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Ghebi Stops: Inventory, Distribution and Voice Onset Time (VOT)

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Abstract: *This study focuses on the Ghebi dialect spoken in Pakistan's northwest. The study primarily examines stops of the Ghebi dialect at word initial, medial, and final positions while also investigating the Voice Onset Time (VOT) values of Ghebi stops. Through the analysis of minimal pairs, 16 plosive sounds have been discerned in Ghebi, characterized by a four-way voicing contrast and articulated at four distinct locations. The voiceless unaspirated plosives consist of /p, ʈ, ʈ, k/, while the voiceless aspirated plosives include /ph, ʈʰ, ʈʰ, kʰ/. Voiced unaspirated plosives are represented by /b, ɖ, ɖ, g/, whereas voiced aspirated plosives feature /bʰ, ɖʰ, ɖʰ, gʰ/. VOT values were quantified using PRAAT, with voiceless stops exhibiting shorter VOT values. It was found that /ʈ/ has the shortest VOT value, while /ɖ/ has the longest VOT value. This present study will greatly contribute to the documentation and exploration of the Ghebi dialect.*

Key Words: Ghebi, Plosives, Minimal Pairs, Acoustic Analysis, VOT, PRAAT

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Introduction

The Ghebi dialect is a regional language spoken in Tehsil PindiGheb and certain parts of Tehsil Fateh Jang in the Attock district. It is named after the Gheba tribe residing in the Ilaaka Gheb region, which encompasses Fateh Jang and PindiGheb (https://wordsimilarity.com>ghebi). As per the 2017 census, the Ghebi dialect is the predominant language in Tehsil PindiGheb, spoken by over 95% of the population. The census also indicates that the estimated amount of Ghebi dialect native speakers is 260,718 (https://www.citypopulation.de>attock).

According to Shackle, (1980) and Marshall, (1990) Ghebi is classified as a dialect of the Hindko language. Hindko denotes a collection of diverse dialects used in the northwestern regions of Punjab, Pakistan. These dialects have a shared linguistic heritage and are known for their

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unique characteristics, including their phonetics, syntax, and lexicon (Rashid and Akhtar, 2014).

In the Pakistani province of Khyber Pakhtunkhwa, Hindko dialects are extensively used, particularly in the districts of Peshawar, Kohat, Abbottabad, Haripur and Mansehra. They also exist in various areas in Punjab including districts of Attock and Chakwal, Azad Jammu and Kashmir, and Gilgit-Baltistan (Rashid and Akhtar, (2014).

Despite being classified as a dialect of Hindko, Ghebi has distinct features that set it apart from other Hindko dialects. These include its unique vocabulary, grammar, and pronunciation (Marshall, (1990).

According to Shackle, (1980), Hindko language encompasses several dialects, including Ghebi, Avankari, Chacchi, Kohati, and Peshawari. The Peshawari dialect, which is spoken in the northwestern region of Peshawar, is often used as a literary language. In contrast, the Hindko dialect spoken in the Hazara region is known as Northern Hindko or Kagani. Despite sharing a linguistic heritage, every Hindko dialect has its own distinctive lexicon, syntax, as well as pronunciation. Because of its literary standing, the Peshawari dialect has contributed greatly to the growth of Hindko literature. Kagani or Northern Hindko, on the other hand, has been recognized as a distinct dialect with its own characteristics, such as a different pronunciation system and a distinct vocabulary. Overall, the Hindko dialects reflect the rich cultural and linguistic diversity of the region.

The classification of the Ghebi dialect remains a matter of debate among scholars. Grierson (1928) classified Ghebi as a member of the northeastern group of Lehnda languages. However, Shackle (1980) placed Ghebi and Avankari in the Hindko proper group. In contrast, Marshal (1990) classified Ghebi as part of the southern Hindko group. These varying classifications reflect the complexity of language categorization and the challenges involved in identifying and classifying dialects. The linguistic features of Ghebi, including its vocabulary, grammar, and phonetics, may have similarities to other languages or dialects, leading to different interpretations of its classification.

Further research is necessary to definitively classify the Ghebi dialect and to better understand its linguistic characteristics and relationships with other languages/dialects in the region.

According to Marshal (1990), the earliest attempt to classify Hindko - an Indo-Aryan language - was made by Grierson (1928), who grouped the Hindko dialects with other languages of western Punjab and surrounding areas under the Lehnda group. Rensch (1988) further illustrated that Grierson identified three sub-groups within the Lehnda Group as follows:

A) Southern Lehnda
1. Standard (Shahpur)
2. Multani (including Surraiki)
3. Khatrani and Jafiri
4. Thali (Thal Desert East of Indus)

B) North Eastern Lehnda
1. Pothohari
2. Pahari
3. Chibhali (including Punchi-Kashmir)
4. Western Salt Range (North Shahpur)
5. Avankari (Attock and Kohat)
6. Ghebi (Attock)

C) North Western Lehnda
1. Dhanni (West Jhelum)
2. Sawain (East Attock)
3. Hindko (North Attock, Peshawar, Hazara)

This classification system provides a useful framework for understanding the distribution and relationship between the various dialects of the Lehnda group. However, it is important to note that the classification of languages and dialects is complex and often subject to revision and reinterpretation based on new linguistic and

historical pieces of evidence. Marshal (1990) and Shackle (1980) classified the Avankari and Ghebi dialects as part of the Hindko dialect, grouping them together as "Hindko proper." This is in contrast to Grierson's (1928) classification, which placed Ghebi in the northeastern group of Lehnda languages. Shackle's classification reflects a more nuanced understanding of the linguistic relationships between the various dialects spoken in the region and highlights the shared linguistic features of these dialects. However, as with any classification system, there is the potential for ongoing debate and revision as new linguistic and historical evidence emerges. Based on the classifications presented by Marshal (1990) and Rensch (1988), Ghebi is classified as part of the Hindko dialects group of the Punjabi language. This group is further divided into various sub-dialects, such as Avankari, Attock Hindko, Dhanni, Haripur Hindko, Siraiki (Multan), Kohat Hindko, Pothohari, Peshawar Hindko, and Central Punjabi (Lahore). The classification system highlights the shared linguistic features and historical connections between these dialects, allowing for a better understanding of the diverse linguistic landscape of the region.

Given that Ghebi is a relatively understudied dialect, there is still much to learn and document about its linguistic features. The current research, which is exploratory in nature, serves as a preliminary investigation and may inspire future researchers to delve deeper into this dialect. Specifically, current scholars are focused on the plosive sounds present in the Ghebi dialect. They aim to identify and analyze these plosives/stops in order to discern their acoustic characteristics and cues. This research could provide valuable insights into the phonetic and phonological properties of Ghebi, and contribute to a more comprehensive understanding of this unique Hindko dialect.

Research Objectives

1. To recognize the occurrence of Ghebi stops in speech.
2. To catalogue the various applications of Ghebi stops in the initial, medial, and final positions of words.
3. To determine the Voice Onset Time (VOT) values for Ghebi stops.

Research Questions

1. What is the total number of stops present in the Ghebi dialect?
2. In what manner are Ghebi stops employed in the initial, medial, and final positions of words?
3. What are the Voice Onset Time (VOT) values for the Ghebi stops?

Ghebi Stops

Through the analysis of minimal pairs in the Ghebi dialect, a total of sixteen plosives have been identified, exhibiting a four-way voicing contrast. These plosives are produced at four different places of articulation: bilabials (/p, p^h, b, b^h/) dentals (/t̪, t̪^{h}, d̪, d̪^{h}/), retroflexes (/ʈ, ʈ^h, ɖ, ɖ^h/), and velars (/k, k^h, g, g^h/). The voiceless unaspirated plosives include /p, t̪, ʈ, k/, while /p^h, t̪^{h}, ʈ^h, k^h/ are voiceless aspirated. The voiced unaspirated plosives comprise /b, d̪, ɖ, g/, while /b^h, d̪^{h}, ɖ^h, g^h/ are voiced aspirated. The identification of these plosives and their respective acoustic cues will facilitate the further exploration of the Ghebi dialect, aiding in the documentation of this understudied language.

Table 1

Shows 16 Oral Stops of Ghebi Dialect

	Bilabial	Alveolar	Retroflex	Velar
Voiceless plosive	P	t̪	ʈ	k

	Bilabial	Alveolar	Retroflex	Velar
Voiceless aspirated plosive	pʰ	ʈʰ	ʈʰ	kʰ
Voiced plosive	B	ɖ	ɖ	g
Voiced aspirated plosive	bʰ	ɖʰ	ɖʰ	gʰ

Table 2

Shows 16 Oral Stops at word initial position in Ghebi inventory

Phoneme	Word	Transcription	Ghebi	Meaning
P	Pul	/pʊl/	پُل	Bridge
pʰ	Phul	/pʰʊl/	پھُل	Flower
b	Bari	/bɑ:ri/	باری	Window
bʰ	Bhari	/bʰɑri/	بھاری	Heavy
ʈ	Tali	/ʈəli/	تَلی	Palm
ʈʰ	Thali	/ʈʰəli/	تھلی	Step
ʈ	Tali	/təli/	تَلی	Bell
ʈʰ	Thaali	/ʈʰəli/	ٹھلی	To bear a load
ɖ	Das	/ɖəs/	دَس	Tell
ɖʰ	Dhas	/dʰəs/	دَھس	Force, stroke
ɖ	Dah	/ɖɑ:h/	ڈاہ	To lay
ɖʰ	Dhah	/ɖʰɑ:/	ڈھا	Drop, fall
k	Kal	/kəl/	کَل	Tomorrow
kʰ	Khal	/kʰəl/	کھَل	Fodder
g	Ga	/gɑ:/	گا	Sing
gʰ	Ghah	/gʰɑ:/	گھاہ	Grass

In Table 2 above,8 minimal pairs containing 16 stops have been identified in the Ghebi dialect to investigate their phonemic function in word-initial position.

Table 3

Shows 16 Oral Stops at word middle position in Ghebi inventory

Phoneme	Word	Transcription	Ghebi	Meaning
p	Chappa	/ʧəpə/	چپا	Half bread
pʰ	Japha	/ʤəpʰə/	جپھا	Embrace
b	Ubar	/ʊbə/	اُبر	Speak
bʰ	Ubhar	/ʊbʰə/	اُبھر	Raise
ʈ	Patar	/pəʈə/	پَتر	Leaf, leaves
ʈʰ	Pathar	/pəʈʰə/	پتھَر	Stone

Phoneme	Word	Transcription	Ghebi	Meaning
ʈ	Sota	/sɒʈə/	سوٹا	Stick, rod
ʈʰ	Sotha	/sɒʈʰə/	سوٹھا	Patch up
ɖ	Sada	/sɑːɖə/	سادا	Simpleton
ɖʰ	Sadha	/sɑːɖʰə/	سادھا	To tease
ɖ	Roda	/rɒɖə/	روڈا	Bald headed
ɖʰ	Modha	/mɒɖʰə/	موڈھا	Shoulder
k	Choka	/tʃɒkə/	چوکا	A tile, seat
kʰ	Chokha	/tʃɒkʰə/	چوکھا	Much more
g	Magar	/məgər/	مگر	Shoulder
gʰ	Maghar	/məgʰər/	مگھر	name of a month in winter

In Table 3 above, 8 minimal pairs containing 16 stops have been identified in the Ghebi dialect to investigate their phonemic function in the word-middle position.

Table 4

16 Oral Stops at the word-final position in the Ghebi inventory

Phoneme	Word	Transcription	Ghebi	Meaning
P	Lape	/leip/	لیپ	Smear, coat
pʰ	Laph	/leipʰ/	لیپھ	Quilt
b	Dab	/dʌb/	دب	Press
bʰ	Dabh	/dʌbʰ/	دبھ	A kind of grass
ʈ	Kat	/kʌʈ/	کٹ	Mating, copulation
ʈʰ	Kath	/kʌʈʰ/	کٹھ	Story
ʈ	Nut	/nʌt/	نٹ	Joker, jester
ʈʰ	N'uth	/nʌʈʰ/	نٹھ	Run
ɖ	Lid	/liɖ/	لڈ	Dong
ɖʰ	Lidh	/liɖʰ/	لڈھ	Sluggish
ɖ	Bud	/bʊɖ/	بڈ	Drowning
ɖʰ	Mudh	/mʊɖʰ/	مڈھ	Trunk, start-up
k	Ruk	/rʊk/	رُک	Stop
kʰ	Rukh	/rʊkʰ/	رُکھ	A tree
g	Vaag	/vaːg/	واگ	Bridle
gʰ	Bagh	/baːgʰ/	باگھ	Lion

Shows 16 Oral Stops at the word-final position in the Ghebi inventory

Ghebi has a total of 16 oral stops, which are organized into four phonemic series: voiceless unaspirated (p, ʈ, ʈ, k), voiceless aspirated (pʰ, ʈʰ, ʈʰ, kʰ), voiced (b, ɖ, ɖ, g), and voiced aspirated (bʰ, ɖʰ, ɖʰ, gʰ). The stops are contrastive in all positions in the word (initial, middle, and final), and they are also phonemically distinctive (i.e., when used in place of another stop, they have the ability to alter a word's meaning.). For example, "pul" (bridge) and "phul" (flower) are two distinct words that differ only in the aspiration of the initial stop. The inventory of Ghebi plosives is relatively symmetrical and balanced, with four series of four stops each. This is in contrast to many other languages, which may have asymmetrical inventories with fewer stops in certain series (e.g., many languages have fewer voiced stops than voiceless stops). The plosives in the Ghebi dialect occur at word-initial, word-medial, and word-final positions, similar to other languages like Hindi and Sindhi. In particular, the Ghebi dialect possesses voiced aspirated stops, which are characterized by a period of breathy voice, or a murmur, after the stop closure and before regular voicing starts for the following vowel. This distinct phonetic feature has been found to be important in differentiating between minimal pairs in the Ghebi dialect and highlights the importance of considering these features in future studies of Ghebi phonology. Overall, the presence of voiced aspirated stops in the Ghebi dialect is a unique characteristic that sets it apart from other dialects in the region and further research into its phonetic and phonological features could shed light on its history and development.

Voice on Set Time (VOT) Of Ghebi Plosives

Methodology

The purpose of this descriptive study was to investigate the duration of Voice Onset Time (VOT) of Ghebi plosives or the period of time between the start of speech sounds and the beginning of vocal cord vibration. The study used a quantitative research methodology which is thought suited to this kind of work. Convenient sampling was used to recruit five participants who represent the target group, which consists of all Ghebi dialect speakers. The selected participants were physically and mentally healthy undergraduates, aged between 18 and 25 years, who were considered to be a representative sample of the target population. Data collection was carried out using a mobile phone in a soundproof room, ensuring minimal external noise interference. A written list of minimal pair words (Table 2.1) was presented to the participants, each of which consisted of two words with a target stop sound at the initial position followed by the same vowel sound. The use of minimal pairs allows for a standardized environment for all stops and eliminates any influence from adjacent sounds. It was instructed the participants to pronounce each word normally, and their pronunciation was recorded using the voice recorder app on a mobile phone in the soundproof room. The written list presented to the study participants contained the following words.

Table 5

Serial No.	Stops	Word	Transcription	Ghebi	Meaning
1	p	Pul	/pʊl/	پُل	Bridge
2	pʰ	phul	/pʰʊl/	پھُل	Flower
3	b	Bari	/bɑ:ri/	باری	Window
4	bʰ	bhari	/bʰɑ/	بھاری	Heavy

Serial No.	Stops	Word	Transcription	Ghebi	Meaning
5	ʈ	Tali	/ʈəli/	ٹلی	Palm
6	ʈʰ	Thali	/ʈʰəli/	ٹھلی	Step
7	t	Tali	/təli/	تلی	Bell
8	tʰ	Thaali	/tʰəli/	ٹھلی	To bear a load
9	ɖ	Das	/ɖəs/	دس	Tell
10	ɖʰ	Dhas	/dʰəs/	دھس	Force , stroke
11	ɖ	Dah	/dɑ:h/	ڈاہ	To lay
12	ɖʰ	Dhah	/ɖʰɑ:/	ڈھا	Drop, fall
13	k	Kal	/kəl/	کل	Tomorrow
14	kʰ	Khal	/kʰəl/	کھل	Fodder
15	g	Ga	/gɑ:/	گا	Sing
16	gʰ	Ghah	/gʰɑ:/	گھاہ	Grass

The list of words chosen for the current study's recording and analysis is displayed in Table 5.

The words in Table 2.1 were given to the participants and they were asked to pronounce these words at a normal pace. The researchers recorded the pronunciation of the participants through a recorder app on a mobile phone. The collected data were then subjected to acoustic analysis using PRAAT, computer-assisted speech analysis software. PRAAT generated waveforms and digital spectrograms that facilitated the analysis of VOT duration. The analysis of the collected data aimed to determine the VOT duration, which is the time interval between the release of the stop closure and the onset of the following vowel.

Analysis and Findings

The average values for the voiceless stops generated by five chosen native speakers of the Ghebi dialect are displayed in Table 3.1 below.

Table 5

VOT for Voiceless Ghebi Stops

Stop	p	pʰ	ʈ	ʈʰ	t	tʰ	k	kʰ
VOT	0.018	0.057	0.019	0.041	0.006	0.041	0.021	0.055

Table 3.1 Contains eight voiceless stops of Ghebi dialect /**p, pʰ, ʈ, ʈʰ, t, tʰ, k, kʰ**/and their VOT values. The VOT values shown in the table above were taken after analyzing those sounds by using Praat. VOT values range from 0.006 to 0.057, where / **t** / has the shortest VOT value of 0/006 whereas / **pʰ** / has the longest VOT value of 0.057.

Figure 1 below shows the physical properties of voiceless Ghebi stops.

Figure 1

Spectrograms of Voiceless Ghebi Stops

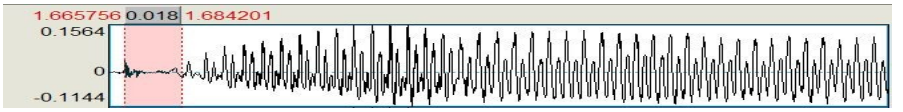
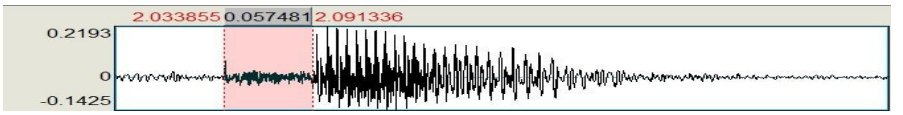
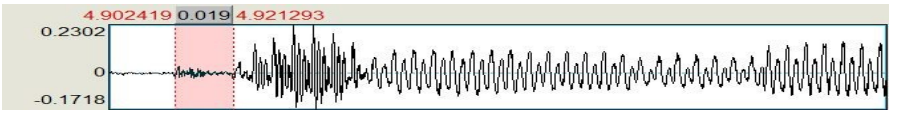
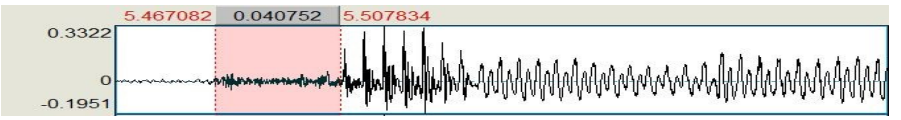
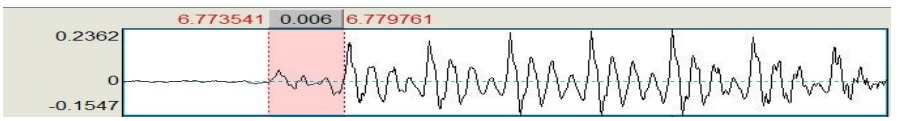
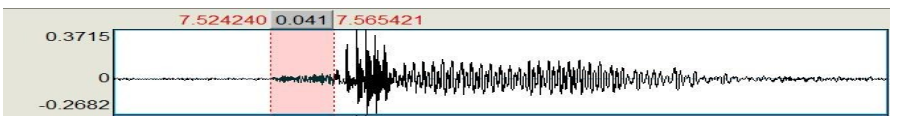
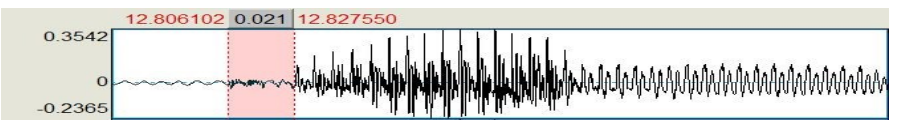
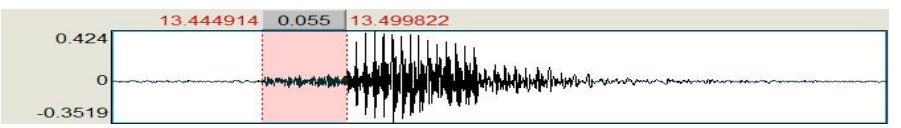
Ghebi Stops	VOT
/ p /	
/ pʰ /	
/ ʈ /	
/ ʈʰ /	
/ ʈ /	
/ ʈʰ /	
/ k /	
/ kʰ /	

Figure 1 above shows the spectrograms taken from Praat. VOT values are highlighted and other physical properties of these voiceless Ghebi stops are clearly indicated on the spectrograms.

The average values for the voiced stops pronounced by five chosen native Ghebi speakers are displayed in Table 3.2 below.

Table 6

VOT for Voiced Ghebi Stops

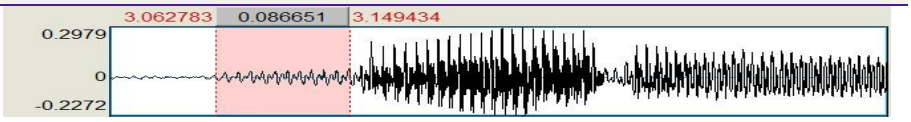
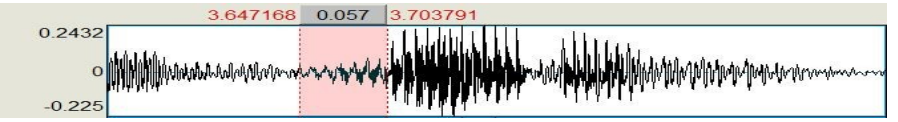
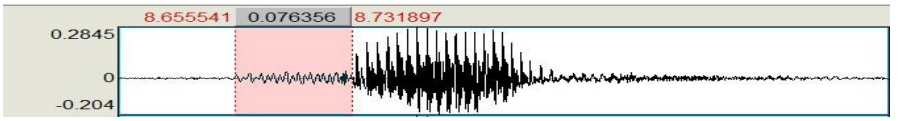
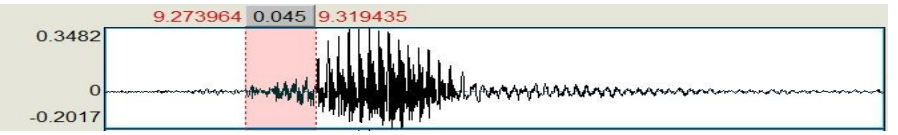
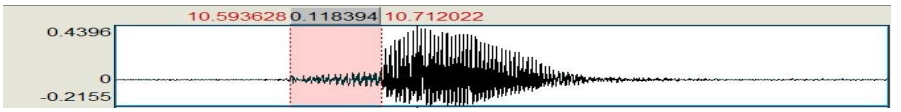
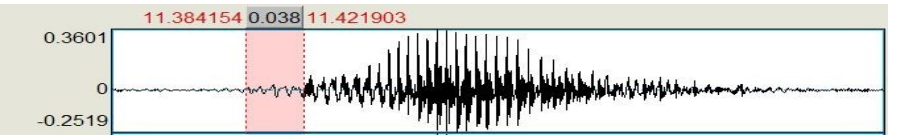
Stop	b	bʰ	ɖ	ɖʰ	ɖ̣	ɖ̣ʰ	g	gʰ
VOT	0.087	0.057	0.076	0.045	0.118	0.038	0.086	0.073

Table 6 Contains eight voiced stops of Ghebi dialect **/b, bʰ, ɖ, ɖʰ, ɖ̣, ɖ̣ʰ, g, gʰ**/and their VOT values respectively. The VOT values shown in the table above were taken after analyzing those sounds by using Praat software. VOT values range from 0.038 to 0.118, where / **ɖ̣ʰ** / has the shortest VOT value 0.038 whereas / **ɖ̣** / has the longest VOT value 0.118.

Figure 2 below shows the physical properties of voiced Ghebi stops.

Figure 2

Spectrograms of Voiced Ghebi Stops

Ghebi Stops	VOT
/ b /	
/ bʰ /	
/ ɖ /	
/ ɖʰ /	
/ ɖ̣ /	
/ ɖ̣ʰ /	

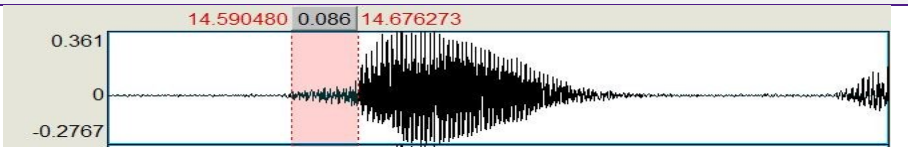
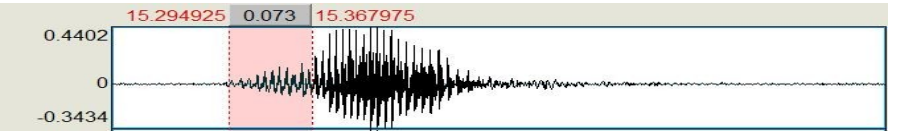
Ghebi Stops	VOT
/ g /	
/ gʰ /	

Figure 2 above shows the spectrograms taken from Praat software after analyzing the voiced Ghebi stops sounds. VOT values are highlighted and other physical properties of voiced Ghebi stops are clearly shown on the spectrograms.

From the data discussed above, we can see that the voiceless Ghebi stops have comparatively shorter VOT values. Overall shortest VOT value is of / ʈ / which is a voiceless stop whereas the longest VOT value is of / ɖ / which is a voiced stop.

The current study investigated the Voice Onset Time (VOT) values of voiceless and voiced stops in the Ghebi dialect. The analysis was conducted on eight voiceless and eight voiced stops produced by five native Ghebi speakers. The obtained results revealed that the voiceless stops have shorter VOT values compared to the voiced stops. Moreover, it was observed that the shortest VOT value belonged to the voiceless stop /ʈ/, whereas the longest VOT value was associated with the voiced stop /ɖ/.

The spectrograms obtained from Praat software further highlighted the physical properties of these stops. The spectrograms clearly indicated the VOT values, and other acoustic features of the voiceless and voiced Ghebi stops. The spectrograms can serve as a useful tool for phonetic analysis and can be utilized to compare the acoustic properties of other languages.

Conclusion

In conclusion, this study provides insight into the VOT values of voiceless and voiced stops in the Ghebi dialect. The results indicate that the voiceless stops have shorter VOT values compared to the voiced stops. The spectrograms obtained from Praat software further highlight the physical properties of these stops. The obtained results can be used as a reference for future studies on the Ghebi dialect and can contribute to the development of speech and language pathology in the region.

In the Ghebi dialect, all the voiceless and voiced phonemes have their aspirated contrasts- the feature that includes the Ghebi dialect in the Indo-Aryan languages but separates it from the Kangani-Hindko dialect spoken in the Hazara region, which does not have voiced aspirated stops as claimed by Rashid (2014).

The Ghebi plosives exist in word inventory at word initial, word medial and word-final positions. Similar to Hindi and Sindhi languages, the Ghebi dialect also features voiced aspirated stops. These stops have a breathy voice (murmur) phase following the stop closure before the regular voicing for the subsequent vowel begins.

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