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Affrication in Ha'ili Arabic: A Rule-Based Approach

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Abstract

The current work tackled two phonemes, /k/ and /g/, examining the phonological operations in charge of their allophonic variation in Ha'ili Arabic. The study found out that the phoneme /k/ has two allophones: [k] and the dental voiceless affricate [ts]. The latter occurs when preceded or followed by either [a] or [i], whilst the former shows up elsewhere. However, the latter generalisation falls out when the resulting allophone violates the Obligatory Contour Principle (OCP) which impinges on the occurrence of the allophone affricate [ts] when clustered with sounds with same place features. Similarly, the study argued that the phone /g/ has two surface forms whose occurrence is predictable: [g] and the voiced dental affricate [dz]. The latter shows up when preceded or followed by the front high vowel [i], whereas the former occurs elsewhere. Additionally, the study worked out how affrication feeds vowel lowering in HA.

Keywords: Affrication, Ha'ili arabic, Obligatory contour principle, Rules feeding

1. Introduction

Phonological processes occupy a distinctive place in modern phonological theory (Katamba 1989, Pitt 1998, and Brady & Shankweiler 2013). Since Chomsky and Halle's (1968) *Sound Patterns of English*, (SPE), phonological processes have been treated as incontrovertible evidence for the existence of underlying phonological representations. Empirically-backed indications as well as theoretically-grounded perspectives have argued for the non-arbitrariness of occurrence of such phonological processes whose applications are, to a large extent, rule-governed (Carr & Montreuil 2013). For instance, substitution, as a phonological process, has been regarded an indication to differentiate between phonemes, underlying representations, on one hand and their concomitant allophones, surface representations, on the other (cf. Edwards 1992 and Engel de Abreu & Gathercole 2012). By the same token, these phonological processes have made available a comprehensive account of how phonetic, morphological and even lexical elements are incorporated in unison to create the environment for a given phonological process (Davenport & Hannahs 2010:136). As a result, motivated by their over-arching role in delineating phonological operations, various studies have cross-linguistically investigated phonological processes, including assimilation, affrication, de-palatalization, asalization, etc. By and large, these studies have attempted to figure out the phonological factors, triggering the application of a given phonological process (e.g., Ohala 1990, Cohn 1990). Moreover, no virtual access to fathoming how outputs are possibly derived from inputs is attainable without making recourse to the phonological processes, which, in turn, introduce an elegant framework for the underlying relation between a given input and its possible outputs (Ferguson 1978 and Benua 2000).

Against this background, the current research investigates one of these phonological processes, namely affrication in Ha'ili Arabic (hereafter, HA).[1] It looks particularly at two phonemes /k/ and /g/, examining their allophonic variation related.[2] As compared to other dialects of Arabic, Najdi Arabic (hereafter, NA) of which HA is a part shows an interesting allophonic variation of the two phonemes, /k/ and /g, which are, under certain circumstances, substituted by two allophones [ts] and [dz], respectively. Such allophones are not exhibited by other Arabic dialects (Prochazka 1988 and Ingham 1994).[3] Thus, the main objective of the current research is to work out the phonological factors which pertain to the allophonic variation of these two phonemes (/k/ and /g/). Additionally, it aims to determine whether these factors are phonetically, morphologically or lexically conditioned. To this end, linear-based rules are utilized.

The following discussion is structured as follows. In Section (2), the significance of the study is touched upon, assuming that no study has addressed the two phonemes, /k/ and /g/ in HA.

[1] Ha'il city serves as the capital city of the Ha'il Province, with a population of approximately 597,144 (census 2010) (GeoHive, 2015). It is located in the northern central part of the Najd region, the Kingdom of Saudi Arabia.
[2] Allophones are defined as variants of one another which are fully predicable from the phonological context. (Kager 1999:27)
[3] According to Miller *et al*, (2007), local people are attempting to retain these phonemes /k/ and /g/ in the places where they are substituted by their accompanying allophones. They add that the main cause for such a trend is mainly augmented by the increasing urbanisation and education where such a substitution is less tolerated.

Section (3) provides a general background on affrication. Section (4) addresses the affrication of the voiceless velar stop /k/, whereas Section (5) tackles the affrication of the voiced velar stop /g/. Both sections (4) and (5) prove that affrication process in HA is systematic and subject to certain rules whose effects and interactions end up with the surface realizations. The conclusion is included in Section (6).

2. Significance of the Study

As a native speaker of HA, I have observed that this dialect utilizes many sounds which are not found in other neighbouring Arabic dialects. One of the intriguing phenomena this dialect is known for is the use of dental affricates. Although these affricates have been investigated by various studies including Johnstone (1963) and Ingham (1994), no study worked out the actual phonological operations determining their production. In addition, these few studies addressed the affrication within the general approach of NA. Nonetheless, HA has received less attention and scrutiny despite the fact that NA is a fair mixture of interrelated dialects many of which single out unique phonological phenomena not necessarily utilized by all NA dialects (cf. Ingham 1994 and Alessa 2008). Hence, this research adds to literature, shedding light on the phonological process of affrication in HA in particular. In this connection, it should be mentioned that some studies addressed affrication within the socio-linguistic approaches, indicating that the use of affricates is ruled by some social factors including social class and educational level (cf. Bahloul 2007, and Al-Rojaie 2013).

3. Affrication

According to Shriberg & Kwiatkowski (1980), affrication can be taken as the use of an affricate to replace a fricative, stop, etc. Affrication results in decreasing (in case of fricative →affricate; i.e., *fortition*) or increasing (in case of stop→ affricate i.e., *lenition*) the duration of a given consonant.[4] Additionally, affrication has been cross-linguistically examined, e.g. in Italian (Cardinaletti 1993), German (Kortlandt 1996) and Russian (Petrushin, & Makarova, V. 2006), *inter alia*. All of these studies have been motivated by the importance of affrication as a phonological process which enhances our understanding to the phonological components of the grammar in particular and the Universal Grammar (UG) in general.

4. Affrication of the Voiceless Velar Stop /k/

Before examining the factors behind the affrication of the voiceless velar stop /k/, let us first consider the allophonic relation between the phoneme /k/ and its two allophones [k] and [ts]. At first glimpse, such sounds might be separate phonemes or even potential allophones for other phonemes. In order to carry out this conclusive investigation, the notion whether these sounds stand for a complementary or contrastive distribution must be called for. In all surveyed data, no minimal pair was spotted in which the alternation of [k] and [ts] might yield (any) changes in meaning. For example, the two words: [mi**ts**a:n] and [mika:n] mean the same thing: *place*.

Regarding the underlying representation for these two allophones, it is /k/ rather than /ts/.

[4] For more data on affricates, cf. Ladefoged & Disner (2012).

Such an assumption is backed by the fact that the former shows up in more environments than the latter (as will be discussed below). In addition, the occurrence of the allophone [ts] is predictable via a specific rule limiting its occurrences. Besides, what does away with the assumption that the underlying representation is /ts/ is the asymmetric relation between [k] and [ts]: when [ts] is replaced by [k], the resulting word is definitely acceptable. However, when [k] is replaced by [ts] (in cases where [ts] is not tolerated), the resulting word is rendered unacceptable (as can be seen in 1):

(1)

ħatsi→haki (speech)

ʃakil → *ʃatsil (shape)

In conclusion, we suggest that [k] and [ts] are allophones of a single phoneme /k/. This relation is best schematically represented in the following figure.

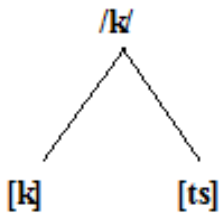


Figure 1. The allophonic variation of the phoneme /k/ in HA

Having figured out the allophonic variation of the phoneme /k/ in HA, let us consider the phonological environment in which [ts] occurs. Since this allophone shows up in all positions: word-initially, word medially, and word finally (as shown in Table (1) below), the dichotomy of syllable-initially and syllable-finally is adopted. Since Arabic resists in general consonant clusters (Kiparsky 2003 and Davis & Ragheb 2014,), it follows that the vowel quality and quantity might be the key factors in charge of this allophonic variation.[5] Table (1) presents words with the allophone [ts].

Table 1. The occurrence [ts] in different places[6]

	Position	Word	Meaning
1.	Syllable-initially	**ts**a.bad	liver
2.		bi.**ts**a	cried
3.		mi.**ts**a:n	a place
4.		ħa.**ts**i	speech
5.		ra:.**ts**id	stable

[5] The possibility that this allophonic variation can be ascribed to supra-syllabic environments will be investigated as well.
[6] Dots inside words stand for syllables boundaries.

6.	Syllable-finally	ʔi**ts**.ðaʔ	thus
7.		ʕi**ts**	rough
8.		ʃir.i**ts**	tree root
9.		ʃi.ri:**ts**	partner
10.		miʃ.ba**ts**	a paper clip

As can be clear from the data in Table (1), the vowel quantity has no bearing on the allophonic variation of the phoneme /k/ as [ts] can occur in an onset of a syllable with a long vowel like [mi.**ts**a:n] or a short vowel like [bi.tsa]. The same observation is held when it shows up in a coda of a light syllable (like [ʕits]) or heavy syllable (like [ʃi.ri:ts]). The latter observation shows that the position of [ts] in a given syllable either in the onset or in the coda has no relevance to its distribution in conjunction with another allophone [k] which occurs exactly in all of these environments as indicated in Table (2).

Table 2. The occurrence [k] in different places

	Position	Word	Meaning
1.	Syllable-initially	**k**u.sˁam	cut into pieces
2.		**k**ir.si	Chair
3.		ʔib.ru.**k**ah	Blessing
4.		ka:s	a glass
5.		Kuff	a glove
6.	Syllable-finally	ma.la**k**	King
7.		mab.ru:**k**	congratulations!
8.		ʔi**k**.waj.jis	Good
9.		ʃi**k**.ma:n	an exhaust
10.		Da**kk**	smashed. Past

Consequently, we can end up with an initial generalization that neither the vowel quantity nor the position inside a given syllable is on their own responsible for the allophonic variation of the phoneme /k/. Furthermore, no relation to the make-up of the whole word can be drawn to this variation since both allophones can occur in words with different syllable structures (LL, HH, LHL, etc.). Thus, let us probe into the relation of the vowel quality with this variation. Depending on all data, it is clearly observed that /ts/ occurs much in the onset of the syllables with front vowels [a] and [i] (as can be seen in 2):

(2)
a- /k**a**bad/ →[tsa.bad] ‘liver’
b- /b**i**ka/ → [bi.tsa] ‘cried’
c- /mik**a:**n/ →[mitsa:n] ‘a place’

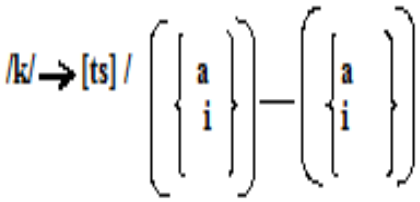
d- /ħak**i**/ → [hatsi] ‘speech’

This allophonic variation also occurs when /k/ in a coda position is preceded by these sounds:

(3)
a- /ʃir**i**k/→[ʃirits] ‘Tree root’
b- /ʃir**i:**k/ →[ʃiri:ts] ‘Partner’
c- /miʃb**a**ts/→ [miʃbats] ‘A paper clip’

Thus, this allophonic variation can be expressed by the following rule:[7]

(4)



The rule in (4) is read as follows: the phoneme /k/ becomes [ts] when it is preceded or followed by either [a] or [i]. So, [k] can be used elsewhere. This observation goes in line with the findings of the studies working out NA. For instance, both Ingham (1994) and Prochazka (1988) maintain such conclusions on the main varieties of NA. However, this is not the whole story. Two remarks are in order. Firstly, there are many exceptions which have to be dealt with. Secondly, all loan words resist this rule. In other words, /k/ becomes [k] in all loan words even if the above environment is met. Let’s first look at the first observation. Consider the following data; [k] shows up with the environment where [ts] has to be used instead, nevertheless.

(5)
a- /ku.sˤam/→[ku.sˤam] but *[tsu.sˤam] ‘cut into pieces’
b- /kir.si/→[kir.si] but *[tsir.si] ‘a chair’
c- /ka:s/→[ka:s] but *[tsa:s] ‘a glass’
d- /ʔik.way.yis/ → [ʔik.way.yis] *but* *[ʔits.way.yis] ‘good’
e- /tit.kal.lam/ →[tit.kal.lam] but *[tit.tsal.lam] ‘speak.2nd person singular’
f- /ʔik.taab/ → [ʔik.taab] but *[ʔik.taab] ‘a book’
g- /mik.ni.sah/→[mik.ni.sah] but *[mits.ni.sah] ‘a vacuum cleaner’

In all of the surveyed exceptional cases, it seems that such a diversion from the general rule in (4) can be accounted for. The non-application of the rule even if the suitable environment is met is mainly caused by the ‘Obligatory Contour Principle’ (OCP). Indeed, the rule in (4) is banned from application as the adjacent consonants share place features with the allophone [ts]. According to Kenstowicz (1994), the OCP is defined as follows in (6):

[7] Due to the huge bulk of features involved in the rule, segments are used instead.

(6) *Obligatory Contour Principle*: Adjacent identical tones are banned from the lexical representation of a morpheme' (1994:323)

Although OCP in (6) is actually attached to the investigation of tones and tone patterns, its application can be extended to account for non-occurrences of adjacent consonants in the lexical representation of a given word.[8] In all of the words maintaining the environment of the rule (4) but with the use of [k] in lieu of [ts], a sound with place feature with the allophone [ts] can be detected. This prohibition is observed in cases where the given word contains either [s] or [t] which are actually the main material for the dental affricate [ts] Consider the ungrammatical words in figure 2 where the rule is followed.

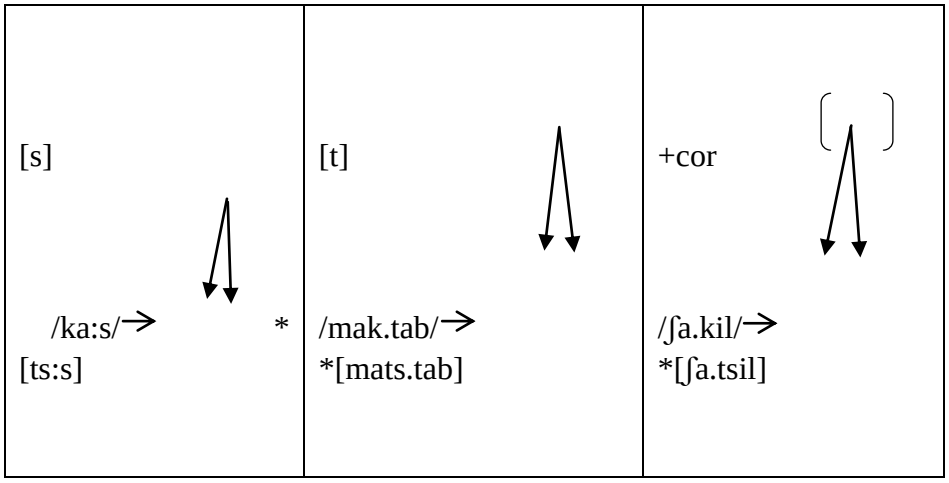


Figure 2. The effect of the OCP

As is seen, the effect of the OCP is supra-syllabic. To render /k/ into [ts], it should be available any segment with the same place features of the allophone [ts] either within the syllable containing the underlying phoneme /k/ or in the preceding or the following syllables.[9]

What supports the erminat of the allophone [ts] not to co-occur with segments of similar place features is the ban on its ermination. It is observed that in cases where the rule in (4) is met but with a geminate /k/ underlyingly, it is impossible to use the allophone [ts]. Consider the following examples:

(7)
a- /ruk.kaab/→[ruk.kaab] *[ruts.tsaab] 'passengers'
b- /sak.ka:n/→[sak.ka:n] *[sats.tsa:n] 'inhabitants/residents'
c- /ʃakk/→ [ʃakk] *[ʃatsts] 'doubt'
d- /fakkak→[fakkak] *[fatstsats] 'deciphered'

Using the allophone [k] in such cases is hard-evidence that the underlying form is /k/ rather than /ts/. The notion that the examples in *a, b,* and *c* can be better analysed with reference to

[8] The effect of OCP has been widely investigated in world languages; for example McCarthy (1986) and Meyers (1997).
[9] It appears that what determines the domain where [ts] cannot occur with other segments with same place feature is the foot not the whole word. However, I will not pursue this issue further.

the OCP is somehow debatable. What supports this assumption is the erminat of certain words without ermination. For instance, the word /ra:kib/ becomes [ra:**ts**ab] but ruk.kaab/→[ruk.kaab] not [ruts.tsaab] although both words have approximately the same environment except the latter shows up with the back vowel [u] instead of the long front [a:]. Having been aware of the notion that this vowel shift might trigger the block of the rule in (4), we did not find a single example of the whole data where the geminate /k/ can be substituted with geminate [ts].

With regard to the loan words (whose origin is not Arabic), no word has been found where /k/ can be replaced with [ts] even in cases where the general rule in 3.1.d is met.

(8)
a- /mi.ki:.nah/→ [mi.ki:.nah] but *[mi.tsi:.nah] 'a machine'
b- /ʔikreek/→[ʔikreek] but *[ʔitsreek] 'a shovel'
c- /ʔib.lak/→[ʔib.lak] but *[ʔib.lats] 'bricks'
d- /kam.moon/→ [kam.moon] but *[tsam.moon] 'cumin'
e- /ka.nab/→ [ka.nab] but *[tsa.nab] 'sofas'

All loanwords above satisfy the appropriate environment in (4) to use the allophone [ts]. However, no word obeys the rule.[10] This observation backs the assumptions that loan phonology should not be all time regarded as natural phonology (cf. Jacobs & Gussenhoven 2000, Smith 2006, Calabrese & Wetzels 2009).

A further issue to tackle before winding up this section is the notion of vowel change occurring when [ts] is used in unstressed syllables. The vowel following the allophone [ts] can be changed. This change is totally governed by certain conditions. Consider the following examples:

(9)
a- /ra:k**i**b/ →[ra:ts**a**b] 'rider'
b- /ra:.k**i**d/→[ra:.ts**a**d] 'stable (adj)'
c- /du :.n**i**k/→ [du :.n**a**ts] 'take ! (said for women)'
d- /ba:.k**i**r/→ [ba:.ts**a**r] 'tomorrow'

As is shown in all examples above, the phoneme /k/ is substituted with the dental affricate [ts]. However, what seems unusual with such examples is the vowel change in the second syllable. The vowel changes from [i] to [a] (from high to low) where [ts] is used. This vowel lowering is invoked when the affrication occurs in unstressed syllables. The second restriction against vowel lowering is that the unstressed syllable must be closed. Put differently, it should not be coda-less. For example, the word /ħa.ki/ becomes [ħa.tsi] without vowel lowering because the unstressed syllable is open. The third restriction on the vowel lowering is that [ts] must occur in the onset position not in the coda. For example, the word /ʃir.ik/ becomes [ʃir.its] without any vowel lowering of that of the second syllable since the affrication targets the coda rather than the onset. Thus, the environment of the vowel

[10] It is beyond the scope of the current research to work out in detail the reasons why loan words do not consider the rule in (4).

lowering in case of affrication must subsume the following conditions in (10):

(10)

1-Unstressed syllable
2-Closed syllable
3-Affrication occurs in the onset position

This environment of vowel lowering can be clearly expressed on the following rule:

(11)

$$[i] \rightarrow [a] / \underset{[-stress]}{[ts]\ \_\_C_1}$$

By the same token, lowering is invoked by the difference in sonority between the consonants forming the syllable.[11] The sonority of the first consonant is changed when /k/ becomes [ts], bearing in mind that voiceless affricates like [ts] are more sonorant than voiceless stops. The evidence that change of sonority can be the reason for this vowel lowering is that when [k] is used instead of [ts] in the careful conversation, no vowel lowering can be triggered.

Thus, we can conclude that the affrication of the phoneme /k/ feeds the application of the vowel lowering. This derivational analysis can be schematically illustrated in the figure (3):[12]

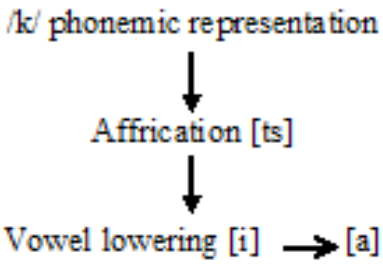


Figure 3. The derivational analysis of both affrication and vowel lowering in HA

5. Affrication of the voiced velar stop /g/

In HA, the phoneme /g/ has two different allophones: [g] and [dz]. The notion whether these sounds stand for a complementary or contrastive distribution is also addressed. Again, in all of the surveyed data, no minimal pair was found where the alternation of [g] and [dz] can render a given word different in meaning. Consider the examples in (12) where each set of two words have the same meaning:

(12)

a. [wa.ʃi:g] and [wa.ʃi:dz]: dried meat

[11] There is much literature on sonority scale in world languages, most notably Parker (2008).
[12] It should be stressed that proper nouns seem to resist affrication in HA. However, this generalization needs further study to attest (see, Kashani, *et al*., 2007 and Jarrah, *et al*. 2013, for studies addressing some issues related to proper nouns in Arabic).

b. [sa.li:g] and [sa.li:dz]: Rice pudding
c. [fa.ri:g] and [fa.ri:dz]: Team
d. [ma.xa:li:g] and [ma.xa:li:dz]: Humans; people
e. [ga.li:b] and [dza.li:b]: a water well

Additionally, concerning the underlying representation for these two allophones, the representation should be /g/ rather than /dz/. There is a lot of evidence supporting this conclusion. Most importantly, the existence of [dz] is predictable (as will be seen below) via a specific rule determining the phonological environment where it can show up. What is important to mention at this point is that [dz] can appear syllable-initially and syllable-finally as clearly shown in Table (3) below:

Table 3. The occurrence [dz] in different positions

	Position	Word	Meaning
1.	Syllable-initially	θa.**dz**i:l	Heavy
2.		ra.**dz**i:b	surgeon (military rank)
3.		**dz**idir	Pot
4.		**dz**id.da:m	in front of
5.		**dz**ib.lah	Direction
6.	Syllable-finally	ʔib.ri:**dz**	Jug
7.		ma.xa:li:**dz**	humans; people
8.		ʕil**dz**	Stuck
9.		sa.li:**dz**	rice pudding
10.		mi**dz**.bil	Coming

As is shown in Table (3), the vowel quantity does not contribute to the allophonic variation of the phoneme /g/ as [dz]. It shows up in onset position of a syllable with a long vowel like [ra.**dz**i:b] or a short vowel like [**dz**ib.lah]. The same observation is extended when it occurs in the coda position of a light or heavy syllable like [mi**dz**.bil] and [ma.xa:li:**dz**], respectively. All of these observations are held also in cases with [g] (Table (4).

Table (4). The occurrences [g] in different places

	Position	**Word**	**Meaning**
1.	Syllable-initially	**g**a.mul	lice
2.		**g**u.mar	moon
3.		**g**a:.ri	reader
4.		ʔiʕ.**g**al	kind of Arabic clothing
5.		ʃi.**g**al	hinder.past
6.	Syllable-finally	ma.ra**g**	soup
7.		ʃar**g**	east
8.		ʃa.ra**g**	stuck in throat

9.		ma**g**.bu:l	accepted (adj)
10.		ma**g**.roosˤ	bitten (adj)

Relying on all of the data surveyed, it is evident that /dz/ occurs in the onset position of the syllables with the front high vowel [i] (as can be seen in 13):

(13)

a- /θa.gi:l/→ [θa.dzi:l] 'Heavy'
b- /ra.gi:b/ → [ra.dzi:b] 'Surgeon (rank)'
c- /gidir/→ [dzidir] 'a pot'

This allophonic variation also occurs when /g/ in a coda position is preceded by this front high vowel:

(14)

a- / ma.xa:li:g/→[ma.xa:li:dz] 'Tree root'
b- / ʕilg / → [ʕildz] 'stuck'
c- / sa.li:g /→ [sa.li:dz] 'Rice pudding'

Thus, this allophonic variation can be expressed by the following rule:[13]

(15)

/g/ → [dz] / ([i]) ___ ([i])

The rule in (15) is read as follows: the phoneme /g/ becomes [dz] when it is preceded or followed by [i]. So, [g] can be used elsewhere. In comparison with the rule in 3.1.d (of the phoneme /k/), no exceptions (pertaining for OCP) has been spotted throughout the whole data surveyed. This high consideration to the rule can be ascribed to the fact that the environment of the rule of /g/ is more restricted than that of /k/, reducing the number of words involved. Additionally, lowering vowel is triggered by the affrication of the phoneme /g/. Consider the data in (16):

(16)

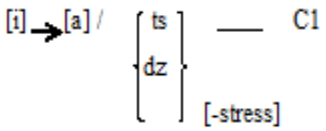
a. /sˤa:.dig/→[sˤa:.dz**a**g] 'Faithful'
b. /ʕa:gid/→ [ʕa:**dz**ad] 'Heavy & strong'

As is clearly shown in all examples above, the phoneme /g/ is substituted with the dental affricate [dz]. As a result, the vowel changes from [i] to [a]. This vowel lowering is actually governed by the same rules discussed with the affrication of the phoneme /k/. Firstly, the affrication must occur in unstressed syllables. For instance, the phoneme /g/ in the word /gidir/ is affricated ([gidzir]), but no vowel change is involved as the affrication occurs in a stressed syllable. Secondly, the given syllable must not be open. For example, the word /ba:gi/ becomes [ba:dzi] without vowel lowering because the syllable where affrication occurs is codaless. Thirdly, [dz] must occur in the onset position. For example the word /ʕa:ʃig/ becomes [ʕa:ʃidz] without any vowel lowering of that of the second syllable since the affrication shows up in the coda rather than in the onset. Hence, the environment of vowel

[13] Due to the huge bulk of features involved in the rule, segments are used instead.

lowering can be generalized (since phonology is mainly set for ehavior ation, Davenport & Hannahs (2010) as follows:

(17)



Similarly, the difference in sonority can be taken as the underlying reason for vowel lowering. Voiced affricates like [dz] are more sonorant than voiced stops like /g/ (Parker 2008). Thus, we can conclude that the affrication of the phoneme /g/ feeds the application of the vowel lowering.

Before winding up the whole discussion, it should be noted that both phonemes /k/ and /g/ share many properties with respect to their phonological ehavior. Both phonemes have two allophones whose occurrence is predicted in similar phonological environments. In addition, they show the same ehavior regarding vowel lowering.

6. Conclusion

This study investigated affrication in HA. Both phonemes /k/ and /g/ were examined in terms of their allophonic variation. The phoneme /k/ has two allophones whose occurrence is predictable. These phonemes are: the dental voiceless affricate [ts] which occurs when preceded or followed by either [a] or [i] and [k] which occurs elsewhere. In addition, the study showed how the OCP affects the occurrence of the affricate [ts] from blocking it to co-occur with sounds with same place features even if the general rule of /k/ affrication is met. Similarly, the study argued that the phoneme /g/ has two surface forms whose occurrence is predictable as well. These phonemes are [dz] which shows up when preceded or followed by the front high vowel [i] and [g] which occurs elsewhere. Additionally, the study argued that the affrication of the phonemes /k/ and /g/ feeds the application of the vowel lowering. Establishing a relation between affrication and other phonological operations including vowel lowering, the OCP, vowel quality, the current research is best taken as a start of a more comprehensive analysis of phonological processes in HA and other Arabic dialects within the main tenets of the recent phonological theory, the optimality theory (Prince and Smolensky, 1993, McCarthy and Prince, 1993a, b).

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