A Comparative Study of Vowels in Chakma and English

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A Comparative Analysis of Chakma and English Vowels

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I am also thankful to my friends who helped me to find information and the recordings.

Abstract

This study examines that a comparative analysis of English and Chakma vowel phonemes with which different features of these two languages comes out. In this study the similarities and dissimilarities of Chakma vowels with English is the main concern. Chakma vowels are compared to English vowels by description of vowels, diphthongs, phonemic contrast of vowels, vowel length, nasalization, and vowel stressed. The vowels are described articulatory movements of the vowels, position of the vowels within the words etc. Additionally, phonemic contrast of vowels is described through initial, medial and final contrast of vowels. In the last part of the paper, acoustic analysis is given to draw the position of the vowels while articulation in Chakma.

Table of Contents

Introduction

In phonetics vowels are the phonemes of spoken language which can be differentiate according to the phonetic and phonological aspects. Phonetically, a sound produced with an open vocal tract which does not obstruct airflow above the glottis is called a vowel. On the other hand, from a phonological point of view, vowels are the sounds that form the peak of a syllable. In all spoken languages, vowels form a small part of the overall inventory of phonemes. As we know, a syllable must contain a vowel or vowel like sound. With a few vowels we can produce a myriad of syllables. All the vowels are different from each other considering the shape and position of the tongue. Daniel Jones developed the cardinal vowel system in the early twentieth century. He proposed a set of eight reference vowels. The cardinal vowels are a standard reference system which provides an accurate outcome and also helps to recognize the tongue position of vowels (Roach, 2010). In the cardinal vowel system, all the vowels are categorized according to front/back, high/low and roundness (lips position). A particular language can have separate and individual vowels at different positions; on the other hand, some of the vowels can have same qualitative and quantitative features. Through the acoustic analysis, the position of the vowels can easily be identified. Other distinctive features of vowels should be considered in a language. They are vowel length, nasality, etc. In English and Chakma, the monophthongs and diphthongs have some affinities as well as differences. English language contains thirteen distinct vowel phonemes. However, Chakma language has eight vowel phonemes.

The purpose of this paper is to trace the comparative study of English and Chakma vowels. This paper is segmented into different parts e.g. literature review, cardinal vowels, description of monophthongs and diphthongs, phonemic contrast of vowels, vowel length, nasalization, vowel stress, acoustic analysis of Chakma vowels and the findings. In the vowel

description part, I only emphasis on Chakma vowels and only those vowels will be compared to English vowels.

Literature Review

From the geographical aspect, Chakmas are mostly found in Bangladesh, India and Myanmar. The actual origin of Chakma language is obscure. It can be properly classified as a separate language of Indo- Aryan origin (Hossain, 2011). However, since the Chakmas anthropologically belong to Mongoloid people, the early language was either Tibeto-Burman or the branch of the Siamese-Chinese from the Sino-Tibetan language. Chakma language has great similarities with Ahom and Arakanese. The present Ahom or Assamese language is also a branch of the Indo-Aryan language. According to the linguists, the original language was Shan which was a branch of Siamese-Chinese language. It is distinctly prominent that among all the Mongoloid groups of people living in north eastern India, only the Chakmas and the Ahom have accepted the Indo-Aryan language. About Chakma language, Lucien Burnot says "…it is most provable that the Chakmas spoke a language not belonging to the Indo-European family before they settled themselves where they are now living. The Chakma group appears to be an example of Mongoloid group giving up its own language to the benefit of Indo-European" (Supriya, 2006). In this regard, another linguist Pierre Bessaignet writes "Although ancient manuscripts reveal that the original Chakma language was written in Burmese characters, and probably was a Burmese dialect, the common tongue today is a corrupted form of Bengali". As earlier mentioned, Ahom and Arakanese have great similarities in the language with Chakma; the following tables exhibit the connection of Ahom and Arakanese vocabularies with Chakma (Supriya, 2006).

Chakma	Ahom	English
Agatya /agattie/	Aoghtiya	Stubborn, Hard
Eyot /ijot/	Eyat	Here
Udhumduma /udumdume/	Udhamuda	Doing something at random without understanding
Uzu /uzu/	Uzu	Easy to do or understand
Uvalfaal /ubolfal/	Uchahalpachal	Delighted, intoxication with joy
Gheghechya /geʧegeʧe/	Ghekech	Really
Loge /lɔgæ/	Log	With, along

Table 1: The similarity of words between Chakma and Ahom

From the Table 1, we can see the some similar vocabularies of Chakma and Ahom. Although in some words the vowels and consonants are different, still the words are appeared as like as dialectical. Similar features are seen with the Arakanese language (Supriya, 2006).

Chakma	Arakanese	English
Akyang /akkieŋ/	Akhyiong	Habituated
Thum /ʰhum/	Thum	End
Tong /tɔŋ/	Taung	Hills
Tareng /tareŋ/	Teirang	Hill top
Aang /aŋ/	Aang	Sketch, Tattoo

Poi /poi/	Poi	Dish
Porong /pɔrɔŋ/	Porong	To shift (usually shifting home)

Table 2: The similarity of words between Chakma and Arakanese

As most of the Chakmas are Buddhist, for this reason Pali and Sanskrit also have a great influence on the language (Chakma, Jyotirmoy, 3). However, the modern version of Chakma is an admixture of other languages. In Bangladeshi context, Bangla is the most dominant language over this region. For this reason Bangla has a significant influence on the Chakma language. A lot of words borrowed from Bangla. Even some of the vocabularies are found same in Chakma and Bangla. Modern Chakma language in Bangladesh is close to Bangla A list of similar words is given in the following table.

Chakma	Bangla	English
Cul /sul/	Chul /tʃul/	Hair
Halam /hɔlɔm/	Kalam /kɔlɔm/	Pen
Aat /at/	Hat /hat/	Hand
Boi /boi/	Boi /boi/	Book
Pani /pani/	Pani /pani/	Water

Table3: Chakma and Bangla similar words

Some linguists claim Chakma language as a dialect of Bangla. To talk about similarities G. A. Grierson claims Chakma language as “a broken dialect of Bengali”. Md. Kamal Hossain says “…their language became aberrant form of Chittagong dialect”. On the contrary, as earlier

mentioned the Chakmas are Mongoloid and hence Bengali language can never be their original language. But the enormous influence of Bangla language upon Chakma language cannot be denied. Regarding this aspect Jyotimoy Chakma's says "It is called Chakma, and is based on South- Eastern Bengali, but has undergone so much transformation that it is almost worthy of the dignity of being classed as separate language". In Chakma there are some English words, and the Chakmas have their own way of pronouncing those words. The following table shows some borrowed words from English and Chakma pronunciation of those words.

English Word	Chakma Pronunciation
Hospital	/aspatal/
School	/iskul/
Bank	/bæŋk/
Paper	/pæpar/

Table 4: English borrowed words in Chakma

Vowel Inventory

In Jyotirmoy Chakma writings "Origin and Evolution of Chakma Language and Script" mentions that Chakma vowels consist of four Agju Harag and one Anji Harag. The Agju Harag are presented in the following table:

		Agju Harag		
Lejubo E	Deldya I	Borsi U ƨ	Bi	Jwilya Ja

Table 5: Chakma *Agju Harag*

There is another vowel called *Anji Harag*- 𑄃𑄪 (Chakma, Jyotirmoy, 6) that produce [a] sound.

Jyotirmoy Chakma also claims that in the ancient scripture and literature there was only one vowel, other vowels are written only with the help of diacritics used above and below consonants. He says that the *Anji Harag* is the only fundamental vowel in Chakma. In addition, in "Preliminary proposal for encoding the Chakma script in the UCS" is mentioned that five independent vowels and eight dependent vowel signs which includes long [i:] (Baanniphadaa ii) and long [u:] (Dvittaana uu). On the other hand, Sugata Chakma in his book "Tribes of Chittagong Hill Tracts" fixed the different characters of vowels for writing and omitted the long [i:] and long [u:] and for vowels. The projected vowels produce seven distinct phonemes, those are [i], [e], **[æ],** [a], [ɔ],[o], [u]. On the other hand, I found that there are eight vowel phonemes in Chakma. And those are [i], [e], [æ], [ʌ], [a], [ɔ],[o], [u]I will discuss the Chakma vowels in detail in the section on cardinal vowels and vowel length. The vowel inventory of UCS and Sugata Chakma is given bellow:

Alphabet	Name	Pronunciation
𑄃	Pichapujhaa aa	a
	Delabhaanga i	i
𑄄	Bacaci u	u
	Lejaubaa e	e
𑄅	Bajonyaa waa	Wa

Table 6: Dependent vowel proposed by UCS

Signs	Name	Pronunciation
◌	Ubaratulyaa a	[a]
◌	Bahrayaa i	[i]
◌	Baaniiphadaa ii	[i:]
◌	Ekattaana u	[u]
◌	Dvittaana uu	[u:]
◌	Ekaara e	[e]
◌	Dekabhaanga ai	[ai]
◌	Okaara o	[o]

Table 7: Independent vowel signs proposed by UCS

Alphabet	Pronunciation
𑄃	[ɔ]
𑄀	[a]

𑄃𑄴	[i]
𑄅𑄴	[u]
𑄇𑄴	[æ]
𑄇𑄧	[o]
𑄃𑄧	[oi]

Table 8: The vowels in Sugata Chakma's book

In this regard, I can say that as the vowels are the phonemes of spoken language, the main concern is to find out the existence of long and short vowels in spoken Chakma. In this paper I will use alphabets that Sugata Chakma suggested for Chakma writings.

Cardinal Vowels

The cardinal vowels were devised by Daniel Jones in the early twentieth century. Later on Ellis and Bell developed the cardinal vowel system and made it more systematized. Cardinal vowels are a reference system that helps to learn the vowels accurately and recognize them correctly (Roach, 2010). The shape of the cardinal vowel diagram is recommended by the International Phonetic Association (IPA). In addition, cardinal vowels are mainly concerned with the articulatory position of the vowels in terms of hight/low, front/back and lip rounding. If the front part of the tongue is placed near to the roof of the mouth, the vowel is considered as high and front. On the other hand, if the tongue is positioned as low in the mouth those are low vowels. When the back portion of the tongue is raised these vowels are considered as back. In addition, cardinal vowels are the components of vowel classification system which is independent in every language. There are 12 distinct vowels in English in different positions.

Among the 12 distinct vowels six [i, e, æ, ʌ, ɒ, ʊ] of them are short, short vowels require less time, energy and air to be produce. On the other hand, in case of long vowels, moderate time, energy and air are required. There are 5 long vowels in English e.g. [iː,ɜː, ɑː, ɔː, uː]. In English there is another vowel called schwa [ə] which is a reduced vowel. Likewise, there are eight distinct vowels in Chakma [i], [e], [æ], [ʌ], [a], [ɔ],[o], [u]. Among eight different vowels, three [i, e, æ] of them are front vowel**,** one is central [ʌ] and rest of the four [a, ɔ, o, u] vowels are back. In table 6, we can see, there are two open/low vowels [æ, a] and two close/ high vowels [i, u]. And there are three mid vowels [e, ɔ, o] in Chakma. The following section contains the discussion of Chakma vowels in terms of its cardinal and syllabic position and compared them with English vowels.

The cardinal vowels diagram, English vowels and Chakma vowels charts are given bellow.

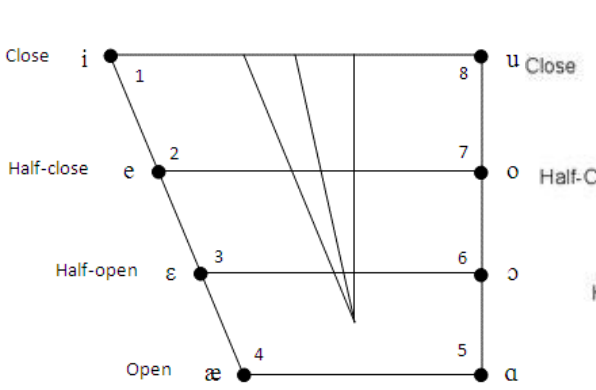

Table 9: Primary Cardinal Vowels

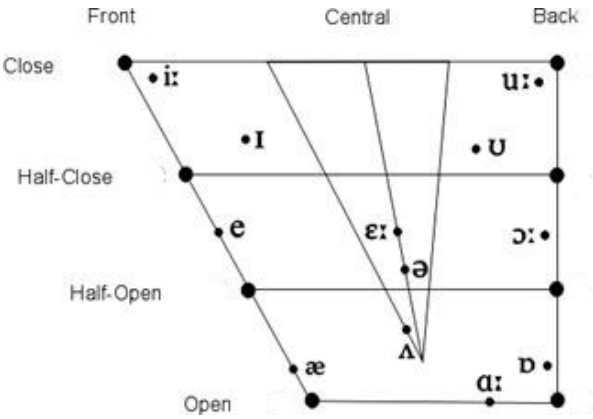

Table 10: English vowels diagram

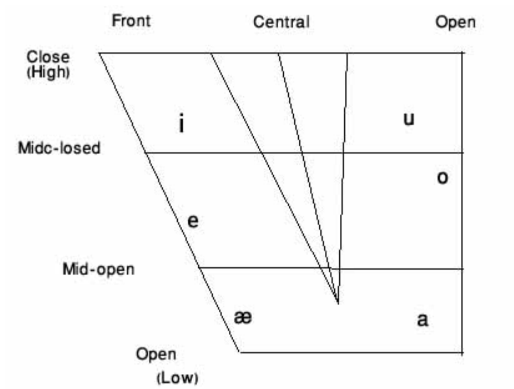

Table 11: Chakma Cardinal Vowels

Monophthongs

From the cardinal vowel chart as a basic system of reference, we can now proceed to a brief description on the vowel phonemes of Chakma in comparison with English vowels.

[i] This is a front vowel in Chakma. [i] is an unrounded vowel. During the articulation of the [i] vowel the tongue positioned high and almost between close and close- mid position. The lips are slightly spread. The length of [i] in Chakma remains same with aspirated and unaspirated consonants. For example, 𑄎𑄨𑄟𑄨𑄖𑄴 /ʤimit̪/ (spark) and 𑄎𑄪𑄚𑄨 /ʤuni/ (glow-worm) in these two words, the first syllable of the first word includes an aspirated consonant which does not influence the following [i] phoneme. Similarly, in the second word [i] is followed by a short and unaspirated consonant /n/ which does not change the length of [i] vowel. The same depiction is found in terms of second syllable of the first word. Furthermore, the vowel [i] can be distributed in all three basic positions e.g. initial, medial and final such as 𑄄𑄘𑄮𑄖𑄴 /idot̪/ (remember), "𑄏𑄨𑄁𑄦𑄚𑄨" /ʤiŋhani), 𑄝𑄢𑄨𑄎𑄬 /barize/ (monsoon), "𑄦𑄘𑄨" /hadi/ (Chakma traditional dress, particularly scarf). In all three basic positions the vowel does not changes its length. Similarly, in

English [i] is also found in three basic positions. For example, *ink, kill, aptly*. However, English vowel phoneme [i] can be spelt with different alphabets for example, *party* (y), *minute* (u) etc. But Chakma vowel phoneme is only spelt with the letter (𑄄) or it representative sign or diacritic (𑄨). For example, 𑄄𑄘𑄪 /idu/ (here), 𑄟𑄪𑄢𑄮𑄟𑄪𑄢𑄨 /muromuri/ (hill), in these examples the first letter of the first word represents [i] phoneme. In the second example the last letter is presented with diacritic which also represents the [i] phoneme. Apart from the letter and diacritic the other alphabets do not represent the [i] phoneme.

[e] This is a second vowel phoneme in Chakma language. According to tongue height it is intermediate between half-close and half open. It is a common vowel in Chakma, distributed in initial, medial and final position e.g. 𑄆𑄣𑄴 /el/ (green) 𑄖𑄢𑄬𑄋𑄴 (tar**eŋ**) (bottom of hill), and 𑄝𑄢𑄨𑄎𑄬 /bari**ze**/ (monsoon). However, the most significance of English vowel [e] is that it never occurs in word final position instead it is normally reduced to [i] or schwa [ə] and if it is unstressed, it diphthongizes to [ei] (The Vowels of English, Chapter 4). Nevertheless, in the word initial and middle positions the vowel can be found; such as, elf, fell etc. Additionally, in English the [e] phoneme is spelt either "**e**" in words like elf, fell or ea in lead. It can be exceptionally spelt "**a**" in ate (the past tense of eat), many, any, Thames etc. On the other hand, in Chakma (**𑄆**) and (**𑄬**) represent the [e] phoneme. For example, 𑄢𑄬𑄖𑄴 /red̪/ (night), 𑄛𑄬𑄉𑄴 /peg/ (bird), 𑄆𑄖𑄴 /et̪/ (elephant) etc. in these examples the first two words contain reduced form (**𑄬**) for [e] phoneme and last example [e] vowel is represented by (**𑄆**).

[æ] This is the lowest front vowel in Chakma. The basic difference between this vowel and the preceding vowels is, **[æ]** is an open vowel phoneme which means that during the

articulation the tongue remains flat and the distance between hard palate and tongue is bigger than the preceding vowels. The lips remain spread. This is one of the most common vowel phonemes in Chakma. The vowel is distributed in three basic positions, initial, medial and final, for example, 𑄇𑄢𑄨 /**æ**ra/ (meat), 𑄟𑄢𑄖 /t̪ɔɖ**æ**k/ (parrot), 𑄟𑄮𑄇 /t̪ɔl**æ**/ (bottom). The vowel is found with both aspirated and unaspirated consonants. For instance, 𑄆𑄌𑄬𑄚 /t̪**æ**bar/ (falling in drop), 𑄌𑄌𑄬𑄚 /t̪ʰ**æ**bar/ (to say), in these two examples, the first syllable of the first word includes an unaspirated consonant whereas in second example the first syllable incorporates an aspirated consonants. On the other hand, in English, this vowel can be found in syllable- initial, middle and final positions; e.g. ant [**ænt],** cat [**kæt**] and rapid [**ræpɪd**] but cannot be found in word final position. In Chakma it is usually spelt with the same letter and sign as [e] vowel phoneme spells. For example, 𑄢𑄃𑄚 /ɖ**æ**ba/ (sky), 𑄌𑄎𑄬𑄚 /b**æ**zar/ (sad), 𑄇𑄢𑄨 /**æ**ra/ (meat) the first two words have the reduced form of (𑄢), in the last example the [æ] is represented by **(**𑄇**)**. Furthermore, there is no specific set of rules to differentiate these two phonemes. The context of a word/ syllable decides whether it is going to be a [e] or [æ]. For example, /dʒ**æ**/ and /dʒe/ both the words contain the same spelling **𑄖𑄨** but first one refers a person. On the other hand the second example, je allied to [e] phoneme and that represents. In English, it is usually spelt **a** e.g. *act, fact*. Exceptionally is [**æ]** spelt with **ai**: *plait* [**plæt**], *plaid* [**plæd**].

[ʌ] is the only central vowel phoneme in Chakma. It is a short, lax, unrounded vowel. According to tongue height this phoneme is intermediate between half-open and open. This phoneme is rare in Chakma. I came across only a few examples of this vowel, e.g. 𑄎𑄪 /dʒʱʌɖi/ (quick), 𑄃𑄋 /banʌ/ (puzzle). From those examples we can see, [ʌ] is found only at the middle

position and final position. In contrast, [ʌ] is a common vowel phoneme in English. it is distributed in word initial and medial positions such as *utter* and *subtle*. It never occurs in word or syllable- final position. [ʌ] is spelt with different alphabets in English. It is usually spelt either u e.g. *under, but*, or "**o"** *come, honey*, "**ou"** *courage, rough* etc. and **oo** in *blood* and *flood* and "**oe"** *does*. However, 𑄃 letter represents the [ʌ] vowel in Chakma. Additionally, in Chakma all the consonants are pronounced with [ʌ] or [a]. Hence, diacritic or reduced form is absent for this vowel. For example (𑄅) and (𑄛) stand for /b/ and /r/ phonemes and [a] or [ʌ].

[a] is open vowel in Chakma. According to the tongue movement of [a], the tongue is completely open, thus this is called back- open vowel. [a] is a common vowel in Chakma. The vowel can be found in all the three basic positions: initial, middle and final, for example, 𑄃𑄇𑄴 /**a**𑄉ɔŋ/ (mess), "𑄝𑄴𑄛𑄝𑄧" /ʤiŋhni/ (life), 𑄎𑄛𑄅 /gɔr**ba**/ (guest). [a] is found in both aspirated and unaspirated consonants such as 𑄛𑄟𑄨𑄚 /t̪arum/ (deep forest) and 𑄞𑄜 /t̪ʰana/ (set, place). However, [a] does not exist in English, instead English vowel [a:] is much longer than Chakma [a] vowel.

[ɔ] This is back a vowel. In comparison with English [ɒ] and [ɔ:], Chakma [ɔ] is found in between [ɒ] and [ɔ:]. The position is more close to the half-open. And during the articulation the back portion of the tongue is raised; hence, it is called back mid close vowel. In all the three basic positions the vowel is found e.g. 𑄃𑄇𑄳 /ɔ𑄉ɔk/ (case for chicken), 𑄎𑄛𑄅 /gɔrba/ (guest), 𑄃𑄌𑄘 / ɔk̪ɔ/ (time). As earlier mentioned, the exact [ɔ] vowel does not exist in English. However, English has short [ɒ] and long [ɔ:]. Both the vowels [ɒ] and long [ɔ:] are only found at

initial and medial positions such as, *on* /ɒn/, *pot* /pɒt/ and *oar* /ɔ:r/ never be found in final position. The short [ɒ] vowel is usually spelt "o" such as *obdurate*, *object* etc. Other spellings are possible, **a** as in *want***, ou** as in *cough* and **au** in rare cases like *laurel* (The Vowels of English). In Chakma [ɔ] is spelt either alphabet (𑄃𑄴) or its diacritic (◌𑄴)

[o] is another common vowel phoneme is Chakma. The back of the tongue is raise during its articulation. The position is near to the half close and lips are rounded. For this reason it is called back, half-close vowel. This vowel is distributed in three positions e.g. initial 𑄝𑄨𑄇 /ol/ (puzzled), middle 𑄟𑄬𑄢 /mon/ (hill), 𑄇𑄨 𑄉 /hallo̱ŋ/ (basket) and final 𑄀𑄨𑄟𑄬 /ullo/ (stubborn). The vowel is usually spelt with (𑄝) or the respective diacritic (◌𑄬). A word at the initial position requires the letter form (𑄝), for example 𑄝𑄟𑄃𑄈 /ogoi/ (tools for making rice). In the medial and final positions, the words are spelt with diacritic (◌𑄬) e.g. 𑄟𑄬𑄢 /mon/ (hill). In contrast, [o] does not exist in English.

Another Chakma rounded vowel is /u/. While articulation, back part of the tongue is raise towards the velum. Its position is between close and half close. For this reason it is called back close and half-close vowel. The position of the u vowel is seen three basic points initial, middle and final, such as 𑄌𑄧𑄖𑄳𑄉 /udʒebɔŋ/ (forward), 𑄥𑄢𑄨 / pʰuni/ (comb) and 𑄃𑄨𑄟 /i̱du/ (here). There is particular letter for [u] in Chakma. The letter also includes a sign which characterizes [u] phoneme. In the word initial position the letter is needed and when the vowel phoneme preceded by a consonant, it can be represented by a diacritic; for example, 𑄟 /hu̱du/ (where). On the contrary, the distribution of English [u] is restricted to medial position. The usual spelling is the

letter “u” in words like *push, pull, put.* The letter o can also represent the phoneme as we see in the previous examples. Apart from **u** and **oo** can also represent [u] such as *wood, good, foot* etc.

Diphthongs

Diphthongs:

Diphthongs are described as sequence of two vowels pronounced together and the two vocalic elements being members of the same syllable (Yule, 2006). When we produce diphthongs, our vocal organs move from one vocalic position to another. It is mentionable that all the diphthongs have its source and glides. A source indicates where tongue starts to move and the glide refers to where the tongue shifts. Usually the second vowel is the glide. The diphthongs are similar to the long vowels. And another important thing to remember about all the diphthongs is that the first part is much longer than the second part (Roach, 2010). For example, in the diphthong [ai] in “eye” consists of the [a] vowel and [i]. As the glide to [i] happens, the loudness of the sound decreases. According to Peter Roach’s descriptions, diphthongs can be divided into two distinct features e.g. centering and closing. If the glide falls towards the low and central vowels it is considered as centering diphthong. On the contrary, the closing diphthongs characterize that they all end with a glide towards a closer vowel. In Chakma, the diphthongs can be found in the medial or final position. There are seven diphthongs in Chakma, those are [ia], [ei], [ai], [oi], [oe], [ui],[uo]. In english, however there are eight diphthongs. Among them three of them are centering [iə̲], [eə̲], [uə̲] diphthongs and five [ei], [ai], [ɔi], [ə̲u], [au] are closing. The accompanying diagram provides an idea of how diphthongs are produced in Chakma.

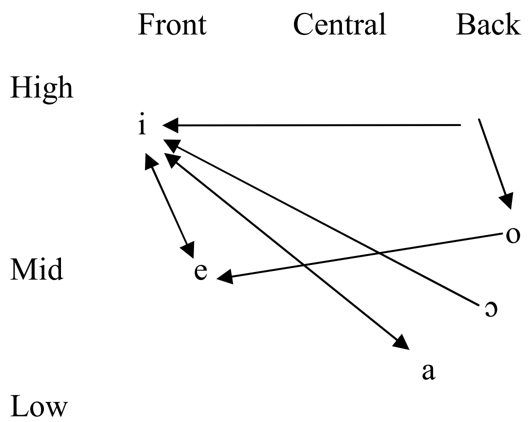

Table 12: Diphthongs in Chakma

[ie]: This diphthong starts at the position of the [i] and glides towards [e]. The diphthong is distributed in all three basic positions initial, medial and final: 𑄃𑄨𑄠𑄬𑄚𑄴/ien/ (that is) 𑄃𑄇𑄴𑄇𑄨𑄠𑄬𑄁 /akkieŋ/ (habituated) and 𑄎𑄨𑄠𑄬 /dʒie/ (gone). If the first element of the diphthong does not have the normal prominence and length, it can be reduced to a glide and the diphthong is changed into semi-vowel /j/. Alternatively, in English [ie] does not exist, rather [iɘ] is found in words such as beard, weird, fierce etc.

[ei] is a closing diphthong in Chakma. It starts with a front mid vowel and glides to a high and close vowel. This diphthong can be found in three basic positions initial, middle and final e.g. 𑄃𑄬𑄃𑄨𑄎𑄝𑄧𑄖𑄴 /eidʒabɔt/ (till now), 𑄝𑄬𑄃𑄨𑄣𑄳𑄣𑄬 /beille/ (afternoon), 𑄗𑄬𑄃𑄨 /t̪ʰei/ (standing position). Additionally, this diphthong is most common with consonant cluster, for example, 𑄝𑄬𑄃𑄨𑄣𑄳𑄣𑄬 /beille/ (afternoon), 𑄝𑄬𑄃𑄨𑄚𑄳𑄚𑄬 /beinne/ (morning), 𑄦𑄬𑄃𑄨𑄣𑄳𑄣𑄬 /heille/ (tomorrow) etc. In

addition, in English this diphthong in found in all basic positions initial, medial and final; such as, eight, reign, clay etc. It can be spelt a: *ace, lace* ai: aid, maid, ay: clay; ei: eight, ea: steak. The diphthong also occurs in a small number of French loan words ending in **é;** such as café, fiancé etc. (The Vowels of English).

[ai]: This is a closing diphthong in Chakma. It is the diphthong that actually implies that the articulatory movement of the tongue shifts from open [a] vowel to a front, close vowel [i]. The diphthong is only found in the final position of the words such as သ်ၜဣ /sɔmai/ (enter), ထုပဣ /t̪ʰubai/ (assemble) etc. when (ဣ) /[i] vowel is followed by consonant that contain [a] phoneme that time the [ai] diphthong is produced. On the other hand, in English the diphthong can be found in all the three basic positions (initial, middle and final) such as *isle* /ail/, *bite* /bait/ and *cry* /krai/. It can be spelt I as in *ice*, y in *fly*, ie as in *die, lie*. The diphthong can also be found in inflected forms such as spies, ye as in *dye*, ei as in *height*, either and uy in *buy, guy* etc.

[ui] is a common diphthong in Chakma. It is a closing diphthong which articulatory movement shifting from high-back towards high-front. This diphthong only appears in final positions of words; e.g. ဃုဣ /mui/ (I), တွိဣ/t̪ui/ (you). In contrast, English does not have this diphthong.

[uo] is an opening diphthong in Chakma which implies that the articulatory movement of the tongue shifts from open back towards mid open position. [uo] is distributed in word-medial: ဘွတ် /huot̪/ (source of water) and word-final position: ဏုဘွ /nuo/ (new). On the contrary, [uo] does not exist in English.

[ɔi] is a closing diphthong in Chakma. The articulatory movement of the tongue changes from back mid-close towards high front position. This diphthong can only be found in medial and word-final position e.g. 𑄇𑄴𑄎𑄨 /pɔize/ (coin), 𑄇𑄨 /pɔi/ (plate), etc. Additionally, this diphthong is also found in initial, medial and final positions e.g. oil /ɔil/, voice /vɔis/ and boy /bɔi/.

[oe] is the another diphthong in Chakma. This is a closing diphthong that starts at the position of back mid-close and glides towards front and mid vowel [e]. This diphthong can be found in word final position for example, 𑄃𑄨 /hoe/ (told), 𑄟𑄃𑄨 /soe/ (tolerate). However, this diphthong is not found in English.

Phonemic Contrasts of vowel

In this part of the paper, I will focus on the phonemic contrast of vowels, particularly the vowel phonemes that are illustrated by minimal pairs. Two words are described as a minimal pair when the words have the same number of sounds which are identical in every sound except one and the different phoneme must be in the same position. Besides, the words must have different meanings (Yule, 2006). Minimal pair is common in Chakma. Due to the distinction of vowel in initial, medial and final positions the meaning can be changed. The distinctions are given bellow:

Initial contrast

- [i/e] : 𑄇𑄮𑄚 itʃ Spit
  : 𑄃𑄮𑄚 etʃ Come

- [e/æ] : 𑄃𑄧𑄴 en law
  : 𑄃𑄧𑄴 æn such
- [æ/a] : 𑄃𑄇 æḍa soul
  : 𑄀𑄇 aḍa ginger
- [a/ɔ] : 𑄀𑄖 aza embrace
  : 𑄁𑄖 ɔza kind of instrument
- [o/u] : 𑄂𑄬 ol bewildered
  : 𑄂𑄬 ul mushroom
- u/i : 𑄂𑄇 uḍe ascend
  : 𑄄𑄇 iḍe throwing stone

Medial contrast

- i/e : 𑄈𑄯 git song
  : 𑄉𑄯 geṭ knot
- [e/æ] : 𑄌𑄰 pek bird
  : 𑄌𑄰 pæk clay
- [æ/a] : 𑄏𑄰 næk husband
  : 𑄐𑄰 nak nose
- a/ʌ : 𑄙𑄈 jaḍi quick

: 𑄘𑄳𑄨 jʌḍi spear

- a/ɔ : 𑄇𑄴𑄟 pʰal jump

: 𑄇𑄳𑄟 pʰɔl cucumber

- ɔ/o : 𑄦𑄪𑄢 mɔn mind

: 𑄦𑄬𑄢 mon hill

- o/u : 𑄇𑄬𑄟 pol fall

: 𑄇𑄭𑄟 pul bridge

- u/I : 𑄌𑄭𑄟 gul round

: 𑄌𑄨𑄟 gil putting a three to clime the

Final contrast

- i/e : 𑄣𑄨 hɔli miser

: 𑄣𑄧 hɔlæ told

- a/ʌ : 𑄁𑄤 bana only

: 𑄁𑄤 banʌ puzzle

- a/ɔ : 𑄥𑄌 maza raised bamboo platform

: 𑄥𑄍 mazɔ polish

- u/I : 𑄘𑄭𑄌 huzu a kind of green leave

: 𑄘𑄭𑄨 huzi unripe

Similarly, minimal pair is also a common phenomenon in English. In the words, the distinction of vowels forms different meaning. In word initial, medial and final the contrast of vowel produce different meanings; such as *add* [æd] and *odd* [ɒd], *man* [mæn] and *men* [men], *sea* [si:] and *see* [si:] etc.

Vowel Length

"Length is the phonological correlate of durational differences between sounds, tied to the phonological concept 'quantity'"(Odden, 2009). The concept of length usually considers durational difference between two vowels. Establishing vowel length in a language is not always straightforward. The vowels in English and Chakma can be divided into two major groups, they are short (lax) and long (tense). English language contains five long vowels among the twelve. The distinction of length among the vowels plays a significant role in a language. In English, there is complementary allophonic vowel length (Odden, 2009). The vowels are lengthened before a voiced consonant and shorter before voiceless consonant. For example, "food" and "foot", in the first example the vowel is located before an voiced consonant /d/ and contain a long vowel [u:]. On the other hand, in the second word the vowel is placed before a voiceless consonant which is followed by a short vowel [u]. Furthermore, due to slight change of length the meaning can also be changed. For example, *ship* and *Sheep* the consonants are the same except the vowels; additionally the pronunciation is also alike. Only for the distinction of the vowel length the meanings are different. In English the vowel length is a common phenomenon for distinct length of vowels.

In Chakma there is a pair of vowels, which are different according to their length those are [ʌ] and [a].Although, in earlier Chakma language learning books short [i] and long [i:], short [u] and long [u:] were shown but in the modern books the long [i:] and long [u:] are discarded (Sugata, 2009). Nevertheless, Chakma vowel length is appeared within short [ʌ] and long [a] vowels. The short vowel is always followed by an unaspirated consonant. Alternatively, the long [a] vowel can be found with both aspirated and unaspirated consonants. For instance, 𑄘𑄬𑄴 /ʤʌdi/ and 𑄙𑄬𑄴 /ʤhadi/ (quick), in these two examples the first syllable of the first word includes short [ʌ] which is followed by an unaspirated consonant /ʤ /. In contrast, the second word, the first syllable contain long [a] which preceding consonant aspirated. Besides, due to distinct vowel length the meaning can also be changed; such as, 𑄝𑄦 /banʌ/ (puzzle) and 𑄝𑄦 /bana/ (only), these two similar words written with the same letter. However, the last syllables contain different length of vowels which separates the meanings of the words.

Nasalization

A nasal vowel is vowel that produced with a lowering of the velum so that air escapes both through nose as well as the mouth (Yule, 2006). The nasal vowels are phonemes distinct from oral vowels. During the pronunciation of the vowel phonemes air also passes through the nose. In the International Phonetic Alphabet (IPA) nasalization is indicated by putting a diacritic above the symbol which is called “tilde”. For example, [ã] is the nasalized vowel phoneme of [a] vowel. There can also be found nasal symbol in Chakma language which is called Chaanapudaa (𑄀). Among the Chakma vowels only four of them can be nasalized. The four nasal vowel are [i], [e], [a], [u]. Sugata Chakma shows different examples four nasalized vowels e.g. 𑄃𑄀 /i/ (yes)

ঁ ি / ihik/ (no), ঁে / ehe/(no) ঁ / /(yes). In Chakma, for absence of nasalization it does not change the meaning, instead the word turns to meaningless. On the other hand, nasalization cannot be found in English. English does not contain any particular representation of nasal vowels or nasal symbol. However, in a particular context, assimilation can affect the nature of the release, nasalization frequently modifying the pronunciation of English vowels. It happens when the vowels are followed by nasal consonants. For example, "I can go" /aj kəŋ gau/ because of the velar stop /g/ in *go* effect the following consonant /n/ and changes to velar nasal /ŋ/. Due to the assimilation the sentence turns into /ajkəŋgau/. However, nasalization is not a regular phenomena in English, for this reason George Yule says "it should be considered that all English vowels are oral and that nasality is only a contextual, allophonic feature in English vowels".

Stress Vowels

In linguistics, stress is the relative emphasis that may be given to certain syllable in words or to certain words in a phrase or sentence. About stress Peter Roach says in his book *English Phonetic and Phonology* "we can study stress from the points of view of production and of perception. In the production of stress the speaker use more muscular energy than is used for unstressed syllables. In stress four different factors need to be considered such as, loudness, length, pitch and quality. Sugata Chakma points out that stress plays a significant role in Chakma. Stress at the initial position on the vowels can make different meanings. In Chakma seven vowels can be stressed. A set of stressed and unstressed vowels and meaning is given bellow:

[i] িত /itʃ/ spit

	𑄃𑄬𑄟	/ itʃ/	irrigate
[e]	𑄃𑄮𑄢	/el/	green
	𑄃𑄮𑄢	/el/	came
[æ]	𑄃𑄨𑄠	/æra/	unwrap
	𑄃𑄨𑄠	/ æra/	meat
[a]	𑄃𑄇𑄣	/aŋ/	tatoo
	𑄃𑄇𑄣	/ aŋ/	glow
[ɔ]	𑄃𑄃𑄬	/ɔi/	yes
	𑄃𑄃𑄬	/ ɔi/	is
[o]	𑄃𑄪𑄢	/ol/	bewildered
	𑄃𑄪𑄢	/ ol/	is
[u]	𑄃𑄫𑄢	/ul/	Mushroom
	𑄃𑄫𑄢	/ ul/	A body organ

In addition, stress has a significant role in English. However, unlike Chakma vowels stress on English vowels does not change the meaning.

Acoustic analysis

In this part of the paper, I am going to focus on the acoustic aspect of Chakma vowels, particularly the acoustic properties of vowels and their articulation. Later on the comparison between English and Chakma will be presented. For the acoustic analysis of Chakma vowels, I used Praat (5.3.57 version), designed by Paul Boersma and David Weenink.

According to the acoustic theory of speech production, through "source" and "filter" all speech sounds can be analyzed. In vowels the sound source is the vibration of the vocal cords and the filter is the system of resonators or cavities whose shapes depend on the positions of the various articulators (Hossain, et. al). The source provides the raw material, which is modified by the vocal tract filtering so as to produce the desired vowel quality. The vibrations at the glottis are responsible for the fundamental frequency which represents the first harmonic and the distance between the following harmonics.

The filter is responsible for the formation of acoustic "formants" or spectral energy peaks. "Formants are the bands of energy which are characteristic of a particular sound" (Cruttenden 2008: 19). Formants can be interpreted of tongue position: first formant (F1) is the auditory quality of height, the higher F1 indicates the lower tongue and second formant (F2) the auditory impression of the front/back, the higher F2 the more fronted the tongue. Through the acoustic analysis, vowel quality is based on our perception of the relationship between the first and second formants (F1 and F2) of a vowel in combination with the third formant.. This

acoustic analysis part segmented into different subsections e.g. Chakma vowels and linguistics aspect, analysis method, experimental results and discussion.

Chakma Vowels and linguistics aspects

In Chakma, there are six vowel exist [ɔ], [a], [i], [æ], [o], [u] (Muriz, 2). Although in the old linguists claim that there eight vowels including long [i:], [u:], [oi], [ou]. However, the long forms of vowel phonemes are not possible to distinguish from the short vowel phonemes. Similarly, other two vowels are considered as semi vowels. Those seem to be long with the aspirated form. According to the phonological aspects there are eight distinct vowel phonemes in Chakma language, those are [i], [e], [æ], [ʌ], [a], [ɔ], [o], [u]. As earlier mentioned [e] and [æ] both contain the same letter or symbol. Furthermore, even though [ʌ] and [a] have the same letter or representation, yet these are considered as different phoneme. In the vowel length part their distinctions are shown.

Analysis Method

I have selected three male native speaker of Chakma; all of them are from Rangamati and speak in Rangamati dialect. All of them were given a word list, illustrated in part of vowel description that contains the specific vowel phonemes e.g. [i], [e], **[æ],** [ʌ], [aː], [ɔ],[o], [u]. In the word list for one particular phoneme three different words were used. The list of words were given and also provided as much time as needed to practice the task and demonstrate an understanding of the pronunciation before the recording. Before the session of recording the speakers were instructed the goal of the recording and how the recording would be proceed. The participants were also told to utter the words in natural speed as they talk. An attempt was made to record at least three readings of list. The list of words were recorded on a Fujitsu notebook

with Praat software and an attached microphone placed at a distance of about 30 centimeters from the participants mouth. To reduce its noises it was done in a controlled room. The sample words are shown in the following table.

Words	Pronunciation	Vowel
𑄃𑄬𑄢𑄴	/**i**doʈ/	I
𑄇𑄴𑄉	/re**d**/	E
𑄢𑄇𑄎	/ʈɔlæ/	Æ
𑄅𑄟	/ban**ʌ**/	ʌ
𑄢𑄟𑄬𑄪	/ʈ**a**rum/	A
𑄃𑄌𑄢	/ ɔkʈ**ɔ**/	ɔ
𑄬𑄟𑄪	/m*o*n/	o
𑄬𑄟𑄭	/ p^{h}**u**ni/	u

Table 8: Sample words list for Recording

Result:

The duration and formants F1, F2 and F3 are calculated for each vowel from the spectrogram. Formant chart is calculated for the vowels according to average value of F1 and F2. As earlier mentioned F3 indicates the roundness of the vowels, so the distance between F2 and F3 indicates the roundness of the vowels. In the formant analysis, the spectrogram shows three different values of vowels e.g. F1, F2 and F3. The three different formant values are given bellow:

	F1	F2	F3
i	322	1956	2464
e	495	1867	3642
æ	714	1719	2571
ʌ	626	1391	2768
a	692	1195	2440
ɔ	582	998	2921
o	473	910	2418
u	320	954	3642

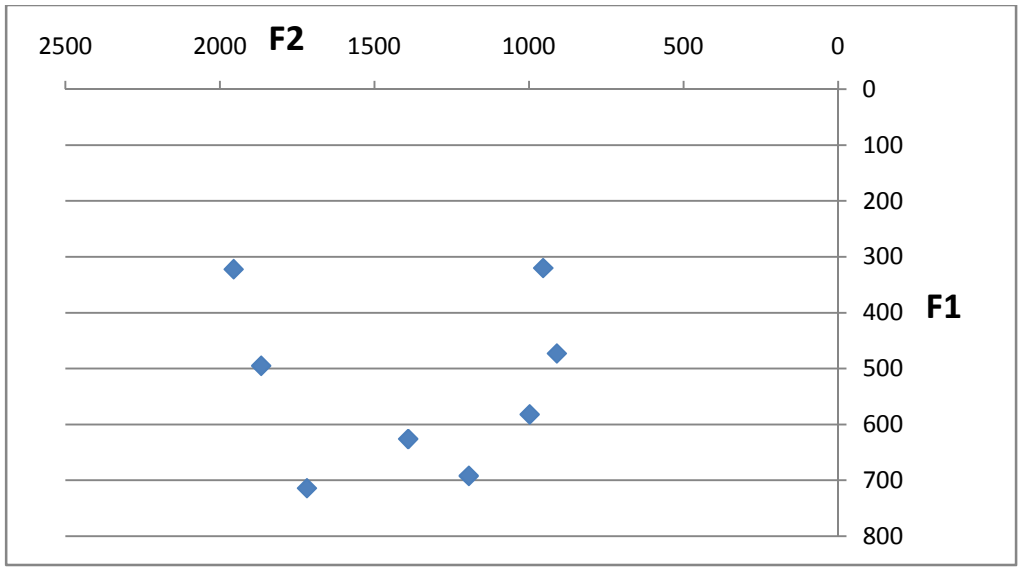

Table 9: a) Formant values and B) the graph

Throughout the acoustic analysis the formant values (F1, F2 and F3) are examined. The high-low and front- back distinctions are represented by the first and second formants of the

spectrogram. As earlier mentioned the first formant (F1) inversely reflects the high-low distinction. That is, lower the formant value, the higher the vowel. For front vowels, F1 becomes lower when the constriction in the oral cavity increases. [i] is the most constricted vowel. F1 increases as the tongue position gets lower. In the chart we can see the first formant (F1) value of [i] is 322 which indicates the higher tongue position. In contrast, [æ] has the highest F1 (714) in the chart which signifies the inverse reflection of tongue which is found at the low position. Additionally, it also mentioned earlier that the second formant (F2) indicates the front-back of the tongue. Lower F2 signifies back vowels. From the chart we can see that the [o] holds the lowest F2 whereas [i] has highest F2. Consequently, it can be said that [o] is the most back vowel [i] is the most front vowel in Chakma. Similarly, the other back vowels [u] and [ɔ] have the lowest F2.

Conclusion

Throughout this paper, Chakma vowels are compared with English vowels in terms of vowel description, diphthongs description, vowel length, nasalization and phonemic contrast of vowel. Chakma vowels have given importance throughout the paper. On the other hand, English vowels are discussed as briefly as possible. Even some of English vowels have not been discussed because of its available sources. It is necessary to devise a conventional system for an accurate specification of vowels features. And cardinal vowels system is such a reference system that provides an accurate specification of vowels features. So I have included the acoustic analysis part. Moreover, the number of diphthongs is not concrete. The amount of diphthongs can be more depending on different dialect. In this paper I only use one particular dialect. For this reason the famous English phonetician Daniel Jones claims that “a good ear can distinguish

well over fifty vowels, exclusive of nasalized vowels, vowel pronounced with retroflex modification, etc." (Jones, 1987).

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