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Nasals and Nasality in Saraiki

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Abstract

The article starts with the introduction to the basic terms and phonetic correlates of nasalization. The second part is about the level of nasality in segments of Saraiki. Part three is a discussion about nasalization in Saraiki in which various phonotactics of Saraiki to manipulate the co-occurrence of nasalization with voicing & implosives have been explained. Part four is about the nature of word-medial nasals and the final part presents the analysis of the relation between contextual and independent nasalization. The article ends with the summary of the discussion in part 6.

1. Introduction & Background

Nasals are segments specified as such according to their manner of articulation. If the air passes through the nasal cavity while a segment is uttered, such a segment will be called nasal. Nasality is the quality of nasal segments. It is the quality of being nasal or nasalized.

Nasalization is a process in which segments spread and/or receive nasality. Ladefoged & Maddieson (1996) have defined the two terms in the following words:

(1)

"Only when a lowered velum is combined with a forward oral occlusion are members of the class of consonants we call nasals produced. Accompanying any other articulation a lowered velum produces a nasalized sound." (p.135)

The term 'nasalization' is used to mean 'spread of nasality'. Independent, Contextual and Syntactic Nasalization are various types of Nasalization. Independent Nasalization is a term used with different meanings. (The term 'Spontaneous Nasalization' is also used as synonym of Independent Nasalization (Botma 2004:287)). Grierson (1922) used the term 'Spontaneous Nasalization' for the nasal vowels which perform phonemic function i.e. which make minimal pairs with oral vowels. The following pair illustrates Independent/Spontaneous Nasalization:

(2)

a. [cha:] 'butter milk'
b. [cha͂:] 'shade'

In (2b), the vowel is nasalized. But the origin of nasalization is not apparent on the surface. Grierson (1922) calls it 'Spontaneous Nasalization.' Bahri (1963, 1962), Varma (1936) and Shackle (1976), use the term 'Independent Nasalization' for it. Simply, it is a term used for nasalization found in nasal vowels.

Contextual Nasalization is a kind of spread of nasality which is triggered by some nasality-bearer. The nasality-bearer in the context is normally a segment having nasality as its inherent property. As result of such spreading, oral segment(s) become(s) the target of nasality although nasality is not their inherent property. Such nasalization is called Contextual Nasalization as it only emerges out of context. The following example illustrates it better.

(3)

a. [pa] ‘insert’

b. Pa:+ υʌɳ > [pã:ῦ̃ʌ̃ɳ] ‘insertion’

In (b) above, neither semivowel nor vowels have nasality as inherent property. They are oral segments. But due to [ɳ] (See appendix A for chart of Saraiki phonemes and symbols.), all the segments except [p] become nasalized. Thus nasalization of the vowels in the above case is contextual. Various terms have been used in literature for contextual nasalization like nasal spreading, anticipatory and carry-over nasalization, dependent nasalization, mechanical nasalization and phonetic nasalization etc. Contextual Nasalization normally does not change the meanings of words but the Independent Nasalization does as illustrated in the examples in (2) above.

The nasality-bearer spreads nasality towards the edges of the word. This spread of nasality may be forwards or backwards or bidirectional. Backward spread of nasality is called Regressive Nasalization and forward spread is called ‘Progressive Nasalization.’

As regards the nature of spread of nasality, it may be segmental, syllabic and/or morphemic. Sometimes the spreading of nasality is blocked by some segments. The segments which get nasalized under the influence of spreading are called the ‘target’ of nasality and those which don’t nasalize are called ‘unaffected’ or ‘neutral’. The ‘unaffected’ segments are of two types; those which allow nasality to spread (skip over) are called ‘transparent’ and those which don’t allow nasality to spread or skip over them are called ‘opaque’.

The behaviour of the segments to nasalization is language-specific. Possibly, a segment may be transparent to nasalization in one language and opaque in the other. However, the behaviour of the segments is determined on the basis of their articulation and sonority. The following is the scale of compatibility of segments with nasality/nasalization.

(4)

From minimum to maximum compatibility

Obstruents → Liquids → Glides → Vowels

Obstruent stops are the most resistant and vowels are the most compatible to nasality. This is a relative scale of nasality. It means if a class of segments in a language is transparent for nasalization, then all groups of phonemes more compatible with nasalization must be transparent in the language (Walker 2000). Similarly, "if a segment blocks nasalization, all segments less compatible by the nasalization hierarchy will also block nasal spreading" (ibid:32).

In phrases or continuous speech, sometimes nasality spreads from one word to the other. Such nasalization is called 'Syntactic Nasalization**.'** Among these various types, Contextual Nasalization is the most common phenomenon cross-linguistically.

The following are the perceptual correlates of nasal/nasalized vowels. It is not necessary that all of the following correlates appear on the spectrogram of a nasalized vowel. The study of nasalization on spectrogram is considered to be a complicated exercise because all of the correlates of nasalization are not commonly apparent on the spectrogram. Thus just some of the following correlates are enough to verify nasalization in a vowel.

1. The formants of the nasal/nasalized vowels are comparatively lower than their oral counterparts (Johnson 2003:165, Ladefoged 2003:137, Pickett 1999:70-72)
2. The bandwidth of the formants of the nasal/nasalized vowels increases due to nasalization (Johnson 2003:165, Ladefoged 2003:137)
3. The formants of oral vowels are comparatively clearer than nasal/nasalized vowels (Johnson 2003:165).
4. The F_1 of the nasalized/nasal vowels 'tends to disappear' or be fainter than that of the oral vowels (Ladefoged 2003:135-6)
5. Extra energy is noticed on the spectrogram of nasalized/nasal vowels (Ladefoged 2003:137) which sometimes distorts the formants.
6. Most of the modifications of nasalization are seen in the F_1 region (Haywood 2000:162).
7. "Sharp dip in the spectrum of nasalized vowels" is another indication of nasalization (Haywood 2000:162).

8. Besides oral formants (F_{1o}), more than one formants (anti-formants (A_1) and nasal formants (F_{n1})) are seen on the spectrograms of the nasal/nasalized vowels (Johnson 2003:164).

2. Levels of Nasality in Saraiki

We can study a nasal segment from two angles; first, how much nasality it carries and second, to what degree it is receptive to nasality. We shall discuss nasality in consonants and vowels from these angles respectively.

2.1. Vowels

In Saraiki, [i, a, u] are easy targets for nasality. It is observed on the basis of acoustic analysis of nasalized vowels that [a] is most receptive and the biggest carrier of nasality among all vowels in Saraiki and schwa on the other hand, is resistant and unaffected by nasality. The following example shows the opacity of schwa.

(5)

kʌ̃m	'work'
kʌ̃m+a > [kəma]	'earn'

The case of [o] is a little different. It is transparent to regressive nasalization. But in progressive nasalization where other vowels become nasalized, it does not. Examples are given below:

(6)

a. si:nũ: 'headcushion'
b. ka:nã: 'reed'
c. ɓʌnĩ: 'ridge'
d. a:no 'bring'

The reason for such incompatible behaviour of vowels is the way they are uttered. Airflow, tongue position (Botma 2004:2 , Cohn 1990) and velic opening (Botma 2004:287, Walker & Pullum 1999) determine the level of nasality in a vowel. High vowels involve more pressure in nasal cavity (Clark, & Mackiewicz-Krassowska 1977) and low vowels involve more velic

opening. So normally both the high and low vowels are more nasalized than mid vowels[1]. Various studies found that high vowels require far less velum opening for acoustic reflection of nasal coupling than the low vowels to acoustically reflect the equivalent amount of nasality (Hajek & Maeda 2000:60).

Besides velum, tongue is another important organ which plays a significant role in the utterance of nasal vowels. The raised position of the tongue gives less margin to the velum to create a nasal opening, while the lowered position of the tongue provides more space to the velum for opening. That is why lower vowels have more nasalization (Hajek & Maeda 2000:57) and this is the reason for the low vowel [a] carrying maximum nasality in Saraiki. Thus we conclude that Quantum[2] vowels (u:, i:, a) are more liable to nasalization in Saraiki. It means that receptivity to nasalization and vowel length are proportional to each other. Cross-linguistic studies (Hajek & Maeda 2000:57) particularly those on Indo-Aryan languages (for example Prasad 2008:136) also confirm the proportional relation between vowel length (duration) and nasalization. This is further reinforced by the fact that in Saraiki, while the long vowels receive maximum nasality and short (mid) vowels receive lesser amount of nasality, the shortest of the vowels i.e. schwa never nasalizes. Stress is also opaque to nasalization in Saraiki.

The behaviour of Saraiki vowels in terms of nasalization is quite compatible with the standard trends in other languages of the world. Quantum vowels [i:, u:, a] are considered most nasalized crosslinguistically (Ladefoged & Maddieson 1996:298, 2001:18) and the vowels like [i,o,ə] are not as easy targets of nasalization (Piggott 2003, Capo 1983) as other vowels are. The opacity of stress is also verified in other languages like Guarani (Lunt 1973:132) and Brazilian Portuguese (Wetzels 1997) etc.

2.2. Consonants

Within the class of nasal consonants, there is a difference of level of nasality. To determine the scale of nasality in the nasal consonants of Saraiki, we measured the amount of nasality

[1] However, some cross-linguistic studies have also shown results contradictory to this claim (Hajek & Maeda 2000).
[2] A term adopted from Roca & Johnson (1999:129)

transferred to a preceding vowel by nasals. For this purpose, we recorded and analysed 25 tokens of five words of CV_1NV_2 structure with [ʌ] in V_1 place while we changed the N (nasal consonant) putting all nasals [m,n, ɲ, ŋ, ɳ] one by one in the word (See Appendix B for list of words.)

On the basis of the level of nasality in V_1, we found how much nasality a particular nasal spreads. The nasality of the vowel was determined on the basis of the study of F2. One of the acoustic expressions of nasality is that the F2 of a vowel lowers in the case of nasalization (Ladefoged 2003:137, Pickett 1999:70-72). So, the height of the F2 is in inverse proportion to the level of nasalization. We noted the frequency of the F2 of the same vowel [ʌ] preceding various nasals. The ANOVA verified the significance and reliability of the data. As per finding, the following is the scale of nasality in Saraiki based on the amount of nasality transferred by the nasal consonants to the preceding vowel:

(7)

From minimum to maximum

m → ɲ → n → ŋ → ɳ

This means [m] spreads the minimum amount of nasality to the adjacent vowel and [ɳ] spreads maximum nasality. In the first four nasals we see a harmonious pattern with reference to the place of articulation. The nasality increases as the point of articulation moves closer to the opening of the nasal cavity. However, retroflex seems incompatible to this pattern by spreading more nasality than velar nasal [ŋ] which is rather closer to the opening of the nasal cavity. The behaviour of [ɳ] in this regards is distinctive. This distinctive behaviour of [ɳ] is due to manner of articulation. All the other nasal phonemes given in (7) are stops [ɳ] is retroflex. Thus we conclude that the manner of articulation plays a major role in increasing the nasality of the retroflex. If the manner of articulation is similar among segments (as in the case of first four segments in the scale in (7)), the distance of the point of articulation to the opening of nasal cavity determines the level of nasality. In that case, the segment with a point of articulation closer to the opening of nasal cavity carries more nasality.

3. Behaviour of Nasals in Saraiki

In Saraiki, nasalization plays a very important role. Eight of its ten vowels have oral/nasal contrast at phonemic level. Besides causing oral/nasal contrast at phonemic and morphemic level, nasalization also spreads in the context originating from a nasal phoneme. In such cases nasalization becomes a secondary articulation spreading backwards and (sometimes) forwards. We have gone through the phonological inventories of 31 Indo-Aryan languages described in Cardona & Jain (2007) and found that Saraiki is one of those rare languages of the family which has the maximum number of nasal phonemes.

Retroflexion is an important feature in the Indo-Aryan family of languages. In Saraiki there are retroflex consonants which have oral/nasal contrast. [ɳ] and [ɳ^{h}] are nasal counterparts of [ʈ] and [ʈ^{h}]. [ɳ] has got special status among the nasals. It is voiced retroflex nasal which occurs in both aspirated (breathy voiced) and un-aspirated forms. With vowels and with voiced retroflex phonemes nasalization creates minimal pairs. In Saraiki, oral retroflex [ʈ, ʈ^{h}] and nasal retroflex [ɳ, ɳ^{h}] are similar in all respects except the oral/nasal contrast. This results in the formation of a minimal pair as illustrated below:

(8)

[ʌ̃ɳ]	'prefix for antonyms'
[ʌʈ]	'cover'
[ʋa:ʈ^{h}a:]	'young ox'
[ʋa:ɳ^{h}ã:]	'plough'

3.1. Voicing and Nasality in Saraiki

In Saraiki, nasals normally precede voiced segments because voiced stops show a 'discontinuity, lowering of amplitude during disclosure and termination into a sudden burst' (Ohala and Ohala 1991). All these physiological gestures are compatible with nasal leakage. But they are not compatible with a voiceless segment. Thus the examples of occurrence of nasal with voiceless segments are less frequent cross-linguistically (Peng 2000:78). However,

nasals followed by voiceless consonants are found in Hindi/Urdu languages which are the languages of the same family as Saraiki. This means that the distribution of nasal followed by voiceless consonants is language specific. Saraiki manages to denasalize segments in such a context, as illustrated in the following examples[3]:

(9)

Urdu/Hindi	Saraiki	Meaning
[ãkh]	[ʌkh]	'eye'
[pʌ̃kha]	[pʌkha]	'fan'
[sãp]	[sʌp]	'snake'
[ũ̟c]	[uc]	'height'
[sãc]	[sʌc]	'truth'

The above examples are words of the same origin. Urdu and Hindi accept a nasal followed by a voiceless consonant which is apparent from the set of words in first column. Saraiki normally avoids such combinations, so a process of denasalization occurred in the words in column 2 above.[4]

Interestingly, Saraiki also has a tendency to nasalize the oral phonemes. Sometimes Saraiki uses another phonotactic to manipulate such situations. It nasalizes oral vowels and adds voicing in the segments to satisfy the constraint against co-occurrence of voiceless segments and nasality. The tendency of co-occurrence of nasalization and voicing in Saraiki is also apparent from the treatment of loanwords in Saraiki. Saraiki uses nasalization as a phonotactic to indigenize loanwords. Many English, Hindi, Arabic and Persian words have been adopted by Saraiki with an additional nasalization which does not exist in these words

[3] Most of the Indian linguists claim that the origin of almost all Indo-Aryan languages is Sanskrit. But many researchers (Mehr 1967, Dil 1969 etc) disagree to this idea. They use the term 'Proto-Indo-Aryan' for the language which gave birth to most of the languages of the Subcontinent.

[4] Another important difference in this set of data is that whereas Urdu/Hindi uses long vowels, Saraiki is inclined to use short vowels in monosyllabic words. This is because long vowels are universally more compatible with nasalization (see section 2.1)

in the donor languages. Along with nasalization, voicing is also sometimes added to the adjacent voiceless segments.

3.2. Implosives and Nasals in Saraiki

Saraiki has implosive segments at the point of articulation of stops. These implosives are voiced. We have already determined that nasalization is compatible with voicing. Implosives are not as much resistant to nasality as obstruents are (Clements & Osu 2003:70). Despite all this, nasals don't occur with implosives in Saraiki. Nasals denasalize if an implosive is added to them as a suffix. This is illustrated below:

(10)

a. [kæ̃] 'who'

kæ̃+ɗa > [kæ̃ɗa] 'whose'

b. [mæ̃] 'I'

mæ̃+ ɖa> [mæɖa] 'mine'

c. [ʈæ̃] 'you'

ʈæ̃+ ɖa> [ʈæɖa] 'your'

[ɗa] and [ɖa] which mean 'of' are suffixes. [ɗ] is plosive and [ɖ] implosive. The vowel [æ̃] at the end of the stem is inherently nasal. In (a), the addition of [ɗ] (a voiced plosive) does not have any effect on the nasality of the vowel. But in (b-c), when an implosive is added, the preceding nasal vowel is denasalized. It shows the incompatibility of nasalization with implosives. The idea is further reinforced when we study the dialectal differences in such words.

(11)

Northern Dialect(Jhang District)	Southern Dialect (Muzaffar Garh District)
[mæ̃da]	[mæɖa]
[ʈæ̃da]	[ʈæɖa]

The above data show the dialectal variation between northern and southern varieties of Saraiki. In the northern dialects, these words are uttered with [d] a plosive stop while in southern dialects these are uttered with [ɖ] an implosive stop. In northern variety, word-final nasal vowels in the stem retain nasality after a suffix (plosive stop) is added. But the same nasal vowels in column 2 are denasalized as they are followed by an implosive. This shows the incompatibility of implosives with nasalization.

The reason for this incompatibility of implosives with nasals may be found in the articulation of implosives. As implosives are uttered as a result of 'greater than average amount of lowering of larynx' (Ladefoged & Maddieson 1996:82), the whole process of airstream is reversed from the larynx, while eggressive airstream is required for nasalization (Piggott 1992:40). Physiologically, simultaneous airflow in opposite directions seems unnatural/impossible. Consequently, the nasal vowels adjacent to implosives are denasalized. Perhaps this is why 'nasal implosives' are 'not known to occur in human languages' (Ladefoged & Maddieson 1996: 102).

The phonological inventory of Saraiki shows that it has implosive, plosive and nasals at the same point of articulation. Saraiki has these three types of segments at different points of articulation. Nasals make natural clusters with homorganic plosive voiced stops but not with implosives. Although implosives are voiced as well as homorganic with the nasals, no homorganic nasal+implosive clusters exist in Saraiki at all due to the reasons discussed above.

3.3. Word- medial Nasalization in Saraiki

In Saraiki, word-medial inherently nasalized vowels are normally followed by a stop. Following are examples

(12)

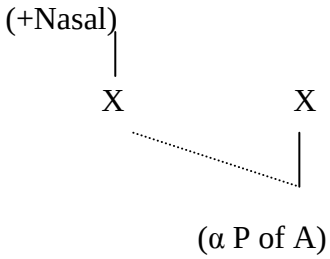
[ʊʌ̃d] ‘division’

[kʌ̃d] ‘back’

According to the traditional point of view the underlying structure of the words of CṼC structure is CVNC and that the surface structure which is CṼC is the result of regressive assimilation occurring in two stages simultaneously, namely the spread of nasality and that of place node. In NC clusters occurring in coda position, N takes its place from the following C. Thus in the CVNC structure, the word-final C spreads the place node to the preceding N which spreads nasality to its preceding vowel because regressive nasalization is mandatory in Saraiki. Saraiki has homorganic nasals with stops in place of articulation. Every stop in the language has a corresponding nasal at the same point of articulation. So it is easier to get NC clusters of the nasals and stops with the same place of articulation. The following figure by Goldsmith reflects such assimilation according to Autosegmental phonology:

(13)

Place Assimilation



(Goldsmith 1990: 285)

(P of A= Place of Articulation)

Thus all the nasalized vowels in such contexts are followed by stops. A question arises whether the nasalization of the vowels in such context is inherent or a result of spreading of the nasal feature. On the basis of the underlying structure, it seems to be a secondary articulation, but surface representation shows that it is an inherent feature of the vowels, as

vowels in such context make minimal pairs on the basis of oral/nasal contrast. On the basis of synchronic surface representation these vowels are considered inherently nasal in Saraiki. Following examples illustrate the phonemic contrast in such cases;

(14)

[gĩɗiː]	'duet'	[giɗiː]	'take'
[sĩɗʰ]	'name of a river/province'	[sĩɗʰ]	'straightness'

4. Contextual and Independent Nasalization

Traditionally, it is considered that Independent Nasalization is the result of N deletion. A nasal in VN context deletes but it leaves its nasality behind to the preceding vowel (Hajek 1997). The process occurs predictably as shown below:

(15)

$$VN \rightarrow \tilde{V}$$

Some linguists (See Hajek 1997) are of the opinion that this process occurs in stages as illustrated below:

(16)

$$VN \rightarrow \tilde{V}N \rightarrow \tilde{V}$$

These are stages of change from Contextual to Independent Nasalization. The first stage is that of Contextual Nasalization. The nasality spreads from N to V in VN context due to phonetic reasons. The process of such Contextual Nasalization is considered 'mechanical' and 'unintended' (Sole 1992). Later on, as a result of historical process, the N disappears but nasality remains on the surface. Thus in a sense Independent Nasalization is the next phase of a historical process the earlier phase of which is Contextual Nasalization as discussed above.

Next is the stage of lexicalization of nasalization. After the origin of nasality i.e. the nasal segment disappears (VN changes into $\tilde{V}$), the nasalization is realised as an independent feature of the language. Now it becomes lexicalized, a process also called 'phonologization'.

The phonologization now gives nasality a distinctive independent status. It becomes a particular feature with its distribution like other features such as voicing or aspiration.

Using the language of Sole (2007:308), when vowel nasalization is dissociated from the conditioning environment (VN), it becomes part of the 'programming instructions' for the vowel. At this stage the nasalization of the vowel becomes intrinsic.

The same diachronic process presumably happened in Saraiki. After the nasalization became part of inventory of the language, (after it was phonologized), it started playing a phonemic as well as morphemic role. The process must have initially triggered in the phonetically conditioned context but later as a result of phonologization, when it had lexicalized, it did not need a particular phonetically conditioned environment. The following list of words reproduced from Bahri (1962) indicates the diachronic process of N-deletion and vowel nasalization in Saraiki[5]:

(17)

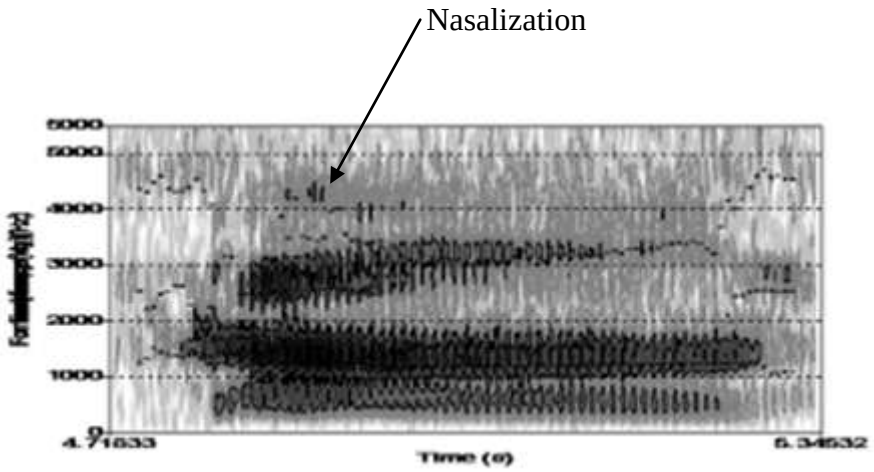
Saraiki words		Sanskritic Forms
[bhõẽ]	'earth'	'bhome'
[mũdh]	'base, trunk'	'bundhna'
[ʊʌ̃d]	'division'	'vʌɳʈaʈi'
[sũgiʈ]	'shrink'	'sʌŋkutaʈi'
[sʌ̃gh]	'throat'	'ʃʌŋkha'
[sʌ̃ĩː]	'master'	'svamin'
[ɗhuː̃]	'smoke'	'dhuma'
[pã]	'itching disease'	'pama'

We find lot of difference between the behaviour of Independent and Contextual Nasalization.

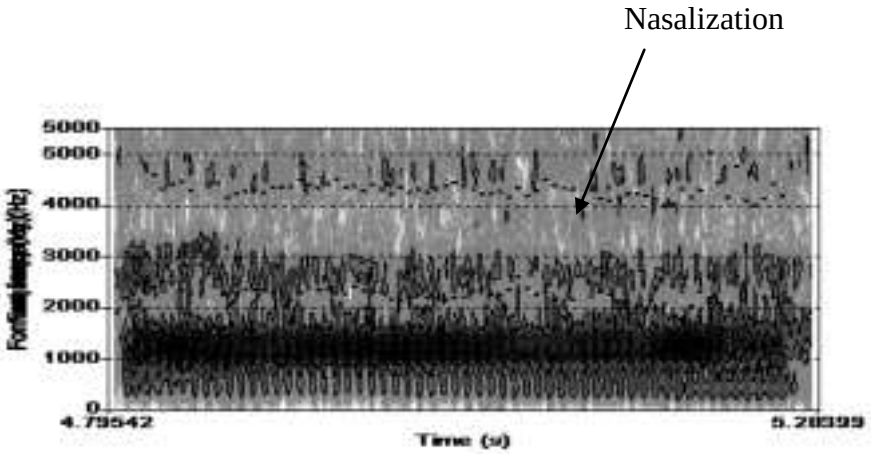
[5] This does not necessarily mean that Saraiki language originated from Sanskrit. It is only an illustration of how Saraiki and Sanskrit treated the vocabulary taken from the Pro-Indo-Aryan language.

Phonologically, the most significant difference between the two is that Contextual Nasalization does not change the meanings of words while Independent Nasalization does. For the purpose of further confirmation of the difference between two types of nasalization, we studied the difference on phonetic level. Thus for comparative analysis of the acoustic properties of the two types of nasalization, we got 40 spectrograms of 8 words (5 spectrograms per word) carrying oral vowels and vowels with Contextual and Independent Nasalization (See list of words in Appendix C). Significant differences between the two types of nasalization were noted in this analysis which substantiated our view about the solid difference between Contextual and Independent nasalization in a word-medial nasalized vowels. The following pair of spectrograms is presented as a specimen.

a. Spectrogram of [ɖãg] 'heavy stick'



b. Spectrogram of [pãn]



A very significant difference between the spectrograms of [pãn] and [ɖãg] is that the nasalization in the vowel in the word [pãn] which is contextual is apparent in the right end of the formant of the vowel in the shape of distortion (pointed out by an arrow). On the other hand, in the formant of the spectrogram of [ã] in the word [ɖãg], the nasalization reflected through lowering of the formant (pointed out by an arrow), seems to start in the beginning of the formant. It shows that nasality in the word [pãn] is spreading backwards (regressive nasalization) from the following adjacent [n]. But in case of [ã] in the word [ɖãg], the nasalization seems an inherent feature of [ã]. According to the prediction of (16-17) above, the underlying structure of the word [ɖãg] is CVNC. If it were only Contextual Nasalization spreading regressively from the following N to the preceding V, there would have been no difference between the spectrograms of the two vowels given above. Hence, the acoustic difference in the two types of vowels gives a clue that the acoustic nature of Contextual Nasalization is different from that of Independent Nasalization and that the nasalization found in the vowel in the word [ɖãg].

When Contextual Nasalization changes into Independent Nasalization, it transforms from a secondary to a primary feature. The difference in spectrograms further supports this and indicates that the acoustic nature of the segments is also changed with the categorical change in the nature of the feature of segments. The following words of Ploch (2003) reinforce our point of view:

(18)

"…as long as the source of a nasalization process, the nasal stop, can be detected (perceptually), the nasalization in the target following nasalized vowel can be weak. However, if the source is undetectable, nasalization in the target is strong." (p.91)

These words have been used to explain Kawasaki's (1986) point of view about nasalization. However, the same is true about regressive nasalization in Saraiki. In the above spectrograms when the source of nasality is known, (the [n] in the word [pan] exists on the surface) the nasality is weak. But in case of [ɖãg] when the apparent source of nasality is not apparent on the surface, the nasality becomes stronger, which is apparent in the spectrograms given above.

Traditionally, it is considered (See Hajek 1997) that inherently nasalized vowels are result of a diachronic process of N-deletion. Vowel lengthening called 'Compensatory Lengthening' (Hajek 1997) is also considered the ultimate result of N-deletion. But we find short inherently nasalized vowels in Saraiki as well as in Urdu and Hindi. In the cases of word-medial position, it is difficult to comment as the nature of structure is controversial. Ohala and Ohala (1991) consider there is an epenthetic nasal in such structures, Goldsmith (1990) calls it placeless nasal licensed by the following obstruent and Piggott (2003) claims that Nasals in such context have their own place and they license the place of the following obstruent. Thus, in word-word medial nasalization, a unanimous point of view may not be developed with reference to the theory of 'N-deletion' and 'Compensatory Lengthening.' But there is absolute unanimity among the linguists about the nature of nasalized vowels word-finally that they are the result of N-deletion and that Compensatory Lengthening is the ultimate result of this process. In the light of this theory, there does not seem to be any sound justification for the presence of short nasal vowels word-finally as given below:

(19)

[pæ̃] 'you are lying'

Why could the word-final nasal vowel not lengthen after N-deletion in such cases? Ohala & Ohala (1991) think that once such vowels were lengthened and later on, they were shortened. They support their view by quoting examples of free variation between such Hindi/Urdu words as:

(20)

[cãɖ] ~ [cɅ̃ɖa]

However, similar examples may not be found in all such cases. There are lots of Saraiki words with short nasal vowels which may not be justified any way. Thus the short nasal vowels in Saraiki are a phenomenon which conflicts with the general prediction of the theory of N-deletion and Compensatory Lengthening.

Another important point is the contrast between nasal consonants and nasal vowels illustrated below:

(23)

a. [c^{h}ã] ‘shade’

b. [c^{h}ãŋ] ‘upper layer of wheat grains’

How can we account for this contrast? If the nasalized vowel in (a) above is the result of N-deletion, why could the nasal consonant in the word in (b) not delete? If the nasal consonant in the end of the word in (b) is the result of later epenthesis (as Ohala and Ohala (1991) claim), why did the same process of N-epenthesis not happen with the word in (a)?

A detailed study of the diachronic process of transformation the nature of nasalization from Contextual to Independent nasalization may provide the answer to these questions. But that is the job of historical linguists. However we can assume that the process of nasalization of vowels must have been triggered by some N which deleted, lengthening the preceding vowel. But after the nasalized vowels became part of phonological inventory, they started behaving as independent segments. They were no longer context dependent.

It is at this stage that nasalization does not remain secondary articulation only. It becomes an independent phonological feature of the language. Its status in the language becomes like voicing or aspiration creating contrast in vowels (short and long). Now 'nasality is viewed as one of the underlying feature of the vowels on a par with [round] or [back]' (Paradis & Prunet 2000:340). It is analogous to the process which predictably triggered the emergence of [ŋ] sound. [ŋ] came into existence as a result of synthesis of [ng] but after it had come into being it started functioning as a separate sound and not merely an orthographic representation of [n+g] sounds. Though it has limited occurrence as compared to the [n] or [g] it *is* an independent member of phonological inventories of languages. Similarly nasality has become an independent feature of the inventory of the languages having oral/nasal contrast providing justification for including the spontaneously/ independently nasalized vowels among the class of nasal phonemes in Saraiki.

Thus we conclude that the diachronic process of N-deletion and Compensatory lengthening does not alone account for or determine the behavior of nasal vowels. It is rather more helpful to determine the overall behavior of nasal segments in Saraiki, taking nasalization as a synchronic feature in the phonological inventory of a language. The acoustic difference between Contextual and Independent Nasalization also supports this idea that although Independent Nasalization is diachronically, a result of the process of Contextual Nasalization, synchronically it has its own independent status. In other words the nasal vowels make part of the phonological inventory of Saraiki language. However, the issue needs further research[6].

5. Summary

In this article we tried to determine the behavior of vowels and consonants of Saraiki towards Nasality. We saw that vowel length is proportional to nasality. Thus long vowels are more receptive to nasality than the short ones. In case of nasal consonants, [m] is the least and [ŋ] is the biggest carrier of nasality. According to our finding, it is the manner of articulation that determines the level of nasality in a phoneme. And retroflex sounds carry more nasality than obstruents. If the manner of articulation is same, then it is place of articulation which determines the level of nasality. In such a case, the closer the point of articulation of the

[6] Also see Ploch (2003).

consonant to the velo-pharyngeal opening, the more nasality it will carry. We also discussed the relations of nasality with voicing and implosives by quoting examples of compatibility of voicing and incompatibility of implosives with nasality. Assimilation is one of the major phonotactics used by Saraiki language to deal with the word-medial nasalization. Finally, we discussed the relation between Contextual and Independent nasalization synchronically and concluded by forwarding a hypothesis about the diachronic process of nasalization in Saraiki.

Appendix A: Consonants of Saraiki

MOA/POA →	Voiced	Aspiration	Glottal	Velar	Palatal	Retroflex	Dental	Labial
Plosive	- - + +	- + - +		k k^h g g^h	c c^h ɟ $ɟ^h$	ʈ $ʈ^h$ ɖ $ɖ^h$	t̪ $t̪^h$ d̪ $d̪^h$	P p^h b b^h
Implsosive	+	-		ɠ	ʄ	ɖ̤		ɓ
Fricative	- +	- -	h	x ɣ	ʃ		s z	f
Nasal		- +		ŋ	ɲ $ɲ^h$	ɳ $ɳ^h$	n n^h	m m^h
Flaps		- +				ɽ $ɽ^h$	r r^h	
Laterals		- +					l l^h	
Semivowels		+ -			j			ʋ ʊ

Appendix B

To compare the levels of nasality of various consonants the following five words were recorded. Each of the following words was recorded five times. In this way 25 tokens were

taken in all.

[ʈʌ̃mã] for [m]

[kʌ̃nã] for [n]

[ʋʌ̃ ɲã] for [ɲ]

[kʌ̃ɳã] for [ɳ]

[cʌ̃ŋã] for [ŋ]

Appendix C

To compare Contextual and Independent Nasalization 40 tokens of the following words (each word five times) were recorded and compared:

[lu:] [lũ:] [lũ:ɳ]

[pa] [pã] [pãʊ̃ãɳ]

[ɖãg] [pãn]

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