

Sub-dialectal Coronal and Non-coronal Assimilation in Yemeni Arabic

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Received: 20-02- 2015

Accepted: 02-05- 2015

Advance Access Published: May 2015

Published: 01-09- 2015

doi:10.7575/aiac.ijalel.v.4n.5p.234

URL: <http://dx.doi.org/10.7575/aiac.ijalel.v.4n.5p.234>

Abstract

This is an investigation of the assimilation process across word boundaries of the four main dialects of Yemeni Arabic. Twenty native speakers of these dialects have been asked to read the collected data, five from each dialect. The reading of the phrases has been transcribed for the analysis. The data under investigation uncovers the fact that assimilation in the four Yemeni dialects can be classified into symmetrical and asymmetrical categories. Symmetrical assimilation does not lead to irregularity. However, asymmetrical assimilation can cause irregularity among the four Yemeni dialects. The asymmetrical category of assimilation is investigated in terms of place, voicing, and emphasis. These irregularities are analogous to earlier typological work undertaken by Lehn (1963), Mohanon (1993), Watson (2002), Zuraiq and Zhang (2006), and Zuraiq and Abu Joudeh (2013). The study provides informative phonetic data useful for the foundation of a cross-dialectal study of assimilation in YA consonants.

Keywords: Yemeni Arabic dialects; assimilation; voicing; manner; place; coronal; non-coronal

1. Introduction

Coronal (C) sounds as defined by Chomsky and Halle (1968) are consonants produced with the blade of the tongue raised from the neutral position (dental, alveolar, palato-alveolar consonants). Non-coronals are consonants produced with the blade of the tongue in the neutral position (bilabial and velar consonants). This phonological investigation provides an insight into symmetrical and asymmetrical assimilation that is a prototypical feature of four major Yemeni dialects: the San'ani dialect (SD), the Ta'izi dialect (TD), the Tihami dialect (THD), and the Hadhrami dialect (HD). Our analysis is hinged upon the production of native speaker informants of the four dialects. Twenty native speakers (10 males and 10 females) five from each dialect (SD), (TD), (HD), and (THD) have produced the required phrases and their production is recorded. The judgment of whether assimilation has occurred is made by listening carefully to the recording and transcribing the output allophonically. The participants have been asked to read the list of phrases at a normal speaking rate and also repeat the phrase three times. The present work explores the patterns of consonant assimilation in the four dialects. The investigation provides phrases that represent all coronal and non-coronal combinations across word boundaries. Given the fact that the four dialects differ in lexicon, other phrases are constructed to mirror the peculiar phonetic nature of the four dialects. It is worthwhile to note that the present phonological investigation is entirely based on the views of Lehn (1963), Al-Ani (1970), Card (1983), Mohanon (1993), Davis (1995), Jun (1995), Zawaydeh (1999), Watson (2002), Zuraiq and Zhang (2006), and Zuraiq and Abu Joudeh (2013). The views of other phoneticians have been consulted during our literature review. The names of these scholars are listed in the references. However, the views of Zuraiq and Abu Joudeh (2013) have impacted the investigation and the outcome of the present work.

2. Aim of the Study

This study aims to investigate the phonological process of assimilation: (i) symmetrical assimilation, and (ii) asymmetrical assimilation. The two types will be discussed in terms of coronal and non-coronal consonants. The current study provides an insight into (i) assimilation with regards to the consonant point of contact assimilation, (ii) the different states of the glottis, and (iii) emphasis in the four different types of Yemeni Arabic (YA). Another major goal of the present discussion is to provide wide-ranging data source for the behaviour of assimilation in YA.

3. Yemeni Dialects

Located in the southern corner of the Arabian Peninsula, Yemen is a country from which the Arabic language is historically known to have sprung. Based on phonetic features, we divide the dialects of Yemen into four major dialects:

The SD which covers the northern part of Yemen from Sa'dah to Dhamar.

The TD covers the region of Ta'iz, Ibb, and Aden.

The THD covers the western areas beginning from Hajja until Mocha.

The HD covers the western region which includes Mareb, Shabwa, Abyan, Hadhramout, and Al-Mahra.

It goes without saying that within each category a lot of differences can be traced. However, the most important distinctive feature is the similarity on the phonetic level. Behnstedt as cited in Versteegh (2004) differentiates the following main areas: the Tihama dialects; the k- dialects; the South-east Yemenite dialects; the dialects of the central plateau (e.g. the dialect of Sana'a); the dialects of the southern plateau; the dialects of the northern plateau; and the North-east Yemenite dialects. But even this subdivision is not a comprehensive depiction of the entire area there are many mixed zones, and some of the areas will probably have to be subdivided when more data become known.

Table 1. Consonant phonemes of all Ds compared to Standard Arabic (SA)

No	Description	SA	TD	SD	HD	THD	Sub-dialectal variations
1	voiced bilabial plosive	b	b	b	b	b	[p ^ʔ] in SD
2	voiceless denti-alveolar plosive	t	t	t	t	t	
3	voiceless pharyngealized denti-alveolar plosive	t ^ʕ	In some TD's variations, [t]				
4	voiced denti-alveolar plosive	d	d	d	d	d	
5	voiceless velar plosive	k	k	k	k̠	k	
6	voiceless velar plosive	ɖʒ	g	ɖʒ	ɖʒ	g	
7	voiceless uvular plosive	q	q	g	G	qk	
8	voiceless glottal stop	ʔ	ʔ	ʔ	ʔ	ʔ	
9	voiced pharyngealized denti-alveolar plosive	ḏ	-	-	-	-	/ḏ/ replaced by /ð ^ʕ / in all Ds.
10	voiced bilabial nasal	m	m	m	m	m	
11	voiced denti-alveolar nasal	n	n	n	n	n	
12	voiceless labiodental fricative	f	f	f	f	f	
13	voiceless dental fricative	θ	θ	θ	θ	θ	/t/ in Aden
14	voiced dental fricative	ð	ð	ð	ð	ð	
15	voiced pharyngealized dental fricative	ð ^ʕ					
16	voiceless alveolar fricative	s	s	s	s	s	
17	voiceless pharyngealized alveolar fricative	s ^ʕ					
18	voiced alveolar fricative	z	z	z	z	z	
19	voiceless postalveolar fricative	ʃ	ʃ	ʃ	ʃ	ʃ	
20	voiceless uvular fricative	χ	χ	χ	χ	χ	
21	voiced uvular fricative	ʁ	ʁ	ʁ	ʁ	ʁ	/q/ in Abyan
22	voiceless pharyngeal fricative	ħ	ħ	ħ	ħ	ħ	
23	voiced pharyngeal fricative	ʕ	ʕ	ʕ	ʕ	ʔ	
24	voiceless glottal fricative	h	h	h	h	h	
25	voiced alveolar trill	r	r	r	r	r	
26	voiced alveolar lateral	l	l	l	l	l	
27	voiced palatal approximant	j	j	j	j	j	
28	voiced labio-velar approximant	w	w	w	w	w	

Table 1. lists the phonemes inventories of the four main dialects. The differences are allophonic. The HD /k/ is produced as a retracted [k̠], and /q/ is pronounced as [G]. The THD voiceless uvular plosive /q/ is pronounced as a mixture of /k/ and /q/, a velarized [qk]. All the YDs do not pronounce the voiced denti-alveolar plosive /ḏ/ as it is the case in the Levantine or the Hijazi dialects. It is replaced by [ð^ʕ]. The voiced pharyngeal fricative /ʕ/ is produced in THD as a voiceless glottal stop [ʔ]. Thus, words such as /ʕalam/, (flag) /ʕaalim/, (scholar), /ʕajn/, (eye) are pronounced in THD as [ʔalam] (pain in SA), [ʔaalim] (causing pain in SA) and [ʔajn], (where in SA) respectively. Other phonemes are pronounced more or less the same with some allophonic variations related to the degree of pharyngealization and

allophonic variations. For example, /p/ is produced as [pʰ] before silence, and /tʰ/ is pronounced as a dark [ɖ] in SD. /θ/ is pronounced as [t] in Aden (a variation of TD) due to the influence of Indian languages. /ʁ/ is produced as [q] in Abyan, (a variation of HD), and in Raymah (a variation of THD). In Yafea and Abyan (HD) and in Raymah and Osaab (THD), /d/ is pronounced with the blade of the tongue against the postalveolar rather than alveolar ridge.

4. What is assimilation?

Assimilation is one type of phonological processes such as dissimilation, deletion, epenthesis, metathesis and vowel reduction (Dobrovolsky and Katamba (1996). For Crystal (1991:65), assimilation is the "influence exercised by one sound segment upon the articulation of another, so that the sounds become more alike, or identical". In the view of Abercrombie (1980), juxtapositional assimilations involves "changes in pronunciation which take place under certain circumstances at the ends and the beginnings of words (changes at word boundaries, that is to say) when these words occur in connected speech, or in compounds'. For example, the word "is" and the word [ʃi:] is pronounced [ʃi:]; but when these two words come together in the phrase (is she), they are often pronounced [iʃʃi:] rather than [iz ʃi:]" (ibid:136). Conversely, phonological assimilation which is a connected speech feature bordering on another juxtaposed feature in a segment in less careful speech has been examined as a purely linguistic phenomenon (Kohler 1991 and 1992, Mohanan 1993, Hansson 2001, Rose & Walker 2004, Jun 1995 & 2005).

Phonological assimilation arises either across word boundaries or within word boundaries. It may occur intervocally, inter-consonantly, or among segmental features. Assimilation is accompanied with a wide range of phonological features such as nasalization, air stream mechanism, point of contact, degree of voicing, vowel height and vowel rounding, and. The phenomenon is attested in many languages (Arabic, English, Korean, Catalan, and many other languages). Assimilation is explained by different phonological theories such as feature geometry theory, underspecification theory, and by generative phonology. In OT, it is taken as the competition between Faithfulness and Markedness constraints for both articulatory and perceptual constraints (Steriade 1995 and 2001, Myers 1997, and Boersma 1998).

Assimilation is not compulsory in many languages, including Arabic: that is to say a speaker may, if he chooses, avoid making them. However, this phonological process usually happens in connected speech by speakers without paying attention to their articulation. When they are made, however, they have the impact, regardless if they are regressive or progressive, of producing some economy of effort in the utterance of a sequence of words. The results of assimilation are to reduce the number, or the extent, of the movements and adjustments that the speech-producing organs have to perform in the transition from one word to the next. Assimilation saves effort by means of three different types of changes in the sequence of speech-producing movements. These different types of changes include:

- (i) the state of the glottis and movement of articulators,
- (ii) velic action, and movement of articulators, and
- (iii) pharyngealization and movement of articulators.

5. Categories of assimilation

There are two major categories of assimilation: (i) symmetrical and (ii) asymmetrical. These are discussed below.

5.1 Symmetrical assimilation

5.1.1 /n/ cases

Assimilation in YA is an attested phonological process. YA is marked by the above three types of assimilation. However, assimilation which involves the movement of articulation is more common than the other types:

- (1) /man rabbuk/ → /marrabbuk/ (who's your Lord?)
 /man li:/ → /mal li:/ (who's my supporter?)

The examples in (1) show that the sound /n/ loses its nasality and totally assimilates with the adjacent segment. Consider the following examples:

- (2) /man qallak/ → /maŋqallak/ (who told you?)
 /min θalaaθah/ → /miŋθalaaθah/ (from three)

The examples in (2) illustrate that the /n/ loses its nasality partially and becomes velar [ŋ] in the first example while it becomes interdental [ɲ] in the second example. However, the uvular /q/ becomes more advanced and is influenced by the sound /ŋ/ in the first example, while the sound /θ/ becomes partially nasalized as a result of the adjacent /n/. Assimilation which involves successive movements of two different articulators is replaced by the movement of one articulator only.

Below is a discussion of assimilation of the sound /n/ in connection with the three different types mentioned above:

(i) Assimilation concerning the state of the glottis and movement of articulators

Let us consider the following data in (3):

(3) Table 2. Assimilation of /n/ to coronals

n+	sound	example	gloss	sort of change	output
	θ	min θalaaθa	out of three	1+3	miŋθalaaθah
	f	min fein	from where	1+3	mimfein
	ʃ	min ʃaaf	who saw	1+3	miŋʃaaf

+voiced		-voiced	/	-voiced	
+alveolar		+dental	##	+dental	##
+nasal		+fricative		+fricative	

Based on the production of all informants of the four dialects, we can produce a phonological rule for the alveolar in complete assimilation with the dental sound, namely: when the voiced /n/ is followed by the voiceless /θ/, it loses its nasality, becomes voiceless, and completely assimilates with the dental sound.

Another phonological rule can be deduced from our informants about the alveolar /n/, namely: when the voiced /n/ is followed by the voiceless /f/, it loses its nasality, becomes voiceless, and completely assimilates with the labiodental sound.

+voiced		-voiced	/	-voiced	
+alveolar		+labiodental	##	+labiodental	##
+nasal		+fricative		+fricative	

Our informants have led us to a third phonological rule for the alveolar in complete assimilation with the postalveolar /ʃ/, namely: when the voiced /n/ is followed by the voiceless /ʃ/, it loses its nasality, becomes voiceless, and completely assimilates with the postalveolar sound.

+voiced		-voiced	/	-voiced	
+alveolar		+postalveolar	##	+dental	#
+nasal		+fricative		+fricative	

(ii) Assimilation concerning the velic action and movement of articulators

Let us consider the following data in (4):

(4) Table 3. Assimilation of /n/ to dorsals

n	sound	example	gloss	sort of change	output
+					
	g	mangam	mine	3	maŋgam
	k	min kallam	who talked to	3	miŋ kallam
	q	min qara?	who read	3	miŋ qara?

+voiced		+voiced	/	+voiced	
+alveolar		+velar	##	+velar	##
+nasal		+plosive		+plosive	

A phonological rule can be deduced from our informants about the alveolar /n/, namely: when the voiced /n/ is followed by the voiced /g/, it completely assimilates and becomes velar.

+voiced		-voiced	/	-voiced	
+alveolar		+velar	##	+velar	##
+nasal		+plosive		+plosive	

Based on the production of all informants of the four dialects, we can introduce a phonological rule for the alveolar in complete assimilation with the voiceless velar sound, namely: when the voiced /n/ is followed by the voiceless /k/, it completely assimilates and becomes voiceless velar.

becomes voiceless, and completely assimilates with the velar sound.

+voiced		+voiced	/##	—————	+voiced	##
+alveolar		+uvular			+uvular	
+nasal		+plosive			+plosive	

According to our informants, a third phonological rule can be presented for the alveolar /n/ in complete assimilation with the uvular /q/, namely: when the voiced /n/ is followed by the voiceless /q/, it becomes voiceless, and completely assimilates with the uvular sound.

(iii) Assimilation concerning pharyngealization and movement of articulators

Let us consider the following data in (5):

(5) Table 4. Assimilation of /n/ to pharyngeals

n+	sound	example	gloss	sort of change	output
	tʰ	min tʰaariq	from Tarik	3	miŋ tʰaariq
	ðʰ	min ðʰarab	who hit	3	min ðʰarab
	sʰ	min sʰaaliḥ	from Saleh	3	min sʰaaliḥ

+voiced		-voiced	/##	—————	-voiced	##
+alveolar		+alveolar			+alveolar	
+nasal		+plosive +pharyngealized			+plosive +pharyngealized	

Based on the production of all informants of the four dialects, we can produce a phonological rule for the alveolar /n/ in partial assimilation with the pharyngealized /tʰ/ sound, namely: when the voiced /n/ is followed by the voiceless /tʰ/, it becomes voiceless pharyngealized, and partially assimilates with the adjacent sound.

+voiced		+voiced	/##	—————	+voiced	##
+alveolar		+dental			+dental	
+nasal		+fricative +pharyngealized			+fricative +pharyngealized	

Another phonological rule can be deduced from our informants about the alveolar /n/, namely: when the voiced /n/ is followed by the pharyngealized voiceless /ðʰ/, pharyngealized, and partially assimilates with the adjacent sound.

+voiced		-voiced	/##	—————	-voiced	##
+alveolar		+alveolar			+alveolar	
+nasal		+fricative +pharyngealized			+fricative +pharyngealized	

Our informants have led us to a third phonological rule for the alveolar in partial assimilation with the alveolar /sʰ/, namely: when the voiced /n/ is followed by the voiceless /sʰ/, it becomes voiceless, and partially assimilates with the adjacent sound.

5.1.2 /al/ cases

(i) the sun /al/

Grammatically, the /al/ is a definite article. Phonetically, however, the /al/ is of two types. The first is called the sun /al/. The sun /al/ means the /l/ is subject to complete assimilation with the coronals. If the /al/ is followed by an interdental, alveolar, or a prepalatal sound, it completely assimilates with the adjacent sound. Also, the /l/ is dropped and the next consonant is geminated (doubled). For more details on gemination in TD, see Aldubai (2015). It is worthwhile to note that the /al/ must always be in syllable initial position. In other words, the /l/ is in complete assimilation with the coronal consonants in all the Yemeni dialects.

Let us consider the following data in (6):

(6)

Table 5. Assimilation of /al/ to coronals

sound	example	assimilation	gloss
/t/	/altamr/	/attamr/	the dates
/θ/	/alθalu:θ/	/aθθalu:θ/	Tuesday
/d/	/aldim/	/addim	the cat
/ð/	/alðaki/	/aððaki/	the intelligent
/r/	/alrabb/	/arrab/	the Lord
/z/	/alzaman/	/azzaman/	the time
/s/	/alsamaʔ/	/assamaʔ/	the sky
/ʃ/	/alʃams/	/aʃʃams/	the sun
/sʕ/	/alsʕalaat/	/asʕsʕalaat/	the prayers
/tʕ/	/altʕalaaq/	/atʕtʕalaaq/	the divorce
/ðʕ/	/alðʕuhr/	/aðʕðʕuhr/	the noon
/l/	/allahm/	/allahm/	the meat
/n/	/alnawm/	/alnawm/	the sleep

Based upon the production of the YA informants, we can formulate the following rule:

The /l/ completely assimilates when followed by interdental, dental, alveolar, or postalveolar (coronal) sounds, whether these sounds are voiced or voiceless, provided that the /l/ is in the initial syllable position and receives primary stress. The assimilation causes gemination, i.e., doubling the consonant that replaces the /l/.



(ii) the moon /l/

The second is called the moon /al/. The moon /al/ means the /l/ is not subject to assimilation with the non-coronals.

The moon /l/ does not feature in all the dialects of the Yemen. However, according to the production of our informants from the inhabitants of the Sabir mountain which belongs to the Ta'iz province, the moon /l/ is in complete assimilation when it is followed by non-coronal sounds (except for the palatal sound) whether it is bilabial, alveolar, postalveolar, velar, uvular, pharyngeal, or glottal. In other words, the speakers of the Sabir area do not distinguish between the sun and the moon /al/; they only produce the moon /al/ except for the palatal. This is illustrated by the following data:

(7)

Table 6. Assimilation of /al/ to non-coronals

sound	example	assimilation	gloss
/b/	/albaab/	[abbaab]	the door
/k/	/alkalb/	[akkalb]	the dog
/m/	/almaaʔ/	[ammaaʔ]	the water
/ħ/	/alhima;r/	[aħħimaar]	the donkey
/ʔ/	/alʔawlaad/	[aʔʔawlaad]	the boys
/h/	/alharabah/	[ahharabah]	the escape
/χ/	/alχalq/	[aχχalq]	the creatures
/f/	/alfawz/	[affawz]	the victory
/ʕ/	/alʕilm/	[aʕʕilm]	the knowledge
/ʁ/	/alʁuraab/	[aʁʁuraab]	the crow
/g/	/algamal/	[aggamal]	the camel
/w/	/alwalad/	[awwalad]	the boys
/q/	/alqalb/	[aqqalb]	the heart

The moon /l/ assimilation is an attested phonological process around the city of Ta'iz. This process can be attributed to the fact that the speakers of this dialect oversimplify the rule and assimilate all the consonants whether they are coronals or non-coronals. The only exception of this rule is when /l/ is followed by the palatal sound /j/ such as /aljawm/ and /aljaman/. In this case, the /l/ is not in assimilation with /j/ due to the fact that the /j/ is an adjacent semivowel to /l/. In terms of articulation, this makes it difficult to move from a vowel /a/ to a semivowel /j/.

The data in (8) below is a summary of all the four dialects with regards to the sun and moon /l/:

(8)

Table 7. Assimilation of /al/ to coronals & non-coronals in Saber Mount

SA		SD	TD		THD	HD
			Other areas	Saber Mount		
/ʔalmadrasah/	school	[ʔalmatrased]	[ʔalmadrasah]	[ʔamadrasah]	[ʔamadrasah]	[ʔalmadrasah]
/ʔalmaʔqur/	odorous plant	[ʔalmaʔgur]	[ʔalmaʔqur]	[ʔamaʔqur]	[ʔamaʔq ^k ur]	[ʔalmaʔGur]
/ʔalhaami/	The hot	[ʔalhaami]	[ʔalhaami]	[ʔahaami]	[ʔamhaami]	[ʔalhaami]
/ʔalmustaʔaan/	the support	[ʔalmustaʔaan]	[ʔalmustaʔaan]	[ʔamustaʔaan]	[ʔamustaʔaan]	[ʔalmustaʔaan]
/ʔalhilaal/	The crescent	[ʔalhilaal]	[ʔalhilaal]	[ʔahilaal]	[ʔamhilaal]	[ʔalhilaal]
/ʔalwardah/	The flower	[ʔalwardeh]	[ʔalwardah]	[ʔawardah]	[ʔamwardah]	[ʔalwardah]
/ʔalwaliimah/	The banquet	[ʔalwaliimeh]	[ʔalwaliimah]	[ʔawaliimah]	[ʔamwaliimah]	[ʔalwaliimah]
/ʔaljaman/	The Yemen	[ʔaljaman]	[ʔaljaman]	[ʔaljaman]	[ʔamjaman]	[ʔaljaman]
/ʔaljawm/	today	[ʔaljawm]	[ʔaljawm]	[ʔaljawm]	[ʔamjawm]	[ʔaljawm]
/ʔalgamal/	The camel	[ʔalɟamal]	[ʔalgamal]	[ʔagamal]	[ʔamgamal]	[ʔalɟamal]
/ʔalɟanbijah/	The dagger	[ʔalɟanbijah]	[ʔalɟanbijah]	[ʔaganbijah]	[ʔamɟanbijah]	[ʔalɟanbijah]
/ʔalhamaam/	The pigeons	[ʔalhamaam]	[ʔalhamaam]	[ʔahamaam]	[ʔamhamaam]	[ʔalhamaam]
/ʔalhanaʔ/	The snake	[ʔalhanaʔ]	[ʔalhanaʔ]	[ʔahanaʔ]	[ʔamhanaʔ]	[ʔalhanaʔ]
/ʔalmuð ^s iif/	The host	[ʔalmuð ^s iif]	[ʔalmuð ^s iif]	[ʔamuð ^s iif]	[ʔammuð ^s iif]	[ʔalmuð ^s iif]
/ʔalʕijaal/	The boys	[ʔalʕijaal]	[ʔalʕijaal]	[ʔaʕijaal]	[ʔamʕijaal]	[ʔalʕijaal]
/ʔalʕudrah/	The dark	[ʔalʕudreh]	[ʔalʕudrah]	[ʔaʕudrah]	[ʔamʕudrah]	[ʔalʕudrah]
/ʔalfaaʔidah/	usefulness	[ʔalfaaʔideh]	[ʔalfaaʔidah]	[ʔafaaʔidah]	[ʔamfaaʔidah]	[ʔalfaaʔidah]
/ʔalqarjah/	The village	[ʔalqarjah]	[ʔalqarjah]	[ʔaqarjah]	[ʔamqarjah]	[ʔalqarjah]
/ʔalkabiir/	The big	[ʔalkabiir]	[ʔalkabiir]	[ʔakabiir]	[ʔamkabiir]	[ʔalkabiir]
/ʔalʔaalah/	The machine	[ʔalʔaalah]	[ʔalʔaalah]	[ʔaʔaalah]	[ʔamʔaalah]	[ʔalʔaalah]
/ʔalhaasibah/	The calculator	[ʔalhaasibah/]	[ʔalhaasibah]	[ʔahaasibah]	[ʔamhaasibah]	[ʔalhaasbah]
/ʔalʔawwal/	The first	[ʔalʔawwal/]	[ʔalʔawwal]	[ʔaʔawwal]	[ʔamʔawwal]	[ʔalʔawwal]
/ʔalʔawlaad/	The boys	[ʔalʔawlaad]	[ʔalʔawlaad]	[ʔaʔwlaad]	[ʔamʔawlaad]	[ʔalʔawlaad]
/ʔalʔabjað ^s /	The white	[ʔalʔabjað ^s]	[ʔalʔabjað ^s]	[ʔaʔabjað ^s]	[ʔamʔabjað ^s]	[ʔalʔabjað ^s]
/ʔalʔadawaat/	The instruments	[ʔalʔadawaat]	[ʔalʔadawaat]	[ʔaʔadawaat]	[ʔamʔadawaat]	[ʔalʔadawaat]
/ʔalbaab/	The door	[ʔalbaab]	[ʔalbaab]	[ʔabaab]	[ʔambaab]	[ʔalbaab]
/ʔalbat ^s aarijah/	The battery	[ʔalbat ^s aarijah]				

Table (7) displays data that show the definite article /al/ when it is followed by coronal or noncoronal sounds. This is in line with the analysis put forward by Kenstowicz (1994). However, in the THD, the sound /l/ is transformed to /m/ in the sun and moon /al/ when it is followed by any sound without exception. Changing /l/ into /m/ is not only specific to the people of Tihamah but it also features in the dialect of the tribe of Hashid to the north of Sana'a.

5.1.3 /t/ cases

Let us consider the following data in (9):

(9)

Table 8. Assimilation of /t/ to coronals

ʔant daari	ʔan daari	you know
ʔant θaani	ʔan θaani	you are different
ʔant ðaahib	ʔan ðaahib	are you going
ʔant ðaalim	ʔan ðaalim	you are unfair

Based on our YA informants, we can introduce a phonological rule, namely: the /t/ gets deleted when preceded by /n/ and followed by /d/, /θ/, /ð/. This is explained in the following examples:

5.2 Asymmetrical assimilation types

Asymmetrical assimilation is a phonological process where the dialects differ from one to another with regards to assimilation. In symmetrical assimilation, all the informants of the four dialects have made unanimous production of assimilation. However, in asymmetrical assimilation, some dialect informants assimilate while others do not. The asymmetrical assimilation can be divided into (i) place assimilation, (ii) voicing assimilation, and (iii) emphasis assimilation. The three types are discussed in terms of coronals (C) and non-coronals (NC).

5.2.1 Place Assimilation

5.2.1.1 non-coronal & coronals (NC&C)

According to our informants, nasal and non-nasal bilabials and labiodentals non-coronals do not assimilate to coronals neither progressively nor regressively in SD, TD, HD, and THD as shown in (10) below:

(10)	SD:	/guum naam/	[guum naam]	'go sleep'
	TD:	/quum naam/	[quum naam]	'go sleep'
	HD:	/Guum naam/	[Guum naam]	'go sleep'
	THD:	/q ^k uum naahi/	[q ^k uum naam]	'go sleep'
	SD:	/nawm naagis ^s /	[nawm naagis ^s]	'incomplete sleep'
	TD:	/nawm naaqis ^s /	[nawm naaqis ^s]	'incomplete sleep'
	HD:	/nawm naaGis ^s /	[nawm naaGis ^s]	'incomplete sleep'
	THD:	/nawm naagkis ^s /	[nawm naagkis ^s]	'incomplete sleep'
		/ʔanaam tamaam/	[ʔanaam tamaam]	'I sleep well'
		/kalaam saliim/	[kalaam saliim]	'prefect speech'
		/sajf naadir/	[sajf naadir]	'precious sword'
		/ʕaḏaab daajim/	[ʕaḏaab daajim]	'lasting torture'

Similarly, dorsal voiceless velar is not targeted by coronals for place assimilation in all YDs as shown in (11) below:

(11)	/samak daijrak/	[samak taijrak]	'king fish'
	/bank tidʒaari/	[baŋ ^k tidʒaari]	'commercial bank'
	/rabbak daari/	[rabbak daari]	'your lord knows'

5.2.1.2 non-coronals & non-coronals (NC & NC)

Place assimilation occurs when the two adjacent consonants are both non-coronals in TD and in THD. However, it does not occur in HD but in SD, a vowel epenthesis occurs across word boundaries as demonstrated by (12) below:

(12)	SD:	/ħaq ʕaalib/	[ħagi ʕaalib]	'belongs to Ghalib'
	TD:	/ħaq ʕaalib/	[ħaʕ ʕaalib]	'belongs to Ghalib'
	HD:	/ħaq ʕaalib/	[ħaG ʕaalib]	'belongs to Ghalib'
	THD:	/ħaq ʕaalib/	[ħaʕ ʕaalib]	'belongs to Ghalib'

The data in (13) show that a vowel is inserted between /q/ and /ʕ/ in SD. The vowel epenthesis prevents the two sounds to assimilate. In TD and THD, however, a complete assimilation takes place where /q/ is changed to /ʕ/. There is no assimilation in HD as the /q/ is pronounced as a uvular /G/. Similarly, /ʕ/ does not assimilate to the voiceless velar according to the production of all the four dialect informants as explained by (13):

(13)	/balliʕ kamaal/	[balliʕ kamaal]	'inform Kamal'
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However, some informants of THD and HD have changed /ɸ/ to /q/ as in the following example:

/balliɸ kamaal/	[balliq kamaal]	'inform Kamal'
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The /n/ does not assimilate to /b/ in TD and THD dialects if the /n/ sound is preceded by a consonant; however, if /n/ is preceded by a vowel, it assimilates to /b/ (cf 16). In SD, a vowel is inserted between the two stop sounds. In HD, /n/ assimilates with /b/, when a vowel is inserted before /n/ as illustrated by (14) below:

(14)	SD:	/samn baladi/	[samni baladi]	'local ghee'
	TD:	/samn baladi/	[samn baladi]	'local ghee'
	HD:	/samn baladi/	[samim baladi]	'local ghee'
	THD:	/samn baladi/	[samn baladi]	'local ghee'

2.3.1.3 coronals & non-coronals (C & NC)

Coronal nasal /n/ assimilates in place to a following labial, labiodental velar stop (oral or nasal), or to a uvular /q/, as shown in (15) below. This has been produced by all dialect informants.

(15)	/fein baba/	[feim baba]	'where's dad?'
	/men faaris/	[mem faaris]	'from Faris'
	/man kallamak/	[maŋkallamak]	'who talked to you?'
	/min qabl/	[miŋ qabl]	'from before'

Although /n/ assimilates with the uvular /q/, it does not assimilate with the pharyngeals /h/ or /ʕ/ due to the fact that the pharyngeals cannot be nasalized. This is shown in (16) below:

(16)	/samn haali/	[samn haali]	'good ghee'	
	HD:	/samn haali/	[samin haali]	'good ghee'

The /ʕ/ is not part of the THD inventory. It is replaced by the glottal stop /ʔ/ as demonstrated by (17) below:

(17)	/ʔamn ʕadan/	[ʔamn ʕadan]	'Aden security'	
	HD:	/ʔamn ʕadan/	[ʔamin ʕadan]	'Aden security'
	THD:	/ʔamn ʕadan/	[ʔamn ʔadan]	'Aden security'

Coronal plosives /t, d, tʰ, dʰ/ do not assimilate in place to a following labial by all dialect informants as shown in (18):

(18)	SD:	/ʃaahid bilhaq/	[ʃaahid pilhaq]	'witnessed truly'
	TD:	/ʃaahid bilhaq/	[ʃaahid bilhaq]	'witnessed truly'
	HD:	/ʃaahid bilhaq/	[ʃaahid bilhaG]	'witnessed truly'
	THD:	/ʃaahid bilhaq/	[ʃaahid bimhaq ^k]	'witnessed truly'

However, the /d/ sound assimilates to /b/ in SD and TD as seen in (19) below:

(19)	SD	/maʕaad biʃ/	[maʕaab biʃ]	'there is no'
	SD	/maʕaad baagi/	[maʕaab baagi]	'what's left?'
	TD	/maw ʕad baaqi/	[maw ʕab baaqi]	'what's left?'

The coronal plosives /t, d, tʰ, dʰ/ do not assimilate in place to a following labial nasal, as seen in (20) below:

(20)	SD.	/saarat malikah/	'Malikah went'
	TD.	/saḥabat maljoon/	'withdraw a million'
		/mafāt bisurʕah/	'passed by quickly'

Coronal plosives /t, d, tʰ, dʰ/ do not assimilate in place to a following non-coronal fricative, as illustrated in (21) below:

(21)	/bint faahimah/	[bint faahimeh]	'understanding girl'
	/χat ^{tʰ} aat ^{tʰ} fannaan/	[χat ^{tʰ} aat ^{tʰ} fannaan]	'creative calligrapher'
	/balad fawḏaa/	[balad fawḏ ^ʕ aa]	'chaotic country'
	/maraḏ fil qalb/	[maraḏ ^ʕ fil galb]	'chaotic country'
	/bint χaali/	[bint χaali]	'my cousin'
	/ʔant ɸariib/	[ʔant ɸariib]	'you are strange'

When coronal fricatives are followed by non-coronals, they are not considered for place assimilation, as shown in (22) below:

(22)	/θalaaθ banaat/	[θalaaθ banaat]	'three girls'
	/naas kaθiir/	[naas kaθiir]	'a lot of people'

Finally, non-nasal coronal sonorants /l, r/ do not assimilate to a following non-coronal, as shown in (23) below:

(23)	/sail kabiir/	[sail kabiir]	‘big torrent’
	/ʔallajl bard/	[ʔallajl pard]	‘night is cold’
	/faar kabiir/	[faar kabiir]	‘big mouse’
	/saar baʕiid/	[saar bʕiid]	‘went far away’

5.2.1.4 coronals & coronals (C & C)

Coronal sounds will be considered from three different passive articulators: interdental, alveolar, and palatoalveolar. When two juxtaposed coronal sounds do not share a sonorancy feature, no assimilation occurs. However, when the juxtaposed coronals share sonorancy, minor place assimilation occurs. This process triggers voicing and emphasis assimilations, making the two coronals identical. This total assimilation has five exceptions:

- (i) non-nasal sonorants /l/ and /r/ do not assimilate to the nasal /n/,
- (ii) the /r/ does not assimilate to /l/, and
- (iii) the strident coronals /s, z, ʃ, ʒ, ʒ/ do not assimilate to nonstrident coronals /t, tʰ, d, dʰ, θ, ð/.
- (iv) within stridents, palatoalveolars /ʃ, ʒ/ do not assimilate to alveolars /s, sʰ, z/.
- (v) within palatoalveolar stridents, the affricate /dʒ/ does not assimilate to the fricative /ʃ/.

These phonological facts will be explained below. Examples in (24) below show that when two coronals disagree on sonorancy, no assimilation takes place. This applies to the four dialects:

(24)	/harr ʃadiid/	[harr ʃadiid]	‘very hot’
	/bard ʃadiid/	[bard ʃadiid]	‘very cold’
	/samn dʒabali/	[samn dʒabali]	‘mountain's ghee’
HD:	/samn dʒabali/	[samin dʒabali]	‘mountain's ghee’
	/burdʒ naadir/	[burdʒ naadir]	‘rare tower’
	/χair daaʔim/	[χair daaʔim]	‘constant good’
	/walad laʔiim/	[walad laʔiim]	‘sneaky boy’

In (25), we can notice that when the adjacent coronals share sonorancy, place assimilation occurs, making the two coronals identical. Voiced alveolar plosive is in complete assimilation when followed by the voiced dental fricative as has been observed in the four dialects:

(25)	/ʕasʕiid ɖurah/	[ʕasʕiid ɖurah]	‘hominy’
	/bisbaas zuʕajtiri/	[bisbaaz zuʕajtir]	‘Zuiateri pepper’
	/bas zantʕ/	[baz zantʕ]	‘stop showing off’
	/buz sallah/	[bus sallah]	‘pick up a basket’
	/ʔant daari/	[ʔand daari]	‘you know’
	/ʔaθaaθ ɖahabi/	[ʔaθaaθ ɖahabi]	‘golden furniture’

Within sonorants, nonnasals trigger total assimilation of the nasal /n/, but not vice versa, as shown in (26). This occurs in all dialects except for SD. However, the process also involves the opposite where nasals trigger assimilation in non-nasals as observed below:

(26)	/ʕinwaan raʔiisi/	[ʕinwaar raʔiisi]	‘main address’
	/ʔaddiin lillah/	[ʔaddʕiil lillah]	‘religion is to Allah’
	/χasʕr naaħil/	[χasʕri naaħil]	‘slim waist’
	/χasʕr naaħil/	[χasʕri naaħil]	‘slim waist’
	/sʕamiil naadir/	[sʕamiin naadir]	‘rare birch’

Within non-nasal sonorants, /l/ assimilates to /r/, but not vice versa, as shown in (27) below:

(27)	SD:	/qaal ruuħ/	[qaar ruuħ]	‘he said "go"’
	TD:	/qaal ruuħ/	[qaar ruuħ]	‘he said "go"’
	HD:	/qaal ruuħ/	[Gaar ruuħ]	‘he said "go"’
	THD:	/qaal ruuħ/	[q ^k aar ruuħ]	‘he said "go"’
		/fukr lillaah/	[fukr lillaah]	‘Thanks to Allah’

Within non-sonorants, the non-stridents /θ/ and /ð/ do not assimilate to the stridents /tʃ/, /ʃ/, /s/, /z/ and /sʃ/ in all the four dialects. Similarly, stridents /ʃ/, /s/, /z/ and /sʃ/ do not assimilate to non-stridents /θ/ and /ð/ as illustrated in (28) below:

(28)	/hadaθ tʃaariʔ/	[hadaθ tʃaariʔ]	‘casual incident’
	/haadiθ ʃaniiʃ/	[haadiθ ʃaniiʃ]	‘horrible accident’
	/θaaliθ ʃaaariʃ/	[θaaliθ ʃaaariʃ]	‘third street’
	/ʔaχað zeit/	[ʔaχað zeit]	‘He took oil’
	/ʔaχað ʃurbah/	[ʔaχað ʃurbah]	‘He took oil’
	/ʔaθθaθ sʃaaloon/	[ʔaθθaθ sʃaaloon]	‘He furnished a saloon’
	/ʔalʔaθaaθ saliim/	[ʔalʔaθaaθ saliim]	‘The furniture is sound’
	/θaaliθ zijaarah/	[θaaliθ zijaarah]	‘third visit’
	/liif θaani/	[liif θaani]	‘why different’
	/masʃsʃasʃ θaani/	[masʃsʃasʃ θaani]	‘another straw’
	/haaris θaabit/	[haaris θaabit]	‘permanent guard’
	/bazz θalaaθah/	[bazz θalaaθah]	‘he picked up three’

Within postalveolar stridents, the fricative /ʃ/ assimilates completely to the affricate /dʒ/, and vice versa in both SD and HD, but not in TD and THD as the latter two dialects lose /dʒ/ in their phonemic inventory as demonstrated in (29) below:

(29)	SD:	/maabiʃ dʒanbijah/	[maabidʒ dʒanbi]	‘there is no ganbiah’
	HD:	/maafiʃ dʒamal/	[maafidʒ dʒamal]	‘there is no camel’

However, we have observed that the above process is not applicable to TD and THD as the affricate /dʒ/ is not part of the phonemic system in these two dialects as shown in the following examples:

	TD & THD:	/mahalloof ganbi/	[mahalloof ganbi]	‘He is not beside me’
	TD & THD:	/maʔindanaaf gamal/	[maʔindanaaf gamal]	‘there is no camel’

Within non-stridents, the alveolar /t/ assimilates to the dental /θ/ in all the four dialects as illustrated in (30) below:

(30)	SD:	/saarat θela/	[saaraθ θela]	‘She went to Thela’
	TD:	/maatat θaloθ/	[maataθ θaloθ]	‘She died three years ago’
	HD:	/raaħat θaani marrah/	[raaħaθ θaani marrah]	‘she went another time’
	THD:	/bukt θula/	[bukθ θula]	‘I went to Thula’

However, the alveolar /s/, /z/ and the pharyngealized alveolar /sʃ/ do not assimilate to the dental /θ/ as shown in (31) below:

(31)	SD:	/qaas θawbuh/	[qaas θawbeh]	‘he measured his thobe’
	TD:	/qaas θawbuh/	[qaas θawbuh]	‘he measured his thobe’
	HD:	/qaas θawbuh/	[Gaas θawbuh]	‘he measured his thobe’
	THD:	/qaas θawbuh/	[q ^k aas θawbuh]	‘another shirt’
		/mawz θaani/	[mawz θaani]	‘different bananas’
		/qamiisʃ θaani/	[qamiisʃ θaani]	‘another shirt’

Within stridents, alveolars assimilate to postalveolars, and vice versa. This has featured in all the four dialects. It is worthwhile to note that in TD and THD, the /dʒ/ is not a segment in the phonemic system of these two dialects. However, in SD, a vowel is inserted between the emphatic /sʃ/ and /dʒ/ which blocks the assimilation as illustrated in (32) below:

(32)		/ʔams ʃuftuh/	[ʔamʃ ʃufteh]	‘saw him yesterday’
		/nusʃ dʒumlah/	[nusʃi dʒumleh]	‘half a sentence’
	SD:	/maabiʃ sandawif/	[maabis sandawif]	‘no sandwich’
	TD:	/maafiʃ sandawif/	[maafiʃ ʃandawif]	‘no sandwich’
	HD:	/maafiʃ sandawif/	[maafis sandawif]	‘no sandwich’
	THD:	/maafiʃ sandawif/	[maafis sandawif]	‘no sandwich’
	:	/ʃilaadʒ ʃaamil/	[ʃilaaf ʃaamil]	‘complete treatment’

We have also observed that within non-strident obstruents, all segments are triggers and targets of total assimilation (place, voice, and emphasis) in all the four dialects except for HD as shown in (33) below. In SD, the /d/ is usually

devoiced and produced as /t/, while in TD and THD, regressive assimilation occurs in all nonstrident obstruents as demonstrated below:

(33)	/ʔakalat θawm/	[ʔakalaθ θawm]	‘ate garlic’
	/waahid θamari/	[waahið θammari]	‘one from Thamar’
SD:	/ʔaxað dawrah/	[ʔaxat tawreh]	‘took a session’
TD:	/ʔaxað dawrah/	[ʔaxað dawrah]	‘took a session’
	/ʔaxað dawrah/	[ʔaxað dawrah]	‘took a session’
	/ʕard ðaʕiif/	[ʕarðð ðaʕiif]	‘weak show’
	/χatθ θaani/	[χaθ θaani]	‘another line’

Data produced by our informants have shown that the alveolar /t/ and /d/ assimilate to the pharyngealized /ðʕ/ but not the vice versa as shown in (34) below:

(34)	/ħarakaat ðʕahirah/	[ħarakaaððʕ ahirah]	‘clear movements’
	/balad ðʕulm/	[balaððʕ ulm]	‘country of injustice’
	/malaað daaʔim/	[malaað taaʔim]	‘permanent shelter’
	/ħaðʕ daaʔim/	[ħaðʕ daaʔim]	‘permanent luck’

5.2.2 Voicing Assimilation

5.2.2.1 non-coronal and coronals (NC & C)

Labials and dorsals are not targeted by coronals for voicing assimilation in all dialects.

5.2.2.3 non-coronals & non-coronals (NC & NC)

When two juxtaposed non-coronal sounds are different only in voicing, they are not considered for voicing assimilation. However, when they are different in any other features, voicing assimilation is allowed. The non-application of voicing assimilation is illustrated by examples from SD and HD. In SD, a vowel epenthesis blocks voicing assimilation; in HD, /q/ is pronounced as a heavy lenis /G/, which blocks assimilation to /k/. Voicing assimilation is shown in TD & THD as shown in (35) below:

(35)	SD:	/ħaq kamaal/	[ħagi kamaal]	‘belongs to Kamal’
	TD:	/ħaq kamaal/	[ħak kamaal]	‘belongs to Kamal’
	HD:	/ħaq kamaal/	[ħaG kamaal]	‘belongs to Kamal’
	THD:	/ħaq kamaal/	[ħak kamaal]	‘belongs to Kamal’
		/nusaχ ʕariibah/	[nusaʕ ʕariibah]	‘strange copies’

The /χ/ undergoes regressive assimilation and becomes voiced /ʕ/ as a result of the influence of the adjacent voiced /ʕ/ in all the four dialects.

5.2.2.3 coronals & non-coronals (C & NC)

Based on the production of our informants, voice assimilation between coronals and non-coronals does not occur in the four dialects.

5.2.3 Emphasis Assimilation

5.2.3.1 non-coronal and coronals (NC & C)

By emphasis we mean the sounds that are pharyngeals or pharyngealized. The pharyngeals are /χ/ and /ʕ/ and the pharyngealized sounds are /sʕ, tʕ, ðʕ, ð̣/. Labials and dorsals are not considered by coronals for emphatic assimilation in all the four Yemeni dialects under investigation as illustrated by (36) below:

(36)	/baab sʕaʕiir/	[baab sʕaʕiir]	‘a small door’
	/baab sʕaʕiir/	[baab zaʕiir]	‘a small door’
	/baab sʕaʕiir/	[baab sʕaʕiir]	‘a small door’
	/baab sʕaʕiir/	[baab sʕaʕiir]	‘a small door’
SD:	/ħaq tʕaarik/	[ħagi tʕaarik]	‘belongs to Tarek’
TD:	/ħaq tʕaarik/	[ħaq taarik]	‘belongs to Tarek’
HD:	/ħaq tʕaarik/	[ħaG tʕaarik]	‘belongs to Tarek’
THD:	/ħaq tʕaarik/	[ħaq ^k tʕaarik]	‘belongs to Tarek’

In TD, we have observed that the sound /sʕ/ in words like /sʕaʕiir/ is pronounced as /z/ [zaʕiir] by uneducated informants of this dialect. However, educated informants of TD pronounce /sʕ/ as it is pronounced in standard Arabic. We have also observed that in TD, our uneducated informants produce /tʕ/ as a depharyngealized [t]. However, their educated

counterparts pronounce /tʰ/ as similar to the other three dialects SD, HD, and THD as shown in the above examples.

5.2.3.2 non-coronal and non-coronals (NC & NC)

The bilabial /b/ neither assimilates to pharyngeals nor to pharyngealized sounds. In SD, a vowel is inserted across word boundaries, which prevents the occurrence of any assimilation as illustrated in (37) below:

(37)	SD:	/qalb ʁaaif/	[qalb ʁaaif]	‘frightened heart’
	TD:	/qalb ʁaaif/	[qalb ʁaaif]	‘frightened heart’
	HD:	/qalb ʁaaif/	[Galb ʁaaif]	‘frightened heart’
	THD:	/qalb ʁaaif/	[q ^k alb ʁaaif]	‘frightened heart’

5.2.3.2 coronals & coronals (C & C)

We can claim that coronals are in complete assimilation with the pharyngealized coronals and the vice versa in all the four dialects as shown in (38):

(38)	/walad δ ^ʕ aʕiif/	[walaδ ^ʕ δ ^ʕ aʕiif]	‘weak boy’
	/walad s ^ʕ aʕriir/	[wala s ^ʕ s ^ʕ aʕriir]	‘little boy’
	/fus ^ʕ zumurrud/	[fuz zumurrud]	‘emerald stone’
	/qamiis ^ʕ zaaʔid/	[qamiiz zaaʔid]	‘extra shirt’
	/kaas s ^ʕ aliit ^ʕ /	[kaas ^ʕ s ^ʕ aliit ^ʕ]	‘cup of sesame oil’
	/ʔant t ^ʕ ajjib/	[ʔant ^ʕ t ^ʕ ajjib]	‘you're kind’
	/ʕarδ ^ʕ δahabi/	[ʕarδ ^ʕ δahabi]	‘golden show’
	/walad ɗaabiħ/	[walaδ ^ʕ δ ^ʕ aabiħ]	‘bored boy’

6. Conclusion

Based on the production of our four dialect informants, we can conclude the following observations:

(i) Symmetrical phonological process: our conclusion includes the following:

- 1) Assimilation involving the articulators are more common than the assimilation involving voicing and emphasis.
- 2) /n/ becomes velar [ŋ] when it is followed by velar or uvular stops.
- 3) /n/ becomes interdental [ɲ] when it is followed by dental sounds.
- 4) /n/ loses its voicelessness when it is followed by voiceless sounds.
- 5) /n/ changes the place of articulation when it is followed by /θ, ʃ, tʃ/.
- 6) /n/ is dentalized when it is followed by /θ/, postalveolarized when it is followed by /ʃ/, labiodentalized when it is followed by /f/. In all these cases, the state of the glottis is changed and /n/ becomes devoiced.
- 7) /n/ assimilates when it is followed by the pharyngealized /δ^ʕ/.
- 8) When the definite article (al) is followed by coronal sounds, it is always in complete assimilation. The /l/ is dropped and the next consonant is geminated.
- 9) In Sabir mountain, the /l/ is in complete assimilation when it is followed by coronal or noncoronals, except for the palatal /j/.
- 10) /t/ gets deleted when preceded by /n/ and followed by /d/, /θ/, /δ/.

(ii) Asymmetrical phonological process: our conclusion includes the following:

- 1) Nasal and non-nasal bilabials and labiodentals non-coronals are not considered for place assimilation neither progressively nor regressively to non-coronals in the four Yemeni dialects under investigation.
- 2) Dorsal voiceless velar is not targeted by coronals for place assimilation in the four dialects.
- 3) Place assimilation occurs when the two adjacent consonants are both non-coronals in TD and in THD. However, it does not occur in HD, while in SD, a vowel epenthesis occurs across word boundaries.
- 4) /n/ does not assimilate to /b/ in TD and THD dialects when /n/ is preceded by a consonant. However, when /n/ is preceded by a vowel, it assimilates to /b/. In SD, a vowel is inserted between the two stop sounds. In HD, /n/ assimilates with /b/, since a vowel is inserted before /n/.
- 5) Although /n/ assimilates with the uvular /q/, it does not assimilate with the pharyngeals /ħ/ or /ʕ/ because the pharyngeals cannot be nasalized.
- 6) Coronal plosives /t, d, t^ʕ, d^ʕ/ do not assimilate in place to a following labial in the four dialects.
- 7) In SD and TD, /d/ assimilates to /b/.
- 8) Coronal plosives /t, d, t^ʕ, and d^ʕ/ do not assimilate in place to a following labial nasal.
- 9) Coronal plosives /t, d, t^ʕ, d^ʕ/ do not assimilate in place to a following non-coronal fricative.
- 10) When coronal fricatives are followed by non-coronal fricatives, they do not enjoy place assimilation.
- 11) Non-nasal coronal sonorants /l, r/ do not assimilate to a following non-coronal.
- 12) Non-nasal sonorants /l/ and /r/ do not assimilate to the nasal /n/.
- 13) /r/ does not assimilate to /l/ in all the four dialects.

- 14) When strident coronals /s, z, ʃ, ʒ, dʒ/ are followed by non-strident coronals /t, tʰ, d, dʰ, θ, ð/, they do not assimilate.
- 15) Within stridents, palatoalveolars /ʃ, ʒ/ do not assimilate to alveolars /s, sʰ, z./
- 16) Within palatoalveolar stridents, the affricate /dʒ/ does not assimilate to the fricative /ʃ./
- 17) When the adjacent coronals share sonorancy, place assimilation occurs, making the two coronals identical. Voiced alveolar plosive is in complete assimilation when followed by the voiced dental fricative in all the four dialects.
- 18) Within sonorants, non-nasals trigger total assimilation of the nasal /n/, but not vice versa. This occurs in all the four dialects except for SD. However, the process also involves the opposite where nasals trigger assimilation in non-nasals.
- 19) Within non-nasal sonorants, /l/ assimilates to /r/, but not vice versa.
- 20) Within non-sonorants, the non-stridents /θ/ and /ð/ do not assimilate to the stridents /tʰ/, /ʃ/ /s/, /z/ and /sʰ/ in all the four dialects. Also, stridents /ʃ/, /s/, /z/ and /sʰ/ do not assimilate to non-stridents /θ/ and /ð/.
- 21) Within postalveolar stridents, the fricative /ʃ/ assimilates completely to the affricate /dʒ/, and vice versa in both SD and HD.
- 22) Within non-stridents, the alveolar /t/ assimilates to the dental /θ/ in the four dialects. However, the alveolar /s/, /z/ and the pharyngealized alveolar /sʰ/ do not assimilate to dental /θ/.
- 23) Within stridents, alveolars assimilate to postalveolars, and vice versa in all the four dialects.
- 24) Within non-strident obstruents, all segments are triggers and targets of total assimilation (place, voice, and emphasis) in all the four dialects except for HD. In SD, however, /d/ is usually devoiced and produced as /t/, while in TD and in THD, regressive assimilation occurs in all non-strident obstruents.
- 25) When alveolar /t/ and /d/ are followed by the pharyngealized /ðʰ/, they assimilate but not vice versa.
- 26) Labials and dorsals are not targeted by coronals for voicing assimilation in all dialects.
- 27) If two juxtaposed non-coronal sounds are different only in voicing, they are not considered for voicing assimilation.
- 28) /ɣ/ undergoes regressive assimilation and becomes voiced /ʁ/ as a result of the influence of the adjacent voiced /ʁ/ in all dialects and by all informants. Voice assimilation between a coronal and a non-coronal does not occur in the four dialects.
- 29) Labials and dorsals are not considered by coronals for emphatic assimilation in all the four dialects.
- 30) The coronal /d/ assimilates completely to the pharyngealized dental /ðʰ/ in all the four dialects.
- 31) Coronals are in complete assimilation with the pharyngealized coronals. The /d/ undergoes regressive assimilation with the pharyngealized /sʰ/ in all the four dialects.
- 32) Emphasis assimilation only occurs between a coronal and a non-coronal when place assimilation also occurs.
- 33) Nasals are more likely targets than stops. However, stops are more targets than non-nasal sonorants and fricatives.
- 34) Coronals are better targets than non-coronals.
- 35) Stops are more likely triggers than nasals. However, nasals are more likely triggers than fricatives.
- 36) Labials are better place triggers than velars. However, velars are more likely triggers than coronals. In terms of the position of target, coronals are usually in assimilation to non-coronals.
- 37) As for the target manner, nasal sonorants are better targets than non-nasal sonorants.
- 38) Stridents are less likely targets than nonstridents. However, affricates are less likely targets than fricatives. Palatoalveolars are less likely targets than the alveolars.
- 39) As for trigger manner, nasal sonorants are less likely triggers than non-nasal sonorants.
- 40) Non-stridents are less likely triggers than stridents.
- 41) Fricatives are less likely triggers than affricates.
- 42) As for the trigger place, alveolars are more likely triggers than palatoalveolars.

Acknowledgements

I would like to thank Professor Hussein Abdul-Raof of Leeds University, United Kingdom, for his critical comments, assistance and proofreading during the earlier drafts of this paper.

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