

Bangla Sign Language: its context, its structure, its community

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ABSTRACT

Bangla Sign Language (BaSL, or here: Bangla SL), also known as Bangladeshi Sign Language (BdSL), is the official sign language of Bangladesh, thought to have developed among the students of Deaf schools of British-era Bengal at the turn of the 20th century. Our goals for this paper are to introduce the reader to the syntax, morphology, and phonology of this understudied and under-resourced language. We conducted interviews with signers in Bangladesh, collected videos from those and other signers, and analyzed publicly-available videos, allowing us to create an extensive wordlist and grammatically-oriented corpus of Bangla SL. With this large and growing language resource, we find that Bangla SL shares some but not all grammatical features with both the spoken and signed languages of Bangladesh and South Asia in general, with the strongest overlap in the syntactic domain.

1 Introduction

The sign language of Bangladesh is known variously as Bangla Sign Language (BaSL, Bangla SL), Bengali Sign Language (BSL), and Bangladesh(i) Sign Language (BdSL). While ongoing research on Bangla SL from the fields of computational linguistics and automatic sign recognition has been growing exponentially (see §2), descriptions of the language itself – its phoneme inventory, its grammar, its internal variation – are lacking. As such, we provide a grammatical sketch of the language, from syntax to phonological contrast. Second, we demonstrate how it relates to neighboring languages, using methods inspired by lexicostatistics. Third, we document examples of variation within and across signers, contexts, and history.

Before we present the findings of those areas of study, we present background on the language alongside a review of the previous literature and the questions guiding our research in §2. We introduce our corpus of data along with our findings in §3 with a summary in §4, ending with further directions in §5.

¹All authors contributed substantially to this work, and are thus ordered purely alphabetically. The first four authors are undergraduate students.

2 Background

Established in 1883, the Calcutta Deaf and Dumb School² (CDDS) is the first educational institution established for the Deaf in Bengal, the region spanning modern Bangladesh and Indian West Bengal (Figure 1). While the CDDS and subsequent Deaf schools in the region were strictly oralist, Banerjee (1928) reported that students at the three schools of the time – Dacca (Dhaka), Barisal, Calcutta (Kolkata) – developed their own sign languages to communicate with one another. Banerjee found these languages to be distinct from other South Asian sign languages, suggesting they developed independently.



Figure 1: Deaf institutes founded in British-era Bengal. Red icons: established 1893–1918, and visited by Banerjee (1928). Blue icons: established 1929–47. Courtesy GoogleMaps.

It has been hypothesized that this language from the CDDS is part of an unbroken chain of linguistic transmission (Johnson & Johnson 2016) that has since developed into what is now called Bangla SL in Bangladesh, and the Kolkata variety of Indian Sign Language (ISL) – alternatively known as West Bengal Sign Language (WBSL) – in India. In 1962, East Pakistan established four schools for the Deaf, and the first HI-Care (oralist) school was established in 1980 in independent Bangladesh. In 1994 the first Bangla SL dictionary was published by the Bangladesh Sign Language Committee.

Today, Bangla SL is an official language of Bangladesh, holding that title since 2009. In 2024, a digital dictionary was launched for the language. However, Bangla SL remains understudied and access is still limited, with the linguistic needs of Deaf Bangladeshis overlooked, leading to social isolation (Debnath 2025).

²This is the official name of the institution, which is still in operation; we acknowledge that outside South Asia, this terminology is outdated and potentially offensive.

Research on Bangla SL and the Deaf community of Bangladesh in general remains limited in comparison with e.g. American Sign Language (ASL) and nearby ISL. The Bangla SL literature can be divided into three areas: early documentation (Banerjee 1928), comparative research with Kolkata ISL (Johnson & Johnson 2008, 2016), and burgeoning computational research (Angona et al. 2020; Jim et al. 2023; Sadrik et al. 2024; Podder et al. 2022; Rahaman et al. 2014; Islam et al. 2022; Rubaiyeat et al. 2025; Dhrubo et al. 2025; Pranto & Siddique 2024).

Despite Banerjee (1928)’s early documentation, the sign language(s) of modern Bengal (i.e. Bangla SL and Kolkata ISL) have been less extensively described compared to “mainstream” varieties of what is sometimes called Indo-Pakistani Sign Language (IPSL). For example, Zeshan (2000, 2003) provides a comprehensive description of the sign language varieties in the region, arguing that the urban varieties of ISL and Pakistani Sign Language (PSL) belong to a single language IPSL, but Bangladesh receives comparatively little attention in this work. Consequently, these studies provide evidence that Bangla SL is similar to other IPSL varieties, but they do not provide a linguistic description of Bangla SL itself.

Johnson & Johnson (2016) begin a shift towards recognizing greater linguistic diversity within South Asian sign languages, using relative mutual intelligibility of signing communities in Delhi, Kolkata, and Dhaka to determine if these varieties should be considered as distinct from each other. Their findings indicate that the varieties of Kolkata and Dhaka are considerably more intelligible to one another than either is to the Delhi variety, supporting the argument that the signing communities in Bangladesh and West Bengal share a variety distinct from (or in a divergent group of) the rest of IPSL.

Despite growing scholarly attention to Bangla SL, there remain significant gaps in the literature, one being the lack of a grammatical sketch of Bangla SL, i.e. a formal description of its phonology, morphology, and syntax. This makes it difficult to determine exactly which properties are characteristics of Bangla SL itself and which may reflect shared history or contact with neighboring sign languages. Another major gap involves internal variation: to our knowledge there is no information about the state of variation between socially relevant categories. Relatedly, there is little information about the relationship between Bangla SL and other South Asian sign languages, beyond Johnson & Johnson (2016)’s mutual intelligibility study. There is also a lack of data of naturalistic Bangla SL discourse. Much of the newer research, particularly computational work, has focused on isolated signs, or even just the fingerspelled letters of the English and/or Bengali alphabets as used in Bangla SL. While these studies are valuable for developing technological resources, they provide little information about how Bangla SL is used in everyday contexts.

3 Current Study

To address the gaps presented in §2, we have been building a large corpus of Bangla SL data gathered both various sources, including interviews with signers in Bangladesh (Deaf Bangladeshis as well as professional instructors/interpreters), short videos sent to us from signers, and publicly-available educational videos on YouTube. In response to requests

from our participants, much of the data has also been processed and presented for non-linguists on our website on the language, covering the vocabulary, grammar, and history of the language: <https://sites.google.com/view/banglasignlanguage> We present below four main domains of analysis of our corpus of Bangla SL: aspects of the syntax of the language are presented in §3.1, followed by a morphological analysis in §3.2, a phonetic/phonological analysis in §3.3, and finally a lexical analysis in §3.4. Each analysis adopted a somewhat different methodology, applied to different components of the corpus, and built upon different literature; thus we present parts of the methods and background literature within each section below.

3.1 Syntactic analysis

To describe the syntax of Bangla SL, we conducted interviews with signers of Bangla SL in Bangladesh, and watched dozens of videos in which signers produced simple sentences and phrases combining signs we had documented in our lexicon. The methods for identifying linguistic patterns involved close translation of the interviews with the aid of Bangla SL interpreters and instructors, allowing us to identify individual morphemes, and carry out follow-up elicitations with our signers. Our grammatical analysis was then compared with the syntax of spoken Bengali/Bangla (which we refer to as simply “Bengali” below, to help distinguish it lexically from Bangla SL) and ISL (Sinha 2018). Broadly, our syntactic analysis can be broken down into descriptions of head-finality (§3.1.1), light verbs including the copula (§3.1.2), and negation (§3.1.3).

Given that both ISL (Sinha 2018) and most spoken South Asian languages (Subbārão 2012) including Bengali are head-final, we might expect the same for Bangla SL. Specifically, we should expect the direct object to precede the verb (SOV), the possessor to precede the possessum, and the modifier noun to precede the head noun.

3.1.1 Head-finality

One exception to head-finality for ISL (but not for Bengali or most spoken South Asian languages) is that the attributive adjective can precede or follow the noun. Also, ISL (Sinha 2018: 137) and Bengali (Bhattacharya 1999) show variation in the position of numerals with respect to nouns, and the position of the embedded clause with respect to the verb introducing it (Subbārão 2012). We might expect similar variation in Bangla SL.

The first observation in our data is that the basic word order of a transitive clause is indeed SOV (1). This general pattern matches ISL (Sinha 2018: 130–1) and Bengali alongside most spoken South Asian languages (Subbārão 2012).

- (1) IX.PALM_{SELF} ALL CAT1 PREFER2_{FRONT}
 ‘I like all cats’³

³Depending on its purpose, a Bangla SL example can be displayed in writing one of two ways: the first, suited for morphosyntactic analysis, involves converting each signed morpheme into an English gloss, in all caps following sign linguistics practice. The second display method, known as HamNoSys, is presented

Similarly, we find that nouns follow the attributive adjective, as in most spoken South Asian languages including Bengali, and ASL. Notably, ISL has both pre- and postnominal options for attributive adjectives (Sinha 2018: 135), while only the prenominal option appears in our data thus far.

- (2) RED1 ^[Q] SHIRT WH4 ^[Q]
 ‘Where is the red shirt?’⁴

Also aligning with ISL and Bengali, Bangla SL places the possessor before the head (3) and the modifier noun before the head (4). Note, however, that a minority of examples do show the modifier noun following the head noun (5), suggesting variation akin to the position of attributive adjectives in ISL (Sinha 2018: 135).

- (3) MOTHER FATHER
 ‘mother’s father’, ‘maternal grandfather’
 *‘father’s mother’, *‘paternal grandmother’
- (4) DHAKA+ DIVIDE
 ‘Dhaka Division’
- (5) BOY COW1 ~ COW1 BOY
 ‘steer, bull’

With respect to numerals, Bangla SL shows the same variation as ISL (Sinha 2018: 137): the numeral can appear either before or after the noun (6–7). More data is needed to determine if this matches the variation in the handful of spoken South Asian languages e.g. Bengali and Assamese where numeral position can reflect definiteness and/or specificity (Bhattacharya 1999); our translations using an indefinite noun in (6) and a definite noun in (7) do suggest that such an analysis may be borne out with more data.

- (6) IX.PALM_{SELF} SCHOOL SIX2 TEACH3+ SEE
 ‘I saw six teachers at school.’
- (7) DIVIDE EIGHT1
 ‘the eight divisions (of Bangladesh)’

below in §3.3.1. Our system provides a written form for each meaningful element of a sign, not necessarily to provide the closest definition or explain how the sign is articulated. For example, the numbers following CAT1 and PREFER2_{FRONT} refer to situations where we have discovered multiple distinct signs for the same meaning, and each variant has been numbered to keep track of their use. The subscript elements _{SELF} and _{FRONT} refer to the final location involved in indexical elements and directional verbs (see §3.2.1). Finally, IX refers to an indexical element (see §3.2.1 and §3.2.2), similar to a pronoun, with the addition of the handshape: POINT for a pointing finger, DIRECT for the palm directing fingertips at the indexed argument, and PALM for the palm perpendicular to the indexed argument.

⁴The ^{[Q]...^[Q]} bracketing represents where the signer produced the tilting of the head (and optional eyebrow furrowing) conveying an interrogative. Sinha (2018) refers to this as the Q-particle in ISL (Sinha 2018: 161).

One instance in which we did find a clearly head-initial structure was with embedded clauses, which as far as we have seen consistently follow the verb (8).

(8) HICARE++ TEACH3 SAY SIGN FORBIDDEN

‘The HI-care teacher said signing is forbidden.’

It is worth noting that the verb + embedded clause exception to head-finality is also seen in a variety of spoken South Asian languages including Bengali (Subbārāo 2012). Postverbal embedded clauses are also seen in ASL and ISL, while the latter is documented to have syntactic variation (Sinha 2018: 131).

3.1.2 Head-finality

Spoken South Asian languages have a wide range of light verbs, which can be categorized into vector verbs (Subbārāo 2012; Hook & Parddeshi 2006; Butt 2003’s “light verbs”) such as Bengali ফেল- *fêl*- ‘drop’, modal verbs such as Bengali পার- *par*- ‘be able, can’, and copular elements such as Bengali আছে- *ačh*- ‘be, exist’. In our data, we find that Bangla SL substitutes these verbs with a single element, HAVE (9–10); we adopt this label from Sinha’s analysis of ISL, where the same sign is used in an equivalent way.

(9) IX.POINT_{SELF} MOTHERS.FATHER1 LIFE.FORCE HAVE1

‘My (maternal) grandfather is alive.’

(10) IX.PALM_{SELF} ALWAYS SCHOOL HAVE2

‘I am always at school.’

(11) IX.PALM_{SELF} VILLAGE KUSHTIA++ LOCATION HAVE

‘My village/hometown is located in Kushtia (District).’

(12) IX.POINT_{SELF} HOUSE DHAKA++ HAVE

‘My home is Dhaka.’ (~‘I live in Dhaka’.)

(13) BOOK HEAVY HAVE

‘The book is heavy.’

(14) IX.POINT_{DOWN} DOG++ HAVE

‘This is a dog.’

Like Bengali, Bangla SL prefers a null copula (which we present as an elided HAVE) in a narrow range of instances, including permanent locations (11–12), adjectival predication referring to inherent properties of an entity (13), and nominal predication (14).

3.1.3 Negation

There are three distinct negation particles in Bangla SL: NOT (which has a full form NOT1 and reduced form NOT2), NOT.BE, and NOT.HAVE, shown in Figure 2.

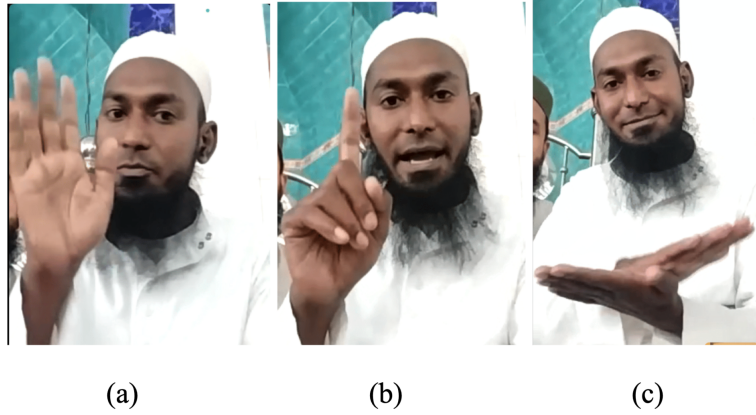


Figure 2: The negation particles NOT1 (a), NOT.BE (b), and NOT.HAVE (c).

NOT primarily negates verbs in non-perfect aspects (15–16), NOT.HAVE primarily negates both verbs in perfect aspect (17) and the copula HAVE (18), and NOT.BE primarily negates nominal (19) and adjectival predicates (20). There appears to be some variation, as we occasionally find NOT.BE used with perfect verbal predicates (21).

- (15) IX.DIRECT_{SELF} MOTHER STORE IX.POINT_{FRONT} GO1 ^[NEG] THINK NOT1 ^[NEG]
 ‘I don’t think my mother went to the store.’⁵
- (16) fsE2-C TEA MUCH3 SLEEP ^[NEG] NOT1 ^[NEG]
 ‘(If you drink) too much coffee (you) won’t (be able to) sleep.’
- (17) ^[NEG] MOTHER FATHER IX.POINT_{SELF} SIGN TEACH2_{SELF} NOT.HAVE ^[NEG]
 ‘(My) parents didn’t teach me to sign.’
- (18) IX.PALM_{SELF} ^[NEG] CAT1 NOT.HAVE ^[NEG]
 ‘I don’t have a cat.’
- (19) IX.POINT_{DOWN} ^[NEG] CAT1 NOT.BE ^[NEG]
 ‘This is not a cat.’
- (20) IX.DIRECT_{SELF} GO1 ^[NEG] RIGHT NOT.BE ^[NEG]
 ‘My going is not okay/alright.’ (∼‘I shouldn’t go.’)
- (21) IX.DIRECT_{SELF} ANGER++ HAVE1 ^[NEG] EXPRESS1 NOT.BE ^[NEG]
 ‘I was angry but I didn’t express it.’

The presence of three distinct negation particles in Bangla SL largely mirrors the situation in Bengali, where *না* *na* negates verbs in non-perfect aspects, *নাই* *nai* negates both verbs

⁵ An additional morpheme is shown in brackets ^{[NEG ...^[NEG]]}; this refers to the subject shaking their head side to side to convey negation nonmanually. The domain of this nonmanual marker can be as narrow as just the negation particle itself (16) or can be as long as the entire utterance (17). Future analysis is needed here.

in perfect aspect and the existential copula আছ- *ačh-*, and না- *nô-* (a verb root colloquially replaced with না *na*) negates nominal and adjectival predicates.

3.2 Morphological analysis

Our corpus for morphological analysis was compiled from multiple sources: interviews conducted with Deaf signers and their instructors/interpreters in Bangladesh, along with YouTube videos aimed at teaching Bangla SL. The proposed structures were compared with those of Bengali and ISL. Here, we present results on directional verbs (§3.2.1), lack of gender in indexicals (§3.2.2), and conjunctions and compounds (§3.2.3).

3.2.1 Directional verbs

One immediate observation on the language is that there is no evidence of overt case marking, with arguments in Bangla SL generally showing their syntactic role through a combination of word order, pragmatic context, and verb directionality (explained below). Furthermore, most verbs in Bangla SL show no overt agreement morphology, with the verb from remaining the same across changes in subject and object.

However, a subset of verbs exhibits agreement-like behavior through *directionality*, i.e. the specification of movement onset and offset location. These locations, marked here as subscripts, can be the signer (_{SELF}), addressee (_{FRONT}), or a third person using the signer’s dominant hand side (_{IPSI}) or the non-dominant hand side (_{CONTRA}). In many instances, the onset and offset index the verb’s subject and object, respectively, but a more accurate way to describe this is semantically rather than syntactically: the onset corresponds to the source or experiencer of a verb, and the offset corresponds to its goal or theme. For example, the same verb GIVE2 appears twice in succession in (22), first moving from the signer’s dominant hand’s side to the non-dominant hand’s side to represent the sister as the subject/source and the friend as the indirect object/goal, and then reversing to represent the flip in arguments.

- (22) IX.PALM_{SELF} SISTER2 FRIEND BUY_{IPSI} GIVE2_{CONTRA}
 ‘My sister_i bought her_i friend_j (a book)...’

IX.POINT_{CONTRA} SISTER2 FRIEND OTHER BOOK BUY_{CONTRA} GIVE2_{IPSI}
 ‘...That friend_j of my sister_i also bought her_i a book.’

While directional verbs canonically have an onset and offset, we have documented instances in which the onset is dropped; such verbs then appear theme/object-oriented due to this “pro-drop”-like behavior. This phenomenon is also seen in ISL (Sinha 2018:151).

Curiously, a smaller set of verbs never takes onset marking while still maintaining offset marking; thus, they only align to their theme/object. For example, PREFER2 (translated as পছন্দ করা *pôčhondo kôra* ‘prefer, like’) starts identically regardless of whether the subject is the signer themselves (23) or a third person (24); only the offset varies, pointing forward as a default for non-first person ALL CAT1 ‘all cats’ in (23) and pointing towards the self for the first person object in (24).

- (23) IX.PALM_{SELF} ALL CAT1 PREFER2_{FRONT}
 ‘I like all cats.’
- (24) IX.POINT_{FRONT} IX.POINT_{SELF} IX.DIRECT_{SELF} PREFER2_{SELF}
 ‘She/he/they_{SG} like(s) me.’

To our knowledge, obligatory offset-only directionality is not seen in ISL or ASL.

3.2.2 Non-gendered indexicals

When referring to human referents, ISL indexicals are obligatorily produced as compounds of the indexical sign itself plus the signs BOY or GIRL⁶, to convey ‘he/him/his’ and ‘she/her’ respectively (Sinha 2018: 106). In contrast, in our data, we have seen no examples of Bangla SL signers combining BOY or GIRL into an indexical, neither in elicited nor spontaneous signing. Thus, the aforementioned example (24) can refer to a subject of any gender. While markedly distinct from ISL, this lack of gender marking on Bangla SL indexicals aligns with Bengali pronouns and ASL indexicals.

3.2.3 Conjunctions and compounds

Like Bengali and other spoken South Asian languages, conjunctions and compounds combining nouns without overt marking are frequently used in Bangla SL, e.g. (25–27).

- (25) WATER++ HUNGER
 ‘thirst’
- (26) LAWYER GAVEL+ PLACE
 ‘court’
- (27) fsE2-C TEA
 ‘C tea’ = ‘coffee’

However, unlike spoken South Asian languages, which tend to have robust case marking paradigms, the lack of case marking in Bangla SL makes noun–noun compounds surface-identical to possessive constructions. As such, we have seen examples like (28), produced in one instance as a conjoining compound as in another as a possessive phrase.

- (28) MOTHER FATHER
 ‘mother (and) father’ = ‘parents’
 ‘mother(’s) father’ = ‘maternal grandfather’
- (29) GIRL GROUP MEMBER1
 ‘women’s group member’

In instances where a compound has a clear head vs. modifier distinction, the head is generally phrase-final (29), aligning with ISL and spoken South Asian languages.

⁶BOY and GIRL are our morpheme labels for what Sinha labels MALE and FEMALE in ISL.

3.3 Phonetic/phonological analysis

For our phonetic/phonological analysis of Bangla SL, we analyzed morphemes through several different parameters. Following the work of other sign language linguists, we used the Hamburg Notational System for Sign Languages (HamNoSys) to notate Bangla SL which splits the sign into four traditional dimensions or phonological parameters of signs: handshape, orientation, location, and movement, plus the added dimension of symmetry (§3.3.1). We then used this notational data to find the most common handshapes (§3.3.2) and identify minimal pairs across all phonological parameters (§3.3.3).

3.3.1 HamNoSys

HamNoSys is a sign language notation system in development by the Hamburg Center for German Sign Language which attempts to create a transparent system for transcribing sign languages in detail phonetically, with symbols notating handshapes (Figure 3), palm and finger orientations, location areas, movements, and symmetries.

There exist more common sign language notation systems, such as the Stokoe system designed for ASL. However many such systems tend to be based on the manual alphabet of an individual sign language, something we wanted to avoid.

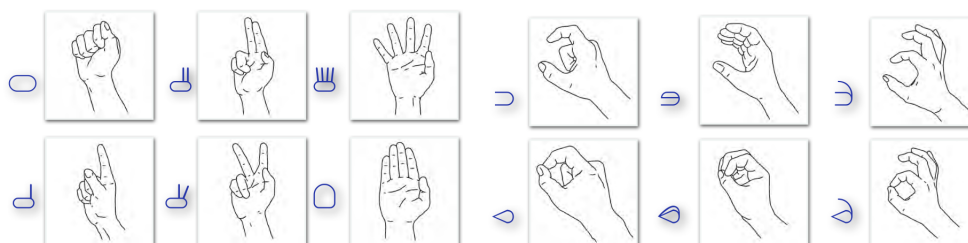


Figure 3: The 12 basic handshapes transcribed in HamNoSys (source: Hanke 2018).

In order to notate more aspects of a sign and to stay consistent with similar literature (e.g. Schmaling (2000) for Hausa SL) we adopted HamNoSys for our notation. Our applied version of HamNoSys notates single morphemes of Bangla SL signs on one row, with differently-colored columns notating symmetry, handshape, orientation, location and movement respectively (Figure 4).

The symbol in red (↔) indicates symmetry. This sign has left–right symmetry and thus only the right side needs to be notated.

The symbol in orange (↻) is the base symbol for a circular handshape with all fingers touching, with the “flattening” diacritic (˘) to create the “pinched circle” handshape.

The symbols in blue display orientation, with the first (↖) showing the dominant hand’s extended index finger described if the hand were in a pointer handshape. If the wrists were kept static and the handshape changed to a pointer finger, the index finger would point away from the chest. The line under the arrow is meant to represent a bird’s eye view of the

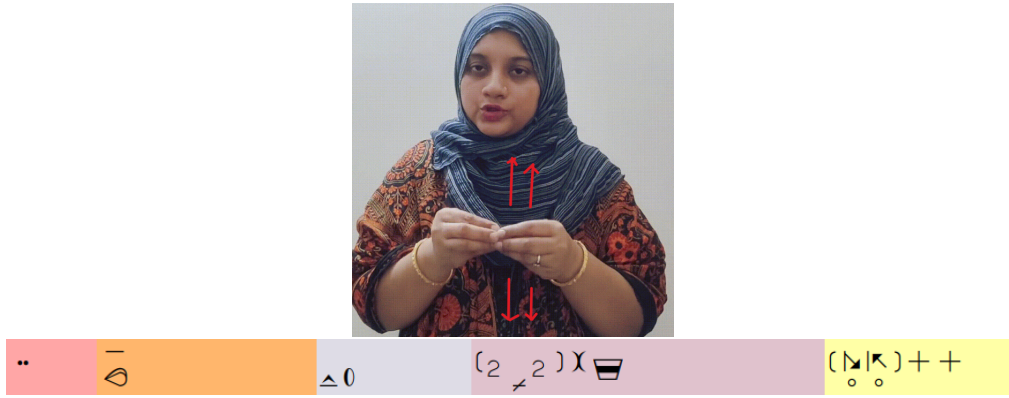


Figure 4: HamNoSys transcription of the morpheme DICED.VEG

signer's body. The second symbol describes the palm ($\circ$). The “shadow” describes where the palm is facing.

The symbols in lavender display location. Location is described as a snapshot at the beginning of the morpheme. In this case we break away from describing the right hand exclusively to show how the two hands are positioned relative to each other ($\circ \times \circ$). The final symbol describes where both hands start ($\equiv$), in this case the center of the chest.

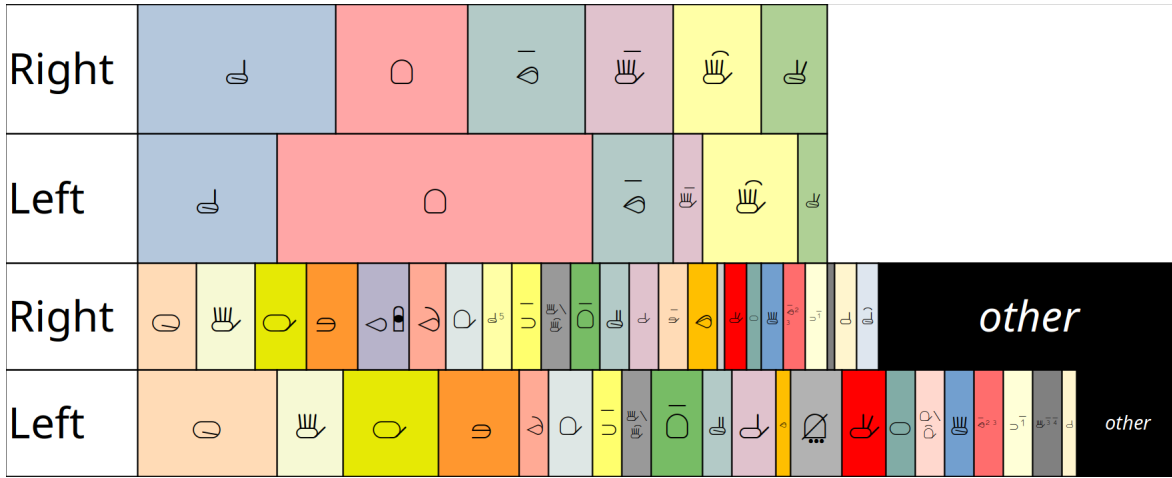
The symbols in yellow display movement. The set of parentheses describe sequential movement. In this sign, the movement is occurring down and forward ($\downarrow$), then up and back ($\uparrow$) repeated twice, ($++$) with a circle diacritic ($\circ$) indicating that the movement is small. Similarly to the orientation column, the line with the movement arrows indicates the body position relative to the movement vector.

3.3.2 Handshape inventory

In an analysis of 269 Bangla SL morphemes, we found 66 unique handshapes used by the dominant hand and only 37 by the non-dominant hand (Figure 5).

We counted 323 handshape tokens of the dominant hand⁷ and only 127 handshape tokens of the non-dominant hand. We found that 36% of dominant-hand tokens come from the 5 most common dominant handshapes ($\triangleleft$ (11.4%), $\square$ (7.4%), $\bar{\square}$ (6.8%), $\bar{\square}$ (5.2%), $\bar{\square}$ (5.0%)), whereas 45% of non-dominant-hand tokens come from the 5 most common non-dominant handshapes ($\square$ (18.1%), $\triangleleft$ (7.9%), $\square$ (7.9%), $\bar{\square}$ (5.5%), $\square$ (5.5%)). Taken together, these observations all support the hypothesis that the non-dominant hand is more likely to take on a smaller, less marked array of handshapes whereas the dominant hand is not so restricted (Battison 1974).

⁷The total number of handshapes exceeds the number of morphemes as several morphemes begin and end with different handshapes.



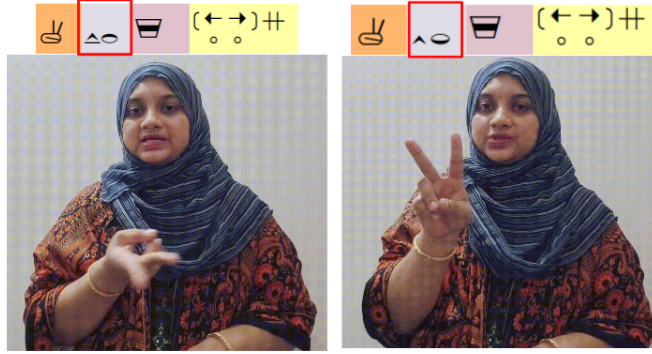


Figure 7: SAME (left) vs. BOTH (right), a minimal pair for palm orientation.

3.4 Lexical analysis

Finally, we looked within different slices of our corpus for three areas of lexical analysis. First, we made comparisons across the basic vocabulary of Bangla SL and what we assumed are its closest relatives in the IPSL group (§3.4.1). Second, we compared historical documentation of the signs used at three colonial-era Deaf schools in Bengal with modern signs (§3.4.2). Third, we looked at the growing role of ASL in the signs produced by our participants (§3.4.3).

3.4.1 Lexicostatistics

As with spoken languages, quantitative lexical comparisons (Swadesh 1955) of sign languages are common (Woodward 2011) when establishing family relations (Abner et al. 2024), or when exploring within a language to determine dialect variation. For example, Woodward (1993)’s comparative study between several sign language varieties in India (Delhi, Mumbai, Chennai, Kolkata), Pakistan (Karachi), and Nepal (Kathmandu) helped argue for both the IPSL family and for the presence of different levels of inter-urban variation within ISL proper.

In order to achieve this sort of comparative lexical analysis, Woodward (1993, 2011) proposes an equivalent of the Swadesh list for sign languages. His list eliminates words expected to overestimate close relations (such as pronouns and body parts, which are often simply pointed to directly) and replaces them with words less likely to do so.

Our focus here was to see if we could situate Bangla SL within the larger IPSL family. For our analysis, we compared Bangla SL to the two documented varieties we hypothesized would be closest to it: the “mainstream” Delhi/Mumbai variety of ISL and the more divergent Kolkata variety of ISL, which we believed could be very close to Bangla SL based on mutual intelligibility and signer intuition (Johnson & Johnson 2016).

Ours is also the first study in the region to take into account the specific roles that phonological evolution can play in establishing whether two signs are related. This is not to say that phonological evolution is a new area of study; the various types of historical

sign evolution documented in the sign language literature goes back to the early research of the 1970s. Frishberg (1975) found that over time, signs can undergo symmetry, fluidity, assimilation, localization, morphemic regularization, and/or displacement. Battison (1974) and later Schembri et al. (2009) studied how forehead contact evolves to be lower on the face, and Lucas et al. (2001) found cases of metathesis (where sequences can vary in order). Further effects of high-visual-acuity zones (Battison 1974; Frishberg 1975; Siple 1978; Lucas et al. 2001), the concept of handshake markedness Swisher et al. (1989), and more distinct locations Siple (1978) also play a role in evolution.

For our methodology, we adopted Woodward’s list, augmented with sign language comparison lists from Parkhurst & Parkhurst (2018), along with a handful of words we added (e.g. GHEE, RICE) to better capture the cultural context of South Asia over words less likely to have a clear, direct counterpart (e.g. COUSIN, WINE). Four of the authors viewed publicly available YouTube videos containing translations of these words, where each author independently judged each pair of signs on a scale of 0-2 (Table 1). For example, GREEN was effectively identical (score of 1) between Kolkata ISL and Bangla SL, but phonologically unrelated to the equivalent in mainstream ISL (Figure 8).



Figure 8: GREEN in mainstream ISL (left), Kolkata ISL (center), and Bangla SL (right). The mainstream ISL form (left) appears unrelated to the others, which appear identical.

We acknowledge that the analysis of a corpus of 62-64 words per language, based solely on publicly-available videos of different varieties collected in different years, cannot provide conclusive evidence of relatedness between language varieties; still, it offers a place to start. With that caveat in mind, our analysis suggests that lexically speaking, Kolkata ISL and Bangla SL are highly similar, with 42% of signs being effectively identical and 79% signs being plausibly related. On the other end, only 13% of signs in mainstream ISL are (effectively) identical to their Kolkata ISL or Bangla SL counterparts, and rather the largest group of signs (45%) is indeed likely totally unrelated to their Kolkata ISL or Bangla SL counterparts. The full results are presented in Table 1.

Our lexicostatistic results suggest that Bangla SL and Kolkata ISL are more closely related to each other than either is to mainstream ISL, which aligns with previous results

Score	Kolkata ISL vs. Bangla SL	Kolkata ISL vs. mainstream ISL	Bangla SL vs. mainstream ISL
2 Nearly identical	42% 26/62 BIRD BLACK COW DAL-2 DAUGHTER DOG EGG-1 FISH-1 FISH-2 GHEE GIRL GREEN LION-1 MEAT-1 MEAT-2 MONDAY RED RICE-1 RICE-2 SALT SISTER-2 SNAKE VEG-1 WATER-1 WHITE YELLOW-1	13% 8/64 APPLE-2 BIRD BLACK COW EGG-1 LION-2 SNAKE WEEK-2	13% 8/64 BIRD BLACK COW EGG ELEPHANT MOTHER-1 SKY SNAKE
1 Related through phono. evolution	37% 23/62 APPLE-1 APPLE-2 BLUE-1 BLUE-2 BOY BROTHER CHICKEN COLOR DAL-1 FAMILY-1 FATHER-1 FATHER-2 LION-2 MONTH MOTHER MOUSE-2 NIGHT-2 SISTER-1 SIT SKY SON VEG-2 WATER-2	42% 27/64 APPLE-1 BOY BROTHER BUS-1 BUS-2 COLOR DAUGHTER DOG FAMILY-2 FATHER-2 FISH GHEE GIRL JANUARY-1 LION-1 MOTHER-1 RED RICE-2 SALT SISTER-1 SISTER-2 SIT SKY SON VEG WATER WHITE	42% 27/64 APPLE BLUE-1 BLUE-2 BOY BROTHER BUS-2 COLOR DAUGHTER DOG FISH-1 FISH-2 GHEE GIRL MOUSE RED RICE-2 SALT SISTER-1 SISTER-2 SIT SON VEG-1 VEG-2 WATER-1 WATER-2 WEEK-1 WHITE
0 Likely not cognate	21% 13/62 BUS CAT EGG-2 ELEPHANT-2 FAMILY-2 JANUARY-1 JANUARY-2 MOUSE-1 NEED NIGHT-1 SWEET WEEK YELLOW-2	45% 29/64 BLUE CAT-1 CAT-2 CHICKEN EGG-2 ELEPHANT-2 FAMILY-1 FATHER-1 GREEN JANUARY-2 DAL MEAT MONDAY-1 MONDAY-2 MONTH MOTHER-2 MOTHER-3 MOUSE-1 MOUSE-2 NEED-1 NEED-2 NIGHT-1 NIGHT-2 RICE-1 SWEET-1 SWEET-2 WEEK-1 YELLOW	45% 29/64 BUS-1 CAT-1 CAT-2 CHICKEN DAL-1 DAL-2 FAMILY FATHER-1 FATHER-2 GREEN JANUARY LION MEAT-1 MEAT-2 MONDAY-1 MONDAY-2 MONTH MOTHER-2 MOTHER-3 NEED-1 NEED-2 NIGHT-1 NIGHT-2 RICE-1 SWEET-1 SWEET-2 WEEK-2 YELLOW-1 YELLOW-2

Table 1: Categorization of each word pair by score of 0 (not cognate), 1 (possibly cognate through phonological evolution), or 2 (effectively identical).

on mutual intelligibility of Kolkata ISL vs. Bangla SL (Johnson & Johnson 2016) and on lexicostatistic differences between Kolkata ISL vs. other ISL varieties (Woodward 1993).

Curiously, we did not find Kolkata ISL to be any more lexically similar to mainstream ISL than Bangla SL is. While more research is of course needed to explore this further, our tentative results could support the hypothesis that Bangla SL and Kolkata ISL descend from a common ancestor, distinct from (mainstream) ISL, and that Kolkata ISL has not undergone large-scale lexical convergence with other ISL varieties even when national borders now divide Kolkata ISL and Bangla SL.

3.4.2 Historical change

Looking internally within Bangla SL, we see three types of change over time. The first is historical on a long time scale, i.e. the modern preservation of vs. innovation from the initial signs used at the CDDS a century ago. The second and third are more recent: changes in placenames matching local usage (not covered in this paper, for space considerations), and “ASL concordance” within the social media era (§3.4.3).

In terms of long-term historical change, we are fortunate to have Banerjee (1928)’s written descriptions of the signs used among the children at the three Deaf schools in then-undivided British Bengal: those of Dacca (now Dhaka, Bangladesh), Barisal (now in Bangladesh), and Calcutta (now Kolkata, India). For this analysis, we focused on the 34 words from Banerjee’s descriptions for which we were able to collect a modern equivalent from our participants (whether plausibly cognate or not), e.g. COME, FLOWER, BOOK, COW, HORSE. For each modern sign, we compared the descriptions of the signs used at the three Deaf schools to see which, if any, matched what we saw in the modern sign.

For example, Banerjee wrote that MOTHER was conveyed as “sign of woman and

holding the children in the lap (upper part of the arm close to the sides of the chest)” in Barisal, “hand down from head over face (veil) fingers to nose” in Calcutta, and that “all gave different symbols except two who put finger to side of nose (a reference to the method of teaching the nasal sound)” in Dacca. Of those three, it is clear that the modern Bangla SL word MOTHER matches the side-of-nose sign produced by the two students at Dacca (Figure 9, right). Similarly, Banerjee writes that FATHER was signed “one hand, finger and thumb over the lip showing moustache” in Calcutta while no consistent sign was used in Barisal or Dacca; here the description of the Calcutta sign matches the modern Bangla SL form (Figure 9, left).



Figure 9: FATHER (left) and MOTHER (right) in Bangla SL.

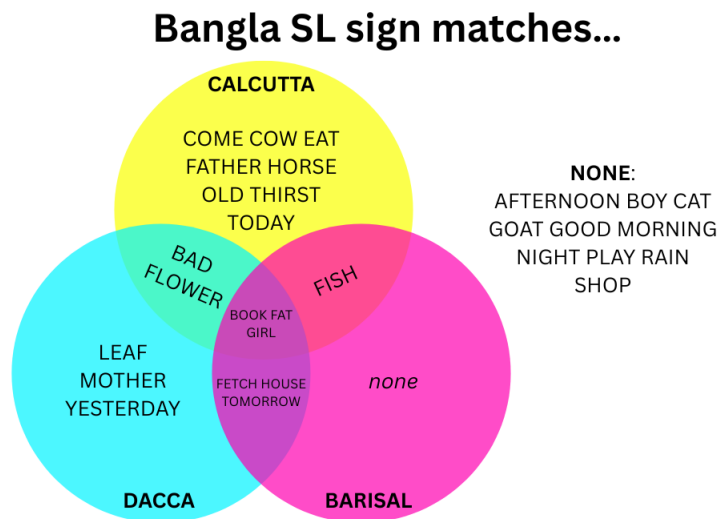


Figure 10: Modern Bangla SL signs arranged by which colonial-era school’s (or schools’) sign’s 1928 description by Banerjee best matches the current form.

The full results of comparing all 34 of these words with Banerjee’s descriptions are presented in Figure 10. The fact that most of the preserved vocabulary from the colonial era (at least within our small data set) matches best with the 1928 description of the Calcutta variety aligns with native intuitions in previous work (Johnson & Johnson 2016) that modern Bangla SL (as with modern Kolkata ISL) derives from the language used at the CDDS. On top of this, a smaller Dacca/Dhaka-concordance suggests some degree of dialect leveling and reorientation towards Dhaka over time, possibly as a post-Partition and post-Liberation effect of Bangladesh being separated from Indian West Bengal.

3.4.3 ASL concordance

Although only representing a small portion of our data, we did notice the use of certain signs matching or strongly resembling their counterparts in ASL, which all of the authors of this paper have some degree of familiarity with. Because we cannot be sure if such signs were independently coined in Bangla SL (and coincidentally similar to ASL), borrowed wholesale from ASL, or derived from some third language that ASL also borrows from, we simply refer to such cases as instances of ASL-concordance. Some salient examples include THANKS, which has a native form and two ASL-concordant forms (Figure 11).



Figure 11: The native sign THANKS1 (left) vs. the one-handed and two-handed ASL-concordant forms, respectively: THANKS2 (middle) and THANKS3 (right).

Signers report that they know some of what they use are বাইরের সাইন *bairer sain* ‘signs from outside’ or even ‘American signs’. While more data is needed, the use of such ASL-concordant signs in Bangla SL struck us as analogous to the English–Bengali codeswitching characteristic of hearing Bangladeshis. Sociolinguistic investigation of who uses these ASL-concordant signs and in which contexts should certainly reveal further patterns.

4 Summary

Summarizing our various approaches and areas of focus, we hypothesize that Bangla SL indeed sits within the IPSL family, which we should clarify extends beyond the borders of India and Pakistan into at least Nepal and Bangladesh. However, the evidence for this familial positioning varies based on which domain of the language we examine.

Syntactically, Bangla SL appears effectively identical with ISL; however, it can also be seen to share some of those same similarities with spoken South Asian languages including Bengali. This leaves open the question of whether the similarities with ISL are due to a shared common ancestor or long-term contact and convergence, widely known among the spoken languages of the region (Emeneau 1956).

Morphologically, Bangla SL is no more similar to ISL than it is to ASL, and it is more notably distinct from spoken South Asian languages in this regard. In this domain, it appears that Bangla SL has distinguished itself from what are its likely sisters.

Lexically, Bangla SL is even more distinct: while there are signs shared across Bangla SL and varieties of ISL, the much closer relationship between Bangla SL and Kolkata ISL (apart from mainstream ISL) stands out, underscoring the likely shared heritage of the two sign languages of Bengal. Whether that shared heritage extends into the rest of India, as opposed to these similarities with ISL resulting from contact, remains unknown.

A significant portion of the modern lexicon of Bangla SL survives from the colonial-era schools of Calcutta/Kolkata and (to a lesser extent) Dacca/Dhaka, suggesting an unbroken chain of sign language use in the region since at least the late 1800s. Over time, the lexicon has undergone phonological/phonetic changes while also showing wholesale replacement of certain words through placenames and the limited adoption of ASL-concordant signs.

5 Further directions

Bangla SL, despite being the official sign language of Bangladesh and (presumed to be) the language of millions of Deaf Bangladeshis, remains highly understudied and underresourced. In addition to our linguistic analyses within the various domains covered in this paper, our project extends into practical applications requested by our participants from all sorts of backgrounds. Some of the desires expressed by our interviewees on behalf of the Deaf Bangladeshi community include (1) substantial improvement and expansion of early education in Bangla SL – not just oralist methods of lipreading and speech therapy, (2) the providing of interpretation services more widely, especially in universities, (3) better training for interpreters and Bangla SL teachers, and (4) dispelling harmful rumors and traditions around deafness.

While our project at this stage cannot address all these long-term desires of the community, we have already begun substantial work on materials that can be used in education as well as linguistic research, with the creation of our website on Bangla SL. Our site includes an extensive wordlist, broken down into individual morphemes that are translated in both Bengali and English, and presented in images, GIFs, and HamNoSys in order to reach different audiences. Unlike other resources on the language, we also put a large focus on explaining the grammar of Bangla SL, using simple explanations that can be useful for linguists and non-linguists alike. The materials for the site are built entirely from our Deaf participants and their instructor/interpreters, ensuring high quality. Our next step will be to build in short lessons that can be used in the classroom.

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