal	velar	uvular	glottal
Stops	p b	t d			ʈ ɖ		k g		ʔ
	p^h	t^h			$ʈ^h$		k^h		
Fricatives			s z	ʃ ʒ			ɣ	χ	h
Affricates				tʃ dʒ $tʃ^h$					
Nasals	m		n				ŋ		
Central approximants	w		r		ɻ	j			
Lateral approximants			l						

(1) IBDs consonants (Phonemes and allophones)

Now, for establishing the phoneme inventories of IBDs (both consonants and vowels), the method of minimal pair and near-minimal pair are used to recognize separate phonemes of IBDs, indeed a minimal pair is the most effective way to illustrate that two sounds are distinct phonemes (Hayes, 2009: 20). So when two sounds are separate phonemes, they are in contrast. There are also pairs of sounds in IBDs that do not contrast, so they are not separate phonemes, the reason is that their distribution is predictable, in fact they are in complementary distribution and there is an allophonic relation between them.

Furthermore, each segment will be represented by set of features which is known as feature matrix, and also the articulatory realization of each phoneme will be given as well. Besides, for each phoneme I try to give examples of all three dialects, i.e. Sarawani, Lashari and Sarhaddi Balochi.

2.1.1.1 Stops

In IBDs, as in many other languages, the stops are [+obstruent] ([-sonorant]), [-continuant], [+consonantal] and [-syllabic].

Stop consonants in IBDs are as follows:

a. The phoneme /p/ is a voiceless bilabial stop.
[+obstruent, - continuant, -voiced, +labial]

Data (2) illustrate that in specific contexts phoneme /p/ becomes aspirated. Indeed, [p^h] occurs in onset position like in (a.i- a.iii), but neither in word-final position nor when it precedes voiceless consonant as in (b.i- b.iii), but [p] is an elsewhere allophone, it occurs not just before voiceless consonants, but at the end of the word. So, they are in complementary distribution. The concrete sounds [p] and [p^h] are allophones of /p/.

(2)	Words with [p^h]			Words with [p]		
	a.i.	[p^hes]	‘father’	b.i	[dʒopt]	‘pair’
	a.ii	[p^hrotʃ]	‘broke’	b.ii	[lɑ:p]	‘stomach’
	a.iii	[næp^hæs]	‘breath’	b.iii	[hæptægɑ:n]	‘ceremony’

Data (3) includes examples forming a minimal pair for consonant /p/ and other phonemes in IBDs.

(3)	Words with /p/			Words with other phonemes		
	a.i.	p/- /b/	[p^hæd]	‘foot print’	[bæd]	‘bad’
	a.ii	/p/- /d/	[p^hær]	‘feather’	[dær]	‘door’
	a.iii	/p/- /t/	[p^hær]	‘feather’	[tær]	‘it’
	a.iv	/p/- /ɖ/	[p^hæl]	‘field’	[ɖæll]	‘weald’
	a.v	/p/- /k/	[p^hætʃ]	‘cooking’	[k^hætʃ]	‘saddlebag’
	a.vi	/p/- /g/	[p^hæʈ]	‘iald’	[gæʈʈ]	‘bite’
	a.vii	/p/- /tʃ/	[p^hæl]	‘field’	[tʃ^{h}æll]	‘wrinkle’
	a.vii	/p/- /dʒ/	[p^hæd]	‘foot print’	[dʒæd]	‘ancient’
	a.ix	/p/- /l/	[p^hær]	‘feather’	[lærr]	‘ data’
	a.x	/p/- /m /	[p^hætʃ]	‘cooking’	[mætʃtʃ]	‘palm tree’
	a.xii	/p/- /n/	[p^hæl]	‘field’	[næl]	‘bamboo’

b. The phoneme /b/ is a voiced bilabial stop.
[+obstruent, -continuant, +voiced, +labial]

Following data show the comparison of /b/ and other phonemes. It proves that /b/ is a distinctive phoneme in IBDs.

(4)	Words with /b/			Words with other phonemes		
	a.i	/b/-/d/	[bɑ:g]	‘garden’	[dɑ:g]	‘hot’
	a.ii	/b/-/t/	[bɑ:l]	‘Wind’	[thɑ:l]’	‘ tub’
	a.iii	/b/-/k/	[berr]	‘gazing’	[khell]	‘hole’
	a.iv	/b/-/g/	[bɑ:m]	‘a kind of herbal’	[gɑ:m]	‘step’
	a.v	b/-/m/	[bɑ:k]	‘petrol tank’	[mɑ:k]	‘bean’

a.vi	/b/-/dʒ/	[bæʈʈ]	‘duck’	[dʒæʈʈ]	‘foolish’
a.vii	/b/-/tʃ/	[bell]	‘hire’	[tʃhell]	‘dirt’
a.viii	/b/-/n/	[bɑ:n]	’roof’	[nɑ:n]	‘bread, food’
a.ix	/b/-/z/	[bi:t]	‘probably’	[zi:t]	‘get’

c. The Phoneme /t/ is a voiceless alveolar stop.
[+obstruent, -continuant, -voiced, +coronal, +anterior]

The data in (5) show that phoneme /t/ like /p/ is realized as an aspirated consonant in the onset position, but not in word-final position. But, [t] occurs elsewhere.

So, by looking at following data one can determine that [t] and [t^h] are allophonic variant:

(5)	Words with	[t^h]		Words with	[t]	
	a.i	[dænt^{h}ɑ:n]	‘teeth	b.i	[hæpt]	‘seven’
	a.ii	[t^huel]	‘weigh’	b.ii	[p^huest]	‘skin’
	a.iii	[t^hru:]	‘aunt’	b.iii	[p^het]	‘father’

Following minimal pairs demonstrate that the /t/ is a separate phoneme.

(6)	Words with /t/			Words with other phonemes		
	a.i	/t/- /d/	[t^hɑ:r]	‘opaque’	[dɑ:ɹr]	‘wood’
	a.ii	/t/- /k/	[t^hɑ:l]	‘a flat round tub’	[k^hɑ:l]	‘unripe’
	a.iii	/t/- /g/	[t^hɑ:s]	‘bowl	[gɑ:z]	‘gas’
	a.iv	/t/- /ɖ/	[t^hɑ:l]	‘a flat round tub’	[ɖɑ:ll]	‘lentil’
	a.v	/t/- /s/	[t^hɑ:k]	‘vine’	[sɑ:k]	‘bag’
	a.vi	/t/- /z/	[t^hɑ:r]	‘opaque’	[zɑ:r]	‘plaint’
	a.vii	/t/- /ʃ/	[t^hɑ:l]	‘a flat round tub’	[ʃɑ:l]	‘scarf’
	a.viii	/t/- /h/	[t^hæɹ]	‘it’	[hær]	‘donkey’
	a.ix	/t/- /dʒ	/ [t^huel]	‘iigh’	[dʒuel]	‘backhander’
	a.x	/t/- /tʃ/	[t^hæp]	‘fever’	[tʃ^{h}æp]	‘left’
	a.xi	/t/- /n/	[t^hu:ɹ]	‘net’	[nu:r]	‘light’
	a.xii	/t/-/w/	[t^hɑ:r]	‘rope’	[wɑ:r]	‘easy breath’

(d) The phoneme /d/ is a voiced alveolar stop.
[+obstruent, -continuant, +voiced, + coronal, +anterior]

Each row in (7) has words which are identical except for their initial sounds. Since, they are different words, it follows that /d/ is a distinctive sound.

(7) Words with /d/ Words with other phonemes

a.i	/d/-/ʈ/	[diem]	‘face’	[ʈiem]	’time’
a.ii	/d/- /ɖ/	[dæm]	‘stew’	[ɖæm]	‘swallow’
a.iii	/d/- /k/	[dæɹ]	‘door’	[k^{h}æɹ]	‘deaf’
a.iv	/d/- /g/	[del]	‘heart’	[gel]	‘mud’
a.v	/d/- /s/	[duːr]	‘far’	[suːr]	‘circumcision
a.vi	/d/- /z/	[dær]	‘door’	[zær]	‘money’
a.vii	/d/- /ʃ/	[dæp]	‘mouth’	[ʃæp]	‘night’
a.viii	/d/-/ʒ/	[del]	‘heart’	[ʒel]	‘gel’
a.ix	/d/- /h/	[dæ]	‘door’	[hæɹ]	‘donkey’
a.x	/d/- /r/	[duːʃ]	‘shoir bath’	[ruːʃ]	‘glandule’
a.xi	/d/- /l/	[dɑːr]	‘wood’	[lɑːl]	‘deaf’
a.xii	/d/-/j/	[dɑːr]	‘wood’	[jɑːr]	‘friend’

e. The phoneme /ʈ/ is a voiceless retroflex stop.
[+obstruent, -continuant, - voiced, +coronal, -anterior, -distribute]

In the consonant inventory of IBDs, retroflex consonants are also observed. The /ʈ/ becomes aspirated in the word-initial position and not in word-final position as in (8), while unaspirated [ʈ] is an elsewhere allophone.

(8) Words with [$ʈ^{h}$] Words with [ʈ]

a.i	[ʈhɑːb]	‘wave’	b.i	[mueʈ]	‘unfortunate’
a.ii	[ˈʈhiel]	‘hair oil’	b.ii	[kɑːʈ]	‘nipper’

The data in (8) show that /$ʈ^{h}$/ is an allophone of phoneme /ʈ/, while data (9) illustrates that /ʈ/ is distinctive and hence a phoneme.

(9) Words with /ʈ/ Words with other phonemes

a.i	/ʈ/-/s/	[ʈhɑːb]	‘wavy hair’	[sɑːb]	’ mathematic’
a.ii	/ʈ/-/n/	[ʈhærr]	‘big’,	[nær]	’male’
a.iii	/ʈ/-/w/	[ʈhɑːb]	‘wave’,	[wɑːb]	‘sleep’
a.iv	/ʈ/-/h/	[ʈheir]	‘tire’	[heir]	‘goodness’
a.v	/ʈ/- /l/	[ʈhuep]	‘ball’	[luep]	‘loose trousers’
a.vi	/ʈ/- /r/	[ʈhuep]	‘ball’	[reup]	‘broom!’

(e) The phoneme /ɖ/ is a voiced retroflex stop.
[+obstruent, -continuant, +voiced, +coronal, -anterior, -distributed]

The comparison of /ɖ/ and other phonemes in IBDs is given in (10).

(10)

	Words with /ɖ/		Words with other phonemes		
a.i	/ɖ/-/k/	[ɖæll]	‘plateau’	[khæl]	‘ditch’
a.ii	/ɖ/- /tʃ/	[ɖæm]	‘swallow’	[tʃæmm]	‘eye’
a.iii	/ɖ/- /dʒ/	[ɖæn]	‘out’	[dʒæn]	‘woman’
a.iv	/ɖ/- /h/	[ɖiel]	‘rolling’	[hiel]	‘habit’
a.v	/ɖ/- /s/	[ɖekk]	‘hill’	[sek]	‘Indian’
a.vi	/ɖ/- /n/	[ɖæm]	‘swallow’	[næm]	‘it’
a.vii	/ɖ/- /m/	[ɖæn]	‘out’	[mæn]	‘I’

(f) The phoneme /k/ is a voiceless velar stop.
[+obstruent, -continuant, -voiced, +dorsal +high]

Data (11) illustrate that /k/ realized as aspirated consonant exactly like / p/, /t /, and/ ʈ/ in an onset position or when it is folloid by a voiced segment, but not when it is followed by voiceless segment or in the word-final position. So, [k] and [k^h] are allophonic variants.

(11)

	Words with [k^h]			Words with [k]	
a.i	[(ʔ)æk^hl]	‘wisdom’	b.i	[sækp]	‘roof’
a.ii	[k^hɑ:h]	‘straw’	b.ii	[moʃk]	‘mouse’
a.iii	[k^hɨp]	‘bag’	b.iii	[gwæk]	‘frog’

Data (12) show that /k/ is a separate phoneme.

(12)

	Words with /k/		Words with other phonemes		
a.i	/k/-/g/	[khæm]	‘little’,	[gæm]	‘grief’
a.ii	/k/-/ʃ/	[khæ]	‘somebody’	[ʃæs]	‘sixty’
a.iii	/ k/-/s/	[khæd]	‘who’,	[sæd	‘hundred’
a.iv	/k/-/h/	[kherr]	‘corner’	[heɹ]	‘foal’
a.v	/k/-/r/	[khɑ:h]	‘straw’	[rɑ:h]	‘way’
a.vi	/k/-/z/	[khipp]	‘tight’,	[zi:p]	‘zipper’
a.vii	/k/-/w/	[khɑ:b]	‘frame’	[wɑ:p	‘sleeping’
a.viii	/k/-/n/	[khæll]	’hole’	[næl]	‘reed’
a.ix	k/-/m/	[khɑ:h]	‘straw’	[mɑ:h]	‘moon’

(g) The phoneme /g/ is a voiced velar stop.
[+obstruent, -continuant, +voiced, +dorsal, +high]

(13) lists the comparison between phoneme /ɡ/ and other phonemes in IBDs.

(13)

	Words with /ɡ/		Words with other phonemes		
a.i	/ɡ/-/ʃ/	[ɡɑ:m]	‘step’	[ʃɑ:m]	’dinner’
a.ii	/ɡ/-/s/	[ɡɑ:r]	‘lost’	[sɑ:r]	‘wise’
a.iii	/ɡ/-/h/	[ɡɨʃ]	‘time’	[hɨs]	‘be quite’
a.iv	/ɡ/-/l/	[goɖɖ]	‘next’	[loɖɖ]	‘nap’
a.v	/ɡ/-/r/	[ɡɑ:z]	‘gas’	[rɑ:z]	‘secret’
a.vi	/ɡ/-/w/	[ɡɑ:m]	‘step’	[wɑ:m]	‘loan’
a.vii	/ɡ/-/dʒ/	[ɡæm]	‘grief’	[dʒæm]	‘addition’
a.viii	/ɡ/-/tʃ/	[ɡo:n]	‘with’	[tʃo:n]	‘how’

(h) The phoneme /ʔ/ is a voiceless glottal stop.
[+obstruent, -continuant, -voiced, + constricted glottis]

Data (14) show that the /ʔ/ is considered as a phoneme in IBDs. It has restricted distribution and only occurs before vowel in an onset position.

(14)

	Words with /ʔ/		Words with other phonemes		
a.i	/ʔ/- /h/	[ʔængir]	‘grape’	[hendʒi:r]	‘fig’
a.ii	/ʔ/-/d/	[ʔæwæl]	‘first’	[dowom]	‘second’
a.iii	/ʔ/-/m/	[ʔeʃk]	‘love’	[moʃk]	‘mouse’
a.iv	/ʔ/- /s/	[ʔɑ:p]	‘water’	[sɑ:p]	‘soft’

In sum, based on the examples in 1- 14, stops in IBDs include /p, b, t, d,ʈ, ɖ, k, ɡ, ʔ/. Additionally, all voiceless stop consonants in IBD have aspirated allophones. Indeed, in the case of allophony, phonetic contrast exists without phonemic contrast, in which a single underlying segment has phonetically distinct surface realizations (Currie Hall, 2011).

2.1.1.2 Fricatives

In IBDs, the fricatives are [+obstruent], [+continuant], [+consonantal] and [-syllabic]. Fricative consonants in IBDs are as follows:

a. The phoneme /s/ is a voiceless alveolar fricative.
[+obstruent, +continuant, -voiced, +anterior, +coronal, +strident]

Following data illustrate the comparison of phoneme /s/ and other phonemes.

(15)

	Words with /s/			Words with other phonemes	
a.i	/s/- /z/	[sɑːl]	‘year’	[zɑːl]	‘old’
a.ii	/s/- /ʃ/	[sɑːp]	‘soft’	[ʃɑːp]	‘hit’
a.iii	/s/- /h/:	[sɑːk]	‘bag’	[hɑːk]	‘land, dust’
a.iv	/s/- /m/	[soːr]	‘hen leg’	[moːr]	‘herb’
a.v	/s/- /l/	[suːt]	‘whistle’	[luːt]	‘desert’
a.vi	/s/- /r/	[suetʃ]	‘burn!’	[ruetʃ]	‘day’
a.vii	/s/- /ɽ/	[lies]	‘lick’	[lieɽ]	‘unfortunate’

b. The phoneme /z/ is a voiced alveolar fricative.
[-sonorant, +continuant, +voiced, +anterior, +coronal, +strident]

Data (16) indicates that the /z/ is a separate phoneme in IBDs.

(16)

	Words with /z/			Words with other phonemes	
a.i	/z/-/h/	[zɑːn]	‘knee’	[hɑ;n]	‘sir’
a.ii	/z/-/l/	[zekk]	‘a leather bottle’	[lek]	‘long’
a.iii	/z/-/m/	[ziːn]	‘saddle’	[miːn]	‘mine’
a.iv	/z/-/n/	[zɑːt]	‘origine’	[nɑːt]	‘put’
a.v	/z/-/tʃ/	[zɑːl]	‘old’	[tʃɑːl]	‘hole’
a.vi	/z/-dʒ/	[zærr]	‘money’	[dʒærr]	‘desert bush’
a.vii	/z/-/w/	[zɑːn]	‘knee’	[wɑːn]	‘reading’

c. The phoneme /ʃ/ is a voiceless post-alveolar fricative.
[+obstruent, +continuant, -voiced, -anterior, +coronal, distributed, +strident]

The following data displays that the /ʃ/ is a distinctive phoneme in IBDs.

(17)

	Words with /ʃ/			Words with other phonemes	
a.i	/ʃ/- /h/	[ʃɑːn]	‘pride’	[hɑːn]	‘yes’
a.ii	/ʃ/- /ʒ/	[ʃen]	‘sand’	[ʒen]	‘gene’
a.v	/ʃ/- /m/	[ʃɑːn]	‘pride’	[mɑːn]	‘enter’
a.vii	/ʃ/- /r/	[ʃued]	‘wash’	[rued]	‘stream’
a.viii	/ʃ/- /l/	[ʃuːl]	‘zigzag’	[luːl]	zonked’

d. The phoneme /ʒ/ is a voiced postalveolar fricative.
[+obstruent, +continuant, +voiced, -anterior, +coronal, +distributed +strident]

The present data show that /ʒ/ mostly occurs in loanwords and its distribution is limited to the onset position, but as there are minimal pairs, it constitutes a phoneme of its own:

(18) Words with /ʃ/Words with other phonemes

a.i	/ʒ/- /s/	[ʒel]	'gel'	[sel]	'tuberculosis'
a.ii	/ʒ/- /p/	[ʒænd]	'tired'	[pænd]	'advice'
a.iii	/ʒ/- /tʃ/	[phæʒm]	'wool'	[tʃæmm]	'eye'

e. The phoneme /h/ is a voiceless glottal fricative.
[+obstruent, +continuant, –voiced, +spread glottal]

The comparison of / h/ and other phonemes is demonstrated in (19).

(19) Words with /h/ Words with other phonemes

a.i	/h/-/m/	[hɑ:k]	'soil'	[mɑ:k]	'bean'
a.ii	/h/-/j/	[hɑ:r]	'necklace'	[jɑ:r]	'friend'
a.iii	/h/-/r/	[hɑ::s]	'special'	[rɑ:s]	'right'
a.iv	/h/-/dʒ/	[hɑ:n]	'sir'	[dʒɑ:n]	'body'
a.v	/h/-/w/	[hæʃʃ]	'mill'	[wæʃʃ]	'beautiful'
a.vi	/h/- /ʔ/	[hers]	'bear'	[ʔærs]	'tear'
a.vii	/h/- /z/	[rɑ:h]	'road, way'	[rɑ:z]	'secret'
a.viii	/h/- /d/	[srɑ:h]	'house'	[srʊd]	'anthem'

(f) The phonemes /ɣ/ and /χ/

The two fricative consonants /χ/ and /ɣ/ are observed only in the pronunciation of loan words by educated IBDs speakers, I will return to loanword phonology in the next chapter.

The phoneme /χ/ is a voiced uvular fricative.
[+obstruent, +continuant, +dorsal, + high, + voiced]

(20) Words with /χ/

a.i	[wæχt]	'time'
a.ii	[sæχm]	'roof'
a.iii	[ræχs]	'dance'

The phoneme /ɣ/ is a voiceless velar fricative.
[+obstruent, +continuant, +dorsal, + high, - voiced]

(21) Words with /ɣ/

a.i	[ʃoloɣ]	'busy'
a.ii	[ɣɑːʃok]	'spoon'

Thus, based on data in 15-21, fricatives in IBDs are /s, z, ʃ, ʒ, ɣ, χ, h]

2.1.1.3 Affricates

In IBDs, the affricates are [+obstruent], [-continuant], [+coronal], [+consonantal] and [-syllabic]. IBDs affricates are as follows:

(a) The phoneme /tʃ/ is a voiceless postalveolar affricate.
[+obstruent, - continuant, -voiced, +coronal, -anterior, +distributed, +strident]

/tʃ/ realized as an aspirated from when it occurs in the prevocalic and postvocalic position, but not in word-final position nor when it precedes voiceless consonant, so there is an allophonic relation between /tʃ/ and /tʃ^{h}/as data in (22).

(22)

Words with [tʃ^{h}]		Words with [tʃ]	
a.i	[tʃhærk] 'wheel'	b.i	[giːtʃ] 'confused'
aii	[tʃhætʃ] 'stuttering'	b.ii	[dræhtʃ] 'tree'

The following data shows that the /tʃ/ is a separate phoneme.

(23)

Words with /tʃ/			Words with other phonemes		
a.i.	/tʃ/ -/dʒ/	[tʃhɑːh]	'ill',	[dʒɑːh]	'place'
a.ii	/tʃ/- /m/	[tʃhɑːkk]	'crack'	[mɑːk]	'grass pea'
a.iii	/tʃ/- /n/	[tʃhɑːr]	'four'	[nɑːr]	'hell'
a.iv	/tʃ/- /r/	[tʃhuːʃ]	'suck'	[ruːʃ]	'glandule'
a.v/	tʃ/- /l/	[tʃuːtʃ]	'tiny'	[luːtʃ]	'naked'

(b) The phoneme /dʒ/ is a voiced postalveolar affricate.
[+obstruent, - continuant, +voice, +coronal, -anterior, +distribute +strident]

Data (24) illustrates that /dʒ/ is a separate phoneme.

(24)

	Words with /dʒ/			Words with other phonemes	
a.i	/dʒ/-/l/	[dʒærr]	‘dessert bush’	[lærr]	‘part of date’
a.ii	/dʒ/-/r/:	[dʒɑ:n]	‘body’	[rɑ;n]	‘the thigh’
a.iii	/dʒ/-/m/	[dʒoz]	‘part’	[moz]	‘salary’
a.iv	/dʒ/-/w/	[dʒɑ:r]	‘brawl’	[wɑ:r]	‘patient’

2.1.1.4 Nasals

In feature theory, nasals can defined as [+ sonorant, - approximant]. The list of nasals consonants in IBDs is as follows:

(a) The phoneme /m/ is a voiced bilabial nasal.
[+sonorant, -approximant, +nasal, + labial]

The comparison of /m/ and other phonemes in IBDs is shown in (25).

(25)

	Words with /n/			words with other phonemes	
a.i	/m/-/n/	[motʃtʃ]	‘group, band’,	[notʃ]	‘no’
a.ii	/m/-/l/	[mɑ:ʃ]	‘a kind of bean’	[lɑ:ʃ]	‘corpse’
a.iii	/m/-/r/	[mɑ:h]	‘moon’,	[rɑ:h]	‘way’
a.iv	/m/-/w/	[mæs]	‘drunk’,	[wæs]	‘desire’

(b) The phoneme /n/ is a voiced alveolar nasal.
[+sonorant, -approximate, +nasal, +coronal, +anterior]

Data (26) shows that there is a phonetic contrast between [n] and [ŋ]. The velar nasal [ŋ] only occurs when it is followed by [g] or [k], but [n] occurs elsewhere. So they are in complementary distribution. [n] and [ŋ] are allophonic variants.

(26)

	Words with [ŋ]		Words with [n]		
a.i	[loŋg]	‘loin-cloth’	b.i	[bænd]	‘rope’
a.ii	[seŋg]	‘stone’	b.ii	[ʃunz]	‘green’
a.iii	[heŋg]	‘stupid’			
a.iv	[tænk]	‘tight’			
a.v	[rink]	‘sand’			

The phonemic contrast among /n/ and other phonemes can be illustrated by data (267).

(27)	Words with /n/			Words with other phonemes	
a.i	/n/- /r/:	[niem]	‘half’	[riem]	‘dirt’
a.ii	/n/- /l/:	[nær]	‘male’	[lærr]	‘dry date’
a.iii	/n/- /w/	[nɑːm]	‘name’	[wɑːm]	‘loan’
a.iv	/n/- /j/	[nɑːr]	‘hell’	[jɑːr]	‘friend’

2.1.1.5 Approximants

Approximants divide into two groups: (1) central approximants as phoneme /r/ and (2) lateral approximants like phoneme /l/. Both central and lateral approximant found in the consonant inventory of IBDs as shown below.

(a) Lateral approximant: Phoneme /l/ is a voiced alveolar approximant.
[+consonantal, +approximant, +coronal, +anterior, +lateral]

The phonemic status of /l/ is illustrated in examples (28). Phoneme /l/ has been already compared in stops, fricatives, affricates and nasals.

(28)	Word with /l/			Word with other phoneme	
	/l/-/w/	[lɑːʃ]	‘corpse’	[wɑːʃ]	‘Khash’

(b) Central approximants

(I) Phoneme /ɻ/ is a voiced retroflex approximant.
[+ consonantal, + approximant, + tap, + coronal, - anterior]

Axenov (2006: 44) mentions that /ɻ/ is often treated as the allophone of voiced retroflex stop /ɖ/ in Balochi of Turkmenistan (BT), but in IBDs there is no evidence to support his idea. Moreover, i cannot consider /ɻ/ to be incompelmentry distribution with /r/, since phoneme /r/ can be found in all positions as it is shown in (28). In IBDs as in BT, the distribution of /ɻ/ is restricted to the word-final position. It seems /ɻ/ can never occur in word-initial position nor form any clusters.

2.2.5 The approximants in (29) shows that /ɻ/ is a separate phoneme in IBDs.

(29)	Words with /ɻ/			Words with other phonemes	
a.i	/ɻ/- /ʒ/	[buːɻ]	‘louse’,	[buːʒ]	‘stiff hair’
a.ii	/ɻ/- /ʃ/	[dʒueɽɻ]	‘health’	[dʒueʃ]	‘boil’
a.iii	/ɻ/- /l/	[wɑːɻ]	‘stable’,	[wɑːl]	‘cotton’

a.iv	/ɻ/- /m/	[buːɻ]	‘louse’,	[buːm]		‘owl’
a.v	/ɻ/- /n/	[dʒɑːɻ]	‘twin’	[dʒɑːn]		‘body’
a,vi	/ɻ/- /r/	[buːɻ]	‘louse’	[muːr]		‘aunt’

(II) Phoneme /r/ is a voiced alveolar approximant.
[+consonantal, +approximant, trill, +coronal, +anterior]

Phoneme /r/ has been already compared to other phonemes in stops, fricatives and affricates and nasals.

(30)

Words with /r/				Words with other phonemes	
a.i	/r/-/l/:	[ros]	‘cooked food’	[loːz]’	‘spit’
a.ii	/r/-/w/:	[ræs]	‘ripe’	[wæs]	‘desire’
a.iii	/r/-/ l/	[tʊr]	‘net’	[tuːl]	‘length’
a.iv	/r/- /g/	[piːr]	‘old’	[piːg]	‘fat’

(III) Phoneme /w/ is a voiced bilabial approximant.
[- consonantal, +approximant, +labial]

Phoneme /w/ has been already shown in from of minimal pair in stops, fricatives, affricates and nasals. The data in (31) illustrate the comparison between /w/ and /j/.

(31)

Word with /w/			Word with /j/		
a.i	/w/-/j/	[wɑː r]	‘patient’	[jɑː r]	‘friend’

(IV) Phoneme /j/ is a voiced velar approximant.
[- consonantal, +approximant, +dorsal, +high]

Phoneme /j/has been already compared in plosive, fricative, affricate and approximant.

Thus, based on all above minimal pairs, the consonant system of IBDs consists of 6 allophones and 25 phonemes which are shown in table (32) and (33) respectively.

(32) IBDs allophones: consonants

	labial	alveodental	Alveolar	postalveolar	retroflex	velar
plosive	P^h	t^h			$ʈ^h$	k^h
affricate			$ʧ^h$			
nasal						ŋ

(33) IBDs phonemes: consonants

	labial	alveodental	alveolar	postalveolar	retroflex	velar	uvular	glottal
plosive	p b	t d			ʈ ɖ	k g		ʔ
fricative			s z	ʃ ʒ		ɣ	χ	h
affricate				ʧ ʤ				
nasal	m		n					
Central approximant	w		r		ɻ	j		
Lateral approximant			l					

2.1.2 Vowel inventory

The following chart represents the complete set of vowels which are common in three Balochi dialects data. However, vowel variations are observed among three dialects, in Sarawani Balochi there are two more back vowels [ɪ] and [ʊ] which are not found in two other dialects. Moreover, each dialect has its own diphthongs: Sarhaddi Balochi: [ie], [ue], Sarawani Balochi: [ou], [ei] and Lashari Balochi: [uə], [iə].

(34) IBDs vowels: (phonemes and allophones)

[+front, -back]	[-front, + back]
i, ĩ ,iː, ĩː	u, ũ, uː, ũː
ɪ, ɪ̃	ʊ, ʊ̃
e, ẽ	o, õ
æ, æ̃	ɑ, ɑ̃, ɑː, ɑ̃ː

Examples 35-42 form a minimal pair for vowels, such set of examples are used to demonstrate the phonemic system (vowels) and allophones of IBDs.

2.1.2.1 Front vowels

Front vowels in IBDs are as follows:

(a) Phoneme /i/ is a high front vowel.
[+high, -low, +tense, +front, -back, -round]

The following examples show that /i/ is a separate phoneme in IBDs.

(35)

	Words with /i/			Words with other phonemes	
a.i	/i/-/e/	[giːr]	‘tar’	[ger]	‘crying a lot’
a.ii	/i/-/æ/	[siːm]	‘wire’	[sæm]	‘poison’
a.iii	/i/-/o/	[riːʃ]	‘beard’	[ros]	‘cooked’
a.iv	/i/-/ɑː/	[phiːg]	‘fat’	[phɑːg]	‘religious cloths’

(b) Phoneme /ɪ/ is a mid-high front vowel.
[+high, -low, -tense, +front, -back, -round]

The data in (36) show that /ɪ/ is a distinctive phoneme in Sarawani Balochi.

(36)	Words with phoneme /ɪ/			Words with other phonemes	
	/ɪ/-/ɑ/	[nɪ̃m]	‘name’	[nɑ̃ːm]	‘half’
	/ɪ-/u/	[khɪp]	‘bag’	[khuːd]	‘fertilizer’
	/ɪ/-/æ/	[ʃɪp]	‘city near Sarawan’	[ʃæp]	‘night’
	/ɪ/-/e/	[bɪl]	‘shovel’	[del]	‘heart’
	/ɪ/-/i/	[ʃɪr]	‘milk’	[ʃiːr]	‘lion’

(c) Phoneme /e/ is a mid-front vowel.
[- high, - low, + tense, +front, -back, -round]

As illustrated in (37), /e/ is a separate phoneme.

(37)	Words with /e/				Words with other phonemes	
	a.i	/e/- /æ/	[sek]	‘Indian’,	[sækk]	‘hard’
	a.ii	/e/- /u/	[thel]	‘headband’	[thuːl]	‘length’
	a.iv	/e/-/ɑ/	[ʃẽn]	‘sand’	[ʃɑ̃ːn]	‘proud’
	a.v	/e/-/o/	[ɡes]’	house’	[ɡoːʃ]	’ear’

(d) Phoneme /æ/ is a low front vowel.
[-high, +low, +front, -back, -round]

The following minimal pairs display the phonemic position of /æ/ in IBDs phoneme inventory.

(38)	Words with /æ/			Words with other phonemes		
	a.i	/æ/- /u/:	[thær]	‘it’	[thuːr]	‘net’
	a.ii	/æ/- /o/:	[phæʈʈ]	‘field’	[phoʈʈ]	‘body hair’
	a.iii	/æ/- /ɑ/:	[ɡæz]	‘manna tree,	[ɡɑːz]	‘gas’

1.1.2.2 Back vowels

(a) Phoneme /u/ is a high back vowel.
[+high, +tense, -front, +back, +round]

The data in (39) show that /u/ is a separate phoneme in IBDs.

(39)		Words with phoneme /u/		Words with other phonemes	
	a.i	/u/- /o/	[ʃuːr] ‘salty’	[ʃoːr]	‘consultation’
	a.ii	/u/- /o/	[duːɹ] ‘far’	[dorr]	‘Balochi earring’

(b) Phoneme /ʊ/ is a mid-high back vowel.
[+high, -low, -tense, - front, +back, +round]

Minimal pairs in (40) illustrates that /ʊ/ is a separate phoneme in Sarawani Balochi.

(40)	Words with phoneme/ʊ/				Words with other phonemes	
a.i	/ʊ/- /o/	[mʊḍḍ]	‘mood’	[mod]	‘fashion’	
a.ii	/ʊ/- /ɑ/	[gʊr]	‘grave’	[gɑːr]	‘grave’	
a.iii	/ʊ/- /u/	[bʊr]	‘ticks’	[buːr]	‘blond’	

(c) Phoneme /o/ is a mid-back vowel.
[- high, -low, +tense, -front, +back, +round]

Phoneme /o/ has bees already compared with Front and Back vowels, data (41) show the comparison between phoneme /o/ and /ɑ/.

(41)	Word with phoneme /o/			Word with other phoneme	
aii	/o/-/ɑ/	[dʒoːh]	’brook’	[dʒɑːh]	‘place’

(d) Phoneme /ɑ/ is a low back vowel.
[-high, +low, -front, +back, -round]

Phoneme /ɑ/ has been already compared to all front and back vowels.

As table (42) illustrates, nasal vowels and long vowels exist in IBDs vowel inventory. Following examples show that all vowels in IBDs are realized as nasal vowel when they precede the nasal consonants, in fact the difference between oral and nasal vowels is not distinctive and they are allophonic variants. Moreover, long vowels occur in CV, CCVC and CVC syllables. Indeed when there is no moraic coda, since three moraic syllables is not allowed in IBDs. I will return to vowel distribution in the next chapter which deals with Suprasegmental phonology in Balochi.

(42)	Words with oral vowels			words with nasal vowels	
a.i	[phoːr]	‘ash’	b.i	[zõmm] ‘dark’	
a.ii	[dɪh]	‘beast’	b.ii	[dĩm]	‘face’
a.iii	[brɑːt]	‘brother’	b.iii	[hɑ̃ːm]	‘raw’
a.iv	[huːk]	‘pig’	b.iv	[buːm]	‘owl’
a.v	[zæhg]	‘child’	b.v	[hæ̃ndʒiːɹ]	‘fig’
a.vi	[neʃɑ̃ːn]	‘spot’	b.vi	[gærdẽn]	‘neck’

2.1.2.3 Diphthongs

(a) Phoneme /ie/ and Phoneme /ue/

/i/+/e/ → /ie/
/i/ [+high, -low, +tense, +front, -back, -round]
/e/ [- high, - low, + tense, +front, -back, -round]

These two phonemes (diphthongs) are only found in Sarhaddi Balochi data as in (43) and (44) respectively.

(43)

	Words with phoneme /ie/			Words with other phonemes		
a.i	/ie/- /ɑː/	[mieʃ]	'ei'	[mɑːʃ]	'grass pea'
a.ii	/ie/- /æ/	[di$\tilde{e}$m]	'face'	[d$\tilde{æ}$m]	'steamed'
a.iii	/ie/- /e/	[lies]	'lick'	[lejs]	'bald'
a.iv	/ie/- /oː/	[tʃ^{h}ieɹ]	'under'	[tʃ^{h}oːɹ]	'stream'
a.v	/ie/- /ue/	[ʃieɹ]	'milk, lion'	[ʃueɹ]	'salty'

(44)

	Words with /ue/			Words with other phonemes	
a.i	/ue/- /ɑː/:	[hu$\tilde{e}$n]	'blood',	[hɑ$\tilde{ː}$n]	'yes'
a.ii	/ue/- /æ/:	[guedʒ]	'salamander'	[gædʒdʒ]	'epileptic'
a.iii	/ue/- /e/:	[t^{h}uel]	'to weigh'	[t^{h}el]	'headband'

(b) Phoneme /ou/ and Phoneme /ei/

/o/ +/u/ → /ou/
/o/ [- high, -low, +tense, -front, +back, +round]
/u/ [+high, +tense, -front, +back, +round]

/e/ +/i/→ /ei/
/e/ [- high, - low, + tense, +front, -back, -round]
/i/ [+high, -low, +tense, +front, -back, -round]

These two diphthongs are only observed in Sarawani Balochi data. Following examples show that /ou/ and /ei/ are separate phonemes.

(45)

Words with /ou/			Words with other phonemes		
a.i	/ou/-/i/	[gouk]	‘part of head’	[giːr]	‘tar’
a.ii	/ou/-/e/	[hour]	‘rain’	[herr]	‘donkey’
a.vi	/ou/-/o/	[dʒour]	‘kind of tree’	[dʒoːh]	‘raceway’
a.ix	/ou/-/ɑ/	[mout]	’death’	[mɑːt]	‘mother’
a.x	/ou/-/ei/	[hour]’	‘rain’	[heir]	‘goodness’

Words with /ei/			Words with other phoneme		
b.i/	/ei/-/i/	[leip]	‘enjoyment’	[liːp]	‘brush’
b.ii	/ei/-/e/	[leis]	‘bald’	[lek]	‘high, tall’
b.iii	/ei/-/æ/	[iil]	‘loose’	[wæll]	‘melon’

(c) Phoneme /iə/ and Phoneme /uə/ and Phoneme /æu/

/i/ +/ə/→ /iə/

/i/ [+high, -low, +tense, +front, -back, -round]

/ə/ [-high, -low, -tense, -front, -back, -round]

/u/ +/ə/→ /uə/

/u/ [+high, +tense, -front, +back, +round]

/ə/ [-high, -low, -tense, -front, -back, -round]

/æ/+/u/→ /æu/

/æ/ [-high, +low, +front, -back, -round]

/u/ [+high, +tense, -front, +back, +round]

These three diphthongs are only observed in Lashari Balochi data. Additionally, vowel /ə/ only occurs in diphthongs and not individually, such as examples in (46) and (47) and (48) correspondingly.

(46)

Words with phoneme /uə/				Words with other phonemes	
a.i	/uə/-/ɑ/	[duəg]	‘Dough’	[dɑːg]	‘warm’
a.ii	/uə/-/æ/	[muər]	‘ant’	[næ̃m]	‘it’
a.iii	/uə/-/o/	[guəʃ]	‘ear’	[godd]	‘cloth’

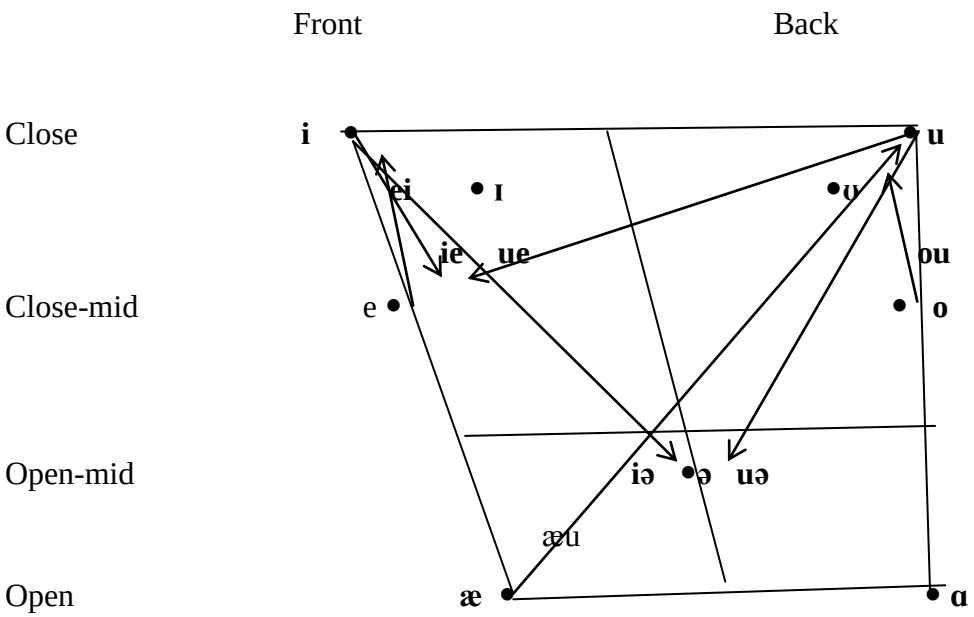
(47)

Words with phoneme /iə/				Words with other phonemes	
a.i	/iə/-/i/	[miəh]	‘nail’	[zĩ̈m]	‘scorpion’
a.ii	/iə/-/æ/	[diər]	‘late’	[dær]	‘door’
a.iii	/iə/-/uə/	[giliəp]	‘pot’	[guəʃ]	‘ear’

(48)	Words with phoneme /æu/			Words with other phonemes	
a.i	/æu/-/o/	[kæuʃ]	‘shoe’	[kors]	‘tablet’
a.ii	/æu/-/æ/	[kæul]	‘promise’	[kæbr]	‘grave’
a.iii	/æu/-/i/	[dæur]	‘throw’	[diːr]	‘late’
a.iv	/æu/-/ɑ/	[dʒæu]	‘straw’	[ʃɑːh]	‘king’

Consequently, based on the above analyses which have been done on the vowels, the IBDs vowel inventory consists of 8 contrastive monophthongs and 7 diphthongs.

(49) IBDs Phonemes (vowels)



2.2 Iranian-Balochi dialects allophonic variations in optimality theory

As was illustrated already, Balochi has no lexical contrast of aspirated/ unaspirated stops and affricates, dorsal/coronal nasals, and oral/nasal vowels. So in this language aspirated and unaspirated stops and affricates, dorsal and coronal nasals, and oral and nasal vowels are allophones: They are predictable from the phonological contexts and do not reflect lexical specification (Hayes 2009).

The allophonic patterns can be stated in terms of violable constraints. In the languages, where phonetic contrast surface as allophonic and not lexically

distinctive (such as that between aspirated or unaspirated stops in Balochi), the markedness constraints dominates faithfulness constraints, so the surface forms (output) are minimally marked by neutralizing the lexical contrasts. But when faithfulness dominates markedness, the lexical contrasts are expressed in the surface form (Kager, 1999: 29).

In the analysis of allophonic variation, three constraint types are involved: context- free markedness (MC-free), context- sensitive markedness (MC-sensitive), and faithfulness. Ranking (50) produces the typologically common sense of allophonic variation (Kager, 1999:34, 36)

(50) Allophonic variation
MC-sensitive >> MC- free >> Faithfulness

In this subsection, I will develop optimality- theoretic analyses of the allophonic variation in Balochi bases on the interaction of two basic kinds of constraints: markedness and faithfulness.

2.2.1 The distribution of aspirated stops and affricates in Iranian-Balochi dialects in OT

Considering aspirated voiceless stops and affricates (those sounds which are characterized by the feature [spread glottis]) in Balochi, there are certain positions in the word where it can occur and other positions where it cannot. Both aspirated stop and affricates surface mostly at the beginning of a syllable with primary or secondary stress whether that syllable is word-initial or elsewhere in the word. This is seen by the data in (51) where the (a) column shows stops and the (b) column aspirated affricate.

(51) At the beginning of a syllable with primary stress

a.i	*ʈiːn*	[ʈh]	‘can’	b.i	*roːtʃaːn*	[tʃh]	‘days’
a.ii	*poːr*	[ph]	‘ash’	b.ii	*tʃuːʃ*	[tʃh]	‘suck’
a.iii	*káll*	[kh]	‘piece’				
a.iv	*taːk*	[th]	‘window, leave’				

The data in (52) show that aspiration can also occur as a first segment of word-initial onset cluster.

(52) As a first member of word-initial complex onset

a.i	*praːh*	[ph]	‘wide’	b.i	tʃlimp	*[tʃh]*	‘water pipe’
a.ii	*krues*	[kh]	‘rooster’				
a.iii	*klieʈ*	[kh]	‘lizard’				

Moreover; the data in (53) illustrates that aspiration can also occur as part of the second position of an onset cluster.

(53) As a possible second member of complex onset

a.i.	*spiːt*	[ph]	‘white’
a.ii	*bkæp*	[kh]	‘lay down!’
a.iii	*stim*	[th]	‘storm’

Furthermore; aspiration surfaces at the beginning of the syllable with secondary stress as in (54).

(54) At the beginning of a syllable with secondary stress

a.i.	*hǽptæ̀*	[th]	‘iek’
a.ii	*piéʈi*	[ʈh]	‘closet’
a.iii	*kæ̀rgʊéʃk*	[kh (in word-initial position)]	‘rabbit’
b.i	*pæ̀tʃǽg*	[ph]	‘to cook’

Another position where aspiration occurs is in the onset position of stressless syllable. This is exemplified by the data in (55).

(55) At the beginning of medial stressless syllable.

a.i.	*kæ̀lkoʃtǽg*	[kh (as the onset of second syllable)]	‘ a kind of herb’
a.ii	kæ̀lpurækɑ́ːn	[ph]	‘ a kind of herb’
a.iii	kæ̀ppægɑ́ː	[ph]	‘the act of hopping’

Finally, the data in (56) illustrates that aspiration can occur in the word-final position as geminate consonant.

(56) Word-final position as geminate consonant

a.i	*gǽʈʈ*	[ʈ^{h}]	‘bite’	b.i	*letʃtʃ*	[tʃ^{h}]	‘mud’
a.ii	*ʈʃǒkk*	[k^{h}]	‘child’				
a.iii	*kipp*	[p^{h}]	‘tight’				

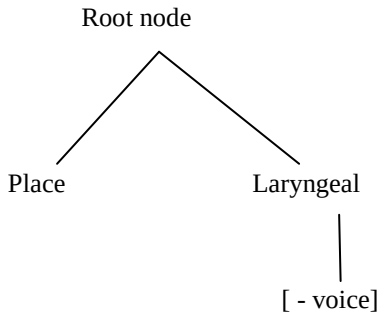
On the other hand there is an environment where aspiration does not occur. The data in (57) show that no aspiration surfaces in coda position (except as word-final geminate consonant). The words in (57a-b) all have voiceless stops and affricates respectively in coda position, but they are not realized as aspirated.

(57) In coda position aspiration does not surface

a.i	*saːp*	[pʰ]	‘soft’	b.i	*metʃaːtʃ*	[tʃʰ]	‘eyelash
a.ii	*hæpt*	[pʰ] [tʰ]	‘seven’	b.ii	*pintʃ*	[tʃʰ]	‘nail’
a.iii	*hæps*	[pʰ]	‘horse’	b.iii	*tætʃk*	[tʃʰ][k]	‘wide’
a.iv	*pliʃtok*	[kʰ]	‘martin’				

Now, in this part I provide an analysis of the data in (51) - (57) based on OT. Before beginning, however, I first make clear my assumption regarding the feature-geometric representation of aspirated stops and affricates in Balochi. Where aspirated stops and affricates in Balochi are not phonemic; thus the feature [spread glottis] is not part of the underlying representation of aspirated stops and affricates, put differently; [spread glottis] is not underlyingly specified for the feature on voiceless stops or voiceless affricates. The underlying representation of a voiceless stop and voiceless affricate is shown in (58).

(58) Underlying representation of Balochi aspirated stops and affricate in feature geometry



As above data in (51) - (57) show, aspirated stops and affricate surface at the beginning of any syllable and not in coda position (except as word-final geminate stop or affricate). The constraint accounting for this, is the alignment constraint (context-sensitive) that aligns the feature [spread glottis] (henceforth [s.g.]) to the beginning of the word, shown in (59).

(59) ALIGN-L (σ, [s. g])
Align the left edge of syllable with the feature [s. g.]

The other important constraints for the analysis are the markedness constraints in (60) - (63) (both are from Davis and Cho 2003) which are (context-free) and the faithfulness constraints in (63) - (64).

(60) *[s.g.]
The feature [s.g.] is prohibited

(61) *[s. g., +voice]
The feature [s.g.] cannot be realized on sounds that are [+ voice]

(62) *[s.g., +continuant]
Continuant sounds (fricatives) cannot be aspirated.

(63) IDENT- IO ([s.g.])
Input and output segments should be identical for aspiration.

(65) MAX- IO
Input segments must have output correspondents.
('No deletion')

Given these constraints, let us now consider their ranking in accounting for the distribution of aspirated stops and affricate in the data in (51) - (57). The first ranking is given in (65), in which the markedness constraint *[s. g., +voice] and *[s.g., +continuant] must outrank the alignment constraint. Based on this ranking, voiced sounds and continuant sounds are not allowed to surface as aspirated in Balochi even in an onset position.

(65) *[s. g., +voice], *[s.g., +continuant] >> ALIGN-L (σ, [s. g])
The second ranking is given in (66), where the alignment constraint outranks the *[s.g.].

(66) ALIGN-L (σ, [s. g]) >> *[s.g.]

In this ranking, unvoiced sounds are allowed to be aspirated in the beginning of the syllable.

Another crucial ranking is that the ALIGN-L (σ, [s. g]) constraint outranks both MAX-IO and IDENT- IO ([s.g.]) as in (67).

(67) ALIGN-L (σ, [s. g]) >> IDENT- IO ([s.g.]) >> MAX-IO

This ranking is necessary in order to prevent winning candidates with deleted segment(s) or unaspirated consonant(s).

The final ranking is given in (68).

(68) *[s. g., +voice],*[s.g., +continuant] >> ALIGN-L (σ, [s. g]) >> IDENT- IO ([s.g.]), *[s.g.] >>MAX-IO

This ranking is all that is needed for the analysis of the aspiration stops and affricates in Balochi. To show this, I will go through the sample tableaux for the data in (51) - (57). In all my OT analysis as discussed in chapter 2, I use the combination tableau (McCarthy2009) which includes information about violations as well as the W and L explanations of the comparative tableau. Furthermore, in all tableaux the cells with W and L tell us that the ranking constraints conflict over the choice of the winner. For the winner to win, the constraint with W must be ranked higher than the constraint with L.

Consider first, data in (51) - (52), where aspiration occurs at the word- initial position containing simple onset or complex onset with primary stress. The tableaux are given in (69) – (71).

Input: /tɑ́ːk/	*[s. g., +voice]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT- IO ([s.g.])	MAX-IO
a. ☞ $t^hɑ́ːk$			*	*	
b. $t^hɑ́ːk^h$		*W	**W	**W	
c. $ɑ́ːk^h$		*W	* W	*W	* W
d. tɑ́ːk		*W	L	L	

(69) /tɑ́ːk/ [$t^hɑ́ːk$] ‘window, leaf’

(70) /prɑ́ːh/ [$p^hrɑ́ːh$] ‘wide’

Input: /prɑ́ːh/	*[s. g., +voice]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT- IO ([s.g.])	MAX-IO
a.☞ $p^hrɑ́ːh$		*	*	*	
b. $p^hr^hɑ́ːh$	* W	L	**W	**W	
c. $r^hɑ́ːh$	*W				* W
d. prɑ́ːh		**W			

(71) /stím/ [st^hím] ’storm’

Input: /stím/	*[s. g., +continuant]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT-IO([s.g.])	MAX-IO
a.☞ st^him		*	*	*	
b. s^ht^him	* W	L	**W	**W	
c. s^him	*W	L	*W	*W	*W
d. stim		**W	L	L	

In the tableau (69) candidates (b), (c) and (d) loses out to candidate (a) because of their violation of ALIGN L (σ, [s. g]). In tableau (70), both candidate (b) and (c) violate the constraint

*[s. g., +voice], because voiced sonorant consonant /r/surfaces as aspirated. In addition, candidate (d) violates ALIGN-L (σ, [s. g]). So, the candidate (a) is a winner. Likewise, in the comparison between the two candidate (b) and (c) in the tableau (71) with winner candidate (a), the two loser candidates violate the *[s. g., +continuant], because the fricative segment /s/ surfaces as aspirated. Further, candidate (d) violates ALIGN-L (σ, [s. g]). In the three tableaux, the (a) candidates violate IDENT- IO ([s.g.]) and*[s.g.], but this violation cannot be fatal given that (a) is the winning candidate.

Next consider the data like that in (54) and (55), where aspiration surfaces in the onset of syllable with secondary stress and at the beginning of word-medial stressless syllable respectively.

(72) /pætʃǽg/ [pʰætʃǽg] 'to cook'

Input: /pætʃǽg/	*[s. g., +voice]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT- IO ([s.g.])	MAX-IO
a.☞ pʰætʃʰǽg			**	**	
b. pætʃʰǽg		*W	*L	*L	
c. ætʃʰǽgʰ	*W	*W	**	**	*W
d. pætʃǽg		**W	L	L	

(73) /kælkoʃtǽg/ [kʰælkʰoʃtʰǽg] 'a kind of herb'

Input: /kælkoʃtǽg/	*[s. g., +voice]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT- IO ([s.g.])	MAX-IO
a.☞ kʰælkʰoʃtʰǽg			***W	***	
b. kʰælkoʃtʰ æg		*W	**L	**L	
c. kʰælʰoʃtʰǽg	* W		***	***	*W
d. kælkoʃtǽg		***W			

As shown, the candidates in tableaux (72) and (73) consist of three syllables. The onsets of all three syllables are voiceless stops, and so can surface with the feature [s.g.]. Candidate (a) shows the aspirated stop at the beginning of the syllable. This allows for perfect satisfaction of two constraints *[s. g., +voice] and ALIGN-L (σ, [s. g]). However, as shown, the candidates (b) and (d) in (23) and (73) fatally violate the higher ranked ALIGN-L (σ, [s. g]) and so do not surface as aspirated stops. On the other hand, the candidate (c) in tableau (732 allows the voiced stop in coda position to be aspirated, which violates both *[s. g., +voice] and ALIGN-L (σ, [s. g]). Likewise, the candidate (c) in (73) aspirates the voiced sonorant consonant and deletes the word-medial onset. Thus, the (a) candidates win out since they best satisfy the constraints.

Now consider the data in (56), where the feature [s.g.] does not surface. As shown by data (56) the aspirated stops or affricate cannot occur in coda position. Tableau (74) illustrates the analysis accounts for this.

(74) /ʔæps/ [hæps] ‘horse’

Input: /ʔæps/	*[s. g., +continuant]	ALIGN-L (σ, [s. g])	*[s.g.]	IDENT- IO ([s.g.])	MAX_IO
a.☞ ʔæps		*			
b. ʔæp^{h}s		*	* W	*W	

In the tableau (74), the second candidate has fatal violations of both IDENT-IO ([s.g.]) and

*[s.g.] constraints. In this analysis, to add aspiration into coda position is not allowed since aspiration occurs in the beginning of the syllable in Balochi.

2.2.2 The distribution of dorsal nasal [ŋ] in Iranian-Balochi dialects

In Iranian Balochi dialects, as in many languages, nasal assimilation is a common phonological process. Nasal consonants assimilate to the place of articulation of the following stops. Examples in (75) focus on the assimilation of the tautomorphemic coronal nasal to a following dorsal stop.

(75)	a.i.	*mængeliːk*	[mæ̃ŋgeliːk]	‘bracelet’
	a.ii	*hængu:r*	[hæŋguːr]	‘grape’
	a.iii	*ʈueng*	[ʈ^{h}ueŋg]	‘knee’
	a.iv	*bædræng*	[bædræŋg]	‘cucumber’
	b.i	*pællink*	[p^{h}ælɫĩŋk]	‘plaints’
	b.ii	*saːlonk*	[sɑːlõŋk]	‘bride groom’
	b.iii	*leɭiːnk*	[leɭĩːŋk]	‘itching’

Data (75) show the occurrence of the dorsal nasal as a result of an assimilation of the coronal nasal to a following dorsal stop. So dorsal nasal [ŋ] stands in an allophonic relation to coronal nasal [n]. The distribution of [ŋ] is limited to coda position and only before dorsal stops.

The context-sensitive markedness constraint which accounts for the nasal assimilation is given in (76) (Fery, 2003):

(76) AGREE (Place) $_{\text{nasal+ stop}}$
The nasal must assimilate to the following stop consonant.

In dealing with the data containing nasal assimilation, I need to refer to a faithfulness constraint as well (Kager1999):

(77) IDENT-IO (Place)
Place features in the input and output are identical.

The constraint ranking in (78) will map input *ʈueng* onto output [ʈueŋg]:

(78) AGREE (Place) $_{\text{nasal+ stop}}$ >> IDENT-IO (Place)

This ranking shows the pattern just described: in Blochi a coronal nasal assimilates to the following dorsal stop and there is an allophonic relationship between [n] and [ŋ].

Consider the representation of ranking in (78) in the following tableau.

(79) *ʈueng* [ʈueŋg] 'knee'

Input:/ʈueng/	AGREE(Place) $_{\text{nasal+ sop}}$	IDENT-IO (Place)
a. ☞ ʈueŋg		*
b. ʈueng	*W	L
c. ʈuemg	*W	*

Candidate (a) is optimal since it satisfies the undominated AGREE (Place) $_{\text{nasal+ stop}}$ at the expense of violation of IDENT- IO (Place), but both candidates (b) and (c) avoid the fulfillment of higher ranked constraint AGREE (Place) $_{\text{nasal+ stop}}$ so they are eliminated.

2.2.3 Vowel nasalization in Iranian-Balochi dialects

Vowels are generally oral in Balochi except when they directly precede a nasal consonant, in which they are nasal. This allophonic pattern occurs in all three dialects of Iranian Balochi; see the examples below:

(80)	a.i	*waːd*	'salt'	b.i.	*ʧĩːntʃok*	'pinky'
	a.ii	*ʈæp*	'hollow'	b.ii	*lẽmp*	'snot'
	a.iii	*pʊk*	'empty'	b.iii	*dæ̃ntãːn*	'tooth'
	a.iv	*læhm*	'slow, soft'	b.iv	*ʔaːsũng*	'sleeve'

As data (80) illustrate, the variation between oral and nasal vowels in Balochi is totally context dependent and it does not reflect lexical specification. It means no word pairs occur that are distinguished by orality/ nasality of their vowels. So, there is an allophonic pattern between oral and nasal vowels in Iranian Balochi dialects.

The context-free markedness constraint in (81) is against nasal vowels (Kager1999):

(81) *V_{NASAL}
Vowels must not be nasal.

However, many languages such as Balochi tend to nasalize vowels before a tautosyllabic nasal constant. A context- sensitive markedness constraint which accounts for vowel nasalization is as follow (Kager 1999):

(82) *V_{ORAL}N
Before a nasal, vowels must not be oral.

The constraints in (83)-(84) require faithfulness to input nasality (c.f. McCarthy and Prince 1995).

(83) IDENT ([nasal])

Correspondening segments in input and output have identical values for [nasal].

(84) MAX-IO
Input segments must have output correspondents.
('No deletion')

Since the grammar of Balochi maps oral vowel to nasal vowel in a specific context, when they are preceded by nasal consonant, the context-sensitive markedness constraint (*V_{ORAL}N) must dominate the anti-nasal context–free markedness constraint (*V_{NASAL}) as well as the faithfulness constraints. This ranking result is shown in (85).

(85) *V_{ORAL}N, MAX-IO >> *$V_{NASAL,}$ IDENT ([nasal])

Tableaux (86) and (87) present a complete picture of the allophonic variation between oral and nasal vowels in Balochi.

(86) /lemp/ [lẽmp] 'snot'

Input: /lemp/	*V_{ORAL}N	MAX-IO	*V_{NASAL}	IDENT ([nasal])
a. ☞ lẽmp			*	*
b. lemp	*W		L	L
c. lep		*W	L	L

(87) /wɑːd/ [wɑːd] ‘salt’

Input: /wɑːd/	*V_{ORAL}N	MAX-IO	*V_{NASAL}	IDENT ([nasal])
a. ☞ wɑːd				
b. wɑ̃ːd			*W	*W
c. wɑː		*W		

As shown in tableau (86), both candidate (b) and (c) have a violation of higher ranking constraint, *VORALN and MAX- IO respectively. Candidate (a) satisfies *VORALN, but has one violation of *VNASAL and one of IDENT ([nasal]). However, these violations cannot be fatal given that (a) is the winning candidate.

Candidate (b) in (87) violates both *VNASAL and *VNASAL. Candidate (c) has a higher ranked faithfulness constraint violation. The winner candidate is (a) since it fulfills all constraints and has no violation.

2.3 The distribution of retroflex consonants in Iranian-Balochi dialects: An OT approach

The phonemic systems of Iranian-Balochi dialects involve two retroflex stops [ʈ], [ɖ] and a retroflex flap [ɽ]. However, these consonants mostly occur in the Indic loanwords, but they are also found as a result of developments within the language (Jahani and Korn2009:643). Retroflex consonants occur infrequently cross-linguistically as for instance in Dravidian, Indo-Aryan , Munda and Australian languages (Hamann 2003, Arsenult 2012) and only 11% of languages have retroflex stops (Hamann2003:3), so it is worth to dedicate a subsection to investigate these types of specific stop consonants in Balochi. First some facts about the retroflex consonants are presented, and then the relevant analysis for the distribution of retroflex in Balochi is given in an optimality-theoretic framework.

The retroflexes are cross-linguistically marked. The complexity of their articulation is responsible for their markedness. The markedness of segment types within OT is shown by lower ranking the constraints which militate against the articulation of less complex segment than those which militate against the articulation of more complex segments as in (88) (Hamann2003):

(88) *RETROFLEX >> *ALVEOLAR

As above ranking presents, it can be said that retroflex segments are more marked than alveolar. In languages such as Balochi, the faithfulness constraints for segmental class is higher ranked than the markedness constraint *RETROFLEX, then retroflex consonants present in these languages.

Furthermore, Hamann (2005:3-6) shows that there is no evidence for perceptual markedness of retroflex, and the retroflex perceptibility is context-dependent. She gives the ranking of context-sensitive markedness constrains for retroflex perceptibility according to the cue availability in specific context as illustrated in the hierarchy in (89):

(89) *DELETE (R / V_V) >> *DELETE (R / V_C) >> *DELETE (R / C_V) >> *DELETE (R/C_C)

As can be seen in (89), retroflexes (R) are most perceptible in intervocalic context and least perceptible in inter-consonantal context. Moreover, Steriade in her approach 'licensing by cues' (Hamann 2003:151, 152) proposes cue distribution in retroflex stops. She shows that the intervocalic context and post-vocalic context provides more cues for retroflex stops, so in these positions retroflexes can be distinguished better from other apical consonants in pre-vocalic position. However, in post-consonant and post- pausal context retroflexes are least salient.

As was mentioned earlier in the present subsection, Iranian-Balochi dialects have two retroflex stops. The examples given below in (90) and (91) illustrate the distribution of retroflex stops /ɖ/ ad /ʈ/ respectively in three Iranian-Balochi dialects.

(90) The distribution of [ɖ] in Iranian-Balochi dialects

a.i	*ɖaːl*	[ɖɑːl]	'a kind of lentil'
a.ii	*ɖuːl*	[ɖuːl]	'bucket'
a.iii	*ɖæng*	[ɖæ̃ŋg]	'sting'
a.iv	*ɖuek*	[ɖuek]	'stone'
b.i	*ɖæɖ*	[ɖæɖ]	'fine, good'
b.ii	*peɖɖ*	[p^{h}eɖɖ]	'pot belly'
b.iii	*koɖɖ*	[k^{h}oɖɖ]	'small room'
b.iv	*gwanɖ*	[gwɑ̃nɖ]	'small'
b.v	*ʧænɖeten*	[ʧ^{h}æ̃nɖetẽn]	'to move'
b.vi	*koɖɖæl*	[k^{h}oɖɖæl]	'aviary'

(91) The distribution of [ʈ] in Iranian-Balochi dialects

a.i	*ʈiːlæk*	[ʈ^{h}iːlæk]	'eye-ball'
a.ii	*ʈekk*	[ʈ^{h}ek^{h}k]	'spot, freckle'
a.iii	*ʈuep*	[ʈ^{h}uep]	'ball'
a.iv	*ʈiel*	[ʈ^{h}iel]	'pomade'
b.i	*goʈʈ*	[goʈ^{h}ʈ]	'neck'
b.ii	*gæːʈ*	[gæːʈ]	'bite'

b.iii	*pieʈi*	[p^{h}ieʈ^{h}i]	‘cupboard’
b.iv	*kunʈ*	[k^{h}ũnʈ]	‘palm bough’
b.v	*kuʈʈek*	[k^{h}uʈʈ^{h}ek]	‘watermelon’

As examples in (90) and (91) show, retroflex stops are allowed in word-initial positions, see (91ai-av, 92ai-aiv); however, word-initial retroflex is disallowed in a number of Dravidian and Indo-Aryan languages (Hamann2003:117). Besides, in word-initial positions retroflex stops have a tendency not to occur pre- consonantal or post-consonantal, in other words they only occur in a simple onset and not complex. See (90a) an (91a) in all these examples retroflex stops appear as the simple onset of monomorphemic words. Another position where retroflex stops occur is in intervocalic context, see (90.b.vi) and (91.b.iii, b.v). Finally, retroflex stops occur in the coda position both in a simple coda, see (90. b.i, and 91.b.ii) or in the word-final cluster as the second component see (90.b.iv, and 91.b.iv). In addition as examples (91.bii, biii, and 92.b.i) display in the coda position retroflex stops occur as geminate stops. However, two interesting restrictions are observed in the distribution of retroflex stops in Iranian- Balochi dialects data. First, in the word-final cluster only alveolar nasal /n/ precedes the retroflex stops and no other segments. Second no retroflex occurs in the front vowel context, namely [iʈ] or [iɖ]. This avoidance can be observed in many languages, but it is not a universal principle (Hamann2003:92).

A third retroflex in the phoneme inventory of Iranian-Balochi as shown already is retroflex flap [ɻ]. Examples in (92) exemplify the distribution of [ɻ] in the three dialects of Iranian-Balochi.

(92) Distribution of [ɻ] in Iranian-Balochi dialects

a.i	*kaːlæɻ*	[k^{h}ɑːlæɻ]	‘collar’
a.ii	*buːɻ*	[buːɻ]	‘louse’
a.iii	*haːɻ*	[hɑːɻ]	‘being together’
a.iv	*gaːɻ*	[gɑːɻ]	‘ominous’
a.v	*klieʈ*	[k^{h}lieɻ]	‘lizard’
b.i	*leɻink*	[leɻ̃ink]	‘badly itching’

The examples given above indicate that the retroflex flap occurs in the simple coda context see (92ai-av) and not in the coda cluster. Further, [ɻ] is found as word-medial onset in one example (92.bi). It seems that in Iranian-Balochi dialects no retroflex flap is allowed to occur in word-initial or intervocalic contexts. Besides, like retroflex stops, the front vowel is avoided by retroflex flap.

In the reminder of this subsection, an optimality-theoretic of the retroflex distribution in Iranian-Balochi dialects is sketched.

The lists of markedness constraints (both context-free and context- sensitive markedness constraints) and faithfulness constraints use in this analysis appear in (93), (94) and (95) respectively.

(93) The context- free markedness constrains (Hamann 2003:4)

a. *RETROFLEX
Retroflex segment are disallowed.

b. *ALVEOLAR
Alveolar segments are prohibited.

(94) Context-sensitive markedness constraints (constraint (a), Steriade, 2001a:240 and constraints (b) Hamann, 2003:5)

a. V [_apical, stop] C
The contrast between apical and retroflex stops is more salient in the V-C context.

b. *DELETE (R / V_V)
Deletion of retroflex segment in intervocalic context is not allowed.

c. *DELETE (R / # _ V)
Deletion of retroflex segment in word-initial position is not allowed.

d. *DELETE (R / V_ #)
Deletion of retroflex segment in word-final position is not allowed.

(95) Faithfulness constraint

a. IDENT –IO (R)

Correspondent segments in input and output have identical values for [retroflex].

b. MAX-IO
'No deletion.

The rankings of markedness and faithfulness constraints for the data in (90), (91) and (92) are as follow:

(96) The constraints ranking for the distribution of retroflex stops in Balochi

a. Word-initial retroflex stop
*DELETE (R/ #_ V), *ALVEOLAR, IDENT-IO(R), MAX-IO >> *REROFLEX

b. Inter-vocalic retroflex stop

*DELETE(R /V_V), IDENT-IO(R), *ALVEOLAR, MAX-IO>> *RETROFLEX

c. Post-consonant retroflex stop
V [_apical, stop] C >> IDENT-IO (R), *ALVEOLAR >> *RETROFLEX

d. Post-vocalic retroflex stop
*DELETE(R/V_ #), IDENT-IO (R), *ALVEOLAR>> *RETROFLEX

It is shown in all above rankings that retroflex stops are allowed in Balochi by lower ranking the *RETROFLEX and the higher ranking of the context-free markedness constraint *ALVEOLAR prevents the replacement of retroflex segment by apical one. In addition, the context–sensitive markedness constraints are undominated in all above rankings as well. The following tableaux present rankings in (97).

(97) *ḍuek* [ḍuek] ‘stone’

Input: /*ḍuek* /	*DELETE (R /#_ V)	IDENT-IO(R)	*ALVEOLAR	MAX_IO	*RETROFLEX
a.☞ ḍuek					*
b. uek	*W	*W		*W	*
c. duek	*W	*W	*W		L

Candidate (b) in tableau (97) wins because it satisfies the undominated constraints namely *DELETE(R/ V_ #), ALVEOLAR and IDENT-IO(R). The other candidates fail on these three undominated constraints and are eliminated.

(98) *pieṭi* [pieṭi] ‘cupboard’

Input: /pieṭi/	*DELETE (R / V_V)	IDENT-IO(R)	*ALVEOLAR	MAX_IO	*RETROFLEX
a. ☞ pieṭi					*
b. pieti	*W	*W	*W	*W	L
c. piei	*W	*W		*W	L

In tableau (98), the constraint against deleting the retroflex stop is higher ranked than the constraint requiring deleting retroflex segment. Candidate (a), with [ɻ], is thus optimal.

(99) *kunʈ* [kunʈ] ‘palm bough’

Input:/kunʈ/	V[apical, stop]C	IDENT-IO(R)	*RETROFLEX
a. ☞ kunʈ			*
b. kunt		*W	L
c. kuɲʈ	*W		**W

Tableau (99) shows why *kunʈ* does not realize as [kuɲʈ], in other words why no assimilation happens between apical and retroflex segments. The undominated consonant V [apical, stop] C preserves the apical alveolar in post-vocalic context. Candidates (c) and (b) fulfill this higher ranked constraint, but candidate (b) is a loser since it violates the IDENT-IO (R). Candidate (a) violates the undominated constraint, thus it is eliminated. So, the winner candidate is (c).

(100) *buːɾ* [buːɻ] ‘louse’

Input: /buːɾ /	*DELETE (R / V_#)	IDENT-IO(R)	*ALVEOLAR	MAX_IO	*RETROFLEX
a. ☞ buːɻ					*
b. buːr	*W	*W	*W	*W	L
c. buː	*W	*W		*W	

The tableau in (100) establishes that *DELETE(R / V_#) higher ranked than *RETROFLEX: the winning candidate (candidate a) has [ɻ] in word-final position, while the other two candidates have no retroflex consonants, they fatally violate the undominated constraints.