Investigating Sonority and Consonant Clusters in Word-Initial Position in Benghazi Arabic Dialect: An Exploratory Study

الجهورية والعناقيد الصامتية في بداية الكلمة في لهجة بنغازي: دراسة استكشافية

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ABSTRACT

This paper studies consonant clusters in word-initial position in Benghazi dialect. The study assumes that initial clusters result from short vowel deletion; a minority of speakers also inserted an initial glottal stop. Clusters were analyzed using the Sonority Sequencing Principle (SSP). The study began with a list of 100 words, and used a questionnaire to select the 53 words most frequently used by Benghazi speakers. The sample of the study consisted of eighteen native speakers of Benghazi dialect. They were asked to read a list of 53 words three times, and the second repetition was transcribed auditorily. The main finding is that the Benghazi dialect permits word-initial consonant clusters mainly as a result of short vowel deletion and, in some cases, glottal stop insertion. With regard to sonority, 56.6% of the clusters show rising sonority and thus follow the SSP, 24.5% show plateau sonority, and 18.9% show falling sonority and hence violate the SSP. This is an exploratory study based on a convenience sample and a limited word list; therefore, the findings should not be generalized to the whole population of Benghazi.

الملخص .

تركز الورقة على العناقيد الصامتية في بداية الكلمة في لهجة بنغازي. وتفترض الدراسة أن العناقيد في بداية الكلمة تظهر في العربية البنغازية نتيجة لحذف الحركات القصيرة، وفي بعض الحالات نتيجة إقحام الهمزة. تم تحليل هذه العناقيد باستخدام مبدأ تتابع الجهورية (SSP). بدأت الدراسة بقائمة من 100 كلمة، واستُخدم استبيان لاختيار 53 كلمة هي الأكثر استعمالًا في لهجة بنغازي. تكونت عيّنة الدراسة من 18 متحدثًا أصليًا للهجة بنغازي. طُلب منهم قراءة هذه الكلمات الثلاث والخمسين

ثلاث مرات، وجرى تفريغ القراءة الثانية صوتيًا بالسماع. وتتمثل النتيجة الرئيسة في أن لهجة بنغازي تسمح بالعناقيد الصامتية في بداية الكلمة نتيجة حذف الحركات القصيرة، وفي بعض الحالات نتيجة إقحام الهمزة. أما من حيث الجهورية، فإن 56.6% من العناقيد الثنائية تُظهر جهورية صاعدة، وهي بذلك تتوافق مع مبدأ تتابع الجهورية. أما 24.5% منها فتُظهر جهورية متساوية (هضبية)، و18.9% تُظهر جهورية هابطة، وهي بذلك تخالف المبدأ نفسه. وتُعدّ هذه الدراسة استكشافية، إذ اعتمدت على عيّنة ميسّرة وقائمة كلمات محدودة. لذلك لا ينبغي تعميم نتائجها على مجتمع بنغازي بأكمله.

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الكلمات المفتاحية: مبدأ تتابع الجهورية (SSP)، العناقيد الصامتية، بداية الكلمة، اللهجة البنغازية

Introduction

A consonant cluster is defined as an arrangement of "adjacent sounds, occurring in constrained pattern at the beginning (onset) or end (coda) of syllables" (Crystal, 2008, p. 81). Catford (1988, as cited in Rahal, 2026, p. 116) defines consonant clusters as "those sequences of consonants that occur initially or finally in syllables." For example, both /pl/ and /nt/ are consonant clusters in the word "plant", because they occur in one and the same syllable without a vowel inserted between them. A consonant ccluster is defined as a string of consonant segments that appear consecutively in one syllable without a vowel between them. For example, /tr/ in "true", /pl/ in "plan", and /str/ in "street" (Yule, 2014). Clusters can occur at the beginning or end of a syllable, such as the beginning /br-/ of "bread" or the end /-st/ of "best". However, not every combination of consonants is possible in a language (Crystal, 2008). Unlike English, Classical Arabic does not allow consonant clusters in onset position (Abushihab, 2010, as cited in Al-Aboudi & Aljutaily, 2025).

In Classical Arabic syllable structure, vowels must be preceded by one consonant and followed by up to two consonants. Standard Arabic does not allow consonant clusters at the beginning of a syllable, since onsets usually take a CV shape, as in "book" /kitaːb/ (Al-Hattami, 2010, as cited in Rahal, 2026). At the end of a syllable, however, a two-consonant cluster may occur, as shown by the coda /nt/ in bint /bInt/ (Bishr, 2000, as cited in Rahal, 2026). The Arabic syllable structure usually starts with a single consonant and can end with either a consonant or a vowel. Classical Arabic permits consonant clusters in coda place but not in onset position (Abushihab, 2010, as cited in Al-Aboudi & Aljutaily, 2025).

Sonority Sequencing Principle (SSP), also known as Sonority Sequencing Generalization (SSG), is another key concept in the analysis of consonant clusters. Many researchers argue that SSP is universal across languages and it governs the shape of both onsets and codas (McMahon, 2002). In phonology, sonority describes how prominent a sound is compared to other sounds. Every speech sound has a degree of sonority, which depends on three factors: how open the vocal tract is, how loud the sound is, and how long it can maintain (Davenport & Hannahs, 2010).

A sound is highly sonorous when it becomes louder, longer, and more open. Nasals, liquids, and glides (sonorants) have higher sonority than stops and fricatives (obstruents). Different scholars have proposed different sonority scales. For example, McMahon (2002, p. 107) ranks sounds from lowest to highest sonority as follows: voiceless stops, voiced stops, voiceless fricatives, voiced fricatives, nasals, liquids, glides, and vowels. Jespersen (1904, as cited in Xhaferaj, 2023) proposed a sonority hierarchy with eight levels. Voiceless stops and fricatives are the least sonorous (level 1), followed by voiced stops (level 2) and voiced fricatives (level 3). Nasals and laterals are placed at level 4, and r-sounds are assigned level 5. The other three levels (6, 7, and 8) belong to high, mid, and low vowels, respectively. Foley (1972, as cited in Xhaferaj, 2023) proposed another sonority scale. The scale is based on the resonance feature. In this scale, sounds were divided into six groups, starting from the least sonorous sounds to the most sonorous:

Stops (1) < fricatives (2) < nasals (3) < liquids (4) < glides (5) < vowels (6)

Clements (1990, as cited in Xhaferaj, 2023) divides sounds into five classes, ordered from lowest to highest sonority as follows: obstruents < nasals < liquids < glides < vowels. Each class has a sonority value from 0 to 4: obstruents get 0, nasals 1, liquids 2, glides 3, and vowels 4. Clements's scale depends on four binary features:[±syllabic], [±vocoid], [±approximant], and [±sonorant]. Jespersen's scale is the most detailed of these three scales with eight levels, whereas Foley's has six and Clements' has only five. Although the scales differ, all of them agree that vowels are the most sonorous sounds.

This study follows the sonority scale of Selkirk (1984, as cited in Ploumidi, 2024), which has five levels. From lowest to highest, these are: stops (1), fricatives (2), nasals (3), liquids (4), and glides (5). This scale was chosen because it distinguishes stops from fricatives, a distinction that matters for analyzing clusters. Vowels are not included, as the analysis is restricted to consonant clusters.

According to the SSP, the vowel of the syllable has the highest sonority, and sonority falls toward the edges of the syllable. Thus, in an onset, sonority should rise toward the vowel, as in /pl/ in "play". In a coda, it should fall away from the vowel (McMahon, 2002, p. 108). Based on this, the two-consonant onset clusters in this study are classified into three types: rising (following the SSP), plateau (neutral), and falling (violating the SSP).

Aim of the Study

This study has three main aims:

1. To study consonant clusters at the beginning of words in Benghazi Arabic.
2. To discover the pattern of clusters that appear in the data, and the phonological processes that account for the pattern.
3. To find out whether these clusters obey the Sonority Sequencing Principle (SSP) or violate it.

Research Questions

This study addresses the following research questions:

1. Does Benghazi Arabic permit consonant clusters in word-initial position.
2. What cluster patterns are observed in the data?
3. Which phonological processes produce these clusters?
4. To what extent do the observed clusters obey the Sonority Sequencing Principle (SSP)?

Significance of the Study

Different researchers have studied Arabic and its dialects. For example, Ahmed (2010) described the phonology of Tripolitanian Arabic, including its syllable structure. Al-Ageli (1995, as cited in Ahmed, 2010) studied syllable and metrical structure in the same dialect. Also, Bobaker (2018) examined stress and syncope in Tobruq Arabic within a Stratal Optimality Theory framework. However, the Benghazi dialect has received little attention: to the best of the researcher's knowledge, few studies have focused on it, particularly on its

consonant clusters and their sonority profiles. This study aims to fill this gap by analyzing these clusters and their patterns in light of the SSP.

Previous Studies

Although in Classical Arabic and Modern Standard Arabic (MSA) consonant clusters are not possible in onset position, some Arabic dialects allow consonant cluster in onset position. This usually occurs as a result of phonological processes such as vowel deletion. Three studies investigated Libyan Arabic. Ahmed (2010) claims that Tripolitanian Arabic (TA) permits consonant clusters in initial and final word position. In TA, consonant clusters results from vowel deletion process. Ahmed (2010) points out that when this rule applies to the MSA pattern CVCVC, it changes to the TA form CCVC. Also, this rule works only with open syllables that are followed by a CV sequence. This means that the second vowel in such words is still pronounced because it is part of a CVC sequence, not a CV one.

Recently, Yousif (2017) investigated onsets in Libyan Arabic. He found that contact with languages such as Berber, Italian, and English could make complex onsets more likely than in Classical or Modern Standard Arabic, where they are not permitted. Bobaker (2018) studied stress and syncope in Tobruq Arabic, an Eastern Libyan dialect, using Stratal Optimality Theory. He found that two-consonant clusters can occur at the beginning of words in this dialect, as in /tra:b/ 'soil'. He also explained that vowel syncope produces more complex onsets at the stem level, while epenthesis repairs them at the word level. Alghmaiz (2013) examined word-initial consonant clusters and their sonority in Najdi. Data were collected from a number of native speakers. They produced a set of words and sentences. The findings showed that the dialect allows initial clusters in certain environments. Future research is needed to investigate which vowel is deleted, since this may affect the results.

Methodology

This exploratory study investigates word-initial consonant clusters and their sonority in Benghazi Arabic dialect. Since the sample was a small convenience one and the word list was limited to a number of words, the findings should not be generalized to the whole community.

Participants

The participants of the study were 18 native speakers of Benghazi Arabic: They were divided into 10 males and 8 females. Their age between 18 and 50. All of them were born in Benghazi and they were living in the city at the time of the study. Table 1 presents the demographic information of the participants.

Table 1. Demographic Information of Participants

No.	Group	Male	Female	Total	Percentage
1	MA students	2	1	3	16.7%
2	Undergraduate students	2	2	4	22.2%
3	Teachers	2	2	4	22.2%
4	Public sector workers	4	3	7	38.9%
Total		**10**	**8**	**18**	**100%**

Ethical Considerations

Before the recording sessions began, the researcher informed all the participants that their voices would be recorded and used for future analysis. All participants gave their verbal consent after they were informed that their names would be anonymous. That is, no real names would be attached to the audio files. Instead, each participant was assigned a number (P1-P18) on all transcriptions and analysis sheets.

Materials and Stimuli

The study began with a list of 100 words. These words were expected to include different word-initial consonant clusters. Six native speakers of Benghazi Arabic were asked to indicate whether the word is used in the Benghazi dialect (Yes/No). Then, for each word marked "Yes", they rated how often they use it in daily life, from 1 (rarely) to 5 (very often). The researcher chose the words that were ranked 3, 4, or 5, which gave a final list of 53 words. Table 2 includes the words that are frequently used in the Benghazi dialect according to six participants. The table shows these words with their English translations, and their patterns in MSA.

Table 2. Target words and Their Modern Standard Arabic Transcription

#	Word	Translation	MSA Transcription (IPA)
1	مريض	Sick	/mariːdˤ/
2	صغير	Small	/sˤaɣiːr/
3	حمار	Donkey	/ħimaːr/
4	بلاد	Country	/bilaːd/
5	حصان	Horse	/ħisˤaːn/
6	رخيص	Cheap	/raxiːsˤ/
7	تراب	Soil	/turaːb/
8	رسم	he drew	/rasama/
9	خمار	Veil	/ximaːr/
10	مرتبط	Engaged	/murtabitˤ/
11	سمين	Fat	/samiːn/
12	سلاح	Weapon	/silaːħ/
13	عنب	Grapes	/ʕinab/
14	شتاء	Winter	/ʃitaːʔ/
15	كتاب	Book	/kitaːb/
16	عرب	People	/ʕarab/
17	جمل	Camel	/dʒamal/
18	سمع	he heard	/samiʕa/
19	قمر	Moon	/qamar/
20	طيور	Birds	/tˤujuːr/
21	كلاب	Dogs	/kilaːb/
22	قبور	Graves	/qubuːr/
23	حزام	Belt	/ħizaːm/

24	قريب	Near	/qariːb/
25	ذكر	Male	/ðakar/
26	ذنوب	Sins	/ðunuːb/
27	مغيم	Cloudy	/muɣajjim/
28	بقرة	Cow	/baqara/
29	سنين	Years	/siniːn/
30	دموع	Tears	/dumuːʕ/
31	حقير	despicable	/ħaqiːr/
32	قديم	Old	/qadiːm/
33	ثمانية	Eight	/θamaːnija/
34	دمار	destruction	/damaːr/
35	سحاب	Cloud	/saħaːb/
36	برتقال	Oranges	/burtuqaːl/
37	خطبة	Sermon	/xutˤba/
38	ملعب	Stadium	/malʕab/
39	متزوج	Married	/mutazawwidʒ/
40	سماء	Sky	/samaːʔ/
41	طماطم	Tomato	/tˤamaːtˤim/
42	فلان	Person	/fulaːn/
43	بنات	Girls	/banaːt/
44	حفرة	Hole	/ħufra/
45	جبل	mountain	/dʒabal/
46	مطر	Rain	/matˤar/
47	قبل	he accepted	/qabila/
48	كتب	he wrote	/kataba/

49	قتل	he killed	/qatala/
50	كذب	he lied	/kaðaba/
51	ضعيف	Weak	/dˤaʕiːf/
52	كبير	Large	/kabiːr/
53	بعيد	Far away	/baʕiːd/

Data Collection Procedures

The participants were asked to read the 53 words three times using Benghazi dialect, not MSA. The words were presented without diacritical markers [ḥarakāt] to reduce the influence of Arabic orthography on participants' pronunciation. Because the first pronunciation may have initial hesitation, the second repetition of each word was selected and analyzed. This gave 954 productions for analysis (18 participants × 53 words x1). The data were recorded using the Dolby On app, which was chosen for its audio quality and ease of use.

Transcription of the Data

The researcher transcribed the data manually using the International Phonetic Alphabet (IPA). The transcription was based on the researcher's auditory judgment only. In some pronunciations, a short schwa-like sound was heard between the two consonants. Since no acoustic analysis was used, they were transcribed as clusters. To check transcription reliability, two other analysts were asked to check the transcriptions of a number of words.

Sonority Analysis

Initial cluster of each word was scored on a five-level sonority scale. The scale starts from the least to the most sonorous following Selkirk 's scale (1984, as cited in Ploumidi, 2024): stops, fricatives, nasals, liquids, and glides. A cluster was classified as rising if the second consonant was more sonorous than the first. It was a plateau if the two consonants were of equal sonority on the scale. If the second consonant was less sonorous than the first, the cluster was falling. Clusters with rising sonority conform to the Sonority Sequencing Principle (SSP), while falling clusters violate it, and plateaus were treated as neutral.

Data Analysis

The analysis shows that Benghazi Arabic dialect permits consonant clusters in word initial position, although Classical Arabic and MSA do not allow initial consonant cluster initially. The clusters result mainly from short vowel deletion. In some cases, vowel deletion accompanied by glottal stop insertion.

Table 3. Words Pronounced with Vowel Deletion

	Word	Translation	Arabic Pattern	Benghazi Pattern	Participant Pronunciation
1	مريض	Sick	CVCVC	CCVC	[mriːdˤ]
2	صغير	Small	CVCVC	CCVC	[sˤɣiːr]
3	حمار	Donkey	CVCVC	CCVC	[ħmaːr]
4	بلاد	Country	CVCVC	CCVC	[blaːd]
5	حصان	Horse	CVCVC	CCVC	[ħsˤaːn]
6	رخيص	Cheap	CVCVC	CCVC	[rxiːsˤ]
7	تراب	Soil	CVCVC	CCVC	[traːb]
8	رسم	he drew	CVCVCV	CCVC	[rsam]
9	خمار	Veil	CVCVC	CCVC	[xmaːr]
10	مرتبط	Engaged	CVCCVCVC	CCCVCVC	[mrtabɪtˤ]
11	سمين	Fat	CVCVC	CCVC	[smiːn]
12	سلاح	Weapon	CVCVC	CCVC	[slaːħ]
13	عنب	Grapes	CVCVC	CCVC	[ʕnab]
14	شتاء	Winter	CVCVC	CCV	[ʃtaː]
15	كتاب	Book	CVCVC	CCVC	[ktaːb]
16	عرب	People	CVCVC	CCVC	[ʕrab]
17	جمل	Camel	CVCVC	CCVC	[ʒmal]
18	سمع	he heard	CVCVCV	CCVC	[smaʕ]

19	قمر	Moon	CVCVC	CCVC	[ɡmar]
20	طيور	Birds	CVCVC	CCVC	[tˤjuːr]
21	كلاب	Dogs	CVCVC	CCVC	[klæb]
22	قبور	Graves	CVCVC	CCVC	[ɡbuːr]
23	حزام	Belt	CVCVC	CCVC	[ħzæm]
24	قريب	Near	CVCVC	CCVC	[ɡriːb]
25	ذكر	Male	CVCVC	CCVC	[ðkar]
26	ذنوب	Sins	CVCVC	CCVC	[ðnuːb]
27	مغيم	Cloudy	CVCVCCVC	CCVCCVC	[mɣajjɪm]
28	بقرة	Cow	CVCVCV	CCVCV	[bɡara]
29	سنين	Years	CVCVC	CCVC	[sniːn]
30	دموع	Tears	CVCVC	CCVC	[dmuːʕ]
31	حقير	Despicable	CVCVC	CCVC	[ħɡiːr]
32	قديم	Old	CVCVC	CCVC	[ɡdiːm]
33	ثمانية	Eight	CVCVCVCV	CCVCCV	[θmaːnja]
34	دمار	Destruction	CVCVC	CCVC	[dmaːr]
35	سحاب	Cloud	CVCVC	CCVC	[sħaːb]
36	برتقال	Oranges	CVCCVCVC	CCCVCVC	[brtaɡaːl]
37	خطبة	Sermon	CVCCV	CCCV	[xtˤba]
38	ملعب	Stadium	CVCCVC	CCCVC	[mlʕab]
39	متزوج	Married	CVCVCVCCVC	CCCVCCVC	[mtzawwɪʒ]
40	سماء	Sky	CVCVC	CCVC	[smaːʔ]
41	طماطم	Tomato	CVCVCVC	CCVCC	[tˤmaːtˤm]
42	فلان	Person	CVCVC	CCVC	[flæn]
43	بنات	Girls	CVCVC	CCVC	[bnaːt]

44	حفرة	Hole	CVCCV	CCCV	[ħfra]
45	جبل	Mountain	CVCVC	CCVC	[ʒbal]
46	مطر	Rain	CVCVC	CCVC	[mtˤar]
47	قبل	He accepted	CVCVCV	CCVC	[gbal]
48	كتب	He wrote	CVCVCV	CCVC	[ktab]
49	قتل	He killed	CVCVCV	CCVC	[gtal]
50	كذب	He lied	CVCVCV	CCVC	[kðab]
51	ضعيف	Weak	CVCVC	CCVC	[dˤʕiːf]
52	كبير	Large	CVCVC	CCVC	[kbiːr]
53	بعيد	Far away	CVCVC	CCVC	[bʕiːd]

Table 3 shows that Benghazi Arabic Dialect allows consonant clusters at the beginning of the words. This occurs when the high front vowel /i/, the short high back vowel /u/, or the low vowel /a/ is deleted in the first syllable. According to examples presented in Table 3, the short vowels /a/, /i/, and /u/ are deleted from the basic pattern. The way the sounds are rearranged at the surface leads to formation of onsets, where a group of two or three consonants are possible. When the short vowels /a/, /i/ and /u/ are dropped in the Benghazi dialect, it changes the CVCVC pattern of the words into CCVC pattern which allow consonant clusters at the beginning. For example, in classical Arabic, the word ثمانية /θamaːnija/ meaning "eight" is structured as CV--, while in the Benghazi dialect the same word appears as [θmaːnja] CCV---. In the same way, the word /banaːt/ meaning "girls" has a CVC-- pattern in classical Arabic, but in the Benghazi dialect it has a CCV- pattern, presented as /bnaːt/. In Benghazi Arabic, MSA /q/ becomes [g] and /dʒ/ becomes [ʒ]. Some words also lose their final vowel (rows 8, 18, 47-50), but this study does not deal with that. The process of deleting the vowels and the initial cluster formation are illustrated in the following diagram:

Syllable Restructuring CVCVC to CCVC

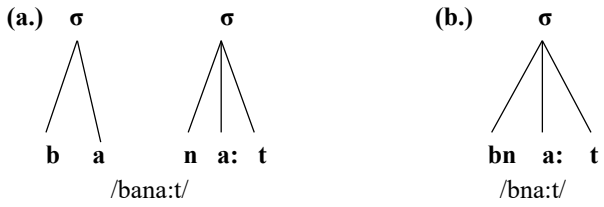


Table 4. Words Pronounced with Both Glottal /ʔ / Insertion and Vowel Deletion

	Word	Translation	MSA Pattern	Participant Pronunciation	Vowel Deleting	Tokens	Percentage
1	حمار	"donkey"	/ħimaːr/	/ʔħmaːr/	/i/	4	22.2%
2	بقرة	"cow"	/baqara/	/ʔbɡara/	/a/	3	16.7%
3	كتاب	"book"	/kitaːb/	/ʔktaːb/	/i/	5	27.8%
4	خمار	"veil"	/ximaːr/	/ʔxmaːr/	/i/	3	16.7%

Table 4 shows that the participants produced these words in two ways. In the first production, they deleted the first short vowel without inserting a glottal stop. This led to produce a word-initial cluster. In the second production, they inserted a glottal stop /ʔ/ and simultaneously deleted the first short vowel (/a/ or /i/) of the MSA form, so that the word begins with a consonant cluster. Four participants (22.2%) produced the word حمار "donkey" with inserting glottal stop (/ʔħmaːr/), while 14 participants, representing (77.8%) of the participants produced the same word without / ʔ/ insertion as (/ħmaːr/). The word بقرة "cow" was produced with insertion (/ʔbɡara/) by three participants (16.7%) and without insertion (/bɡara/) by fifteen participants (83.3%). The word كتاب "book" was produced with insertion (/ʔktaːb/) by five participants (27.8%), the highest percentage of insertion, and without insertion (/ktaːb/) by 13 participants (72.2%). The word خمار "veil" was produced with insertion (/ʔxmaːr/) by three participants (16.7%) and without insertion (/xmaːr/) by 15 participants (83.3%).

Classification of Initial Consonant Clusters

The researcher grouped the 53 words by the manner of articulation of their first two consonants, based on their Benghazi pronunciation without [ʔ]. The classification produced thirteen cluster types: four cluster types start with a fricative (fricative + nasal, fricative + fricative, fricative + stop, and fricative + liquid), while five start with a stop (stop + stop, stop + nasal, stop + liquid, stop + glide, and stop + fricative). Three start with a nasal (nasal + liquid, nasal + stop, and nasal + fricative), and only one starts with a liquid (liquid + fricative). Table 5 gives the number of words in each type.

Table 5. Classification of the 53 Words by Initial Cluster Type

First sound	Second sound	Words	IPA transcription	No.
Fricative	**Nasal**	حمار، خمار، سمين، عنب، سمع، ذنوب، سنين، ثمانية، سماء، جمل	[ħmaːr], [xmaːr], [smiːn], [ʕnab], [smaʕ], [ðnuːb], [sniːn], [θmaːnja], [smaːʔ], [ʒmal]	**10**
	Fricative	صغير، حصان، حزام، سحاب، حفرة	[sˤɣiːr], [ħsˤaːn], [ħzæm], [sħaːb], [ħfra]	**5**
	Stop	شتاء، حقير، خطبة، ذكر، جبل	[ʃtaːʾ], [ħgiːr], [xtˤba], [ðkar], [ʒbal]	**5**
	Liquid	سلاح، فلان، عرب	[slaːħ], [flæn], [ʕrab]	**3**
Total (Fricative)				**23**
Stop	**Stop**	كتاب، قبور، بقرة، قبل، كتب، قتل، قديم، كبير	[ktaːb], [gbuːr], [bgara], [gbal], [ktab], [gtal], [gdiːm], [kbiːr]	**8**
	Nasal	قمر، دموع، دمار، طماطم، بنات	[gmar], [dmuːʕ], [dmaːr], [tˤmaːtˤm], [bnaːt]	**5**
	Liquid	بلاد، تراب، كلاب، برتقال، قريب	[blaːd], [traːb], [klæb], [brtagaːl], [griːb]	**5**
	Glide	طيور	[tˤjuːr]	**1**
	Fricative	كذب، ضعيف، بعيد	[kðab], [dˤʕiːf], [bʕiːd]	**3**
Total (Stop)				**22**
Nasal	**Liquid**	مريض، مرتبط، ملعب	[mriːdˤ], [mrtabɪtˤ], [mlʕab]	**3**
	Stop	مطر، متزوج	[mtˤar], [mtzawwɪʒ]	**2**
	Fricative	مغيم	[mɣajjɪm]	**1**
Total (Nasal)				**6**
Liquid	**Fricative**	رخيص، رسم	[rxiːsˤ], [rsam]	**2**
Total (Liquid)				**2**
Total				**53**

Table 5 shows that the 53 words represent a wide range of cluster types. They reflecting the variety of word-initial consonant sequences that can appear in Benghazi Arabic through the deletion of a short vowel after the first consonant. The most frequent type in the word list was the fricative+nasal combination (10, 18.9% of all words), for example [ħmaːr] and [smiːn]. Among the other fricative-initial words, fricative + fricative and

fricative + stop each had five words, and fricative + liquid had three. Stop-initial words were more various. Stop + stop was the most frequent type, with 8 words (36.4%). Stop + nasal and stop + liquid had 5 words each (22.7%), and stop + fricative had 3 (13.6%). Only one word began with stop + glide (4.5%).

Words starting with a nasal were divided into three types: nasal + liquid (3), nasal + stop (2), and nasal + fricative (1). Words starts with liquid sounds occurred only with a following fricative (2). For the second sound, nasals and stops were the most common (15 each, 28.3% each), followed by liquids and fricatives (11 each, 20.8% each) and glides (1, 1.9%). Most clusters in the word list start with an obstruent. According to the word list, the most common type was fricative + nasal (10 words). However, we should bear in mind that these results reflect only the word list used in this study. Thus, findings should not be generalized to Benghazi Arabic dialect as a whole. A more representative sample of the Benghazi community is needed.

Sonority Sequencing Principle (SSP) Analysis of the Target Words

Using the five-level scale (stop = 1, fricative = 2, nasal = 3, liquid = 4, glide = 5), sonority change is calculated as the sonority of the second consonant minus the sonority of the first. If the second consonant is higher than the first, the cluster is rising. If the two consonants are of equal sonority, the cluster is a plateau. If the second consonant is less sonorous than the first, the cluster is falling.

Table 6. Rising Sonority Clusters

No.	Word	IPA	First sound	Second sound	Sonority change
1	حمار	[ħmaːr]	Fricative	Nasal	+1
2	خمار	[xmaːr]	Fricative	Nasal	+1
3	سمين	[smiːn]	Fricative	Nasal	+1
4	عنب	[ʕnab]	Fricative	Nasal	+1
5	سمع	[smaʕ]	Fricative	Nasal	+1
6	ذنوب	[ðnuːb]	Fricative	Nasal	+1
7	سنين	[sniːn]	Fricative	Nasal	+1
8	ثمانية	[θmaːnja]	Fricative	Nasal	+1

9	سماء	[smaːʔ]	Fricative	Nasal	+1
10	سلاح	[slaːħ]	Fricative	Liquid	+2
11	فلان	[flæn]	Fricative	Liquid	+2
12	عرب	[ʕrab]	Fricative	Liquid	+2
13	قمر	[gmar]	Stop	Nasal	+2
14	دموع	[dmuːʕ]	Stop	Nasal	+2
15	دمار	[dmaːr]	Stop	Nasal	+2
16	طماطم	[tˤmaːtˤm]	Stop	Nasal	+2
17	بنات	[bnaːt]	Stop	Nasal	+2
18	بلاد	[blaːd]	Stop	Liquid	+3
19	تراب	[traːb]	Stop	Liquid	+3
20	كلاب	[klæb]	Stop	Liquid	+3
21	برتقال	[brtagaːl]	Stop	Liquid	+3
22	قريب	[griːb]	Stop	Liquid	+3
23	طيور	[tˤjuːr]	Stop	Glide	+4
24	كذب	[kðab]	Stop	Fricative	+1
25	ضعيف	[dˤʕiːf]	Stop	Fricative	+1
26	بعيد	[bʕiːd]	Stop	Fricative	+1
27	مريض	[mriːdˤ]	Nasal	Liquid	+1
28	مرتبط	[mrtabɪtˤ]	Nasal	Liquid	+1
29	ملعب	[mlʕab]	Nasal	Liquid	+1
30	جمل	[ʒmal]	Fricative	Nasal	+1

The findings in Table 6 show that 30 of the 53 words (56.6%) show rising sonority. In these words, the second sound is more sonorous than the first, so they follow the SSP. The cluster types are classified as: fricative + nasal

(10), fricative + liquid (3), stop + nasal (5), stop + liquid (5), stop + glide (1), stop + fricative (3), and nasal + liquid (3). The most common is fricative + nasal (10 words), but its rise is small (+1). The largest rise is stop + glide (+4), found in one word only.

Table 7. Plateau Sonority Clusters

No.	Word	IPA	First sound	Second sound	Sonority change
1	صغير	[sˤɣiːr]	Fricative	Fricative	0
2	حصان	[ħsˤaːn]	Fricative	Fricative	0
3	حزام	[ħzæm]	Fricative	Fricative	0
4	سحاب	[sħaːb]	Fricative	Fricative	0
5	حفرة	[ħfra]	Fricative	Fricative	0
6	كتاب	[ktaːb]	Stop	Stop	0
7	قبور	[gbuːr]	Stop	Stop	0
8	بقرة	[bgara]	Stop	Stop	0
9	قبل	[gbal]	Stop	Stop	0
10	كتب	[ktab]	Stop	Stop	0
11	قتل	[gtal]	Stop	Stop	0
12	قديم	[gdiːm]	Stop	Stop	0
13	كبير	[kbiːr]	Stop	Stop	0

Table 7 shows that 13 of the 53 words (24.5%) have plateau sonority. They do not show either rising nor falling sonority. Both sounds have the same sonority level. This means that there is no increase in the sonority. The cluster types are: fricative + fricative (5), stop + stop (8). In this study, these clusters are considered as neutral, not violating SSP. Yet, others regard them as violating the SSP.

Table 8. Falling Sonority Clusters

No.	Word	IPA	First sound	Second sound	Sonority change
1	شتاء	[ʃtaːʾ]	Fricative	Stop	−1
2	حقير	[ħgiːr]	Fricative	Stop	−1
3	خطبة	[xtˤba]	Fricative	Stop	−1
4	ذكر	[ðkar]	Fricative	Stop	−1
5	مطر	[mtˤar]	Nasal	Stop	−2
6	متزوج	[mtzawwɪʒ]	Nasal	Stop	−2
7	مغيم	[mɣajjɪm]	Nasal	Fricative	−1
8	رخيص	[rxiːsˤ]	Liquid	Fricative	−2
9	رسم	[rsam]	Liquid	Fricative	−2
10	جبل	[ʒbal]	Fricative	Stop	−1

Table 8 shows that only 10 of the 53 words (18.9%) show falling sonority. In these words, the second consonant is less sonorous than the first, so these words clearly violate the SSP. The cluster types are: fricative + stop (5), nasal + stop (2), nasal + fricative (1), liquid + fricative (2). The biggest drops (−2) were in nasal + stop, as in مطر [mtˤar] and متزوج [mtzawwɪʒ], and in liquid + fricative, as in رخيص [rxiːsˤ] and رسم [rsam].

Table 9. Summary of Sonority Patterns

Sonority pattern	Number of words	Percentage
Rising	30	56.6%
Plateau	13	24.5%
Falling	10	18.9%
Total	**53**	**100%**

Table 9 summarizes the sonority patterns found in the study. It gives each pattern, the number of words, and their percentage. According to the table above, more than half of the clusters (56.6%) show rising sonority and thus they follow the SSP. Other clusters (43.4%) do not show rising scale and are treated as either plateau or falling. The non-rising clusters (43.4%) consist of 24.5% plateaus, which are treated as neutral, and 18.9% falls, which violate the SSP.

Results and Discussion

The results showed that consonant clusters in the Benghazi dialect result from a vowel deletion process. In some words, this was accompanied by glottal stop insertion at the beginning of the word. Vowel deletion was the most common pattern, while glottal stop insertion occurred in only four words (see Table 4). For example, /ħimaːr/ becomes [ħmaːr], and /ximaːr/ becomes [xmaːr]. The deleted vowel is in the initial syllable, so the word begins with a consonant cluster. Three short vowels were deleted in the first syllable: /i/, /u/, and /a/. In the four words with glottal stop insertion, the deletion was accompanied by [ʔ], as in [ʔħmaːr], [ʔbɡara], [ʔktaːb], and [ʔxmaːr].

The sonority analysis shows that of the 53 words, only 30 words (56.6%) show rising sonority and therefore conform to the SSP. Thirteen words (24.5%) show plateau sonority, whereas 10 words (18.9%) show falling sonority and therefore violate it (Table 9). Since plateaus are treated as neutral, 43 of the 53 words (81.1%) do not violate the SSP. More than half of the clusters that follow the SSP do so with a minimal rise. Three types rise by only one step on the scale: fricative + nasal, the most frequent type (10 words), stop + fricative (3 words), and nasal + liquid (3 words). Thus, 16 of the 30 rising clusters rose by one step. Clusters with a rise of more than one step are found in fricative + liquid (+2, 3 words), stop + nasal (+2, 5 words), stop + liquid (+3, 5 words), and stop + glide (+4), which is found in only one word, 'birds' [tˤjuːr]. The plateau and falling clusters are also limited to a few types. All 13 plateau clusters are either stop + stop (8 words) or fricative + fricative (5 words). The falling clusters are fricative + stop (5, a drop of one step), nasal + stop (2, −2), liquid + fricative (2, −2), and nasal + fricative (1, −1). The biggest drops (−2) occur in nasal + stop, as in [mtˤar] 'rain' and [mtzawwɪʒ] 'married', and in liquid + fricative, as in [rsam] 'he drew' and [rxiːsˤ] 'cheap'.

Another study that supports the present study's findings is by Ahmed (2010). In his study of Tripolitanian Arabic phonology, he reported that Tripolitanian Arabic permits consonant clusters as a result of a vowel deletion process. Also, the findings of this study are similar to Bobaker's study (2018), which aimed to investigate stress and syncope in Tobruq Arabic. The study revealed that Tobruq Arabic is a non-differential dialect where both high and low vowels can be deleted. This leads to changes in the syllable structure and produces word-initial clusters, as in /ħɪ.sˤaːn/ becomes [ħsˤaːn] 'horse'. Similarly, in Benghazi Arabic, initial clusters were observed when a short vowel was deleted after the first consonant.

With regard to sonority, the findings of this study agree with Alghmaiz's (2013). He studied consonant cluster patterns at the beginning of words in Najdi Arabic. The findings revealed that Najdi Arabic has initial consonant clusters in certain environments. Degree of Sonority was 1+ between the first and second consonants. Similarly, in Benghazi dialect, more than half of the rising clusters (16 of 30) rise by only one step. Also, Bobaker (2018) found that some initial clusters in Tobruq Arabic violate the SSP, such as the nasal + stop cluster in [ŋgu:l] "I said". In general, Benghazi Arabic does not strictly follow the SSP. In this study, SSP was followed in just over half of the words (30 of 53), while 10 words with falling sonority violate it. The 13 plateau words (24.5%) are considered neutral here. If they were counted as violations, the total would be 23 words (43.4%).

Conclusion

This study examined consonant clusters in word initial position in Benghazi Arabic. It used 53 words produced by 18 native speakers. The results showed that initial clusters result from short vowel deletion (/a/, /i/, or /u/); a minority of speakers also inserted an initial glottal stop [ʔ], along with vowel deletion. With regard to sonority, the initial clusters in Benghazi dialect fall into three groups. The first group of clusters (56.6%) show rising sonority and thus conform to the Sonority Sequencing Principle (SSP), as /ħm/ in [ħmaːr] 'donkey'. The second group (24.5%) show plateau sonority, where the two consonants are of equal sonority, as /kt/ in [ktaːb] 'book'. They are considered as not violating the SSP. The third group (18.9%) showed falling sonority, where sonority decreases towards the nucleus, as /ʃt/ in [ʃtaː] 'winter'. This group violates the SSP.

Limitations and Recommendations

The findings were based on the 53 words analysed in this study. The sample also was a small convenience sample. Thus, we can not make a general statement out of these findings. The transcriptions were based on the researcher's own auditory judgement, plus did not use any acoustic analysis. Clusters of equal sonority were counted as neutral, but some studies treat them as violations. Future research is needed to cover a wider range of the Benghazi vocabulary, using acoustic analysis such as Praat and other sonority scales.

References

1. Ahmed, A. (2010). Tripolitanian Arabic: An investigation in the phonology of the dialect spoken in the city of Tripoli, Libya [Unpublished manuscript]. Department of English, Faculty of Arts, University of Zawia.
2. Al-Aboudi, A., & Aljutaily, M. (2025). Consonant clusters in Qassimi Arabic: Analysis from optimality theory and sonority principles. Folia Linguistica. https://doi.org/10.1515/flin-2024-0055
3. Alghmaiz, B. A. (2013). Word-initial consonant cluster patterns in the Arabic Najdi dialect [Master's thesis, Southern Illinois University Carbondale].
4. Bobaker, M. (2018). Stress and syncope in Tobruq Arabic, an Eastern Libyan dialect: A Stratal OT account (Doctoral dissertation). University of Essex.
5. Crystal, D. (2008). A dictionary of linguistics and phonetics (6th ed.). Blackwell Publishing.
6. Davenport, M., & Hannahs, S. J. (2010). Introducing phonetics and phonology (3rd ed.). Hodder Education.
7. McMahon, A. (2002). An introduction to English phonology. Edinburgh University Press.
8. Ploumidi, E. (2024). The acquisition of medial codas in child Greek: A constraint-based account. In M. Tănase-Dogaru, A. Tigău, & I. Stoicescu (Eds.), Crosslinguistic approaches to language analysis (pp. 349–381). Cambridge Scholars Publishing.
9. Rahal, A. (2026). Variation in the production of consonant clusters in the speech of Tunisian speakers of English. In A. Rahal (Ed.), Research in linguistics: Contributions from STaPs-21 (pp. 115-126). J.B. Metzler.

10. Xhaferaj, A. (2023). Application of sonority theory in standard Albanian. International Journal of English Language and Literature Studies, 12(2), 86-96. https://doi.org/10.55493/5019.v12i2.4740

11. Yousif, A. M. A. (2017). Word initial consonant clusters in Libyan Arabic (Master's dissertation). University of Malta.

12. Yule, G. (2014). The study of language (5th ed.). Cambridge University Press.