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# On Transliteration of Chinese Anthroponyms and Toponyms Into Azerbaijani and Establishment of Guidelines

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**Abstract**. Accurate translation facilitates seamless communication. Personal and geographical names are frequently used in communication, necessitating a uniform standard for transliterating anthroponyms and toponyms from the source to the target language. The Republic of Azerbaijan achieved independence nearly three decades ago. Despite extensive efforts in various fields throughout time, problems with transliteration persist. In 2013, a state program on using Azerbaijani was launched, including a clause on formulating guidelines for mutual transliteration between Azerbaijani and other languages. Over the last decade, transliteration tables for toponyms in Azerbaijani-Russian and Azerbaijani-English languages have been compiled, and publications utilising materials in both languages have been released. However, the absence of research concerning the Chinese language has led to considerable problems in the translation process and daily interaction. Currently, there are no established criteria for transliterating Chinese anthroponyms and toponyms into Azerbaijani, and some transliterations have phonetic inaccuracies. In this article, transliterations of certain Chinese anthroponyms and toponyms found on the AZERTAC (The Azerbaijan State News Agency) portal were examined and criticised, and guidelines for transliterating Chinese anthroponyms and toponyms into Azerbaijani were also proposed. Translating Chinese characters into other languages is not undemanding, and finding a comprehensive solution within the confines of a single article poses a challenging endeavour. This article laid the initial scientific foundation for creating Chinese-Azerbaijani transliteration tables.

**Keywords**: anthroponym; toponym; Chinese; Azerbaijani; transliteration.

## INTRODUCTION

The implementation and advancement of the Belt and Road initiative have contributed to an acceleration in the interchange and collaboration between China and Azerbaijan in politics, business, and culture. Language serves as an essential bridge that connects Azerbaijan and fosters effective communication between both sides, playing a significant role in the collaboration and exchange efforts of the Belt and Road initiative. Successful intercultural communication calls for mutual respect and the accurate transliteration of anthroponyms and toponyms in the target country's language. This is a fundamental aspect of diplomatic etiquette.

Proper names are an essential component of a language's linguistic structure. Each location, whether a country, city, or street, possesses its distinct appellation, and it is inconceivable to imagine a world devoid of these names. Linguistics consistently concentrates on the research of personal and geographical names. According to [1]:

*"The conversion of geographical names and toponyms that include significant historical, geographical, linguistic, and linguacultural information has long been a subject of interest for experts and*

*translators. Translators must accurately and correctly translate both proper names and geographical names from the source language to the target language".*

*Situation in China.* In 2008, the national standard document [2] was issued. The [3] was published in 2018. Subsequently, the problem of transliterating English anthroponyms and toponyms into Chinese has been completely solved. The Chinese media and publishing industry follows a uniform set of transliteration rules. Each English anthroponym and toponym adheres to a standardised transliteration method, thus minimising the ambiguity in prior Chinese transliterations of English personal and geographical names. This, in turn, has significantly improved communication efficiency. The author [4] mentioned:

*"In general, transliteration is of great scientific and practical importance. International sociopolitical and economic relations are expanding in the era of globalisation, and their differential and addressee functions require accurate usage of language units in official documents, maps, and other publications. The importance of the transliteration of Azerbaijani geographic names lies exactly here".*

*Situation in Azerbaijan*. Similarly, Azerbaijan also has [5, p. 13–21]. The Cabinet of Ministers of the Republic of Azerbaijan approved this on April 16, 2019, per decision No. 174; on November 3, 2020, specific modifications were implemented per decision No. 438. The contemporary Azerbaijani language contains several loanwords due to historical factors. After undergoing localisation, most of these expressions have become vital to Azerbaijanis' everyday interactions. Accordingly, all these words adhere to the orthographic norms indicated above. The President of the Republic of Azerbaijan, Ilham Aliyev, issued an action plan on April 9, 2013, regarding implementing "The State Program on the usage of Azerbaijani by the demands of our time and on the domestic development of linguistics". The document touched upon the development of national transliteration standards in § 6.1.4. Paragraph 6.3.9 discussed establishing standards and transliteration systems, according to which Azerbaijani text should be converted to other alphabets [6].

Concerning this matter, the research carried out in this field has widened considerably in recent years. The books [1, 4] were both published in 2022. The two works were compiled to comply with the Prime Minister of the Republic of Azerbaijan decree issued on December 16, 2020.

It ought to be noted, however, that these writings have only addressed these two languages thus far. Therefore, establishing normative guidelines for transliterating Chinese anthroponyms and toponyms into Azerbaijani assumes the utmost significance. These guidelines should aim to not only indicate the phonetic characteristics of such names in Chinese but also take into account the phonological features of Azerbaijani. The purpose of this article is to propose standardised guidelines for transliterating Chinese anthroponyms and toponyms into Azerbaijani.

## RESULTS AND DISCUSSION

*Chinese characters and Hanyu Pinyin*. The Azerbaijani writing system uses Latin letters and is categorised as phonogramic. However, Chinese is distinct due to the absence of an alphabet. The author [7, p. 482] argued that "around the world, some ethnic groups write with pictorial scripts (Nakhi), some with hieroglyphs (Chinese, Japanese), and yet others with letters (Arabic, English, German)". The Chinese script comprises many Chinese characters and is classified as a logographic writing system. Generally speaking, each Chinese character represents a morpheme. For example, the character "冰" denotes ice, "箱" signifies a box, and "冰箱" refers to a refrigerator. A distinguishing characteristic of logograms, instead of phonograms, is their tendency not directly to indicate pronunciation. Once primary school pupils in Azerbaijan have mastered the 32 letters in the alphabet, they can pronounce words, even when encountering unfamiliar vocabulary they do not understand. Nevertheless, Chinese students cannot instantly articulate a newly discovered Chinese character. Certain Chinese characters also remain unknown to most adults regarding meaning and pronunciation.

However, how do the Chinese determine the pronunciation of Chinese characters? The answer is *Hanyu Pinyin* (or simply *Pinyin*). Pinyin utilises Latin letters, their combinations, and some additional symbols to denote the pronunciation of Chinese characters. For example, the character "冰" pronunciation is transcribed as "bīng" in Pinyin. With this knowledge, logograms may be comprehended deeper: the logogram "冰" representing ice is pronounced as "bīng". In other words, every Chinese character possesses not only a sound but also a meaning. Therefore, logograms offer a unique advantage: their users may convey messages without uttering any sound. To

provide a more concrete illustration, suppose the symbol "&" is used to signify "girl" and is pronounced as "qız" in Azerbaijani, "kız" in Turkish, and "girl" by English speakers. However, people from all three nations will likely realise this symbol refers to "girl" when they see it. The pronunciation of each Chinese character may differ among various Chinese dialects. In ancient times, people from different dialect areas faced obstacles to communicating via speech. However, by writing characters, they could communicate without any hindrances.

When it comes to the phonological system of a language, the subject of conversation naturally revolves around vowels and consonants. For example, nine vowel phonemes in the Azerbaijani language are represented by nine vowel letters [8, p. 195]. How many vowels and consonants are there in Chinese? The terminologies *initials* and *finals* are used more frequently in Chinese teaching. Once again, I shall take the character "冰" as an example. It is pronounced "bīng" with the initial being "b" and the final being "ing". The final "ing" here is not a vowel. The *Scheme for the Chinese Phonetic Alphabet* (Scheme) [9, p. 1797–1799] was promulgated at the Fifth Session of the First National People's Congress on February 11, 1958 [10, p. 22]. Table 1 presents specific components of the scheme.

Table 1 – Scheme for the Chinese Phonetic Alphabet – Initials and Finals

| Initials | | | | Finals | | | |
|---|---|---|---|---|---|---|---|
| b | p | m | f | er | i, $i_2$, $i_3$ | u | ü |
| d | t | n | l | ɑ | iɑ | uɑ | |
| g | k | h | | o | io | uo | |
| j | q | x | | e, ê | ie | | üe |
| zh | ch | sh | r | ɑi | | uɑi | |
| z | c | s | | ei | | uei | |
| | | | | ɑo | iɑo | | |
| | | | | ou | iou | | |
| | | | | ɑn | iɑn | uɑn | üɑn |
| | | | | en | in | uen | ün |
| | | | | ɑng | iɑng | uɑng | |
| | | | | eng | ing | ueng | |
| | | | | ong | iong | | |

*Notes:* Table 1 is compiled from the appendix [9, p. 1797–1798].

Typically, the pronunciation of a Chinese character is determined by its initial and final. For example, the character "冰": b+ing→bing. However, it is worth noting that certain characters lack an initial. The notion of *zero initial* has been introduced into Chinese teaching [10, p. 31]. For example, the character "乙" is pronounced as "i", possessing a final but lacking an initial. This kind of character is called a *zero initial character*. Therefore, the scheme included provisions because of such exceptional circumstances.

1. When finals from the row of "i" do not require an initial to form a syllable (in other words, when a syllable begins in a final), they are written as yi, ya, ye, yao, you, yan, yin, yang, ying, and yong [9, p. 1799].

2. Under similar circumstances, finals in the row of "u" are written as wu, wa, wo, wai, wei, wan, wen, wang, weng, and finals in the row of "ü" as yu, yue, yuan, yun (umlaut removed) [9, p. 1799].

3. When the three finals, "iou, uei, uen", combine with initials to form syllables, they are abbreviated to "iu, ui, un" [9, p. 1799].

4. Letter e in finals "ie, üe" represents final "ê", which is different from final "e". The form "ê" only occurs when this final is used alone as an exclamation [9, p. 1798].

5. Letter i indicates three separate finals. "$i_2$" appears only in its combination with initials "zh, ch, sh, r", "$i_3$" with initials "z, c, s". In other cases, the letter i does the final "i" [8, p. 1798].

As shown in Table 1, there are 22 initials (including zero initials) and 40 finals in Chinese. In theory, generating 880 syllables by combining all initials and finals is feasible, resulting from a combination of 22 multiplied by 40 (22×40=880). Yet, only around 400 syllables exist, as not all initials match all finals.

Table 2 displays the combinations of initials and finals – all available syllables – in Chinese.

*After the emergence of the scheme*. To address this topic, it is necessary to trace back to the era preceding the creation of Pinyin and thoroughly examine the historical context in which Pinyin originated.

Before the founding of the People's Republic of China (the PRC), there was a vox populi for Latinizing Chinese characters.

Table 2 – Combinations of Initials and Finals (Existing Syllables) in Chinese

| | 0 | b | p | m | f | d | t | n | l | g | k | h | j | q | x | zh | ch | sh | r | z | c | s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| i | + | + | + | + | | + | + | + | + | | | | + | + | + | | | | | | | |
| ia | + | | | | | + | | | + | | | | + | + | + | | | | | | | |
| ie | + | + | + | + | | + | + | + | + | | | | + | + | + | | | | | | | |
| iao | + | + | + | + | | + | + | + | + | | | | + | + | + | | | | | | | |
| io | + | | | | | | | | | | | | | | | | | | | | | |
| iou | + | | | + | | + | | + | + | | | | + | + | + | | | | | | | |
| ian | + | + | + | + | | + | + | + | + | | | | + | + | + | | | | | | | |
| in | + | + | + | + | | | | + | + | | | | + | + | + | | | | | | | |
| iang | + | | | | | | | + | + | | | | + | + | + | | | | | | | |
| ing | + | + | + | + | | + | + | + | + | | | | + | + | + | | | | | | | |
| u | + | + | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| ua | + | | | | | | | | | + | + | + | | | | + | + | + | + | | | |
| uo | + | | | | | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| uai | + | | | | | | | | | + | + | + | | | | + | + | + | | | | |
| uei | + | | | | | + | + | | | + | + | + | | | | + | + | + | + | + | + | + |
| uan | + | | | | | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| uen | + | | | | | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| uang | + | | | | | | | | | + | + | + | | | | + | + | + | | | | |
| ueng | + | | | | | | | | | | | | | | | | | | | | | |
| ong | | | | | | + | + | + | + | + | + | + | | | | + | + | | + | + | + | + |
| ü | + | | | | | | | + | + | | | | + | + | + | | | | | | | |
| üe | + | | | | | | | + | + | | | | + | + | + | | | | | | | |
| üan | + | | | | | | | | | | | | + | + | + | | | | | | | |
| ün | + | | | | | | | | | | | | + | + | + | | | | | | | |
| iong | + | | | | | | | | | | | | + | + | + | | | | | | | |
| $i_2$ | | | | | | | | | | | | | | | | + | + | + | + | | | |
| $i_3$ | | | | | | | | | | | | | | | | | | | | + | + | + |
| a | + | + | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | | + | + | + |
| o | + | + | + | + | + | | | | | | | | | | | | | | | | | |
| e | + | | | + | | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| ê | + | | | | | | | | | | | | | | | | | | | | | |
| er | + | | | | | | | | | | | | | | | | | | | | | |
| ai | + | + | + | + | | + | + | + | + | + | + | + | | | | + | + | + | | + | + | + |
| ei | + | + | + | + | + | + | + | + | + | + | + | + | | | | | | + | | + | | |
| ao | + | + | + | + | | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| ou | + | | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| an | + | + | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| en | + | + | + | + | + | + | | + | | + | + | + | | | | + | + | + | + | + | + | + |
| ang | + | + | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |
| eng | + | + | + | + | + | + | + | + | + | + | + | + | | | | + | + | + | + | + | + | + |

Notes: Special notations in Table 2 are as follows: "0" represents the zero initial, a cell with "+" indicates a syllable existing in Chinese, and a blank signifies that the initial and final cannot be combined herein.

During that period, most intellectuals advocated for eliminating Chinese characters, citing their complexity in learning and writing, and instead promoted the use of Latin letters, which were considered significantly more straightforward and more transparent. The Chinese Language

Reform Committee was established in 1954, after the founding of the PRC.

Simultaneously, the campaign to simplify Chinese characters also gained momentum. The authorities first intended to undertake both the simplification and Latinization of Chinese characters [11]. However, altering deeply ingrained writing habits that have existed for thousands of years within a limited timeframe is challenging. The author [12, p. 192] wrote:

*"Instead of reforming the difficult Chinese script, cannot we replace it with a phonographic writing system? It is possible to switch to such a writing system… However, there are objective and subjective reasons that prevent this. Above all, ancient Chinese culture is deeply intertwined with Chinese writing. One cannot abruptly sever the connection between them. At the same time, it is necessary to create a new, perfect orthography, for which great work must be done… Undoubtedly, after a certain time, Chinese people can also use an easy writing form".*

Until 1958, the urge to "simplify Chinese characters" progressively overpowered the appeal to "abolish Chinese characters". Meanwhile, the Latinization of the Chinese language slowed down, too [13, p. 172]. The *Scheme for the Chinese Phonetic Alphabet* (Scheme) was promulgated at the Fifth Session of the First National People's Congress on February 11. The verdict favoured simplifying Chinese characters and determined that the scheme would be a helpful tool for learning Chinese characters and advancing the modern common Chinese language [13, p. 175].

In simple terms, Pinyin is a compromise that reconciles the simplification and Latinization of Chinese characters. Initially, it was expected that Pinyin would supplant Chinese characters and promote literacy. As a result, the scheme incorporates several specific provisions – for handwriting, ease of learning, and simplicity. For example, the final "ao" is phonetically closer to "au". But, according to the scheme, it is written as "ao" to avoid confusion between the letters u and n in handwriting [6, p. 49]. Provision 4 mentioned the abbreviation issue, which aimed to enhance handwriting speed. Another example is Provisions 1 and 2, which emphasise the necessity of "y" and "w" under certain circumstances. For example, "xian yan (colourful)" can be misunderstood as "xia nian (the next year)", likewise "jin yü (goldfish)" and "ji nü (prostitute)". Thus, it could be said that Pinyin indeed possesses a few problems and deficiencies. However, in general, this scheme's advantages cannot be overlooked.

Furthermore, due to its utilisation of the Latin alphabet, Pinyin swiftly acquired global recognition. Since June 15, 1979, the Secretariat of the United Nations has adopted Pinyin as the official methodology for transcribing the names of Chinese persons, places, and geographical features in languages that employ Latin characters. From that moment onwards, any documents created, translated, or released by the Secretariat should utilise the Pinyin version of Chinese names [14, p. 351]. In 1982, the International Organization for Standardization issued the ISO 7098 document (Romanization of Chinese) using the scheme [10, p. 22].

*Guidelines for transliterating Chinese anthroponyms and toponyms into Azerbaijani*. The presence of Pinyin might potentially benefit the issue of transliterating Chinese personal names and placing names in Azerbaijani. Employing English as a case study, the current appellation for the capital of China in English is "Beijing", which aligns with the Pinyin transliteration of Chinese characters. Nevertheless, this city bore the name "Pekin" for a considerable duration. It is evident that English transliteration was based on Pinyin, but Azerbaijani transliteration overlooked this [15]. What is the current regulatory framework for transliterating into Azerbaijani?

The can's research basis comprises articles on AZERTAC (The Azerbaijan State News Agency) portal regarding the People's Republic of China from 2022–2023. Anthroponyms and toponyms were identified as the primary focus of the article's analysis by examining the news here. Table 3 displays the anthroponyms and toponyms that have been gathered.

Among the 76 transliterations, only 11 are deemed accurate and proper, as shown by being marked in bold. The remaining transliterations exhibit various phonetic inaccuracies.

My suggestions for transliterating anthroponyms and toponyms in Chinese are outlined below, focusing attention on the following: 1) compiling by Pinyin; 2) adjusting to the phonetic characteristics of Azerbaijani; 3) adopting a perspective based on the concepts of initials and finals instead of merely transliterating letters; 4) restoring Pinyin abbreviations and the original spellings; 5) remedying the shortcomings of Pinyin.

First, I have transliterated all the initials and finals in Chinese (see Table 4).

Table 3 – China-related Anthroponyms and Toponyms on AZERTAC Portal and Their Original Pinyins

| Transliteration | Pinyin | Transliterasiyası | Pinyin | Transliterasiyası | Pinyin |
|---|---|---|---|---|---|
| Heyluntszyan [16] | Heilongjiang | Siçuan | Sichuan | Si Cinpin [21] | Xi Jiping |
| Mohe [16] | Mohe | Çendu [18] | Chengdu | Qo Min | Guo Min |
| **Cilin** [17] | Jilin | Çonçin [18] | Chongqing | Mao Cedon | Mao Zedong |
| Çançun [17] | Changchun | Henan | He’nan | Li Keçyan | Li Keqiang |
| Hebey [18] | Hebei | Cencou [18] | Zhengzhou | Cian Cemin [21] | Jiang Zemin |
| Şiciacuan [18] | Shijiazhuang | Anyan | Anyang | Van İ | Wang Yi |
| Pekin [16] | Beijing | Uhan [18] | Wuhan | **Van Yan** | Wang Yang |
| Dasin [19] | Daxing | Sian | Xi’an | Han Cen | Han Zheng |
| Çaoyan [20] | Chaoyang | Ciuçüən | Jiuquan | Liu He | Liu He |
| Babaoşan [21] | Babaoshan | **Sincian** | Xinjiang | Sun Çunlan [18] | Sun Chunlan |
| Tienanmen | Tian’anmen | Haynan | Hainan | Fey Cunlon | Fei Junlong |
| **Ciansu** | Jiangsu | **Vençan** | Wenchang | Den Çinmin | Deng Qingming |
| Nankin | Nanjing | Fucien | Fujian | **Can Lu** | Zhang Lu |
| **Şanxay** [18] | Shanghai | **Fucou** | Fuzhou | Sun Licün | Sun Lijun |
| Pudon | Pudong | Honkonq [21] | Hong Kong | Fu Cenhua | Fu Zhenhua |
| Honçiao | Hongqiao | Tayvan | Taiwan | **Van Likı** | Wang Like |
| **Şencen** | Shenzhen | **Taybey** | Taipei | Li Şaosien | Li Shaoxian |
| **Quancou** [18] | Guangzhou | Hualien | Hualian | Niu Sinçun | Niu Xinchun |
| Çonhua [18] | Chonghua | Bayyun | Baiyun | **Şencou** | Shenzhou |

*Notes:* A total of 76 anthroponyms and toponyms, encompassing individual names, geographical names, and terminologies, were gathered by keyword search from news articles spanning 2020–2023. Due to spatial constraints, the sources of six examples were denoted.

Table 4 – Suggestions for the Transliteration of Initials and Finals in Chinese

| Pinyin | Transliteration | Pinyin | Transliteration | Pinyin | Transliteration |
|---|---|---|---|---|---|
| | | | Initials | | |
| b | b | l | l | zh | c |
| p | p | g | q | ch | ç |
| m | m | k | k | sh | ş |
| f | f | h | x | r | j |
| d | d | j | c | z | z |
| t | t | q | ç | c | ts |
| n | n | x | s | s | s |
| | | | Finals | | |
| a | a | an | ən | ê | e |
| ia/ya | ia/ya | ian/yan | iən/yən | en | en |
| ua/wa | ua/va | uan/wan | uən/vən | uen (un)/wen | uen/ven |
| ao | au | üan/yuan | üən/yüən | ei | ey |
| iao/yao | iau/yau | e | ı | uei (ui)/wei | uey/vey |
| ang | an | eng | ın | i/yi | i/yi |
| iang/yang | ian/yan | ueng (weng) | vın | in/yin | in/yin |
| uang/wang | uan/van | er | ır/ğır | ing/ying | inq/yinq |
| ai | ay | ie/ye | ie/ye | $i_2$ | ı |
| uai/wai | uay/vay | üe/yue | ö/yö | $i_3$ | ı |
| o | o | ou | ou | u/wu | u/vu |
| uo/wo | uo/vo | iou (iu) /you | iou/you | ong | un |
| ü/yu | ü/yü | ün/yun | ün/yün | iong/yong | iun/yun |

*Note.* Only a couple of exclamations, such as "哟", "唷", etc., are pronounced as "yo". Final "io" has not been included in Table 4. Final "ueng" is never preceded by an initial, so it is always found in the form "weng" according to which I transliterated it as "vın".

The suggested guidelines are fully elucidated in Table 4:

1. *Compiling by Pinyin.* The suggestions presented are based on the Pinyin of their corresponding initials and finals. For example: b ↔ b, n ↔ n, a ↔ a, en ↔ en, etc.

2. *Adjusting to the phonetic characteristics of Azerbaijani*.

a) Finals "ai, ei, etc." are written according to the scheme; however, my guidelines dictated that their Azerbaijani transliterations should be "ay, ey, etc.". In Azerbaijani, loanwords from Arabic and Persian often finish with the letters "ai, ei". Besides, the pronunciation of "ai" in loanwords like "Xətai [xətayi]" is "a-yi". However, the final "ai" in Chinese is a diphthong that cannot be separated.

b) If the final "üe" is calqued to "üe", the pronunciation will not align with the phonetic characteristics of contemporary Azerbaijani. I selected the vowel "ö", close to the final "üe" in Azerbaijani.

c) Historical Chinese phonology subdivides a final into three components at most: the medial, nucleus, and coda. For example, in the final "iao", the medial is "i", while the nucleus and coda are "a" and "u" [10, p. 53]. It is relatively easy to come across several finals that end with "n" and "ng" (with "n" and "ng" as their codas), which are referred to as *nasal finals*. For instance, "in" and "ing". There are Azerbaijani words that finish in [n] as well, such as "min", "əmin", "din", etc. The digraph "ng" denotes the consonant [ŋ]. Finals that finish in "ng" are referred to as *back nasal finals*, whereas those that end in "n" are defined as *front nasal finals*. The distinction between these two types of finals is of such significance that they should be regarded as two separate phonemes. As an illustration, the word "bing" corresponds to "ice", whereas "bin" means "guest". Therefore, I deemed it necessary to emphasise this distinction in transliterating them. As seen in Table 4, I substituted the final "in" with "in" and the final "ing" with "inq".

d) When discussing nasal finals other than "ing", it is notable that there are distinctions in not only the coda but also the nucleus. For instance, even though the nuclei of the finals "an, ang" are graphically represented by the same letter (a), their actual sounds differ. The "a" in the final "an" is pronounced as a front vowel sound, while the "a" in the final "ang" is a back vowel sound. To be more precise, the former is articulated by raising the tongue at the front of the mouth, while the latter is made by lifting the tongue at the back of the mouth [10, p. 96]. Consequently, when transliterating these nasal finals, I focused on their nuclei and favoured the corresponding Azerbaijani vowels. For example: an ↔ ən, ang ↔ an; en ↔ en, eng ↔ ın, etc. I believe that the distinctions between the codas of these finals are not essential for differentiating them but rather that their nuclei play a more significant function.

e) Under the scheme's provisions, the letters y and w should be added before the Pinyin of zero initial characters. Unfortunately, there is no letter w in the Azerbaijani alphabet. That is why I replaced the letter w with v. For example, wa ↔ va, wo ↔ vo, wu ↔ vu, etc.

f) The final "er" in Chinese is a peculiar vowel that poses challenges in transliteration. This final, transcribed as [ɚ] according to the IPA, is a retroflex single vowel [10, p. 28]. The syllable "ır" in Azerbaijani, which consists of the vowel "ı" and the consonant "r", is phonetically closest to [ɚ]. Because of this, I utilised "ır" to approach the final "er". It is important to note that, unlike Azerbaijani, liaisons in Chinese speech are rare. Consider the word "qaldırılırıq" as an example: The word follows a morphological structure of "qaldır-ıl-ır-ıq"; however, in speech flow, it is divided into syllables as "qal-dı-rı-lı-rıq". But in the case of Chinese, the word "dan an" is not articulated as "da-nan". Nonetheless, the final "er" is occasionally subject to liaison. For instance, by my guidelines, the personal name "Bao Beier" should be transliterated as "Bau Beyır". When Azerbaijanis encounter the word "Beyır" they are prone to saying it as "be-yır" instinctively; yet, the accurate pronunciation should be "bey-ır (bei er)". I implemented the letter ğ from the Azerbaijani alphabet as a syllabic delimiter to prevent such scenarios. By employing this strategy, I can ensure the accuracy of my transliterations (Bao Beier ↔ Bau Beyğır).

g) I aim to represent each initial with only a single letter. However, the phonetic characteristics of the Chinese and Azerbaijani languages prevent a comprehensive implementation. Considering that "ç" was previously employed to transliterate initials "q, ch", I did not support the ongoing usage of "ç" for initial "c". The IPA transcription of the initial "c" is [tsʰ] [10, p. 28]. It is equivalent to the voiceless alveolar affricate /ts/ in English words, such as cats, tsunami, etc. Thus, I have

employed the digraph "ts" to transliterate the initial "c". Furthermore, the scheme includes three initials denoted by diagraphs "zh, ch, sh", too. The initial "z" has some characteristics. This initial is transcribed as [ʦ] in IPA, the unaspirated equivalent of the initial "c [$ʦ^h$]" [10, p. 28]. It is different from the z in Azerbaijani. Therefore, I chose the digraph "dz" in my earlier transliterations. From a phonological perspective, the phonemes "dz" and "ts" exhibit unambiguous opposition, aligning with their respective sound values. However, if I used "dz", the letter z would remain completely unused. The optimal choice would be to use the z, also included in the Azerbaijani alphabet. This method prevents the need to introduce a new digraph.

3. *Adopting a perspective based on the concepts of initials and finals instead of merely transliterating letters.* I have already addressed the fact that the phonetic realisation of the "a" in the finals "an, ang" is not identical. Furthermore, it should be noted that the letters i and e in Pinyin have different phonetic values. Specifically, there are four distinct pronunciations of the letter e in the finals "e, ie, en, ei" [10, p. 100]. Despite the noteworthy variations among finals "i, $i_2$, $i_3$", they are designated by one single letter i in the scheme. Because of this, I adhered to the principle of faithfully retaining phonetic features during the transliteration process. Consequently, I utilised multiple letters to signify different pronunciations. For example, e ↔ ɪ, ie ↔ ie, üe ↔ ö; i ↔ i, $i_2$ ↔ ɪ, etc.

4. *Restoring Pinyin abbreviations and the original spellings.* As stated in the 3rd provision of the scheme, finals "uei, uen, iou" that come after an initial to form syllables shall be abbreviated as "ui, un, iu" [12, p. 1799]. From my viewpoint, it is advisable to restore these three finals during the transliteration process into Azerbaijani. Pinyin is straightforward for those familiar with Chinese, but it can be perplexing and result in erroneous pronunciations for people lacking language knowledge. For example, one of the mascots of the Beijing Winter Olympics is referred to as "Bing Dundun" in Pinyin, while its official English name is *Bing Dwendwen*. The reason for this is that the pronunciation of the letter combination "un" in English is significantly different from the final "un (uen)" sound in Chinese, therefore necessitating the restoration of the letter e. Similarly, I advocate restoring the umlaut (two dots above the letter u) in the final "ü" when it combines with the initials "j, q, x" to form syllables. As a case study, my name is written as "Siyuan Wang" in Pinyin. So, the transliteration of "yuan" into Azerbaijani should be "yüən". Furthermore, as previously stated, the final "ao, iao" should be transliterated as "au, iau".

5. *Remedying the shortcomings of Pinyin.* The findings of experimental linguistics indicate that the final "ong, iong" should be rendered as "ung, üng" [6, p. 53]. Since the scheme's launch, the ongoing discussion on this matter has never waned. "Ung, üng" are considered more scientifically accurate and linguistically proper orthographies. Consequently, I have converted the final "ong" sound into "un" via transliteration. Considering the final "ün" has already been transliterated as "ün", I have transliterated the final "iong" using the Azerbaijani syllable "yun".

## CONCLUSIONS

To better meet the demand for transliterating Chinese anthroponyms and toponyms into Azerbaijani, I established five guidelines and devised a transliteration table for initials and finals in Chinese. I believe this set of guidelines considers the features of the Chinese and Azerbaijani languages. It is precise, easily understandable, and facilitates reading, writing, and learning. Following these guidelines, I retransliterated the samples in Table 3, as shown in Table 5.

Table 5 – New Guideline-based Transliteration of Anthroponyms and Toponyms in Table 3

| New transliteration | Pinyin | New transliteration | Pinyin | New transliteration | Pinyin |
|---|---|---|---|---|---|
| Xeyluncian | Heilongjiang | Sıçuən | Sichuan | Si Cinpinq | Xi Jiping |
| Moxı | Mohe | Çındu | Chengdu | Quo Min | Guo Min |
| **Cilin** | Jilin | Çunçinq | Chongqing | Mau Zıdun | Mao Zedong |
| Çançuen | Changchun | Xınən | He'nan | Li Kıçian | Li Keqiang |
| Xıbey | Hebei | Cıncou | Zhengzhou | Cian Zımin | Jiang Zemin |
| Şıciacuan | Shijiazhuang | Ənyan | Anyang | Van Yi | Wang Yi |
| Pekin, Beycinq | Beijing | Vuxən | Wuhan | **Van Yan** | Wang Yang |

| New transliteration | Pinyin | New transliteration | Pinyin | New transliteration | Pinyin |
|---|---|---|---|---|---|
| Dasinq | Daxing | Siən | Xi'an | Xən Cın | Han Zheng |
| Çauyan | Chaoyang | Ciouçüən | Jiuquan | Liou Xı | Liu He |
| Babauşən | Babaoshan | **Sincian** | Xinjiang | Suen Çuenlən | Sun Chunlan |
| Tiənğənmen | Tian'anmen | Xaynən | Hainan | Fey Cünlun | Fei Junlong |
| **Ciansu** | Jiangsu | **Vençan** | Wenchang | Dın Çinqminq | Deng Qingming |
| Nankin, Nəncinq | Nanjing | Fuciən | Fujian | **Can Lu** | Zhang Lu |
| **Şanxay** | Shanghai | **Fucou** | Fuzhou | Suen Licün | Sun Lijun |
| Pudun | Pudong | Honqkonq | Hong Kong | Fu Cenxua | Fu Zhenhua |
| Xunçiau | Hongqiao | Tayvən | Taiwan | **Van Likı** | Wang Like |
| **Şencen** | Shenzhen | **Taybey** | Taibei | Li Şausiən | Li Shaoxian |
| **Quancou** | Guangzhou | Xualiən | Hualian | Niou Sinçuen | Niu Xinchun |
| Çunxua | Chonghua | Bayyün | Baiyun | **Şencou** | Shenzhou |

*Notes:* The transliterations I considered accurate in Table 3 are preserved in Table 5 and marked in bold.

The guidelines I established for transliterating Chinese anthroponyms and toponyms into Azerbaijani have the potential to be of considerable help to the Azerbaijani press and mass media, and I am hopeful about the possibility.

## REFERENCES


1. Tahirov, I. (2022). *Azärbayjan Respublikasının ärazi vahidlärinin adları inġilis dilindä* [Names of territorial units of the Republic of Azerbaijan in English]. Baku: Zärdabi Näshr (in Azerbaijani).
2. Standardization Administration of the P.R.C. (2008). *Transformation guidelines of geographical names from foreign languages into Chinese – English*. Retrieved from http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=2CB556608008A9A9A07FC96952187E92 (in Chinese).
3. Li, X. (2018). *The Handbook of English Names Translation* (5th ed.). Beijing: Commercial Press (in Chinese).
4. Akhundova, Ġ. (2022). *Azärbayjan Respublikasının ärazi vahidlärinin adları rus dilindä* [Names of Territorial Units of the Republic of Azerbaijan in Russian]. Baku: Zärdabi Näshr (in Azerbaijani).
5. Azärbayjan Milli Elmlär Akademiyası Näsimi adına Dilchilik Institutu. (2021). *Azärbayjan dilinin orfografiya lüghäti* [Orthography dictionary of Azerbaijani] (7th ed.). Baku: Elm (in Azerbaijani).
6. Azärbayjan Respublikasının Prezidenti İlham Äliyev. (2013, April 09). *Azärbayjan dilinin globallashma shäraitindä zamanın täläblärinä uyghun istifadäsinä vä ölkädä dilchiliyin inkishafına dair Dövlät Programı* [The State Program on the usage of Azerbaijani in accordance with the demands of our time and on the domestic development of linguistics]. Retrieved from https://president.az/az/articles/view/7744 (in Azerbaijani).
7. Gurbanov, A. (2019). *Ümumi Dilçilik* [General Linguistics] (Vol. 3). Baku: Azärbayjan Milli Elmlär Akademiyası (in Azerbaijani).
8. Gurbanov, A. (2019). *Ümumi Dilçilik* [General Linguistics] (Vol. 1). Baku: Azärbayjan Milli Elmlär Akademiyası (in Azerbaijani).
9. Lü, S. (2016). *Xiàndài Hànyǔ Cídiǎn* [Modern Chinese Dictionary] (7th ed.). Beijing: Commercial Press (in Chinese).
10. Huang, B., & Liao, X. (2017). *Xiàndài Hànyǔ* [Modern Chinese] (6th ed.). Beijing: Higher Education Press (in Chinese).
11. Wikipedia. (2024, February 16). *Pinyin*. Retrieved from https://en.wikipedia.org/wiki/Pinyin

12. Gurbanov, A. (2019). *Ümumi Dilçilik* [General Linguistics] (Vol. 2). Baku: Azärbayjan Milli Elmlär Akademiyası (in Azerbaijani).

13. Zhou, Y. (1958). Hànyǔ Pīnyīn Fāng'àn De Zhēnglùn Wèntí Jí Qí Yuánmǎn Jiějué [The controversial Issue of the Scheme for the Chinese Phonetic Alphabet and Its Perfect Solution]. *Zhōngguó Yǔwén, 4*, 172–178 (in Chinese).

14. United Nation. (1983). *United Nations Editorial Manual*. New York: United Nations (in English).

15. Wikipedia. (2024, January 16). *Beijing*. Retrieved from https://en.wikipedia.org/w/index.php?title=Beijing&oldid=1206916275

16. AZERTAC. (2023, January 25). *Pekindä son 45 ilin än ġüjlü shakhtaları geydä alınıb* [The strongest frosts in the last 45 years were recorded in Beijing]. Retrieved from https://azertag.az/xeber/2459030 (in Azerbaijani).

17. Shahin, J. (2022, September 28). *Chindä restorandakı yanghında 17 näfär ölüb* [17 people died in a fire in a restaurant in China]. Retrieved from https://azertag.az/xeber/2311040 (in Azerbaijani).

18. Shahin, J. (2022, December 1). *Chindä karantin tädbirläri bir gädär yumshaldılıb* [Quarantine measures in China have been relaxed a little]. Retrieved from https://azertag.az/xeber/2393009 (in Azerbaijani).

19. AZERTAC. (2021, July 18). *Ġüjlü yaghıshlar säbäbindän Pekindä 370-dän chokh aviareys läghv edilib* [More than 370 flights were canceled in Beijing due to heavy rains]. Retrieved from https://azertag.az/xeber/1834129 (in Azerbaijani).

20. Shahin, J. (2022, November 20). *Chindä may ayından bäri COVID-19 virusu ilä baghlı ilk ölüm halı geydä alınıb* [China has reported its first death from the COVID-19 virus since May]. Retrieved from https://azertag.az/xeber/2380685 (in Azerbaijani).

21. Shahin, J. (2022, December 5). *Chinin sabig lideri Jian Jemin däfn edilib* [Former Chinese leader Jiang Zemin has been buried]. Retrieved from https://azertag.az/xeber/2397554 (in Azerbaijani).

# Standard Language in Norway and Azerbaijan

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**Abstract**. A standard or common literary language is a cultural and historical event. This language's oral and written form is based on the artistic needs of society and created as a result of particular necessities. The norms of the language are put forward through a standard language, and a neat, grammatically and phonologically "perfect" form of speech emerges. Moreover, a particular order is created, which is applied to local authorities, the press, and education, and they are expected to follow these language rules.

Also, a standard literary language is essential for second language learners. Without a standard spoken literary language, foreigners meet difficulties in language learning. For instance, second language learners study a different form of Norwegian in the classroom. Still, they meet Norwegians who use a dialect daily, which can cause misunderstandings for foreigners. There is no official standard language in Norway. However, some linguists do not agree with this statement and associate standard language with prestige and high social status. On the contrary, Azerbaijan has an official common literary language in both spoken and written form.

Norway and Azerbaijan's official languages have undergone a series of complicated historical development stages. Norway has two official written languages, bokmål and Nynorsk. Azerbaijan has one official written language, which is called Azerbaijani. Even though Norway has no officially accepted standard spoken language, people sometimes follow standard speaking rules. However, people tend to use dialects or fail to use the standard form of language in Azerbaijan. Therefore, the analysis of the language society in these two countries is of interest.

**Keywords**: official written language; standard language; Norwegian; bokmål; Nynorsk; Azerbaijani.

## INTRODUCTION

The standard language was polished during historical development, and various rules were engraved. V.V. Vinogradov expresses, "Changes in the functional and stylistic diversity of the language are closely related to the historical changes in the capacity, composition and sociological essence of the people as a historical category." [6, p. 43]. The nation's language formation processes and history are closely related.

Azerbaijani language is the standard means of communication for more than 50 million Azerbaijanis worldwide [1, p. 12]. In addition, the Azerbaijani language is the second mother tongue of some ethnic groups living in the country, such as Lahij, Talish, Tat, and Kyrgyz. The Azerbaijani language belongs to the Oghuz-Seljuk subgroup of the Oghuz language group in the family of Turkic languages according to genealogical division. The Azerbaijani language is the closest to Turkic, Turkmen and Gagauz languages among the modern languages of the Turkic language family [3, p. 13].

In general, the history of the Azerbaijani language can be divided into two significant periods: 1) the period before writing (before the 12th century) and 2) the period of written standard/literary language (XIII century and later). The first period is mainly related to the spoken

language of Azerbaijan, while the second phase is primarily about the history of the written standard language. The national spoken language was pivotal in forming the written standard language, so they are studied as a unity [2, p. 8].

Moreover, the history of literary language can be divided into three periods in Azerbaijan:

1) *20th-century Azerbaijani literary language.* During this period, a decision was made about the state language during the AXP government (1918-1920), and the government adopted the Azerbaijani language, which was called the Turkish language at that time, as the official language for the first time [2, p. 19].

2) *The Soviet period of Azerbaijani standard / literary language.* In this period, an important social factor was the change of the Arabic alphabet and its replacement with an alphabet containing the phonetic features of the language. Thus, the process of improving the literary language of Azerbaijan based on the national colloquial language began. 3) *Azerbaijani literary language in the years of independence.* During the years of independence, the Azerbaijani language acquired all the powers of the state languages. There was a struggle to replace the Cyrillic alphabet with the Latin alphabet. Changes were also needed in spelling, vocabulary and other areas [2, p. 376]. Nowadays, problems related to the use of standard language have also appeared in internet language, press language, etc. These are further analysed in the conclusion section.

Norwegian is the mother tongue of about 5 million people [7, p. 210]. Nevertheless, tens of thousands of people in Norway have another mother tongue. First of all, the Sami - ethnic minorities settled in Norway speak the Northern Sami, Lule Sami and Southern Sami dialects, which are considered separate languages. Another ethnic minority living in the country is the Kven language. Also, the Romanian language has become a national minority language. In addition, many "immigrant languages" have been introduced to the country since the 1960s. However, the Norwegian language is the language of most of the population [7, p. 222].

The Norwegian language has two different official written forms: bokmål ("book language") and Nynorsk ("new Norwegian"). Bokmål is a Norwegianized version of the Danish language, and Nynorsk is a generalised variant of Norwegian dialects [7, p. 210]. Bokmål is used by 90% of the Norwegian population. This written language was formed by the Norwegian linguist K. Knudsen based on the Danish language due to gradual Norwegianization in the 1800s and 1900s. After Danish rule in 1814, the idea of creating a new language based on Norwegian dialects was supported [11, p. 2]. Thus, nynorsk's written language is formed. Nynorsk's written language is associated with the name of the Norwegian linguist Ivar Osen, the founder of Norwegian dialectology. The linguistic history of Norway can be divided as follows: *Medieval period.* In Norway, during the Viking Age and the Middle Ages, the spoken and written language of the Norwegians was Old Norse. At the same time, this language is called the Western Scandinavian language and includes the ancient Norwegian language, similar Icelandic and Faroese languages [4, p.42]. In addition to quickly assimilating into the society in the areas they settled, the Vikings also influenced the local language. For example, the ancient northern language traces can be seen in Scotland and North England's regional dialects and place names [4, p. 42]. Therefore, the period between 700 and 1050 is the historical period in which the all-Scandinavian language dominates.

*Romanticism era.* During the Romanticism period, Danish gradually gained a superior position as a written language and eventually became the written language of Norway, and the ancient Scandinavian writing norms disappeared [7, p. 199]. After the period of Danish sovereignty ended in 1814, many considered the use of Danish as a written language unacceptable. Thus, bokmål and bynorsk languages were formed.

*Independence period.* In modern times, Norway has no officially accepted standard literary colloquial language. Bokmål, created under the influence of the Danish language and considered a Norwegianized Danish language, is regarded as the language of entertainment and music in modern times. In contrast, Nynorsk, developed based on dialects, is considered the language of literature [7, p. 212].

## RESULTS AND DISCUSSIONS

There is an official standard language in Azerbaijan. The norms and styles of this language have been determined, and books, textbooks, and the press should operate based on these norms.

Nevertheless, the rules of the literary language are violated in several cases, which is closely related to the development trend of the modern era. Thus, the internet, one of the main requirements of the modern era, has significantly influenced the spoken and written language of the young generation. In many cases, this effect can lead to a violation of literary language norms. Short answers and informal writing styles are examples of this. Some linguists claim that the language of the press in modern times does not correspond to literary norms [2, p. 21].

On the contrary, there is no official literary language in Norway. Nevertheless, the debate about the existence of the Norwegian language or a standard literary language was still debated in the 1980s. [7, p. 26]. Norwegian linguist B. Mæhlum defended the idea of a standard spoken language in Norway, although it is unofficial, while H. Sandøy claimed the opposite of this opinion [7, p.27]. According to B. Mæhlum, some language variations are related to forms of prestige, high status and elite level. The linguist believes that the Oslo variation, close to bokmål or the dialect of southeast Norway, is at the highest level in this prestige hierarchy because it relates to the capital. Since the standard spoken language developed in close connection with the written language, the terms "spoken bokmål" and "spoken nynorsk" are usually used in Norway [8, p. 13].

Although the main language form is not clearly stated in the curriculum, a standard language is used to teach Norwegian as a second language. Norwegian linguist O. Husby believes that the tradition of using a common language can be explained by the fact that books written in bokmål are usually used in the classroom. This leads to teachers using a spoken language close to bokmål. This is practical for teachers because teaching oral language skills without the support of books can lead to misunderstandings. Learning a spoken language near a written one is also more accessible for new language learners. Since bokmål dominates both textbooks and media, it is more appropriate to teach a spoken language that is similar to written language [9, p. 82].

Thus, although there are lexical, grammatical and phonetic differences between bokmål and Nynorsk, the number of people who refer to both written languages in modern times is sufficient. Nevertheless, bokmål is the first choice of Norwegian learners [11, p. 3]. Bokmål and Nynorsk must also represented at the official level in Norway. It means state and regional administration, health care, and educational institutions must use official written languages in Norway [7, p. 219].

So, Norwegian and Azerbaijani languages have historically gone through similar processes. The dominant country ruled both, and the language of that country became the language of government. For example, as a Soviet Socialist Republic, the state language of Azerbaijan was Azerbaijani. Still, that language was used only at certain levels (village, district, and even some central institutions and organisations). However, the government utilised the Russian language to establish relations between the upper government and state departments, countries and nations [2, p.10]. Also, during the reign of Denmark, the "dark 400 years", as Norwegians called it, Danish was the primary language of government, the elite class, the media, and science. Thus, the language was in danger of being forgotten.

The problems of the standard language in Azerbaijan arose related to the language freedom exercised by the private sphere during the period of independence. For instance, business people gave foreign names to their private organisations, such as International Service, Vitomax, Crystal Water Company, etc., which undermined the terminological system of this national language. The Terminology Committee was established, and this situation was controlled [2, p. 376-378]. Despite this fact, there are still enough names of companies and shops in foreign languages.

The absence of a standard spoken literary language in Norway makes the language situation hard for foreigners. Second language learners get firstly familiar with bokmål in the classroom. However, they most likely encountered a dialect used in Norway. In some cases, Norwegians normalise their speech; in other words, they use "spoken bokmål". As stated before, the standard Norwegian language can be understood as a language close to the bokmål written language and contains features of the eastern dialect in terms of phonology and prosody [7, p. 3-6]. However, in other cases, the language input different from "spoken bokmål" can cause misunderstandings.

Although Norway is called a "dialect paradise", according to many linguists, there is a standard spoken Norwegian language similar to bokmål combining the phonological features of the eastern dialect, the western Oslo dialect. However, this cannot be considered a factor limiting the area of use of dialects. For example, Norway's state television, NRK, is one of the instances where there is an official language norm [5, p. 10]. These language rules apply only to NRK news programs and program information. However, in other programs, primarily regional news, the local dialect is preferred [10, p. 11].

## CONCLUSIONS

Meanwhile, Azerbaijani law on the state language of the Republic of Azerbaijan states that the presenters of the television and radio channels broadcasting in the state language must ideally acquire the state language and be able to speak it fluently. Films and programs dubbed on television and radio channels must be adapted to the language norms determined by the state and the literary language. Undoubtedly, these law requirements are being followed only to some extent in those media. In particular, programs are shown on television channels where the norms of the literary language of Azerbaijan are not correctly followed [2, p. 21].

It can be concluded, therefore, that an unofficial spoken standard language exists in Norway, while it is official in Azerbaijan. Foreign language learning and striving to preserve language stability are the reasons for supporting standard spoken language. However, the internet, mass media, and the desire to sustain other language varieties can be incentives for not obeying the standard language's norms.

## REFERENCES

1. Abbasov, A., & Aliyev, H. (2021). Müasir Azərbaycan dili: uğurlar, problemlər [Modern Azerbaijani language: successes, problems]. *Azerbaijani language and literature teaching, 4*(270), 10-24 (in Azerbaijani).

2. Azerbaijani literary language history. (2007). *Encyclopaedia*. Baku: Şərq-Qərb (in Azerbaijani).

3. Bayramov, A., Maharramov, Z., & Isgandarzade, M. (2015). *Azərbaycan dili və nitq mədəniyyəti. Dərslik* [Azerbaijani language and speech culture]. Baku: ULU (in Azerbaijani).

4. Hamzayeva, L. (2018). Sosiolinqvistikanın başqa elmlərlə həmhüdud anlayışları [Border concepts of sociolinguistics and other sciences]. *Scientific news. Social and Humanitarian section, 3* (in Azerbaijani).

5. Store Norske leksikon. (n. d.). *NRK*. Retrieved from https://snl.no/NRK

6. Kazimov, J. (2021). Postmodernizm dövründə Azərbaycanın dil situasiyası [Language situation in the era of post modernism]. *Azərbaycan dili və ədəbiyyat tədrisi, 1*(267), 41–51 (in Azerbaijani).

7. Maagerö, E., & Simonsen, B. (2008). *Norway: Society and Culture* (2nd ed.). Kristiansand: Portal books.

8. Mæhlum, B. (2009). Standardtalemål? Naturligvis! [Standard speech goals? Of course!]. *Norsk lingvistisk tidsskrift, 27*, 7–25 (in Norwegian).

9. Øynes, A. (1995). *Talemål i undervisninga av norsk som andrespråk – en sosiolingvistisk individstudie* [Spoken language in the teaching of Norwegian as a second language - a sociolinguistic individual study]. Trondheim: NTNU (in Norwegian).

10. Øvregaard, Å. (2008, January 27). *Når dialekt blir maktspråk* [When dialect becomes the language of power]. Retrieved from https://www.aftenposten.no/meninger/kronikk/i/nw6xL/Nar-dialekt-blir-maktsprak (in Norwegian).

11. Tørdal, R., Oddvar, E., & Marion, F. (2018). *Nasjonal Digital Læringsarena*. Retrieved from https://ndla.no

# The Characteristics of Discourse in Economic Texts

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**Abstract**. This article explores the distinct discursive features prevalent in economic texts, focusing on the unique language patterns, rhetorical strategies, and communicative functions characterising this genre. The study identifies critical elements that differentiate economic discourse from other professional and academic writing forms by analysing various economic documents, including academic papers, financial reports, and policy briefs. These features include specialised terminology, quantitative data presentation, argumentative structures, metaphor, and analogy. The findings highlight how these characteristics effectively convey complex economic concepts, persuade diverse audiences, and facilitate informed decision-making. This analysis contributes to a deeper understanding of the linguistic and rhetorical conventions in economic writing, offering valuable insights for economists, educators, and communicators.

**Keywords**: economic text; new content; pragmatics; genre; terminology; translation.

## INTRODUCTION

Economic texts encompass various documents, from scholarly articles and textbooks to financial reports and policy briefs. These texts are crafted to inform, persuade, and instruct diverse audiences, including economists, policymakers, investors, and students. This article delves into the distinctive discursive features of economic texts, shedding light on the specialised language patterns, rhetorical strategies, and communicative functions that define this genre. By examining these elements, we can better understand how economic writing effectively conveys complex concepts, supports arguments, and influences decision-making.

One of the most salient features of economic texts is specialised terminology. Economists often employ a lexicon rich in technical jargon and acronyms, which can be daunting to the uninitiated. Terms such as "GDP," "monetary policy," "elasticity," and "fiscal deficit" are commonplace. This specialised vocabulary efficiently conveys precise meanings and concepts among those familiar with the field. However, it can also create barriers to understanding for non-experts, necessitating glossaries or explanatory notes in texts intended for broader audiences.

An economic text is a specialised form of writing to document, preserve, and convey economic knowledge. It encapsulates the verbal outcomes of economic debates. Its dense information content distinguishes it, as well as robust methods of logical reasoning and argumentation related to specific economic events, alongside the presentation of economic forecasts.

Economic discourse involves creating texts shaped by sociocultural, psychological, and practical factors. These texts include oral and written communications within the economic field, mirroring real-world scenarios. The extensive linguistic knowledge at our disposal highlights the growing influence of the English language in the global economy. This linguistic richness lays the foundation for a multicultural perspective, facilitating effective English communication across economic boundaries in different societies. Since linguistics is a captivating area of human knowledge and behaviour, the interplay between pragmatics and economic texts in linguistic studies is essential for developing appropriate models of competence and behaviour for English language teaching.

The term "discourse" in economic texts is complex in modern linguistics. Its presence in English is

explained by the conditions of its use and the inherent ambiguity within the system of language categories. Broadly, discourse refers to a communicative event between a speaker and a participant within a specific time, space, and context, which can be verbal, written, or non-verbal. In a narrower sense, discourse can be understood as text or conversation.

It is crucial to understand that economic discourse is a multifaceted communication involving language and various non-linguistic factors. The acquisition of new economic knowledge is a communicative process that shapes economic behaviour within the framework of social and cultural norms, particularly in preparing economic contracts [1; 2].

This *article aims* to analyse economic texts' distinctive linguistic and pragmatic features, exploring how these elements contribute to effective communication within the economic domain. By examining the lexical, grammatical, phonetic, and prosodic characteristics, as well as the pragmatic aspects such as speech acts, rhetorical structures, and discourse management, the study seeks to understand how economic information is conveyed, argued, and understood. This analysis aims to provide insights that enhance the comprehension, teaching, and practical application of economic communication, thereby improving the clarity and persuasiveness of economic documents across various contexts.

## METHODS

This investigation employs a mixed-methods approach to analyse linguistic and pragmatic features of economic texts. The primary materials include a corpus of economic documents, such as academic papers, financial reports, and policy briefs. These texts are selected to represent a range of economic discourses.

The corpus's lexical, grammatical, and phonetic features are analysed using linguistic software. This includes identifying standard terms, phrases, and syntactic structures. Intonation patterns and rhythmic structures are examined to understand their role in conveying meaning and enhancing communication. The texts are analysed for speech acts, rhetorical structures, discourse implications, and management strategies. This involves qualitative analysis to explore how these pragmatic elements function within the texts.

Combining quantitative and qualitative methods ensures a comprehensive understanding of economic texts' structural and functional aspects, providing insights into how they achieve effective communication in the financial domain.

This research is relevant because it enhances the quality and effectiveness of economic communication across various fields, from international business to academia and public policy. It ensures that financial information is conveyed accurately, objectively, and in a manner that is accessible to diverse audiences.

### Literature review

Research on the discursive analysis of economic texts includes the study of terminology, structure, and vocabulary in economic documents such as financial reports, company press releases, articles in economic journals, and more. One of the critical areas is the analysis of corporate communication discourse, which examines texts created by companies for external and internal audiences to understand the messages and objectives they pursue. The study of the discourse of economic texts allows for uncovering the specifics of language and communication in economics, revealing societal representations, ideological stances, and methods of influencing the audience through textual materials. Research in this area helps to understand how economic messages sound, how they are interpreted by different groups of people, and how economic realities can be shaped based on linguistic constructions.

The book [3] examines the influence of economics textbooks on the formation of economic knowledge, understanding, and evaluation of economic processes. In this book, L. Bäuerle investigates the specific information, terminology, structure, and approaches used in economics textbooks to shape certain perceptions of economic reality. Through discourse analysis, the author aims to identify which educational texts are tools for shaping the correct understanding of economic phenomena and concepts from the authors' perspective [3].

Authors [6] investigate the changes in the emotional connotation of economic terms over time, specifically the fluctuations in the meaning of the word "inflation" during periods of crisis, reflecting semantic changes in a limited diachrony. The study examines the evolution of the target term "inflation" in the business news sections of quality

publications and the impact of the Great Recession. This is achieved through quantitative and qualitative methods: sentiment analysis, analysis of usage fluctuations, corpus linguistics, and discourse analysis.

This study reveals several findings: terms become "event words" due to the increase in their frequency of use in connection with ongoing crisis events, and there are statistically significant, culturally motivated changes in the form of emergent collocations with emotionally charged words that have a lower level of domain specificity.

Some authors focus on neologisms within this discourse by analysing the linguistic features of economic texts. For instance, Anglicisms in economic discourse can be an essential element of communication in international business, finance, and other areas where the consistent use of specific terms can contribute to more transparent and more effective information exchange.

Authors [7], addressing this issue in the context of economic texts, analyse how these Anglicisms are introduced and adapted into economic discourse from the perspectives of linguistics, semantics, cultural studies, and pragmatics. Their work possibly also considers the impact of Anglicisms on the structure and content of economic texts and their perception and understanding by various audiences.

These studies represent only a tiny portion of the work being conducted in the field of discursive analysis of economic texts. They help to understand how language and texts influence the formation of economic perceptions and realities and the communication strategies used to impact the audience.

## RESULTS AND DISCUSSION

The analysis reveals that a text, unlike discourse, is a product of speech activity, and its communication is tied to establishing context in the Azerbaijani language. In this framework, the content and structure of economic texts are demonstrated through communicative behaviour as a form of social interaction. Thus, the text emerges from the participants' communicative actions. The primary difference between discourse and text is that discourse is seen as an ongoing communication process, whereas text is the outcome of this process.

Authors [8] pioneered researchers exploring economic discourse and pragmatics, linking them with linguistics and introducing relevant terminology, intonation, and rhythmic structures for discursive communication. Intonation and rhythmic patterns in discourse are vital in texts, influencing the transmission of new or established information through varying linguistic rules. The prosodic approach, which includes features like accented or unaccented intonation, lexical substitutions, and nominal components, plays a significant role in forming relationships within texts.

Research suggests that the specific text is less critical in selecting different types of economic information. This implies that regardless of the situation, the new context conveys information to new economic discourse [5].

Economic discourse heavily relies on quantitative data to support arguments and provide evidence for claims. Charts, graphs, tables, and statistical analyses are integral to economic texts. The presentation of this data is not merely descriptive but often analytical, with authors interpreting trends, comparing metrics, and forecasting future developments. The effective use of quantitative data requires clarity and accuracy, as misrepresentation or misinterpretation can lead to flawed conclusions and misguided decisions.

Economic texts are inherently argumentative, often structured to advocate for particular policies, theories, or interpretations of data. Authors build their arguments through logical reasoning supported by empirical evidence. A typical structure might include a clear thesis statement, a literature review, methodology, results, and a discussion that interprets the findings in the context of existing knowledge. Counterarguments are also addressed to bolster the credibility of the primary argument and demonstrate thorough consideration of alternative perspectives.

*Linguistics features of economic texts*. Despite the technical nature of economic texts, authors frequently employ metaphors and analogies to elucidate complex concepts and make them more relatable. For instance, economies are often described as "machines" or "organisms" with components that must work together harmoniously. Financial markets might be depicted as "turbulent seas" or "bulls and bears." These figurative language tools help to simplify abstract ideas and engage readers, making the content more accessible and memorable.

"Therefore, in the process of characterising the linguistic features of economic texts, we identified

the main ones as informativeness, relevance, professional significance, objectivity, formality, logical structure, lack of excessive imagery and emotional colouring, and a high level of standardisation of speech structures and language means." [11, p. 495].

Language communication occurs through text, where lexical, grammatical, phonetic elements and intonation are crucial in establishing internal relationships within the text. The author [12, p. 147] highlights that textual corrections differ significantly from individual sentences, and certain events can only be fully understood within the context of a complete text. The linguistic features of a text are vital for creating a network of interrelations between its linguistic categories. Analysing the semantic-structural relationships between components of independent sentences is essential. It is necessary to identify the appropriate structural elements and criteria for defining the beginning and end of texts to comprehend these relationships. When isolated from other components, a sentence loses meaning and cannot stand alone.

Authors [4, p. 243] demonstrated that the linguistic features of economic texts and the development of pragmatic discourse are common research subjects among writing scholars. Language features are typically categorised into three primary structures: lexical, syntactic, and phraseological combinations. The economics of language, including the impact of language skills on income and trade and the principle that language proficiency enhances economic terminology, influence the preservation of economic costs and benefits. Economic texts themselves possess lexical and grammatical categories that structure economic discourse. This research paper will examine four aspects of pragmatics in economic texts: speech acts, rhetorical structure, discourse implication, and discourse management. Mastery of these aspects during communication impacts the formation of the communicative act in preparing such texts. Therefore, considering linguistic features as a pragmatic aspect is essential. Research defines it as a combination of linguistic and extralinguistic characteristics that influence the choice of linguistic and stylistic means.

*The communicative functions of economic texts*. The communicative functions of economic texts vary depending on the intended audience and purpose. Academic papers aim to advance theoretical understanding and contribute to scholarly discourse. Financial reports provide stakeholders crucial information about an organisation's performance and prospects. Policy briefs seek to inform and influence decision-makers regarding specific economic issues. Despite these differences, all economic texts share a common goal: to communicate information in a way that is both informative and persuasive.

Furthermore, non-linguistic factors such as motivation, attitude, personality, and emotion significantly influence students' preparedness in English, particularly concerning extralinguistic pragmatics. Another critical linguistic component is deixis, which involves words or phrases whose meanings are context-dependent, including unity and collocations. Integrating linguistic and extralinguistic tools within the communicative context is essential in the pragmatic approach to economic texts. The modality expressed in the texts demonstrates consistent attitudes towards the ideas conveyed. Modal verbs are pivotal in linking various sections of economic texts. Here, modality is considered a facet of systemic functional linguistics employed in critical discourse analysis. Halliday suggests that modality represents a judgment regarding the probabilities or commitments expressed by the speaker during discourse.

Economic pragmatic discourse encompasses a broad spectrum of activities such as business, finance, credit, accounting, auditing, taxation, insurance, and commerce. Therefore, when translating economic texts into English, linguistic discourse participants must also identify the different areas of activity.

Various researchers have consistently defined the linguistic fields related to these areas. Authors [5, 10] focused on teaching the lexical terms used in economic texts as part of their study on the linguistic aspects of economic discourse [10, p. 12; 7, p. 70]. The author [8] examined the syntactic dimension of economic discourse by developing a specialised vocabulary of noun and verb combinations found in economic texts. Henderson also explored the relationship between conventional form and meaning in economic discourse writing. Meanwhile, the author [10] discussed using linguistic mechanisms in developing abstract concepts [10, p. 303].

Various researchers have consistently defined the linguistic fields related to economic texts. The authors [5, 9] focused on teaching the lexical terms used in economic texts as part of their study of the linguistic aspects of economic discourse. Their

studies examined how these terms are used and understood within the context of economics, providing valuable insights into the specialised vocabulary of the field.

The author [8] examined the syntactic dimension of economic discourse by developing a specialised vocabulary of noun and verb combinations found in economic texts. This research highlighted the importance of syntactic structures in conveying economic information effectively and contributed to a deeper understanding of how these structures function within the genre.

Henderson's additional work explored the relationship between conventional form and meaning in economic discourse writing. This investigation likely involved analysing how standard expressions and formats in economic texts help convey specific economic ideas, emphasising the interplay between form and content in effective communication.

Meanwhile, the author [10] discussed the use of linguistic mechanisms in developing abstract concepts in economic texts. Mason's research focused on how language can articulate complex, abstract economic ideas clearly and understandably, shedding light on the strategies to make sophisticated economic concepts accessible to a broader audience.

Together, these studies underscore the comprehensive efforts of researchers to define and analyse the linguistic characteristics of economic texts, enhancing our understanding of how economic information is communicated through language.

## CONCLUSIONS

The discourse of economic texts is marked by its specialised terminology, reliance on quantitative data, structured arguments, and use of metaphor and analogy. These features work in concert to convey complex economic concepts clearly and persuasively, catering to the needs of diverse audiences. By understanding these characteristics, we can appreciate the nuances of economic writing and enhance our ability to communicate effectively within this field. This analysis provides valuable insights for economists, educators, and communicators, contributing to more effective and informed economic discourse.

## REFERENCES

1. Abdullayev, A. (2011). *Dzhari uzvluk, matn va sohbat* [Current membership, text and discourse]. Baku: Zardabi (in Azerbajaini).

2. Samender, A. F. (2016). The Communicative-pragmatic Classification of Economic Texts. *Theory and Practice in Language Studies, 6*(12), 2260. doi: 10.17507/tpls.0612.04

3. Bäuerle, L. (2019). *The power of economic textbooks: A discourse analysis*. Retrieved from https://www.researchgate.net/publication/334737279_The_Power_of_Economic_Textbooks_A_Discourse_Analysis

4. Benwell, B. & Stokoe, E. (2006). *Discourse and identity. University of Stirling*. Retrieved from https://www.researchgate.net/publication/281760769_Discourse_and_Identity

5. Brown, V. (1993). *Decanonizing discourses: textual analysis and the history of economic thought*. London: Routledge.

6. Fernández-Cruz, J., & Moreno-Ortiz, A. (2023). Tracking diachronic sentiment change of economic terms in times of crisis: Connotative fluctuations of 'inflation' in the news discourse. *PLOS ONE, 18*(11), e0287688. doi: 10.1371/journal.pone.0287688

7. Gordienko, D., & Leshnevskaya, K. (2021). Osobennosti funkcionirovanija novejshhih anglicizmov v jekonomicheskom diskurse [Features of the functioning of the newest Anglicisms in economic discourse]. *Colloquium-journal, 33*(120), 15–17 (in Russian).

8. Halliday, M., & Jonathan, J. (2003). *Linguistic Studies of Text and Discourse*. N. d.: A&C Black.

9. Henderson, W., & Hewing, A. (1987). *Reading economics: How Text Helps or Hinders*. N. d.: British Library.

10. Mason, R. (2008). Be Interested and Beware: Joining Economic Valuation and Heritage Conservation. *International Journal of Heritage Studies, 14*(4), 303–318. doi: 10.1080/13527250802155810

11. Shostak, I. (2017). The linguistics charasteristics of the English financial and economic texts in the process of reading by students – future economists. Young Scientist, 4(44), 493–497 (in Ukrainian).

12. Veysalli, F. (2013). *Dilchiliyin asalary* [Fundamentals of Linguistics]. Baku: Tardzcuman (in Azerbajaini).

# Поэтический корпус газелей Мухаммеда Физули

## Muhammad Fizuli's Poetic Corpus of Ghazals

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**Аннотация.** Данная статья посвящена корпусному исследованию. Материалом исследования послужили газели из «Дивана» Мухаммеда Физули на азербайджанском языке. В «Диване» представлено 305 газелей. Основная цель статьи заключается в глубоком анализе поэтического корпуса газелей Мухаммеда Физули. Это исследование направлено на анализ основных тем и мотивов, присутствующие в газелях Физули, и их влияние на восточную поэзию, оценивание влияние газелей Физули на развитие азербайджанской и мировой поэзии, а также их место в литературной традиции. Автор в рамках данной статьи статья стремится дать всестороннее понимание поэтического наследия Мухаммеда Физули и его важности для литературоведения и культурологии, так как именно Мухаммеда Физули является основоположником литературного *азербайджанского языка*. Исследование поэтического корпуса газелей Мухаммеда Физули обладает высокой актуальностью по ряду причин: во-первых, оно способствует сохранению культурного наследия Азербайджана и Востока в целом, а также укреплению национальной идентичности; во-вторых, работы Физули оказали значительное влияние на современную литературу и являются предметом интереса для лингвистов, культурологов и филологов; в-третьих, переводы газелей Физули на различные языки способствуют межкультурному диалогу и пониманию восточной поэзии; в-четвертых, философские и эстетические идеи, содержащиеся в его произведениях, остаются актуальными и сегодня, обогащая наше понимание мира; в-пятых, тема важна для академических исследований и образовательных программ, способствуя расширению научных знаний и обогащению культурного опыта студентов и исследователей. Таким образом, изучение поэтического наследия Мухаммеда Физули имеет широкое значение для различных сфер науки, культуры и образования.

**Ключевые слова**: корпусная лингвистика; лингвостатистика; корпус; поэтический корпус; конкорданс; азербайджанский язык; частотный словарь; корпус текстов Физули; газели.

**Abstract**. This article is dedicated to corpus research. The material for the study consists of gazelles from M. Fizuli's "Divan" in Azerbaijani language. The “Divan” contains 305 gazelles. The article's primary goal is to comprehensively analyse the poetic corpus of M. Fizuli's gazelles. This study aims to investigate the main themes and motifs present in Fizuli's gazelles and their influence on Eastern poetry, assess the impact of Fizuli's gazelles on the development of Azerbaijani and world poetry, as well as their place in literary tradition. Within the framework of this article, the author aims to provide a comprehensive understanding of M. Fizuli's poetic legacy and its significance for scholarly studies and cultural

studies, as M. Fizuli is considered the founder of Azerbaijani literary language. The survey of M. Fizuli's poetic corpus is highly relevant for several reasons: firstly, it contributes to the preservation of Azerbaijan's and Eastern culture's cultural heritage and strengthens national identity; secondly, Fizuli's works have had a significant influence on contemporary literature and are of interest to linguists, cultural historians, and philologists; thirdly, translations of Fizuli's gazelles into various languages contribute to intercultural dialogue and understanding of Eastern poetry; fourthly, the philosophical and aesthetic ideas contained in his works remain relevant today, enriching our knowledge of the world; fifthly, the topic is essential for academic research and educational programs, contributing to the expansion of scientific knowledge and enrichment of the cultural experience of students and researchers. Thus, studying M. Fizuli's poetic legacy has broad significance for various science, culture, and education fields.

**Keywords**: corpus linguistics; linguistic statistics; corpus; poetic corpus; concordance; Azerbaijani language; frequency dictionary; Fuzuli text corpus; ghazal.



## ВВЕДЕНИЕ

Корпус текстов – это «большой, представленный в электронном виде, унифицированный, структурированный, размеченный, филологически компетентный массив языковых данных, предназначенный для решения конкретных лингвистических задач» [9, с.3].

Корпуса текстов бывают разного типа, однако, как отмечает Захаров, «несмотря на разнообразие корпусов, можно выделить два основных способа деления корпусов на классы: 1) это противопоставление корпусов, относящихся ко всему языку (часто к языку определенного периода), корпусам, относящимся к какому-либо подъязыку (жанр, стиль, язык определенной возрастной или социальной группы, язык писателя или ученого и т.п.); 2) разделение корпусов по типу лингвистической разметки». К примеру, по признаку «Язык текстов»: русский язык, азербайджанский язык, английский язык, турецкий язык и др., «Параллельность: одноязычные, двуязычные, многоязычные, «Общность»: общие и одного писателя; по «Разметке»: размеченные и неразмеченные, по «Литературности, специфичности»: литературные, диалектные, разговорные, терминологические, смешанные, по типу разметки: морфологические, семантические, синтаксические, просодические и др. [9, с.12-13].

Как известно, во многих языках есть корпуса языков, к примеру, Национальный корпус русского языка, Британский национальный корпус, Чешский национальный корпус и др.

Благодаря корпусу языка\текстов исследователь может работать с массивом текстов, имея возможность извлечь оттуда интересующую его лексическую единицу, то есть исследователь может проанализировать или выявить поведение данной единицы в естественной языковой среде, не теряя при этом время на сбор материала, разметку и т.д. [6, с.122].

Корпуса могут быть разные. Особый интерес представляют корпуса текстов отдельных писателей, например, корпус текстов Шекспира. Корпуса текстов отдельных писателей также очень значимы, за счет таких корпусов, к примеру, можно будет выявить особенности языка того или иного писателя [6, с. 122].

Основная задача исследования – проанализировать принцип формирования корпуса газелей Мухаммеда Физули, который впоследствии будет расширяться добавлением в эту базу и других его литературно-классических произведений. Мухаммед Физули – не только выдающийся поэт, но и философ и мыслитель, переводчик. Он также по праву считается основоположником литературного азербайджанского языка. Мухаммед Физули писал, как на персидском, так и на азербайджанском. Исходя из этой точки зрения, считаем, что создание корпуса произведений Мухаммеда Физули намного упростит различные лингвостатические исследования по изучению диахронической картины азербайджанского языка.

## МЕТОДЫ ИССЛЕДОВАНИЯ

Исследование проводилось на материале азербайджанского языка. Материалом послужили газели Мухаммеда Физули из его «Дивана» [7] на азербайджанском языке. В данное собрание произведений Мухаммеда Физули входят 305 газелей.

## РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ

Результаты корпусного и лингво-статистического исследования «Дивана» М. Физули на азербайджанском языке [7]:

— определено количество токенов (word tokens), т.е. словоупотреблений и word types (словоформ) в газелях М. Физули. Общее количество токенов: 31372; общее количество word types: 9289;

— составлен частотный словарь с прилегающим к нему конкордансом;

— определены самые частотные словоупотребления:

*Kim* – 509 употр.: *Ah kim, qanlı yaşım qılmadı izhar sana; Kim, alır başlardakı sevda cəmalından niqab; Kim, qılıb hörmət, binalər dutmuş üstündə hübab.*

*Bir* – 418 употр.: *Hiç gərəkməzmi sənə bir səvab? Eylə bir dərman ki, dərdin edə gün-gündən ziyad.*

*Ey* – 415 употр.: *Ey Füzuli, intihasız zövq buldun eşqdən; Ey gül, qəmində əşk rüxi-zərdim etdi al; Ey həkim Kim, vücudi-xəlqdən ancaq bu sevdadır qərəz.*

*Ki* – 362 употр.: *Ey mələksima ki, səndən özgə heyrandır sana; Çıx ki, təmaşayə çıxa afitab! Yar sual etsə ki, halın nədir, Xəstə Füzuli, nə verərsən cəvab?*

*Ol* – 324 употр.: *Ol şəhdən iltifat nə nisbət mana, sana; Ol sözə tutma qulaq, mən çəkdigim əfğanə tut!*

*Füzuli* – 265 употр.: *Xəstə Füzuli, nə verərsən cəvab? Bu rəng ilə Füzuli, ol səri-ku bir gülüstandır.*

*Bu* – 259 употр.: *Bu xərab olacaq məkandan keç; Bu pünhan nüktəni bir vaqifi-əsrar olandan sor, Bu nə dindir, Allah-Allah, bütə səcdə vacib olmuş.*

*Hər* – 247 употр.: *Ta hər birilə bir gəz olaydım fəda sana; Oxun hər ləhzə kim, canım dələr, könlüm qılar əfğan.*

*İlə* – 225 употр.: *Qiblə ilə ol xəmi-əbru bərabərdir mana; Ha böylə möhnət ilə keçsinmi ruzigarım?*

*Nə* – 222 употр.: *Tutar olsam, nə əcəb, mey ətəgin dürd sifət; Nə qafil padişəhdir, mülk viran olduğun bilməz; Nə müşkül dərd imiş eşqin ki, dərman eyləmək olmaz.*

В ходе лингвостатического анализа выявлены некоторые особенности языка М. Физули.

Ниже подробно рассмотрим выявленные в результате исследования особенности языка его произведений:

1. Обильное использование вспомогательных глаголов *etmək* (делать), *eyləmək* (делать) və *olmaq* (быть).

Исследователь [1, с. 126] отмечает, что «вспомогательные глаголы – это абстрактные, родовые единицы, которые лишены лексической семантики, в силу чего эти единицы мало пригодны или не пригодны для поэзии». Как видим, в результате лингвостатистического исследования выявлено, что только словоупотребление ol использовано поэтом 324 раза и является четвертым по частотности. Словоформа *olmaq* –употребляется в газелях 16 раз, *olsam* – 12, *olsun* – 13, *olmuş* – 45 и др. Словоформа *et* употребляется в газелях из «Дивана» 90 раз, etdi – 55, *etdim* – 44, *etdin* – 29, *etmək* – 17; *eylər* – 90; *eylə* – 60, *eyləmək* – 17 *eylədi* – 15, *eylədin* – 13 раз и т. д.

Также нужно отметить, что не случайно именно словоупотребление *ol,* то есть быть в форме третьего лица единственного числа располагается рядом с личным местоимением 3-го лица ед. числа – автор использует это в таких стихах, как *iştiqaq* в соответствии с их звуковым составом (то есть для рифмовки). Как отмечает автор, использование асемантических единиц в поэзии Физули важно именно в стилистико-эстетических целях частое использование вспомогательных частей речи [1, с. 127].

На самом деле, использование слов, относящихся к вспомогательным частям речи, у Физули в разы превышает нормы их употребления в общелитературном языке.

1. Частое использование местоимений в связывающей функции. Также следует отметить, что выдающийся философ и поэт изобильно употребляем местоимения, которые большей частью выполняют функцию союзов [1, с.135].

2. Употребление заимствований – арабизмов и персизмов. Арабо-персидские заимствования можно подразделить в общих чертах на две группы: «1) арабо-персидские заимствования, получившие право гражданства в словарном составе современного азербайджанского литературного языка, 2) арабо-персидские заимствования, не вошедшие в народный язык как трудно воспринимаемые, сложные слова, носящие лишь терминологический характер» [2].

Примеры арабизмов из «Дивана» Мухаммеда Физули, которые обрели право существования в современном азербайджанском литературном языке: *qurban* 'жертва', məst 'пьяный, опьяненный', *surət* 'лик, лицо, вид, образ, форма', *qəbir* 'могила', *qamət* 'стан, стройность', *aləm* 'мир, вселенная'; *cənnət* 'рай', *sifət* 'образ, лицо, лик'; *zaman* 'время', *qərib* 'чужестранец', *nadan* 'невежда, невежа, глупец', *müşkül* 'сложный, трудный', *məzar* 'могила', *israf* 'расточительство', *asan* 'лёгкий' и мн. др. Все эти слова в современном азербайджанском языке являются общеупотребительными.

Часть арабизмов из «Дивана», которая входила в активный запас слова литературного языка XVI века (и использовалась предшественниками и последователями Мухаммеда Физули – Имадеддином Насими, Шах Исмаилом Хатаи, Нематуллахом Кишвери, Говси Тебризи, Саибом Тебризи и другими [2]), однако на сегодняшний день эта лексика не понятна, т.е. вышла из употребления. К ним относятся, к примеру: *səna* 'хвала', *mil* 'колонна, столп', *qəni* 'богатый' и др.

Нужно подчеркнуть, что в начале XX века известный азербайджанский учёный А. Демирчизаде отмечал, что «великий поэт Мухаммеда Физули выбирал и пользовался такими словами арабского и персидского языка, часть которых гораздо раньше него (его употребления) обрела гражданство в азербайджанском языке, а другая часть – малая, несложная, легко усвояемая, возможно посредством его газелей, активно распространилась и усвоилась азербайджанцами» [3, с.186].

Несмотря на то, что великий философ и поэт использовал арабо-персидские заимствования, он подчинял их правилам и нормам, требованиям родного азербайджанского языка [1, с.115].

3. Употребление сложных слов. Мухаммед Физули также соединял некоторые арабизмы с глаголами азербайджанского языка, тем самым он «придавал им иной смысл и более глубокое значение» [2].

Как отмечает автор [2], «это свидетельствует о том, что гениальный знаток языков, поэт Мухаммед Физули вынужденный использовать арабизмы в своих произведениях, представляющими трудность для восприятия, употреблял их в сочетании с понятными и простыми словами родного азербайджанского языка, облегчал процесс их восприятия и понимания широкой народной массой. Не случайно, что заслуга поэта, использующего арабо-персидские заимствования в составе атрибутивных сочетаний, подчиняющихся законам азербайджанского языка в большинстве своём вошедших в группу общеупотребительных слов и обретших право гражданства, справедливо отмечена в научных трудах многих исследователей». Такого типа сложные сочетания можно разделить на два типа: а) заимствования, использованные в сочетаниях с устаревшими вспомогательными глаголами, вышедшими из употребления. В сочетаниях первой группы часто встречаются вспомогательные глаголы *qılmaq* 'делать' (словоформа *qılmaq* – 3 употр., *qılmış* – 11, *qılmışam* – 5, *qılsa* – 11 употр.), *bulmaq* 'находить' (словоформа *bulmaq* – 4, *bulmuş* – 8,*buldu* – 7) , *yetmək* 'достичь, добиться' (словоформа *yetmək* – 3 употр., *yetmiş* – 2, *yetmişəm* – 8 употр.), *urmaq* 'бить' (словоформа *urmaq* – 2 употр., urmuş – 3, *urub* – 5, *urdum* – 2 употр.) и др.: *Kim, məhü xürşiddən bulmuş təmənnasın Xəlil; Bir tifl sən tək, ta fələk Dəhr zalınqılmış ətfali-rəyahin dayəsi; Rəngi-ruyindən dəm urmuş sağəri-səhbayə bax! önçə lə'linlə lətafətdən dəm urmuş, bilməzəm.* б) заимствованные слова, использованные в сочетаниях с общеупотребительными в современном азербайджанском языке, вспомогательными глаголами: *Əgərçi su bürudət kəsbini eylər həva görgəc, Könül mir'atını eylər mükəddər əql təklifi; Zərrə-zərrə ayə, san gün nuri eylər intiqal* и мн. др.

Следует также отметить, что глагол ***qılmaq*** (делать), хоть и является устаревшим [4, с. 49], однако он сохранился в сочетаниях с некоторыми отвлеченными существительными: *səcdə qılmaq* преклоняться перед кем -, чем; *çarə qılmaq* – найти выход, решение какого-л. вопроса; *namaz qılmaq* (религ.) – совершать, совершить намаз (молитву), *dərdinə dərman*

*qılmaq* – найти исцеляющее средство для кого-либо., помочь преодолеть трудности.

При выборе заимствований для своих произведений Мухаммед Физули всегда отдавал предпочтение словам, получившим право гражданства в родном азербайджанском языке. Говоря о языке и стиле художественного творчества Мухаммеда Физули, автор [8, с. 41] отмечал их особую простоту, яркость, ясность, гармонию по форме и составу, несмотря на то что поэт соблюдал все формальные требования к языку своей эпохи.

## ВЫВОДЫ

Таким образом, в результате корпусного и лингвостатистического исследования «Дивана» Мухаммеда Физули на азербайджанском языке добавлены в базу данных 305 газелей автора. Составлен частотный словарь и конкорданс, выявлены особенности языка великого мастера, определены количественные соотношения токенов и словоформ.



## СПИСОК ИСПОЛЬЗОВАННЫХ ИСТОЧНИКОВ / REFERENCES

1. Adilov, M. (2020). *Mahammad Fuzulinin uslubu va poetik dili* [The style and poetic language of Mohammad Fuzuli]. Baku: Elm va tehsil (in Azerbaijani).
2. Alieva, S. (2009). Arabo-persidskie zaimstvovaniya v azerbaidzhano-tyurkskom "divane" Mukhammeda Fizuli [Arabic-Persian borrowings in the Azerbaijani-Turkic "divan" of Muhammad Fizuli]. *Zhurnal nauchnykh publikatsii aspirantov i doktorantov* (in Russian).
3. Damirchizade, A. (1979). *Istoriya azerbaidzhanskogo literaturnogo yazyka* [History of the Azerbaijani literary language] (Vol. 1). Baku: Maarif (in Russian).
4. Dzhavadov, M. (1977). *Shah Ismaiyl khatajinin leksikasy* [Lexicon of Shah Ismail Khatayi]. Baku: Elm (in Azerbaijani).
5. Hadzhiyev, T. (1994). *Fuzuli: dil sənətkarlığı* [Fuzuli: language arts]. Baku: Gandzhlik (in Azerbaijani).
6. Khalilova, G. (2023). "Khamse" Nizami Gyandzhevi kak ob"ekt korpusnogo i lingvostatisticheskogo issledovaniya ["Khamsa" by Nizami Ganjavi as an object of corpus and linguistic-statistical research]. *Rossiiskaya nauka v sovremennom mire* (in Russian).
7. Mahammad, F. (2005). Asarlari [Works] (Vol. 1). Baku: Sharg-Garb (in Azerbaijani).
8. Pashayeva, M. (2018). *Fuzuli sənətkarlyg'y* [Arts of Fuzuli]. Baku: Chashyoglu (in Azerbaijani).
9. Zakharov, V. (2005). *Korpusnaja lingvistika* [Corpus linguistics]. Saint-Petersburg: n. d. (in Russian).

# An Analytical Study on the Reformation of the Nigerian Education System

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**Abstract.** The apparent deterioration in the standard of the educational system in Nigeria has become a significant source of concern to government officials at the local and state level and private citizens despite different reforms over the years that have been put in place to proffer possible solutions to this challenges and ensure that the products of our educational system are more self-reliant, sustainable and also able to make a necessary contribution to the advancement of the country. Some of the most notable reforms are the UPE and UBE schemes centred on enhancing the literacy level among citizens, yet the same challenges that hampered the success of UPE persist in the UBE scheme. Challenges across our educational sector include a lack of accurate statistical data, funding, infrastructure, inconsistent policies, and curriculum implementation. Considering the significance of education in developing a thriving nation, we should urgently prioritize a complete overhaul of the education system.

**Keywords:** Reform; Education; Policies; Curriculum.

## INTRODUCTION

Education is central to the development and sustenance of any nation, which is one of the reasons that propels Governments of Nations to reform existing policies to meet the changes in human knowledge, technology, globalization, and the need to adapt to a changing world. Education reform implies the changes made to improve the educational system by teaching new ideas, methods, and strategies [1].

The reform aims to identify the challenges with old policies and seek ways to enhance efficiency by proffering solutions to the identified issues.

Many developed countries have put in measures to ensure the thriving of their educational system; however, developing nations have struggled with developing and implementing a robust policy that provides quality education. Several challenges have plagued Nigeria's educational system, as it is one of the developing nations. As such, reforming and restructuring the educational system is vital for the country to meet the standards of other developed nations.

The United Nations Education Scientific and Cultural Organization (UNESCO) 2022 released statistics reflecting the number of out-of-school children in Nigeria. The statistics show that 1 in 5 out of school children in the world is a Nigerian, and an estimated 20 million children have been out of school in the country to authors [2]. The alarming nature of these statistics has ensured that the country's educational policies have encouraged children's enrolment in school, commencing with the NPE scheme in the western and eastern regions before independence and continuing down to the Universal Essential Act in 2004. However, the government's focus on education, which is the right of every child's access to school, has widened the gap in the quality of education in public schools.

Poor funding of Nigerian educational institutions has led to a heavy impact on the quality of public schools. Other shortcomings include dilapidated infrastructure, poorly trained teachers, the need to update curricula to adapt to global changes, and a shortage of teaching materials. The challenges of financing and mismanaging of funds have been a massive problem that has inhibited the growth of the country's educational sector. UNESCO recommends allocating 26% of a nation's budget to the academic sector. Yet, it is pretty surprising that Nigeria, a country that wishes to improve its educational system through policies, has yet to allocate more than 13% of its budget towards educational improvement since its inception to authors [3].

Therefore, this paper makes an analytical study of the reformation of the Nigerian education system since the country's inception to evaluate the flaws that have hampered the success of each of these reforms, which would serve as a way forward toward the actualization of a quality educational system that could be comparable with other developing and developed countries of the world.

## RESULTS AND DISCUSSION

### Nigerian Education Reforms

Reforms in the educational system are vital to ensure the thriving of any nation in the current technological revolution, economy, and continuous changes across the globe through the development of graduates who are well adapted to contribute their quota towards their country's development. Nigeria had diverse education reforms before and after independence from the British colonial system. This paper studies some of the most prominent reforms between 1952 and 2004.

*Universal Primary Education (UPE) of the Old Western Region and Eastern Nigeria*. Chief S.O. Awokoye, the then Western Minister of Education, proposed the comprehensive free Universal Primary Education Programme in July 1952, centred on enhancing literacy among citizens of the old Western region [4]. The author [5] noted that the proposal had included massive training of teachers, construction of new classroom blocks, and further expansion of teachers' training facilities. Authorities fully implemented the reform in January 1955, enrolling 811,000 primary school children. Implementing the program directly impacted the budget, doubling the education budget from 2.2 million pounds to 5.4 million pounds, as authorities procured teaching aids such as books and chalk and erected several new school buildings. [6].

Similarly, the Universal Primary Education Programme was also proposed in the Eastern region in 1953, a year after a similar feat in the Western region. Authorities initiated the proposal in February 1957, leading to an exponential increase in primary school enrollment from 775,000 to 1,209,167 to authors [4,7,8]. The challenge that followed the initiation of the policy was the challenge of poorly trained teachers due to insufficient time for training and inadequate classrooms, which led to the leasing of unfit buildings and temporary shelters to accommodate the increased student population.

The scheme's failure in both the Western and Eastern regions of Nigeria was a factor in the poor planning and financing of the scheme. The author [8] recorded that financing the NPE scheme in the western region was due to the increased taxation of the people, which led to much resistance. Aside from the challenge of finance, the program was hurriedly executed without accurate budgeting, resulting in the lack of classrooms to accommodate the increased student population. More so, the poor and hasty implementation in the Eastern region also led to the laying off of teachers and the subsequent closing of some of these schools [4]. The author [6] highlighted the challenge of opposition from Mission schools, which was a challenge to the scheme's success, bearing in mind that free primary education had impacted mission school student enrolment [6].

*Education policies between 1960 and 1976 Universal Primary Education (UPE).* After independence, Nigerian educational policies centred on using education to develop human resources for economic development. However, critics levelled several criticisms against the academic policies. The criticisms include obsolete teaching methods, irrelevant curricula, high drop-out rates, and graduates being poor on initiative and over-dependent [9]. Several complaints on the educational policies led to the 1969 National Curriculum Conference, which reviewed the educational system and identified goals for Nigeria's future. The conference was Nigeria's first attempt to abandon its colonial orientation in favour of a more self-reliant one [9]. More notably, this period was characterized by the government's takeover of Mission schools, and due to the oil boom of 1976, the government took on the ambitious move of initiating Universal Primary Education schemes across the nation to improve literacy.

Universal Primary Education schemes were already in operation in some regions (Western and Eastern regions); however, under the military head of state, Lt. General Olusegun Obasanjo, the Federal Government launched a centralized Universal Primary Education scheme on September 6, 1976. The scheme commenced with an enrolment record of 8.2 million primary school children across the country, with an annual grant of N 40 paid by the Federal Government for each pupil in the scheme [4]. The author [4] noted that

the Federal Government projected 60,000 teachers across the country for training for the scheme, but they trained a total number of 48,780 teachers; the figure was short by 11,200 to meet the gap in teachers, so they employed retired but healthy teachers on a contract basis. Moreover, authorities allocated special grants for textbooks and other teaching aids.

Even though the scheme was already in operation in some regions, Nigeria had not learned from the previous implementation process of UPE schemes in both the old Western and Eastern regions. The same issues of 1955 UPE in western Nigeria also hampered the success of UPE in 1976, bearing in mind the immense benefits of the program in lifting the country's literacy level. The program failed to achieve its goals due to improper preparation, insufficient data, and inadequate funding for the scheme. Significant challenges such as inadequate classrooms, teaching materials, and hiring unqualified teachers hindered the scheme's success. Authorities employed some of these teachers after a crash program in teacher training colleges hurriedly set up by the government. [9]. The author [10] noted that Nigeria had budgeted 500 million naira to initiate the UPE project. Still, within a year of its execution, the government had already spent over 1 billion nairas on Primary Education. Such funding indicates an underestimation of the cost of project implementation and inaccurate statistics.

The takeover of the mission schools, which placed the provision of education as the sole duty of government, also resulted in a unified educational system of 7-5-2-3 educational policy, which implies "7 years of primary education, five years of secondary school, two years Higher School Certificate Levels, and three years of university education. This change replaces the 8-5-2-3 education policy: eight years of primary education, five years of secondary school, two years of tertiary certificate level education, and three years of university education." [9, p.189].

*The National Policy on Education since 1977*. The National Policy on Education of 1977 documented the country's aim for self-sufficiency and reliance through education. Then, the government centralized the education funding, deviating from the colonial education funding model, which relied on cost-sharing between parents, local communities, and the government. Consequently, the government assumed sole responsibility for controlling education in the country [9]. The move by the government was an ambitious step, considering the financial burden required to shoulder the education of her citizens. The author [11] noted that this policy introduced the 6-3-3-4 education, modelled from the American education system. The system comprises six years of primary school, three years of junior secondary school, three years of senior secondary school, and four years of tertiary education. The government introduced the education system to achieve its goal of self-reliance in a technologically advanced world. Before this period, primary education was free, yet not compulsory; therefore, the policy proposed to make UPE mandatory for all children. [9].

The author [12] noted that Prof. Babatunde Fafunwa introduced the 6-3-3-4 system to ensure the country's graduates are self-assured. Additionally, the system aimed to separate technically gifted children from academically talented ones, enabling them to thrive and have equal opportunities upon leaving school. Authorities designed the junior secondary school curriculum to be more technical and vocational-oriented. Conversely, administrators expect to admit students who excel in junior secondary school into a senior secondary school more oriented toward academics than vocational education. However, the same challenge that had affected the previous implementation process in Nigeria's educational system had caught up with the education policies in 1977 and even its revision in 1981. In an interview with Sunday Triumph in 1984, the then Commissioner of Education explained the reality of the hasty implementation of the 6-3-3-4 system, which commenced in 1982. He noted that:

"The civilian regime implemented the Junior Secondary Schools in 1982, but due to numerous constraints, they hastily implemented the program for the Junior schools. Authorities converted some primary schools to junior secondary schools because the new systems' facilities were inadequate. In such a situation, many things go missing: no science laboratories, workshops, etc. Junior secondary schools are supposed to deal mainly with technical education, but this isn't easy. We expect about 37,000 children to graduate from junior secondary schools in September (1984). So, knowing fully well that the majority of these are ill-equipped, academically and in technical fields, we are making the necessary preparations to have at least one vocational centre, a reasonably comprehensive one, in each lo-

cal government area so that we can enrol a large percentage of the products of the junior secondary schools in some of the centres. We hope this will equip them better for the labour market and other higher institutions. Nevertheless, we will take a large percentage of the 37,000 into the Senior Secondary Schools" [13, p.4].

The UPE program ended in 1981 with the revision of the Education policy, which occurred because the Federal government could not shoulder the responsibility of providing free education for both primary and junior secondary school levels. Consequently, the state and local governments were responsible for funding primary education. This change greatly impacted primary school enrolment as the number of pupils dropped [14]. The author [15] noted that the federal government's reversal of UPE resulted from the dip in oil revenue in the 1980s, which affected the country's revenue-generating capacity [15]. Insufficient funding from the government led to the degradation of education facilities, constant non-payment of salaries to teachers, and a declining literacy level in the country due to the reintroduction of school fees. [16].

*Universal Basic Education (UBE)*. The government launched the Universal basic education program in 1999 following the revision of the National Education Policy in 1998. The launching of UBE was under the administration of Chief Olusegun Obasanjo. The program advocates for free and compulsory primary education for every child, which represents the first nine years of a child's education, i.e., six years of primary education and three years of junior secondary education, with the aim of programs similar to that of UPE which is to reduce the level of illiteracy and to provide equal education opportunity for all. The UBE Act 2004 established the Universal Basic Education Commission (UBEC), which aimed to Implement the UBE program. At the same time, the Act also led to the establishment of the State UBE Board (SUBEB) for state implementation of the UBE program and Local government Agencies (LGEA) at the local government level [17].

The initiation of the UBE program gave birth to the 9-3-4 education, which slightly modified the 6-3-3-4 education system. The UBE program also became a casualty of policy executed hastily without putting in place the human and material resources needed to guarantee the scheme's success. During the administration of Goodluck Jonathan, the government reverted the country's education system to a 6-3-3-4 system with just a minor alteration to include one year of Early Childhood Education (ECE); thus, the education system became a 1-6-3-3-4 system. Such changes indicate the sporadic nature of changes and modifications to the education system in the country. The table below summarizes the breakdown of Nigeria's education system

Table 1 – Nigerian Education System [20]

| Year | System of Education | Early childhood/Pre-primary education (years) | Primary education (years) | Junior secondary education (years) | Senior secondary education (years) | Higher School Certificate (years) | Tertiary Education (years) |
|---|---|---|---|---|---|---|---|
| Before independence – 1982 | 7-5-2-3 | Nil | 7 | 5 | | 2 | 3 |
| 1982 | 6-3-3-4 | Nil | 6 | 3 | 3 | Nil | 4 |
| 1999 | 9-3-4 | Nil | 9 | | 3 | Nil | 4 |
| 2012 | 1-6-3-3-4 | 1 | 6 | 3 | 3 | Nil | 4 |

## Challenges of Nigerian Education Reform

Nigeria has navigated through four major education system reforms since her independence 62 years ago, which reflects the inconsistency in the implementation of the country's education policies while bearing in mind that the differences in each of the policies and systems have sometimes been relatively minor. The former president of Nigeria, in October 2010, in a stakeholders meeting in the education sector, noted that "the 6-3-3-4 system of education has failed and that its proponents should apologize to Nigerians" [18, p.31]. Such a regime reflects the inconsistent im-

plementation of reforms that stakeholders expect to lead to positive education system development. However, when the authorities do not properly implement these changes, the problems these reforms should address remain. Thus, we summarize the challenges associated with the implementation of reforms in Nigeria below:

*Lack of accurate data or statistics in planning education reforms:* One of the significant challenges across Nigerian education reform planning is the issue of inaccurate or incomplete data, which has significantly led to the failure of Nigeria's past educational reforms. The author [19] also shared similar reservations when he noted that the unproductivity of educational planning or reforms is due to unreliable national census or data. The country's lack of credible statistical data could have led to the hasty planning and implementation of reforms. The author [20] noted that "Educational policies are usually not conceived in a rush; it is often a long-term process which involves planning, talks, debates, deliberations, and sensitization" (p.164). Before implementing reforms, stakeholders should ensure the availability of accurate data, such as an updated school-age children database, available school buildings, and qualified teachers. These processes would not be credible without such data.

*Funding of Reforms:* Funding remains a crucial factor in the success and failure of reforms. Nigeria's education budget indicates the value given to this sector. The author [21] noted that Nigeria's highest spending on education was 13 % in 2008, far below other countries, and the benchmark for UNESCO is 26 % of the budget. The end product of the limited budgetary spending on education leads to resource constraints and limited investment in Educational infrastructure and programs.

*Lack of Infrastructure:* Poor infrastructural development has been a significant limitation to the success of educational reforms in Nigeria. The author [22] "noted that to ensure that curriculum must be effectively implemented, infrastructural facilities, equipment, tools, and materials must be provided sufficiently" [4, p.124]; hence, prior educational reforms have been massively affected by inadequate and poor infrastructure, most notably is the challenge of lack of classrooms that ensured the Implementation of NPE and UBE program were not a smooth ride. Implementing the 6-3-3-4 education system was massively affected due to unavailable workshops, laboratories, and libraries. The government should invest in constructing and renovating school buildings, classrooms, libraries, and laboratories and having internet and electricity connections in schools.

*Inconsistent Policies and Curriculum Implementation:* Teachers are central to the successful implementation of reforms as they shoulder the responsibility of curriculum implementation, representing the practical execution of policies. An essential prerequisite in reforms should not be limited to the clarity, need, quality, and complexity of material used but the ability to develop personnel that understands the necessity for a change in strategy, thus ensuring meeting the objective of such reforms [13]. However, the inconsistent generation of reforms in Nigeria has placed teachers in a situation where they do not fully grasp the curriculum implications or features of those reforms. The author [20] noted "More often than not, these teachers are not part of the planning and development of these policies; they only implement anything given them, their incompetence notwithstanding". Therefore, a well-designed implementation strategy should bear in mind the contribution and role of teachers in its success.

*Poor Monitoring and Evaluation:* Evaluation is critical in obtaining information on the standards of reform implementation, identifying its weaknesses and challenges, and determining the program's effectiveness in meeting its objective. Universal Basic Education Commission (UBEC), State UBE Board (SUBEB), and Local government Agencies (LGEA) are saddled with the responsibility of monitoring the Implementation of the UBE Act [17]. Therefore, more effort is required to monitor and evaluate these programs to ensure their success.

*Outdated Curriculum:* One of the fundamental issues with the Nigerian education system is the obsolete curriculum, which fails to align with the demands of a globalized, knowledge-based economy. Incorporating modern subjects like artificial intelligence, robotics, coding, and entrepreneurship into the curriculum is imperative to foster innovation and critical thinking skills. Reforming the curriculum to include these subjects will equip students with the skills needed to adapt to the ever-evolving workplace.

*Infrastructural Deficiencies:* Insufficient infrastructure is a significant challenge many Nigerian schools face. Lack of proper classrooms, up-to-

date learning resources, and inadequate access to technology hinder the delivery of quality education. A thorough reform should prioritize equitable distribution of resources, investing in school infrastructure upgrades, and ensuring reliable access to technology and internet connectivity for urban and rural areas.

### Reforming Nigeria Education

*Enhancing Curriculum Relevance*: The current Nigerian curriculum often fails to prepare students for the modern world's demands adequately. A reformative approach should emphasize integrating practical skills, critical thinking, and problem-solving abilities. Updating the curriculum to include technological literacy, financial literacy, and vocational training will equip students with the skills needed to thrive in a globally competitive job market.

*Quality and Capacity of Teachers:* The quality and capacity of teachers significantly impact the education system's effectiveness. There is a pressing need to enhance teacher training and professional development programs, promoting continuous learning and upskilling of educators. Providing teachers access to advanced teaching methodologies, instructional technologies, and mentorship programs will empower them to create dynamic and engaging student learning experiences.

*Improving Teaching Standards and Capacities:* Teacher quality is paramount to any education system's success. Nigeria must prioritize comprehensive training and professional development programs for teachers to enhance their teaching methodologies and subject knowledge. Promoting ongoing learning opportunities and performance evaluations will help raise the country's overall standard of teaching. Additionally, attracting and retaining talented and motivated individuals to the teaching profession through competitive salaries and improved working conditions is crucial.

*Standardized Assessment and Evaluation:* A robust and objective assessment and evaluation system is crucial for monitoring progress and identifying areas for improvement in the education system. Implementing standardized assessment methods, such as national examinations, can better understand student performance and enable comparisons across schools and regions. Additionally, incorporating practical and project-based evaluations would encourage critical thinking and problem-solving skills over rote memorization.

*Addressing the Gender Gap:* Achieving gender equality in education is essential for the nation's development. Reformation efforts should eliminate gender disparities in access to education, literacy rates, and academic achievements. Authorities should implement policies and initiatives to ensure girls receive equal educational opportunities and are encouraged to pursue fields traditionally dominated by men, such as science, technology, engineering, and mathematics (STEM).

*Enhancing Digital Literacy:* The Nigerian education system must prioritize digital literacy skills in an increasingly digital world. Access to technology and internet connectivity must be improved nationwide, enabling students to develop essential digital skills. Integrating technology into classroom activities, providing teacher training in digital tools, and incorporating online resources into the curriculum will equip students with the skills necessary to participate in the digital economy.

*Collaboration with the Private Sector and NGOs:* The Government should foster partnerships with private sector organizations and non-governmental organizations (NGOs) to supplement the efforts to reform the Nigerian education system. These partnerships can bring expertise, funding, and innovative ideas to support educational initiatives, infrastructure development, teacher training, and digital literacy programs.

## CONCLUSIONS

Before independence, Nigeria's education reforms focused on reducing illiteracy by encouraging schooling. Authorities implemented the NPE and UBE to provide free and compulsory education for Nigerians. Yet, Nigeria still ranks among the highest in the number of out-of-school children, implying that the challenge confronting the educational sector does not lie in the development of reforms but in the successful implementation of policies.

The country still battles the same challenge in its education sector as before obtaining independence, which is baffling considering the several reforms/policies put in place to address these issues. It is a clear indication that authorities did not implement certain factors to ensure the suc-

cess of these reforms. The author [23] noted that authorities should urgently consider the complete overhaul of the education system and not restrict it to the educational sector but extend it to the nation. Considering the significance of education towards the development of a thriving country, authorities should consider the following recommendation as a way forward in the educational sector:

Before implementing policies, authorities should conduct adequate planning, considering they often implement most education reforms quickly. Consequently, under-budgeting, lack of updated statistical records, and poor infrastructural development persist through the significant educational reforms in Nigeria. Teachers should be part of decision-making in educational reforms and curricula planning, considering that the onus of practical implementation of policies/systems also rests on their shoulders.

Authorities should conduct more sensitization programs to enable teachers and parents to understand educational policy changes and the significance of such changes. The government should increase its educational budget to at least match the 26% benchmark recommended by UNESCO. Government authorities should create platforms to enable partnerships between the government and private sectors to fund public schools.

The government should ensure investment in education facilities such as ICT, internet connection, modern laboratories, workshops, instructional materials, and other infrastructures to keep up with the continuous trend in education and further close the gap between the Educational system in Nigeria and other developed nations of the world.

Authorities should increase teachers' salaries and other remunerations to ensure the teaching profession attracts the best brains. In addition, the government should invest in teacher training institutions to ensure the development of quality teachers.

Authorities should continuously audit UBEC, SUBEB, and LGEA educational expenditures to ensure transparency, accountability, and effective resource management,

The Nigerian education system needs comprehensive reform to meet its students' current and future challenges. By addressing issues relating to the curriculum, teacher quality, infrastructure, assessment methods, and partnerships with the private sector and NGOs, a reformed education system can better equip students with the necessary skills and knowledge to thrive in a rapidly changing world. Implementing these strategic reforms will be crucial to building a solid educational foundation for Nigeria's socioeconomic development.

Thus, comprehensive reforms are imperative to overcome the Nigerian education system's challenges. By addressing issues of access, curriculum relevance, teaching standards, gender disparities, and digital literacy, Nigeria can develop an education system that nurtures well-rounded individuals with the skills and knowledge needed to thrive in a globalized world. A reformed education system enhances individual opportunities and contributes to the nation's socioeconomic development. Therefore, policymakers, stakeholders, and the entire society must come together and work towards realizing this vision of educational Reform in Nigeria.

## REFERENCES

1. Kpolovie, P. J. (2012). *Education Reforms without Evaluation Designs: Nigeria at Risk*. Owerri: Springfield Publishers Ltd.

2. Raliyat, H., Umma, A., & Aisha, A. (2022). *AS OUT-OF-SCHOOL CHILDREN, SCOURGE WORSENS… Nigeria Risks Losing Out On Literate, Skilled Workforce*. Retrieved from https://leadership.ng/as-out-of-school-children-scourge-worsens-nigeria-risks-losing-out-on-literate-skilled-workforce/

3. Birabil, S. T., & Ogeh, O. W. M. (2020). Education in Nigeria: Challenges and a way forward. *International Journal of Academic Research and Reflection, 8*(1), 42–48.

4. Amopho, G. R. (2020). Educational Administration And Assessment Reforms In Nigeria: Challenges And Prospect. *International Journal of Institutional Leadership, Policy and Management*, *2*(1), 117–134.

5. Fafunwa, A. B. (1982). *History of Nigerian Higher Education*. N. d.: Macmillian Nigeria Publishers.

6. Ogbonnaya, N. I. (2003). *Principle and Application of Educational Policies in Nigeria.* Nsukka: University Trust Publishers.

7. Adesina, S.; Akinyenu, K., & Ajayi, K. (Eds.), (1983). Trends in the development of primary Education in Nigeria: *Trends and Issues. University of Ife Press.*

8. Adesina, S. (1977). *Planning and educational development in Nigeria*. N. d.: Educational Industries.

9. Imam, H. (2012). Educational Policy in Nigeria from the Colonial Era to the Post-Independence period. *Italian Journal of Sociology of Education,* 181–204.

10. Taiwo, C. O. (1980). *The Nigerian Education System: Past, Present, and Future* N. d.: Lagos: Thomas Nelson (Nig) Ltd.

11 Nwagwu, I. O. (2007). Higher Education for Self-Reliance: An Imperative for the Nigerian Economy. In J.B. Babalola, G.O. Akpa, A.O. Ayeni, & S.O. Adedeji (Eds.), Access, Equity and Equality in Higher Education (pp.1–8). Nigeria: Nigerian Association for Educational Administration and Planning.

12. Ejemezu, C. I. (2015). Towards a pragmatic system of education: a comparative Study of Nigeria 6-3-3-4 and Chinese 9-3-4 system. *International Journal of Education and Research, 3*(5), 79–88.

13 Adamu, A. U. (2000). *Educational reforms in Nigeria*. Retrieved from http://www.kanoononline.com/publications/educational-reform_in_nigeria.htm

14. Osili, U. O. I., & Long, B. T. (2007). Does female schooling reduce fertility? Evidence from Nigeria. *Journal of Development Economics 87*(1), 57–75.

15. Nwagwu, C. C. (1997). The Environment of Crises in the Nigerian Education System. *Comparative Education, 33*(1), 87-95.

16. Odukoya, D., Bowale, E., & Okunlola, S. (2009). Formulation and implementation of educational policies in Nigeria. *African Educational Research Journal, 6*(1), 1–4.

17. Duro, A., & Ayodele, O.O. (2009). New Direction in the Nigerian Educational System. *Contemporary Issues In Education Research, 2*(2), 33–43.

18. Ejemezu, C. I. (2015). Towards a pragmatic system of education: a comparative study of Nigeria 6-3-3-4 and Chinese 9-3-4 system. *International Journal of Education and Research, 3*(5), 79–88.

19. Ajayi, K. (1985). Motivation and productivity. *Ilorin Journal of Education, 5*.

20 Asaaju, O. A. (2011). Appraising the quality of teachers in providing functional education needed for workforce development. *African Journal of Social Research and Development, 3*(2), 162–168.

21. Olawale, O. (2010, April 8). Challenges currently facing the education sector in Nigeria. *The Frontier Post*. Retrieved from http://www.valuefronteira.com/index/post-format

22. Ivowi, U. M. O. (2004). Curriculum Implementation: Implication for School Administration. In A. O. K. Noah, D. O. Shonibare, A. A. Ojo, & T. Olujuwon (Eds.), *Curriculum Implementation and Professionalizing Teaching in Nigeria* (pp. 53-98). Lagos: Untral Educational Services.

23. Olayemi Aderokun Asaaju. (2015). The Inconsistency of Nigeria's Education System and Its Implication for Curriculum Implementation. *Journal of US-China Public Administration, 12*(3). doi: https://doi.org/10.17265/1548-6591/2015.03.001

# An Analysis of Critical Thinking Skills Students of Batik 1 Senior High School Surakarta in the 2022/2023 Academic Year

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**Abstract.** Critical thinking is a pivotal skill that underpins academic success and readiness for contemporary life and work complexities. This research examines the students' critical thinking abilities at Batik 1 Senior High School in Surakarta for the 2022/2023 academic year. A representative sample of 100 students was randomly selected across all grades to participate in this study. They were evaluated using a critical thinking assessment, which measured their proficiency in argument identification and evaluation, problem-solving, and decision-making. Contrary to proficiency expectations, the findings indicate that the student's overall critical thinking skills trend towards the lower end of the spectrum. At the same time, they demonstrate an essential capacity to engage with arguments and make reasoned decisions; their problem-solving abilities need to be more inventive approaches. These results point to an opportunity for Batik 1 Senior High School Surakarta to bolster its critical thinking curriculum. The school could benefit from integrating enhanced learning strategies that promote innovative problem-solving and reasoning to elevate students' critical thinking capabilities to meet the demands of an increasingly digital and complex world.

**Keywords:** education; critical thinking; high school.

## INTRODUCTION

Critical thinking is an essential skill for navigating the complexities of the 21st century [1, 2]. The author aptly states, that in today's rapidly changing world, the ability to think critically is more important than ever. Critical thinking skills are essential for success in various fields, from business and science to education. In education, fostering critical thinking skills enables students to become independent learners, problem solvers, and effective communicators. It empowers them to move beyond rote memorization and develop the ability to analyze information, evaluate arguments, and make informed decisions. As the author asserts, critical thinking is a process that helps us to distinguish the good, the bad, and the ugly, and allows us to make the best of what we have to work with.

However, a comprehensive understanding of the current state of critical thinking skills among SMA 1 Batik Surakarta students is crucial to tailoring and refining these approaches and ensuring their effectiveness. This need aligns with the growing emphasis on measuring and improving critical thinking skills in educational settings, as highlighted by research [5], which identifies critical thinking as a key competency for future-ready graduates.

Furthermore, previous studies within Indonesia have shed light on the importance and potential challenges of developing critical thinking skills among high school students. Research [6] conducted in several Indonesian high schools revealed that while students demonstrated some basic essential thinking abilities, they often needed help with higher-order skills such as problem-solving and evaluation. Similarly, a study [7, 8] identified a need for more student engagement in critical thinking activities due to traditional teaching methods and limited resource access.

These findings underscore the need for a focused investigation into the specific strengths and

weaknesses of critical thinking skills among Batik 1 Senior High School Surakarta students. By drawing on established research and the school's unique context, this study can provide valuable insights and inform targeted interventions to elevate the critical thinking development of its students.

## METHODOLOGY

This study is a quantitative research using a descriptive approach. The descriptive approach objectively depicts the condition or a particular phenomenon. This research method was chosen to describe the critical thinking ability of high school students at Batik 1 Senior High School Surakarta for the 2022/2023 academic year. This study's population comprises all Batik 1 Senior High School Surakarta students, totalling 870 individuals. The sample for this research is 100 randomly selected students. The sample selection was conducted using a simple random technique. The research instrument employed in this study is a critical thinking test. This critical thinking test consists of 30 items measuring students' critical thinking ability: 1) Identification and evaluation of arguments, 2) Problem-solving, and 3) Decision making. The researcher developed this critical thinking test, referencing existing critical thinking theories. The test has been validated for its reliability and validity. The data for this study were collected using a test method. The critical thinking test was administered directly to the research sample. The data from the critical thinking test were analyzed descriptively and quantitatively. Data analysis was performed using descriptive statistics, such as mean, median, and standard deviation.

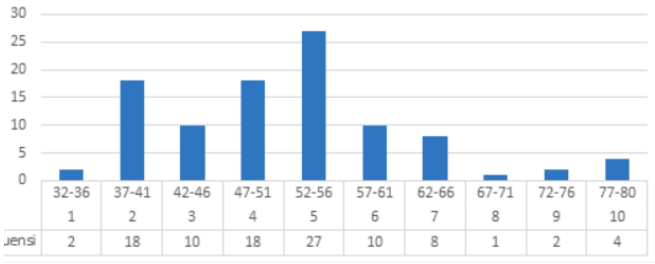
Table 1 – Score Range [9]

| Score Range | Category |
|---|---|
| X>M+ 1,50 s | Very High |
| M+ 0,50 s <X≤ M+ 1,50 s | High |
| M-0,50 s<X≤ M+ 0,50 s | Medium |
| M–1,50 s <X≤ M–0,50 s | Low |
| X≤ M-1,50 s | Very Low |

Notes: M – Ideal Average Score; s – Standard deviation; X – Total Score obtained by students; Score = (Score Obtained / Max Score) *100.

## RESULTS AND DISCUSSION

This research aims to analyze the level of critical thinking skills of students at Batik 1 Senior High School Surakarta regarding alcohol. Research data were obtained from the results of a critical thinking skills test using essay questions. After obtaining the test results, the data were analyzed and categorized into levels of critical thinking skills. The acquisition of data on the frequency of students' critical thinking skills can be seen in the following diagram.




Figure

Based on the histogram, it can be observed that the frequency of students' critical thinking abilities varies across different score ranges. For instance, in the lower score range, only 1 student falls within the 67-71 interval, while the 72-76 interval contains 2 students, and the 77-80 interval includes 4 students. The remaining score intervals reflect significantly lower frequencies of critical thinking scores among the students.

Table 2 – Aspects of Critical Thinking Skills

| Aspects of Critical Thinking Skills | Average Score | Median |
|---|---|---|
| Identification and Evaluation of Arguments | 55 | 54 |
| Problem-Solving | 58 | 57 |
| Decision Making | 50 | 49 |

The data from the table shows that students' critical thinking skills, assessed on three key aspects, display a tendency towards the lower end of the performance spectrum. Specifically, the average Score for Identification and Evaluation of Arguments is 55, with a median close to 54, suggesting that while some students may perform moderately well, a significant portion score below this average. Problem Solving skills have an average score of 58 and a median of 57, indicating a slight improvement in

this area but still room for growth. The most concerning aspect is the decision-making aspect, where the average Score dips to 50 and the median to 49, revealing a need for considerable enhancement in this critical area of thinking skills. These figures highlight areas where educational strategies could be focused to bolster students' critical thinking capacities. Overall, the table provides a concise statistical summary of students' competencies in critical thinking across different dimensions.

The results indicate that students possess some basic critical thinking abilities, yet there is a clear need for improvement, especially in decision-making. These findings could imply that current teaching strategies may need to sufficiently prioritize and effectively develop critical thinking skills, necessitating a shift towards more interactive and problem-centred learning approaches. Including tasks that encourage critical analysis, such as debates or case studies, could be beneficial. The proximity of the median scores to the averages also suggests that targeted support for students who score below the median could have a meaningful impact on raising the overall level of critical thinking among students. By addressing these educational gaps, we can aspire to enhance academic performance and prepare students to tackle real-life challenges with analytical and reflective thinking skills, which are invaluable in today's fast-paced and complex world.

Table 3 – Categorization of Critical Thinking Skills of Students at Batik 1 High School Surakarta

| Level Critical Thinking Skills | % |
|---|---|
| Very High | 0 |
| High | 4 |
| Medium | 21 |
| Low | 62 |
| Very low | 9 |

Table 3, Categorization of Critical Thinking Skills of Batik 1 Senior High School Surakarta Students" provides a classification of students' critical thinking skills levels. It shows that none of the students fall into the 'Very High' category of critical thinking skills. A small percentage, 4%, demonstrate 'High' critical thinking skills. A more significant segment, 21%, displays 'Moderate' critical thinking skills, which could be considered average. Most of the students, 62%, have 'Low' critical thinking skills. Finally, 9% of the students are in the 'Very Low' category. This categorization suggests that the critical thinking skills of most students are below the moderate level, with a significant portion showing low abilities in this area. According to [10], one of the causes is that teaching too focused on memorizing facts without understanding the basic concepts can hinder the development of critical thinking skills. Meanwhile, authors [11] suggest that another cause of students' low critical thinking is the need for more opportunities to engage in practical experiments, making it difficult for students to understand abstract concepts in chemistry, affecting their critical thinking abilities. On the other hand, authors [12] explain that an unsupportive learning environment, such as overly large classes or a lack of learning resources, can affect students' critical thinking ability.

Critical thinking is a trainable skill encompassing indicators such as analysis, evaluation, and inference [13]. However, according to [14], students' critical thinking skills can be enhanced through problem-based learning and the development of evaluation skills and self-regulation. Furthermore, authors [15] suggest strategies for improving students' critical thinking in chemistry education, which can involve using the Discovery Learning teaching model. Another strategy is the development of Discovery-based learning modules/teaching materials in chemistry, which is believed to be able to enhance students' critical thinking skills in chemistry [16].

## CONCLUSIONS

Based on the results of this study, the critical thinking ability of students at Batik 1 Senior High School Surakarta City is in the low category, necessitating efforts to maximize their critical thinking capabilities. Therefore, several recommendations to enhance the critical thinking skills of students at Batik 1 Senior High School Surakarta include:

1) Increasing the intensity of learning activities oriented towards developing critical thinking, such as problem-based, project-based, and inquiry-based learning.

2) Developing curricula and learning materials more focused on critical thinking development.

3) Providing training and mentoring for teachers to improve their skills in developing students' critical thinking abilities. These recommendations are expected to enhance students' critical thinking skills at Batik 1 Senior High School Surakarta so that they may graduate ready to face the challenges of the digital era.

## REFERENCES


1. Pohl, B. E., & Beaudry, C. (2015). Critical Literacy in the Social Studies Classroom: A Case for the 21st Century. *Journal of Family Strengths, 15*(2). doi: 10.58464/2168-670x.1285

2. Scott, L. C. (2015). *The futures of learning 2: What kind of learning for the 21st century?* Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000242996

3. Ennis, R. H. (2016). Critical Thinking Across the Curriculum: A Vision. *Topoi, 37*(1), 165–184. doi: 10.1007/s11245-016-9401-4

4. Facione, P. A. (2011). *Critical thinking: What it is and why it counts*. Retrieved from https://www.researchgate.net/publication/251303244_Critical_Thinking_What_It_Is_and_Why_It_Counts

5. Özaydin, Z., & Arslan, Ç. (2022). Assessment of Mathematical Reasoning Competence in Accordance with PISA 2021 Mathematics Framework. *Kuramsal Eğitimbilim, 15*(3), 453–474. doi: 10.30831/akukeg.1027601

6. Riskiyah, S., Jannah, U. R., & Aini, S. D. (2018). Analisis Kemampuan Berpikir Kritis Siswa SMA Berkemampuan Matematika Tinggi dalam Menyelesaikan Masalah Fungsi [Analysis of Critical Thinking Ability of High School Students with High Mathematics Ability in Solving Function Problems]. *Jurnal Tadris Matematika, 1*(2). doi: 10.21274/jtm.2018.1.2.111-122 (in Indonesian).

7. Gharib, M., Zolfaghari, M., Mojtahedzadeh, R., Mohammadi, A., & Gharib, A. (2016). Promotion of critical thinking in e-learning: a qualitative study on the experiences of instructors and students. *Advances in Medical Education and Practice, 271*. doi: 10.2147/amep.s105226

8. Maryani, Y., Prasetyorini, P., & Permana, I. (2021). Critical Thinking Skills of Junior High School Students in Science Learning. *Scientiae Educatia, 10*(1), 20. doi: 10.24235/sc.educatia.v10i1.8034

9. Azwar, S. (2010). *Metode Penelitian* [Research Methods]. Yogyakarta: Pustaka Pelajar (in Indonesian).

10. Snyder, L. G., & Snyder, M. J. (2008). *Teaching critical thinking and problem solving skills*. Retrieved from https://dme.childrenshospital.org/wp-content/uploads/2019/02/Optional-_Teaching-Critical-Thinking-and-Problem-Solving-Skills.pdf

11. Donnelly, D., O'Reilly, J., & McGarr, O. (2013). Enhancing the Student Experiment Experience: Visible Scientific Inquiry through a Virtual Chemistry Laboratory. *Research in Science Education, 43*, 1571–1592.

12. Danczak, S. M., Thompson, C. D., & Overton, T. L. (2017). 'What does the term Critical Thinking mean to you?' A qualitative analysis of chemistry undergraduate, teaching staff and employers' views of critical thinking. *Chemistry Education Research and Practice, 18*(3), 420–434. doi: 10.1039/c6rp00249h

13. Burhanuddin, Azizah, U., & Ibrahim, M. (2019). Improving critical thinking skill of preservice chemistry teacher through writing assignment. *Journal of Physics: Conference Series, 1307*(1), 012018. doi: 10.1088/1742-6596/1307/1/012018

14. Villalobos Delgado, V., Ávila Palet, J. E., & Olivares, S. L. (2016). Problem-based Learning in Chemistry and Critical Thinking in Secondary School. *Revista Mexicana de Investigación Educativa, 21*(69), 557–581.

15. Suardana, I. N., Redhana, I. W., & Yunithasari, N. P. M. (2020). Students' critical thinking skills comparison in discovery learning based on constructing concept mapping and mind mapping. *Journal of Physics: Conference Series, 1521*(4), 042089. doi: 10.1088/1742-6596/1521/4/042089

16. Ellizar, E., Putri, S. D., Azhar, M., & Hardeli, H. (2019). Developing a discovery learning module on chemical equilibrium to improve critical thinking skills of senior high school students. *Journal of Physics: Conference Series, 1185*, 012145. doi: 10.1088/1742-6596/1185/1/012145

# Analysis of Athlete Rights Fulfillment in the KONI Aceh Development Training Center, Indonesia

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**Abstract.** The Minister of Youth and Sports Regulation No 24 of 2017 regulates the fulfilment of athletes' rights concerning criteria and standards for developing talented prospective athletes and providing income and facilities to outstanding athletes and coaches. Therefore, it has become the obligation of institutions such as KONI Aceh, responsible for athlete development, to fulfil all rights Aceh Pelatda athletes possess. The purpose of this study is to determine the implementation and execution of athletes' rights and the obstacles faced by Aceh regional training athletes in obtaining their rights by applicable regulations. This study uses a qualitative approach with descriptive analysis, employing research instruments such as interviews, observations, and documentary studies. The subjects in this study are 12 individuals, including representatives of the KONI Vice Chairman/Chairman of Pelatda Aceh, KONI Secretary, and two athletes from each of the five different branches, totalling ten individuals. The results show that aspects such as honorariums, accommodation, meals, additional food, travel expenses, and health check-up services have been well implemented in implementing athletes' rights fulfilment by KONI Aceh. However, some areas need improvement, such as drafting employment agreements between athletes and KONI Aceh, improving consumption management, and enhancing health services, especially in psychology. The obstacles athletes face, especially regarding legal uncertainty, are caused by the absence of written agreements between athletes and KONI Aceh. Athletes' perceptions of the fulfilment of rights provided by KONI Aceh tend to be positive, with athletes feeling satisfied with the rights provided. However, there is room for improvement in certain aspects. KONI Aceh is recommended to establish written agreements, revise athlete meal menus, and provide psychological services in addition to Pelatda athlete health services.

**Keywords:** Analysis; Rights Fulfillment; Athletes; KONI Aceh.

## INTRODUCTION

The importance of fulfilling athletes' rights is a top priority that must be met, as it directly relates to enhancing several aspects athletes possess. Athletes' rights must be fulfilled because athletes are integral to the sports world and society. Athletes contribute to achieving high sporting achievements, which can be a source of pride for the country and the regions they represent. Additionally, athletes also play a role in shaping strong and healthy characters and personalities, thereby having the potential to become role models for younger generations.

The importance of fulfilling rights for athletes is not only focused on athletes at the national or centralized training level (national training centres). Still, it must also be balanced with the fulfilment of rights for athletes in regional areas. This, of course, aims to increase the motivation of regional athletes to enhance their skills and competencies so that, eventually, these athletes can improve the quality of the sport from the regional to the national and even international levels.

However, in many regions, fulfilling athletes' rights remains a problem that has not been

adequately addressed. Some common issues include the insufficient fulfilment of athletes' rights, ranging from providing athlete consumption, such as nutritional needs and additional food, to health support for the athletes. These issues occur in several regions across Indonesia, specifically within this context, and are experienced by athletes in the Aceh Province region.

The Aceh National Sports Committee (KONI Aceh) is a sports institution responsible for nurturing and managing athlete training in the Aceh Province. Therefore, KONI Aceh performs all these tasks to fulfil athletes' rights, from providing honorariums to health support. This is outlined in Article 17 §1 of the Minister of Youth and Sports Regulation No 24 of 2017, which concerns the criteria and standards for developing talented prospective athletes and providing income and facilities to outstanding athletes and coaches.

Article 17 § 1 regulates the provision of income and facilities to athletes. According to this article, the provision includes several elements, namely a monthly honorarium with an amount based on the standard input costs set by the Ministry of Finance. The provided facilities include accommodation and meals, athlete supplementary food (supplements), expenses for trial and centralized training travel (tryouts and training camps) domestically and abroad, and health examination services. With these provisions, efforts to support athletes cover financial aspects through honorariums and comprehensively involve other facilities that support physical conditions, training, and athlete welfare, including travel needs and health examinations.

Furthermore, athletes in the Aceh Province, especially those under the auspices of KONI Aceh, are divided into two categories: centralized and decentralized athletes. Centralized athletes are those who are prepared to face multi-event competitions through centralized training in their respective areas, ensuring that the training management process, monitoring, and evaluation can be well-controlled, also known as Regional Training Center Athletes (Pelatda). On the other hand, decentralized athletes are those prepared to participate in multi-event sports and can be trained in their respective regions according to their domicile.

In terms of fulfilling athletes' rights, especially in the context of Pelatda athletes, it is crucial to pay attention to the role of Pelatda athletes, considering their direct representation of the region in a national-scale event such as the National Sports Week (PON). Therefore, the adequacy or inadequacy of the rights provided by KONI to Aceh's Pelatda athletes will influence the athletes' performance both during training sessions and when participating in sporting events.

## METHOD

The research approach employed is qualitative research. The author [1] explains that qualitative research produces findings or discoveries that cannot be achieved through statistical procedures or other quantitative approaches. Generally, qualitative research can be applied to studies of community life, history, behaviour, organizational functions, social activities, and other topics.

The research location is where the researcher conducts the study, primarily to capture the phenomena or actual research occurring from the objects being studied to obtain accurate research data. The determination of the research location is intentional. The research location was at KONI Aceh in November 2023.

To obtain research data, the data collection techniques used by the author include structured interviews, which are conducted in advance to prepare the items to be questioned and direct observation in the field.

According to [2], there are four stages to be conducted during data analysis, including:

1) *Data Collection Stage*: Ideally, data collection should be done when the research is still in the concept or draft stage;

2) *Reduction Stage*: The process of merging and standardizing all forms of analyzed scripts;

3) *Display Stage*: Processing semi-finished data that has been standardized in written form and has a clear thematic flow into a categorization matrix according to the themes that have been grouped and categorized;

4) Conclusion Drawing Stage or Verification Stage.

## RESULTS AND DISCUSSION

The results of this research were obtained through interviews and observations. After the data collection stage of the study, data processing was carried out from these raw data. This step

ensured that the research data obtained a comprehensive overview and drew conclusions. Based on the data from interviews and observations in the field regarding the fulfilment of Pelatda athletes' rights by KONI Aceh, the discussion is divided into five fundamental rights fulfilment that KONI Aceh must meet for Pelatda athletes in Aceh, namely Honorarium Fulfillment Rights, accommodation and consumption, additional food, travel expenses, and health services.

The results of the interviews and field observations depict a situation where KONI Aceh fulfilled its obligations by meeting the fundamental rights of athletes, especially Pelatda athletes from Aceh, starting from fulfilling the honorarium rights by paying athletes monthly pocket money. KONI Aceh has fulfilled the requirements for accommodation and consumption, additional meals, travel expenses, and health services. However, there are some notes regarding the fulfilment of rights carried out by KONI Aceh, ranging from the absence of employment contracts with athletes, management, and composition of food provided to athletes, inconsistent fulfilment of supplements, to health services that only cover athletes' physical health but not their psychological well-being.

Fulfillment of Pelatda Athletes' Honorarium Rights. Due to the absence of specific rules and inaccessible employment agreements for the researcher, the assumption should be that Pelatda athletes from KONI Aceh, essentially centralized athletes, should be paid according to the provincial minimum wage regulations. However, the Secretary-General of the International Association of Sports Law (IASL), Olga Shevchenko, stated at a congress in Bali that athletes need their labour laws to protect professions involved in the sports system. Special regulations are necessary because of fundamental differences between athletes and ordinary workers. These differences can be seen in command and dependence in the relationship between athletes and coaches or clubs. Olga argues that the lack of specific labour relations regulation in the sports sector leaves athletes in a not fully protected position. For example, when an athlete moves to a club in another country, it can lead to significant disparities in contract terms.

Thus, from this situation, it can be explained that legal certainty regarding athletes as a form of employment is essential to protect athletes from arbitrary actions. There is a need for regulations governing how-to-work mechanisms and for the minimum wages for athletes to be set. This ensures that the rights and obligations between the parties nurturing the athletes and the athletes themselves are clear and transparent, as explained by [3]. In case of contract/agreement breach, the aggrieved party can demand its fulfilment by enforcing the contract without any other compensation. This indicates the importance of precise regulation and employment agreements between both parties, especially in this discussion between KONI Aceh and Pelatda athletes from Aceh.

Based on the documented results, a document indicates regulations governing the maximum wage/stipend provided to athletes, namely in Appendix I of Aceh Governor Regulation No 65 of 2020 Regarding the Government of Aceh's Unit Price Standards for the 2021 Fiscal Year. This appendix explains that Pre-PON/PORWIL Centralized Athletes are given a stipend of Rp. 3,500,000, and for PON/PORWIL Athletes, the stipend is Rp. 2,000,000.

According to Appendix I of Aceh Governor Regulation No 65 of 2020, the wages provided to athletes are the government of Aceh's unit price standards for the 2021 fiscal year, which serve as the upper limit. This means that wages can be given below the stipulated stipend amount. Athletes will be disadvantaged in particular circumstances without equivalent regional regulations and written contracts. A recent example occurred in November 2023 when KONI Aceh disbanded Pelatda athletes due to a lack of budget. This situation highlights the vulnerability of athletes who cannot do anything in such circumstances.

The term "allowance" should have been replaced with the term "wage" or "salary." This is to avoid a situation where athlete rights in the form of wage provision become an obligation rather than a customary practice. The term "allowance" is inappropriate because it does not equate to wages or salary since each has different meanings.

Considering the duration of Pelatda athletes' participation in the training centre, typically 2 to 3 years, this period is deemed suitable for drafting a written agreement (contract) to protect athletes from actions that may directly or indirectly harm them. The absence of provincial-level regulations regarding the minimum wage for athletes further weakens the athletes' position, and this needs to be addressed to ensure the athletes' welfare in the event of unforeseen circumstances.

*Accommodation and Consumption for Pelatda Athletes.* Based on interview results, KONI Aceh can say that the fulfilment of accommodation and consumption expenses for Pelatda athletes has been met well. Starting from providing accommodation expenses, KONI Aceh has specifically allocated funds to accommodate Aceh athletes. However, no regulations explain the proper standards for accommodation fulfilment when referring to existing rules. The importance of regulations governing the minimum and maximum budgeting for accommodation expenses during Pelatda athletes' activities are necessary to avoid over-budgeting and under-budgeting.

Over-budgeting means the expenditure allocated for a particular planning item is excessively high and inefficient. This must be considered to distinguish between supportive facilities and essential ones. Thus, errors in prioritizing fund allocation can be avoided. On the other hand, in terms of low budgeting, the expenditure allocated for accommodation is inadequate and insufficient for sports activities, which can lead to discomfort for athletes during rest and potentially disrupt the athletes' performance.

The inadequacy of accommodation provided to athletes will affect their sleep quality, as the authors [4] explained. On the night before a competition, athletes typically sleep below the recommended target of eight hours of sleep for healthy adults, with nearly 70 % of athletes experiencing worse sleep than usual. It was found that anxiety, noise, the need to use the bathroom, and early event times were some of the most common causes of disturbed sleep for athletes on the night before a competition. Athletes experiencing disturbed sleep the night before a competition wake up on the morning of the match feeling more tense, tired, and less energetic, a mood state associated with decreased performance.

The next point from the interviews is fulfilling consumption rights provided to Pelatda athletes. The research findings indicate that KONI Aceh has fulfilled the consumption aspect. The same result was also shown in the observations; the composition of consumption provided to athletes consists of 50 % protein, 20 % fibre, 5 % fat, and 25 % carbohydrates.

The fulfilment of nutritional sources through the provision of consumption by KONI Aceh has indeed been met well by the average normal individual. However, what needs to be noted is the menu provided to Pelatda athletes, which has the same menu and portion size for every sports discipline. This should be avoided when managing athletes' diets, considering that each sports discipline has different nutritional needs. Complete and balanced nutrition should provide sufficient energy, carbohydrates, and protein to ensure optimal nutrition that supports training performance.

*Supplements.* The dietary supplements provided by KONI Aceh include high-protein milk/whey protein, supplements to increase muscle mass, and multivitamins given to the athletes. Dietary supplementation is aimed at complementing the nutrients obtained from food sources, so the issue of nutritional supplements is not too problematic as long as the nutrition from the food received is sufficient to meet the athletes' needs during sporting activities. Authors [5] state that a comprehensive nutritional assessment should be a prerequisite before athletes and their support teams decide on supplements (including vitamins). Supplementation can be justified if it provides an advantage that cannot be obtained with other strategies.

In line with the above opinion, the National Institutes of Health [6] explains that some dietary supplements have sufficient scientific evidence indicating that they can enhance specific exercise and athletic performance. Athletes may use these supplements if they are interested, provided they have already adopted a good diet, are appropriately trained, and received guidance from healthcare providers or sports medicine experts. In most cases, only adults should use performance supplements. For example, the American Academy of Pediatrics states that performance supplements do not enhance the abilities of adolescent athletes beyond what can be achieved through proper nutrition and training.

According to authors [7], although many athletes pay great attention to dietary supplements to enhance performance, it is essential to acknowledge that supplements are only minor in determining overall athlete performance. Additionally, there is a risk that supplement use may expose athletes to banned substances or precursor substances that can be harmful. The importance of cost-benefit analysis in discussions about supplement use is emphasized, especially considering the risks involved. When working with elite athletes, it is explained that a high-performance culture is critical,

and every slight improvement has value. However, suppose ethical guidelines regarding supplement use and doping are not well integrated into that culture or not communicated. In that case, there is a possibility that athletes may make high-risk decisions to enhance their performance.

Based on the explanation above, it is known that a dietary supplement is only an addition, as its name suggests. Little scientific evidence shows that a supplement can enhance an athlete's performance. However, suppose the supplement can significantly improve an athlete's performance. In that case, direct clinical research is needed to determine the supplement's content, whether it contains doping and the health impact of consuming certain supplements.

*Travel Expenses*. Regarding official travel, KONI Aceh has shown its dedication to athlete development by providing total funding to athletes under Pelatda Aceh. This decision reflects a deep concern for athlete well-being and a commitment to creating an optimal training environment. This total funding covers all aspects of travel, relieving athletes from any financial burdens that may hinder their focus and performance during centralized training.

With the total funding provided by KONI Aceh, Pelatda Aceh athletes can entirely focus on their training and skill improvement. Athletes no longer need to worry about accommodation costs, transportation, or other needs related to official travel. This decision reflects the organization's responsibility towards the athletes and provides a positive boost to enhance the quality of training and achievement of performance.

The provision of total funding can also positively impact the motivation and mentality of athletes. With a sense of financial support, they can concentrate more on enhancing their skills without distractions or worries about financial aspects. This not only contributes to the individual development of athletes but can also improve the overall competitiveness of the team.

Through this action, KONI Aceh acts as a facilitator and an active partner in creating a supportive environment for athletes. Providing total funding is one tangible form of investment in sports development at the regional level, creating positive prospects for achieving outstanding results in regional, national, and international competitions.

*Health services*. Healthcare services are indeed crucial in managing athletes under development. Athletes in sports development programs often experience high physical and mental pressure. Therefore, a good and well-planned healthcare system is a critical factor in ensuring athlete well-being and enhancing athlete performance. Based on interview results and direct field observations, it is evident that KONI Aceh has provided adequate healthcare services to Pelatda athletes in Aceh. In this regard, KONI offers comprehensive facilities for athletes, including sports medicine facilities, expert personnel such as doctors and therapists, ambulance services, and even employment insurance for Pelatda athletes for an entire year.

When discussing the fulfilment of healthcare rights for Pelatda athletes in Aceh, it is essential to consider the provision of services and the quantity and quality of healthcare provided to them. In terms of quantity, healthcare personnel are limited to a general practitioner and one neurology specialist, while therapists and psychology experts are not found in KONI Aceh. Regarding quality, insurance is only provided through employment insurance, while health insurance is limited to level 3 (free). Consequently, if athletes experience illness or severe health issues, they are only referred to public hospitals, and there is no accountability in fulfilling the healthcare rights of Pelatda athletes in terms of healthcare provision. As stated by [8], athletes have specific rights concerning their healthcare in elite sports events. These rights include confidentiality of health information, informed consent, second medical opinions, evidence-based medical treatment, and safe and ethical medical practices.

The absence of psychological energy must also be considered, given, as explained by authors [9], the importance of collaboration among athletes, coaches, and medical teams is emphasized, and decisions made should encompass considerations of health, psychological well-being, and athlete preferences. There is a warning against clinicians who overlook these elements, suggesting that they merely practise 'safe medicine' and may struggle to adapt to elite sports environments. Conversely, coaches and athletes are urged not to completely disregard health consequences while focusing on performance, as decisions made in high-pressure situations can have long-term impacts on athlete well-being.

## CONCLUSIONS

The implementation towards fulfilling athletes' rights has been well executed by KONI Aceh, starting from honorarium, accommodation and meals, additional food, and travel expenses to health examination services. However, several areas have room for improvement, such as establishing employment agreements between athletes and KONI Aceh, improving consumption management, and providing additional psychological health services.

The constraints experienced by athletes are caused by the absence of a written agreement between the Athletes and KONI Aceh, leading to legal uncertainty where the Athletes' position will be disadvantaged if, at any time, the KONI Aceh party fails to fulfil the rights of the Athletes.

The athletes' perception of the rights provided by KONI Aceh is predominantly positive, meaning that athletes feel satisfied with the rights provided by KONI Aceh.

For the local government, it is essential to establish specific regulations governing the rights and obligations of Aceh athletes and the institutions that support them. This includes setting minimum standards for compensation to be paid to athletes. This aims to provide protection and legal certainty to athletes in case of misconduct or neglect leading to unfulfilled rights.

For KONI Aceh, engaging in collaborations through written agreements or contracts is advisable. Furthermore, there should be continuous revision and improvement of the menu for athletes during training camps, avoiding standardization with menus from other sporting fields.

## REFERENCES

1. Sumiati, A. (2016). *Metode Pembelajaran* [Learning Methods]. Bandung: Wacana Prima (in Indonesian).

2. Herdiansyah, H. (2012*). Metodologi Penelitian Kualitatif* [Qualitative Research Methodology]. Jakarta: Salemba Humanika (in Indonesian).

3. Amalia, N. (2013). *Hukum Perikatan* [Law of Engagement]. Aceh: Unimal Press (in Indonesian).

4. Lastella, M., Lovell, G. P., & Sargent, C. (2014). Athletes' precompetitive sleep behavior and its relationship with subsequent precompetitive mood and performance. *European Journal of Sport Science, 14*(1), 123–130.

5. Mancevska, S., Gligoroska, J. P., Todorovska, L., & Velickovska, L. A. (2020). Vitamin Supplementation In Athletes: Where Do We Stand In The Moment? *Research in Physical Education, Sport & Health, 9*(1).

6. National Institutes of Health. (2017). *Dietary Supplements for Exercise and Athletic Performance*. Retrieved from https://ods.od.nih.gov/factsheets/ExerciseAndAthleticPerformance-HealthProfessional/

7. Garthe, I., & Maughan, R. J. (2018). Athletes and Supplements: Prevalence and Perspectives. *International Journal of Sport Nutrition and Exercise Metabolism, 28*(2), 126–138. doi: 10.1123/ijsnem.2017-0429

8. Association of Summer Olympic International Federations. (2020). *Health Care Guidelines For International Federation Events / Association Of Summer Olympic International Federations*. Retrieved from https://library.olympics.com/Default/doc/SYRACUSE/354139/health-care-guidelines-for-international-federation-events-association-of-summer-olympic-internation?_lg=en-GB

9. Dijkstra, H. P., Pollock, N., Chakraverty, R., & Alonso, J. M. (2014). Managing the health of the elite athlete: a new integrated performance health management and coaching model. *British Journal of Sports Medicine, 48*(7), 523–531. doi: 10.1136/bjsports-2013-093222

# Analysis of Work Discipline on Performance Employee at Youth Sports Service and Lhokseumawe City Tourism

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**Abstract.** This study aims to evaluate the impact of work discipline on employee performance in the Youth, Sports, and Tourism Department of Lhokseumawe City. The research focuses on all employees working in this department. The sampling method used the Slovin method, determining a sample size of 49 individuals. A questionnaire is utilised for data collection, and data analysis is carried out through a quantitative descriptive approach, particularly the Spearman rank correlation test and hypothesis testing. From the research analysis results regarding the impact of work discipline on employee performance in the Youth, Sports, and Tourism Department of Lhokseumawe City, it is evident that the significance value from the Spearman rank correlation analysis is 0.002 < 0.05.

Furthermore, the T-test results show a significance value of 0.000 < 0.05. Overall, it can be concluded that there is a significant influence between the work discipline variable (X) and the employee performance variable (Y). This highlights the crucial role of work discipline in influencing employee performance in the environment of the Youth, Sports, and Tourism Department of Lhokseumawe City. The findings provide a basis for developing more effective management strategies to enhance work discipline and employee performance.

Additionally, it is essential to note that these findings can serve as a foundation for developing more effective management strategies to improve work discipline and employee performance. This indicates that effective measures to enhance work discipline can significantly improve employee performance. Organisations can improve efficiency and enhance employee productivity by emphasising strong work discipline. Therefore, this research recommends implementing strategies to improve work discipline in the Youth, Sports, and Tourism Department of Lhokseumawe City. These efforts are expected to have a positive impact on employee performance and enhance the achievement of organisational goals.

**Keywords:** Discipline; Work; Employee Performance.

## INTRODUCTION

The level of global competition is increasing day by day. In the current conditions, every institution is driven to sustain its existence. To survive in a high-stakes competitive environment, an institution requires high-quality human resources with outstanding performance. This is because human resources are a decisive factor in the success of an institution. Considering the significant role and position of human resources as the workforce in the business activities of an institution, high work discipline is necessary. Organisations must have high-quality and high-performing human resources to maintain competitiveness in today's challenging environment. Human resources play a vital role in determining the success of an institution. It is imperative to uphold high work discipline, recognising the immense significance of

human resources as the workforce in an institution's business activities.

Discipline is an individual's behaviour that aligns with the rules and work procedures established by the organisation, both in written and unwritten forms. Good employee discipline will accelerate the goals of an institution, while an undisciplined workforce hampers the achievement of an institution's objectives.

Work discipline is one of the crucial factors in achieving high work productivity. Every institution has management equipped with clear rules and work regulations to be followed by all employees, from the lower to the upper levels. As an employee, every action and behaviour must comply with the rules set by the organisation.

Discipline is a crucial element for the growth of an organisation, mainly utilised to motivate employees to discipline themselves in carrying out their work, individually and as a group. According to [1], discipline is a management activity that implements organisational standards.

According to [2], performance results from a specific planned work process involving the workforce and the relevant organisation at the right time. In addition, discipline is an educational tool for the workforce to adhere to existing regulations, procedures, and policies, thereby generating good performance.

Effective and efficient coaching is essential for the DISPORA institution in Lhokseumawe, which focuses on youth and sports, particularly addressing sports-related issues. This relates to the coaching, organisation, and coordination in performance improvement and sports science and technology. However, delays are still encountered by the DISPORA in Lhokseumawe when coaching athletes in the city. This also has an impact on the quality of an athlete.

Based on the phenomenon occurring at DISPORA Kota Lhokseumawe, it appears that one of the factors leading to a decline in service quality is the complex human resources issue within DISPORA Kota Lhokseumawe. Specifically, the problem lies in the lack of discipline among employees. Many employees frequently fail to adhere to working hours, entering the office after 08:00 AM and leaving before 05:00 PM. Furthermore, some employees do not comply with the rules and regulations of the institution, resulting in a decline in employee performance.

Therefore, with the decreasing performance of employees, DISPORA must enforce discipline among its staff. This involves adhering to all rules and regulations that serve as guidelines for all employees within the organisation.

The regulations related to discipline include rules regarding arrival and departure times, break times, fundamental rules for performing tasks and interacting with other units, and restrictions on what employees are allowed and not allowed to do during working hours. These regulations prompt the author to delve further into this topic by choosing the title for this research: "Analysis of the Influence of Work Discipline on the Performance of Employees in the Department of Youth and Sports of Lhokseumawe City."

## METHOD

This research falls under the category of Mixed Method. Merita states, "mixed method is a research approach that combines qualitative and quantitative approaches with a specific design to address the research objectives."

This research was conducted at the Department of Youth, Sports, and Tourism (DISPORA) in Lhokseumawe. The time frame for the research is estimated to be around February 2023 to March 2023.

The population of this study consists of a portion of the overall male and female employees at the DISPORA in the city of Lhokseumawe. The sample represents a subset of the characteristics possessed by that population, as cited in [3]. The sampling method employed is the solving method, with a sample size of 49 individuals, as detailed below:

n= N / 1+N (e)2,

where N – Sample Size; N – Population Size; E – It is the percentage of error tolerated in the selection of cases using e = 10% (0,1).

N= 95 / (1+95) (10%)2 ); N = 95 / (1+95. (0.01); N=95 / 1.95; N=48.71. Rounded to 49.

The data collection technique involves using a questionnaire and distributing a survey to the respondents. The research instrument contains a statement grid to benchmark the research findings.

Table 1 – Questionnaire Grid

| No | Variable | Operational Definition | Indicator |
|---|---|---|---|
| 1 | Work discipline | An instrument used by managers to communicate with employees so that they are willing to change their behaviour and as an effort to increase awareness and willingness of individuals to comply with all company rules and prevailing social norms [4] | 1. Attendance 2. Compliance with Rules 3. Completing tasks well |
| 2 | Employee performance | The work results in quality and quantity achieved by an employee's skills in carrying out their tasks by the responsibilities assigned to them [5] | 1. Having Ideas and Skills 2. Building Good Working Relationships. 3. Following Work Instructions. |

Data Collection Technique using the quantitative descriptive analysis method is as follows:

1. *Spearman Rank Correlation Analysis*. Spearman Rank Correlation tests the influence between variable X and variable Y. The Spearman Rank Correlation test is used when the data obtained is generally in the form of categories or rankings. The Spearman Rank Correlation or rho-spearman coefficient is used when two variables are tested for their relationship, and they have ordinal scales and scores that can be ranked accordingly. The strength of the relationship or influence is called the Spearman rank correlation coefficient. The formula is as follows:

$$r' = \frac{6\,(\sum d^2)}{n\,(n^2-1)}, \quad (2)$$

where n – Lots of Data; d – Rating Difference; r' – Spearman correlation coefficient [6].

2. *Validity Test*. According to [7], a valid instrument is an instrument that can be used to measure what should be measured. The following is the formula for instrument validation using the product moment correlation formula with deviation or standard deviation.

3. *Reliability Test*. The author [7] states that a reliable instrument will yield consistent data when used multiple times to measure the same object. The formula for reliability is determined using the Alpha formula.

4. *Hypothesis Testing*. This testing is intended to determine whether there is an influence between work discipline (X) and performance (Y). It can be calculated using statistical testing, namely the t-test.

## RESULTS AND DISCUSSION

This study elaborates on the relationship between the Work Discipline (X) variables and Employee Performance (Y) at the Department of Youth, Sports, and Tourism of Lhokseumawe City. The results of this research are as follows:

1. *Reliability Test*. The reliability test results for X (Work Discipline) in Table 2 indicate that variable X has an Alpha coefficient above 0.60, precisely 0.811. Thus, it can be concluded that all the measuring items of variable X (Work Discipline) from the questionnaire are reliable

Table 2 – Reliability Test for X (Work Discipline)

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| .811 | 25 |

The reliability test results for Y (Employee Performance) in Table 3 indicate that variable Y has an Alpha coefficient above 0.60, precisely 0.738. Thus, it can be concluded that all the measuring items of variable Y (Performance) from the questionnaire are reliable.

Table 3 – Reliability Test for Y (Employee Performance)

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| .738 | 25 |

*Validity Testing*. Table 4 shows the validity test results regarding work discipline towards employee performance with 25 question items. After

conducting the validity test, three question items were not valid for the work discipline variable. This is because they have values greater than 0.05, while other question items are considered valid as they have Cronbach's alpha values less than 0.05.

Table 4 –Validity Test of Work Discipline Variable

| Work Discipline (X) | | | |
|---|---|---|---|
| Item Number | r Caunt | r table | Status |
| Item 1 | 0,345 | 0,281 | Valid |
| Item 2 | 0,478 | 0,281 | Valid |
| Item 3 | 0,471 | 0,281 | Valid |
| Item 4 | 0,313 | 0,281 | Valid |
| Item 5 | 0,380 | 0,281 | Valid |
| Item 6 | 0,660 | 0,281 | Valid |
| Item 7 | 0,628 | 0,281 | Valid |
| Item 8 | 0,637 | 0,281 | Valid |
| Item 9 | 0,586 | 0,281 | Valid |
| Item 10 | 0,481 | 0,281 | Valid |
| Item 11 | 0,436 | 0,281 | Valid |
| Item 12 | 0,372 | 0,281 | Valid |
| Item 13 | 0,643 | 0,281 | Valid |
| Item 14 | 0,428 | 0,281 | Valid |
| Item 15 | 0,413 | 0,281 | Valid |
| Item 17 | 0,373 | 0,281 | Valid |
| Item 18 | 0,529 | 0,281 | Valid |
| Item 19 | 0,428 | 0,281 | Valid |
| Item 20 | 0,553 | 0,281 | Valid |
| Item 22 | 0,294 | 0,281 | Valid |
| Item 24 | 0,383 | 0,281 | Valid |
| Item 25 | 0,359 | 0,281 | Valid |

Table 5 presents the results of the validity test regarding employee performance with 25 question items, and it appears that 6 statement items are not valid in the employee performance variable after conducting the validity test. This is because they have values greater than 0.05, while for other question items they are considered valid as they have Cronbach's alpha values less than 0.05.

Table 5 – Validity Test of Employee Performance Variable

| Employee Performance (Y) | | | |
|---|---|---|---|
| No Item | r caunt | r table | Status |
| Item 1 | 0,567 | 0,281 | Valid |
| Item 2 | 0,369 | 0,281 | Valid |
| Item 4 | 0,335 | 0,281 | Valid |
| Item 5 | 0,493 | 0,281 | Valid |
| Item 6 | 0,409 | 0,281 | Valid |
| Item 7 | 0,284 | 0,281 | Valid |
| Item 8 | 0,348 | 0,281 | Valid |
| Item 10 | 0,392 | 0,281 | Valid |
| Item 11 | 0,401 | 0,281 | Valid |
| Item 12 | 0,379 | 0,281 | Valid |
| Item 13 | 0,507 | 0,281 | Valid |
| Item 14 | 0,312 | 0,281 | Valid |
| Item 15 | 0,499 | 0,281 | Valid |
| Item 16 | 0,543 | 0,281 | Valid |
| Item 18 | 0,493 | 0,281 | Valid |
| Item 19 | 0,593 | 0,281 | Valid |
| Item 22 | 0,418 | 0,281 | Valid |
| Item 23 | 0,579 | 0,281 | Valid |
| Item 25 | 0,372 | 0,281 | Valid |

*Partial Test (T-Test)*. Based on the output results from SPSS 21, the significance value from the coefficients table is 0.000, less than 0.05. Therefore, it can be concluded that the work discipline variable significantly influences the employee performance variable. With a t-value of 3.672, more significant than the t-table value of 2.012, it can be further concluded that variable X significantly affects variable Y.

Table 6 – Partial Test (t-Test)

| | Unstandardised Coefficients | | Standardised Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Constant | 66.087 | 10.697 | | 6.178 | .000 |
| Total | .397 | .108 | .472 | 3.672 | .001 |

*The Spearman Rank Correlation Test* is used to determine the Spearman rank correlation between two factors or, in this case, more appropriately referred to as variables. This study will indicate the rank of the work discipline and employee performance variables. The following are the results of the Spearman Rank Correlation Test calculations using Excel.

$$r_s = \frac{\frac{1}{n}\sum(R_X - \bar{R}_X)(R_Y - \bar{R}_Y)}{\sqrt{\frac{1}{n}\sum(R_X - \bar{R}_X)^2}\sqrt{\frac{1}{n}\sum(R_Y - \bar{R}_Y)^2}} = 0{,}431$$

$$\frac{1}{n}\sum(R_X - \bar{R}_X)(R_Y - \bar{R}_Y) = 85.89$$

$$\sqrt{\frac{1}{n}\sum(R_X - \bar{R}_X)^2} \sqrt{\frac{1}{n}\sum(R_Y - \bar{R}_Y)^2} = 199.49$$

$$t = \frac{r_s\sqrt{n-2}}{\sqrt{1-r_{s^2}}} = 3.2704$$

From the manual calculation using Excel, the result of the Spearman rank correlation is 0.431. In addition to the manual calculation, the calculation using SPSS 21 is also provided, with rxy = 0.431, p = 0.002, where p < 0.05. Therefore, it can be concluded that there is a positive and significant relationship between variables X and Y at a significance level of 5%, with a moderately strong correlation.

From the above results, it can be interpreted that the higher the work discipline of employees, which includes punctual attendance, working at scheduled times, providing notice if unable to work, maintaining a professional appearance, not misusing inventory for personal purposes, completing tasks responsibly without procrastination, and ensuring cleanliness and neatness in work results, it will enhance employee performance. This is particularly evident in the Department of Youth, Sports, and Tourism of Lhokseumawe City.

Work discipline is the most crucial operational function of human resource management because the better the work discipline of employees, the higher the level of work achievement they can attain. Conversely, the absence of exemplary work discipline implementation makes achieving optimal results challenging for an institution [8].

Work discipline is essential in maintaining orderliness and smoothly implementing every task. Without high work discipline, an institution cannot succeed. In upholding work discipline, every violation is subjected to punishment. Violations of work discipline include any words or actions by employees that violate the provisions or rules of employee work discipline, whether carried out during or outside working hours. Disciplinary punishment is the penalty imposed on employees for violating the rules of employee work discipline. The level and type of punishment

According to [9], disciplinary punishments are differentiated into 1) Mild punishments, such as verbal reprimands, written reprimands, and written expressions of dissatisfaction; 2) Moderate punishments, including delayed salary increases and promotions; 3) Severe punishments, encompassing demotion to a lower equivalent rank, dismissal from the position, and honourable dismissal.

## CONCLUSIONS

Based on the research analysis results regarding the influence of work discipline on employee performance at the Department of Youth, Sports, and Tourism of Lhokseumawe City, it can be concluded that there is a significant influence between work discipline and employee performance. The T-test results show a significance value of 0.000, less than 0.05, indicating that the work discipline variable significantly affects employee performance. Therefore, it can be concluded that the work discipline variable (X) substantially influences the employee performance variable (Y).

Based on the research results using the Spearman Rank coefficient, which indicates a significance level (sig) or p = 0.002, the result is rxy = 0.431. With p = 0.002, where p < 0.05, it can be concluded that there is a positive and significant relationship between variables X and Y at a significance level of 5%, with a moderately strong correlation.

Implications are the consequences or impacts of research findings. The study results regarding whether work discipline significantly influences employee performance at the Department of Youth and Sports in Lhokseumawe City have implications for the Department of Youth and Sports in Lhokseumawe City employees to enhance discipline among employees. The findings of this research illustrate that work discipline has a positive and significant impact on the performance of employees at the Department of Youth and Sports in Lhokseumawe City.

Work discipline holds significant benefits for both the organisation and employees. The work discipline possessed by each employee is cultivated within the workforce, manifesting as compliance with work rules and personal responsibility. The implementation of work discipline is grounded in self-awareness, aiming to create a harmonious condition between aspirations and reality.

Creating a harmonious work environment requires first establishing a balance between the duties and rights of employees. Efforts to improve employee performance through work discipline can include practices such as leaders arriving

early and imposing firm sanctions fairly and without discrimination.

Based on research results and conclusions, the following suggestions can be put forward:

It is recommended by the Department of Youth, Sports, and Tourism of Lhokseumawe City that in enhancing work discipline, there is a need to improve the attendance rate of employees. Additionally, work hours should be effectively utilised to handle tasks.

It is also recommended for further research to consider adding other variables, such as compensation, the imposition of sanctions, and inherent supervision, in addition to the work discipline variable, to study their impact on performance at the Department of Youth, Sports, and Tourism of Lhokseumawe City.

## REFERENCES

1. Handoko, T. (2016). *Management* (2nd ed.). Yogyakarta: BPFE.

2. Mangkuprawira, S., & Hubeis, A. (2007). *Quality Management of Human Resources*. Jakarta: Ghalia Indonesia.

3. Sugiyono. (2009). *Quantitative, Qualitative and R&D Research Methods*. Bandung: Alfabeta.

4. Veithzal, R. (2005). *Performance Appraisal: A Systematic Approach to Assessing Employee Performance and Enhancing Company Competitiveness*. Jakarta: Raja Grafindo Persada.

5. Mangkunegara, A. (2000). *Human Resource Management*. Bandung: Remaja Rosdakarya.

6. Neolaka, A. (2014). *Research Methods and Statistics*. Bandung: Remaja Rosdakarya.

7. Sugiyono. (2015). *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta.

8. Hasibuan, M. (2009). *Human Resource Management*. Jakarta: Bumi Aksara.

9. Wursanto, I. (1995). *Fundamentals of Personnel Management*. Jakarta: Pustaka Dian.

# A Systematic Review of Global Research on Post Infectious Bronchiolitis Obliterans in Children

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**Abstract.** The article aims to analyse the diagnosis of PIBO, inform readers about prediction models, and explore current therapeutic trends. The Systematic Review was conducted as per PRISMA reporting guidelines. The search was done from PUBMED, Cochrane Library, Embase, and Google Scholar for relevant recent studies till September 2023. The study was selected for those satisfying the following criteria: 1) Studies include only children with Post- Infectious Bronchiolitis Obliterans; 2) Original articles with cross-sectional, case-control, and RCT were included. The data collected includes the type of study, author, publication year, study period, study design, study country, number of participants, diagnostic criteria of Post-Infectious Bronchiolitis Obliterans, respiratory pathogens, risk factors, and current therapy trends. The first part of the study involves making the entity of Post-Infectious Bronchiolitis Obliterans well understood through the various primary studies. The second part is about medical treatment attempted successfully by multiple professionals and their studies. Studies including Haematopoietic Stem Cell Transplantation, Lung Transplantation, and chronic lung disease were excluded.

With this information, an attempt has been made to simplify the identification of PIBO, avoid misdiagnosis, and shed some light on the various Prediction models for PIBO and the therapies tried with some success.

**Keywords:** post-infectious bronchiolitisobliterans; systematic review; global research.

## INTRODUCTION

Post-infectious bronchiolitis Obliterans (PIBO) in children is a chronic and irreversible obstructive airway disease usually following a viral lower respiratory. These are generally Adenoviral or Mycoplasma infections. The clinical presentation is varied, with only spirometry findings and negligible symptoms for severe respiratory difficulty requiring prolonged and continuous oxygen support. Histologically, the disease is limited to small airways with peribronchiolar fibrosis. There is no definitive and effective treatment for Post-Infectious Bronchiolitis Obliterans, but early diagnosis and knowledge of risk factors can go a long way to prevent PIBO.

The article aims to analyse the diagnosis of Post-Infectious Bronchiolitis Obliterans, make people aware of the prediction models, and explore the current therapeutic trends.

## METHODS

The systematic review was conducted as per PRISMA reporting guidelines. The search was done from PUBMED, Cochrane Library, EMBASE, and Google Scholar for relevant recent studies till September 2023. The study was selected for those satisfying the following criteria: 1) Studies include only children with Post- Infectious Bronchiolitis Obliterans; 2) Original articles with cross-sectional, case-control, and RCT were included. The data collected includes the type of study, author, publication year, study period, study design, study country, number of participants, diagnostic criteria of PIBO, respiratory

pathogens, risk factors, and current therapy trends. The first part of the study involves making the entity of Post-Infectious Bronchiolitis Obliterans well understood through the various primary studies. The second part is about medical treatment attempted successfully by multiple professionals and their studies. Studies including Haematopoietic Stem Cell Transplantation, Lung Transplantation, and chronic lung disease were excluded. With this information, an attempt has been made to simplify the identification of PIBO, avoid misdiagnosis, and shed some light on the various prediction models to predict PIBO and the therapies tried with some success.

Records identified through database searching (10 000) → Titles, duplicates, and abstracts screened - records excluded (3 000+6 500+300) → Full-text articles assessed for eligibility – excluded (189) → Studies included in the review (11).

## RESULTS AND DISCUSSION

The results of the review are summarised in Table 1

Table 1

| Study Author | Year Published | Country | Study Duration | Type study | Number | Study Topic |
|---|---|---|---|---|---|---|
| 41 | 2023 | China | June 2018-June 2020 | Retrospective | 228 | A diagnostic nomogram for prediction of PIBO in Severe Pneumonia |
| 42 | 2023 | China | January 2019 – December 2019 | Retrospective | 46 | Construction and analysis of Nomogram Prediction Model |
| 43 | July 2023 | Turkey | 2010-2021 | Retrospective | 11 | Regular IVIG Treatment showed favourable clinical and radiological response |
| 44 | 2022 | Korea | Last search 27 January 2022 | Review | 344 | Risk factors in the development of PIBO in children |
| 45 | 2022 | China | One year | Retrospective study | 34 | Effects of inhaled corticosteroids on lung Pulmonary functions in children with PIBO in Remission. |
| 46 | 2021 | China | One year | Retrospective | 47 | Prediction of PIBO Prognosis in Children |
| 47 | 2021 | China | 2009-2019 | Retrospective | 12 | Longitudinal assessment of pulmonary functions and Bronchodilator response in Paediatric Patients with PIBO |
| 48 | 2021 | China | … | Retrospective | 85 | Clinical analysis of Adenovirus PIBO and Non-ADV PIBO in children |
| 49 | 2020 | India | January 2010 - December 2018 | Retrospective | 8 | Clinical profile and course of children with PIBO from a Tertiary Care Hospital |
| 50 | 2020 | Turkey | 2007-2018 | Retrospective | 64 | Post-infectious bronchiolitis Obliterans masked by misdiagnosis as Asthma |
| 51 | 2020 | Taiwan | 2014-2019 | Retrospective and Descriptive Study | 8 | Post-Infectious Bronchiolitis Obliterans HRCT, DECT, Pulmonary Scintigraphy images and Clinical follow-up of eight children |

**Study Characteristics**

A detailed retrospective study by [51] from Taiwan for five years in the Paediatric Cardiopulmonary Outpatient Clinics of Kaohsiung Medical University Hospital of Eight PIBO children (4 boys and four girls) was done. The clinical characteristics, chest X-ray, HRCT images, and pulmonary scintigraphy were diligently documented for each patient. The children's ages ranged from one year and three months to three years and five months. The X-ray, HRCT and DECT given below are by [51] courtesy of PIBO: HRCT, DECT, Pulmonary Scintigraphy images and Clinical follow-up in 8 children.

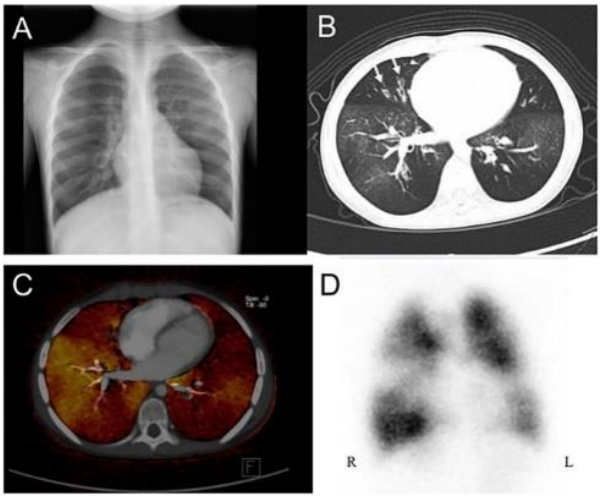


Figure 1 – A 4-year-old girl diagnosed with post-infectious Bronchiolitis Obliterans with initial clinical symptoms of cough and dyspnoea [51]

Notes: A) Chest X-ray revealed peri bronchial thickening and emphysema; B) An axial view of HRCT revealed a mosaic pattern and bronchiectasis (arrow); C) Axial view of DECT reveals regional decreased pulmonary blood vasculature; D) Perfusion scintigraphy showed a reduction in blood flow in bilateral lungs.

HRCT – high resolution computed tomography; DECT – dual-energy computer tomography; R – right side; L – left side

Out of 8 cases, all cases presented with dyspnoea and relative presence of cough, fever, haemoptysis and wheezing. Aetiology of 3 cases was Mycoplasma pneumoniae. The predominant HRCT finding was a Mosaic Pattern in nearly all cases, and Dual Energy CT also showed decreased perfusion in almost all cases. V/Q showed, in many cases, multiple-matched reduction in V/Q [51]. The most common HRCT finding is the Mosaic Pattern, whereas (V/Q) defects are a general feature in Pulmonary Scintigraphy. Their outcomes stated that there was no uniform therapeutic strategy, and HRCT and V/Q scans are necessary if BO is to be diagnosed.

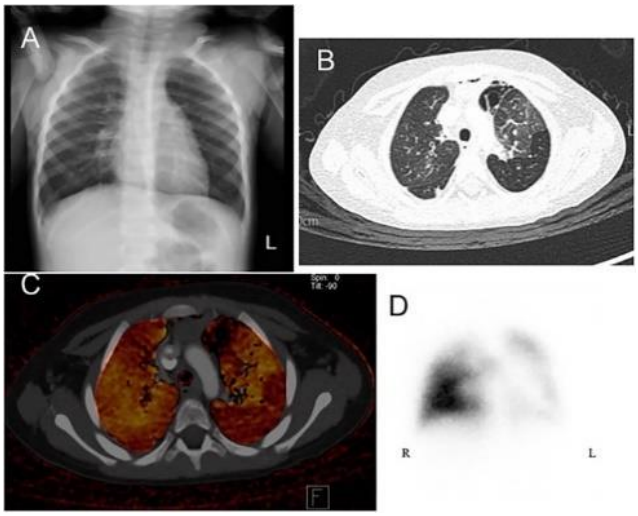


Figure 2 – A 2-year-old boy with tachypnoea and dyspnoea received a flexible bronchoscopy, showing a normal tracheobronchial appearance except for much whitish sputum [51]

Notes: A) Chest X-ray revealed hyperinflation and attenuation of vascular marking in both fields; B) Axial view of HRCT revealed mosaic patterns characterised by well-defined border areas of decreased lung attenuation associated with decreased pulmonary blood vasculature of DECT image; C-D) Perfusion scintigraphy revealed marked lobar defects in right upper, left lower, and left upper lung fields.

In an original article [50], a retrospective evaluation of PIBO patients in 4 Paediatric Pulmonary Centres between 2007 and 2018 was done. In all, 64 PIBO patients were reviewed. They grouped them into two groups, one correctly diagnosed as PIBO and the other misdiagnosed as asthma. They later correctly diagnosed and compared them clinically and through investigations like pulmonary function studies. They found the latter belonged to an older age group and suffered longer due to late diagnosis. Not only clinically, but laboratory findings also differed among the two groups. According to them, asthma mimics PIBO because the symptoms are the same, and some respond to medication [50].

A retrospective chart review was done in India by [49] of children below 18 years of age for over nine years. Detailed recordings of the clinical characteristics, laboratory tests, imaging, treatment received, and outcomes were made [49].

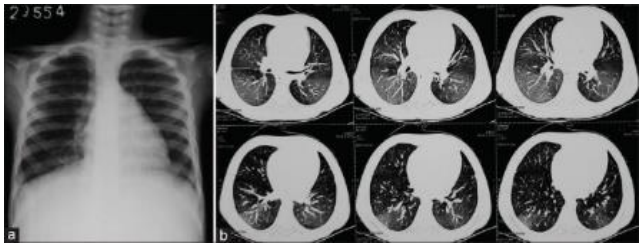

Figure 3 – Chest X-ray and computed tomography chest of case 4: a) chest X-ray showing hyperinflation; b) computed tomography chest showing mosaic attenuation and centrilobular nodule [49]

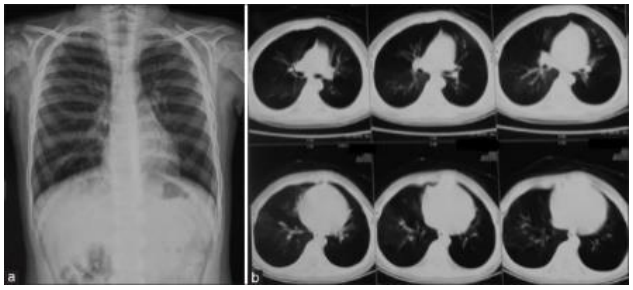

Figure 4 – Chest X-ray and computed tomography chest of case 6: a) Chest X-ray showing hyperinflation; b) computed tomography chest is showing mosaic attenuation and peri bronchial thickening [49]

Another retrospective study was done by [48]. The First Hospital of Jilin University attempted to find differences between AdenoVirus PIBO and Non-Adenovirus PIBO in children. The study involved 56 Adenovirus PIBO, 29 Non-Adeno virus PIBO, and 39 healthy controls for four years from 2016-2020. All were under the age of 14 years, including those who were first diagnosed with the PIBO at OPD or IPD. Inclusion criteria 1) 14 years and below; 2) Diagnosed case of PIBO; 3) clear history of Lower respiratory infection with a specific pathogen; 4) follow-up at least 12 months after diagnosis of PIBO. The various etiological agents were Adenovirus, RSV, Parainfluenza, Mycoplasma, Chlamydia, and Legionella. They are classified into the Adenoviral PIBO group and the non-Adenoviral group. They found no significant clinical differences between them, including history of atopy or incidence of asthma. Essentially, the Adenoviral PIBO group had more extended hospital stays; Mechanical ventilation time and proportion of multifocal pneumonia were higher [48].

In an original article by [47], 12 children between the ages of 6-99 months with PIBO were studied retrospectively from 2009-2019. Standard Spirometry readings, including FVC, FEV1, FEV!/FVC ratio, and maximal mid-expiratory flow velocity 25-75%, were done at each PFT, and response to Bronchodilators was noted [47].

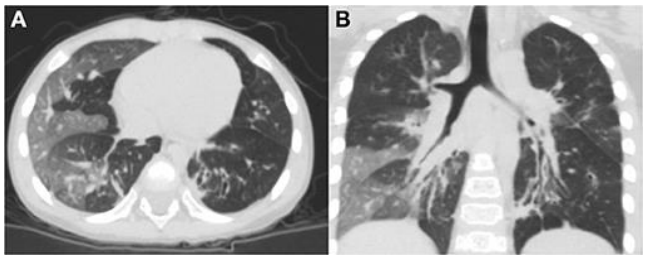


Figure 5 – Chest HRCT scans of a 2-year-old boy with PIBO.

Notes: A) Mosaic perfusion pattern; B) Bronchial wall thickening and bronchial dilation (3D reconstruction)

Tests overall, FEV1 and MMEF 25–75% showed different degrees of improvement after inhaled bronchodilators at each PFT session for ten patients, and FEV1 measures demonstrated significance (>12%) with β2-bronchodilation in 56% of PFT session [47].

In a retrospective study [46], about 47 PIBO patients did Spirometry and Impulse Oscillometry and followed them up for at least one year. The authors noted the clinical characteristics and, based on that, prepared a prediction model to predict the prognoses of PIBO children. The prognoses of 32/47 patients were good, while that of 15/47 were poor. Spirometry values showed significantly lower forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), Forced expiratory flow at 25 to 75% of FVC, and Post Bronchodilator values (BD) FEV1 values in the poor prognosis group. The area under the curve for the nomogram was 84.6% (95% CI) [46]

Another retrospective study published in 2022 by [45] involved 34 patients of PIBO admitted to The First Hospital of Jilin University from 2007 to 2021. The subjects included were divided into two groups, the first receiving continuous corticosteroids and the latter receiving intermittent corticosteroids – the latter after acute RTI or

wheezing. Different lung function tests were performed at various ages.

Seven case-control studies were included in a review by [44] in Korea to find the risk factors for developing PIBO in children. These included 344 children with PIBO and 1310 control children. This review searched all the databases to assess risk factors for developing PIBO in children, published from inception to 13 June 2022 and mentioned 21 variables (like age, sex, respiratory pathogen, symptoms, laboratory and radiological findings, and mechanical ventilation). They concluded by identifying potential risk factors, especially during respiratory infections, and stressing the importance of follow-up on these so as not to miss the diagnosis and improve the outcomes.

Another recent retrospective study by [41] was done to predict the occurrence of PIBO by attempting to make a predictive Nomogram in severe pneumonia. Here is a retrospective data analysis of 228 patients diagnosed with severe pneumonia. In this study, the factors considered were age, mechanical ventilation, length of stay in hospital, human adenoviral infection, and the level of interleukin.

| [41] | [44] |
|---|---|
| Published – 2023 | 1. Published – 2023 |
| 2. Study population – 228 | 2. Study Population – 46 |
| 3. 3 to 148 months, including 106 girls and 122 boys. | 3. Under three years old |
| 4. H/o IMV and ADV present | 4. IMV and ADV present |
| 5. Length of stay | 5. Gender, significant comorbidities; Associated multiorgan dysfunction |
| 6. Exclusion Criteria Chronic lung disease, Congenital BPD, Asthma. In addition, CHD, Immunodeficiency, Organ or Stem cell Transplantation | 6. Chronic Lung disease; Congenital BPD; Asthma |
| 7. Interleukin Levels | 7. RT PCR for ADV |
| Authors made individual nomograms incorporating clinical features | Authors constructed and analysed a prediction model for ADV PIBO after invasive intermittent ventilation |

In this, a predictive model was developed and presented as a Nomogram to help diagnose PIBO in children with severe pneumonia [41]. ROC curves were plotted to evaluate the accuracy of the nomogram, which is helpful in predicting PIBO in severe pneumonia [41]. Serum samples from all 228 patients were collected within 24 hours of admission, stored at −70 °C, and harvested for inflammatory cytokines detection; severe pneumonia was diagnosed according to the standard guidelines. The diagnosis of PIBO in the research group was established without histological confirmation, mainly depending on clinical manifestations, lung function, and high-resolution computer tomography (HRCT) examination, and the standard referred to the diagnostic criteria of [30]. After being diagnosed with severe pneumonia, the etiology was investigated using serum and sputum, PCR, blood culture, and gram staining. Mycoplasma pneumonia was diagnosed using standard diagnostic procedures: serum IgM antibody of > 1:160 or single IgM antibody positivity. The diagnosis of viral infection was established if the tests for virus antigen and/or PCR were positive. The most meaningful clinical features for predicting PIBO were picked by the Least Absolute Shrinkage and Selection Operator (LASSO) analysis. 15 Univariate and multivariate logistic regression analysis was used to screen out independent risk factors for PIBO. Subsequently, a diagnostic prediction model was built and represented these independent risk factors as nomograms. Finally, the discrimination, calibration, and clinical utility of the nomogram were also evaluated.

A study published in Turkey this year by [43] included 11 patients aged 0-18 months with subtle immunological abnormalities who were followed up from 2010 -2021 for PIBO. Clinical characteristics, BMI, CT image scoring, and immunological parameters were recorded before and after IVIG treatment. They found favourable clinical and radiological responses following Intravenous Gamma globulin treatment.

A recent retrospective study by [44] in 2023 is very informative. In this study, 863 children hospitalised for severe ADVP who underwent IMV were included as participants. The children were under three years of age. They were followed up for two years by comparing PIBO and NON-PIBO groups. They found that IMV, duration of fever, and complications were the risk indicators for PIBO in children with severe ADVP after IMV and successfully constructed a nomogram that can screen which children are at risk of developing PIBO early was successfully made.

Some emerging trends in therapy with success are as follows. A Workshop Report [29] have detailed the various therapeutic options by classifying them into two broad categories. First, the anti-inflammatory category comprising of Systemic corticosteroid

1) Azithromycin;

2) Combination therapy: FAM (Fluticasone/azithromycin/montelukast);

3) Immunoglobulin substitution;

4) Steroid-sparing anti-inflammatory agent;

5) Tumour necrosis factor inhibitor;

6) Rescue therapy (extracorporeal photopheresis);

7) Supportive care: 1) Systemic corticosteroid and Supplemental $O_2$; 2) Azithromycin and Nutritional support; 3) Combination-therapy: Fluticasone/azithromycin/montelukast and Immunisation (influenza/pneumococcal); 4) Immunoglobulin substitution and Steroid sparing anti-inflammatory agents; 5) Tumour necrosis factor inhibitor; 6) Bronchodilators if responsive; 7) Rescue therapy (extracorporeal photopheresis).

8. Supportive therapy: 1) Supplemental $O_2$; 2) Nutritional support; 3) Immunisation (influenza/pneumonia); 4) Avoid cigarette smoke; 5) Airway clearance if bronchiectasis (hypertonic saline); 6) Bronchodilators if responsive; 7) Exercise therapy/pulmonary rehabilitation.

In general, the treatment for PIBO should be a combination of optimal supportive care and anti-inflammatory therapy to impair lymphocyte proliferation and activation since inflammation plays a vital role in the pathogenesis of PIBO [52]. In an article published by [54], the BAMA regimen effectively relieved clinical symptoms and signs of PIBO in children, improved pulmonary function and HRCT manifestations, and reduced the use of systemic corticosteroids. Another study by [] concluded that Inhaled corticosteroids could effectively enhance lung function and relieve airway obstruction in patients over five years in PIBO remission, especially continuous ICSs. Patients with PIBO may have reversible airflow limitations. Another detailed study was done with follow-up for ten years [56]. Authors opined that favourable clinical and radiological responses to regular IVIG treatment were possibly due to minor immune deficiency secondary to steroids or undetected adaptive and innate immune defects involved in the aetiology of severe PIBO. A study by [57] demonstrates an aberrant miRNA expression profile in PIBO, which impacts pathways responsible for regulating inflammation and fibrosis. The defined miRNAs are useful biomarkers and should be assessed as potential targets in miRNA therapeutics [57].

## CONCLUSIONS

Bronchiolitis Obliterans, described as early as 1901 as an irreversible small airway disease, has progressed very slowly regarding therapeutic guidelines. Though it is now universally being diagnosed by HRCT and PFT, no standard procedures have been set. This systematic review analysed the recent global research on Post Infectious Bronchiolitis Obliterans in Children in the last three years through eleven studies tabulated above. Starting from the most recent ones, the first three studies tried to predict the incidence of PIBO by constructing a nomogram model from various clinical features. They wanted to validate it internally with the bootstrapping method. The second predictive nomogram was mainly built for PIBO children with ADV Pneumonia after IMV. Here, four critical factors were considered: mostly gender, duration of fever, ADV load, and fungi co-infection. The ROC curve for the risk of the occurrence of PIBO was used to assess the Nomogram model. Subsequently, the calibration curve was made, and it was a straight line, indicating that the predictive model agreed with the actual risk. In the third, a prediction curve was created using Spirometry results, post-BD (bronchodilator) FEV1, and inflammatory Bronchiolitis on HRCT. The area under this curve of the nomogram was 84.6% (95% Confidence Interval 72.8-96.4%). This nomogram is easy to use and can be applied during diagnosis.

A detailed study of the clinical profile and imaging modalities was done by [49]. The original research article by [47] in 2021 recorded PFT changes in pediatric patients with PIBO over time. Given the detailed analysis described above, PIBO has proved itself to be a distinct entity with definite diagnostic criteria both clinically and by HRCT and PFT. So, at least some therapeutic and supportive treatment schedules for the young paediatricians so that these cases are not missed or misdiagnosed as asthma. Further, precise guidelines for follow-up and exclusion of PIBO should be made for any severe pneumonia.

Further, BO is seen in Western countries after transplantation. This may be Lung Transplantation or Human stem cell Transplantation. Also, as it is seen that PIBO cases are high in Asian countries, research should be done to find out whether the geographical preference is solely aetiology related or some other factors like socio-economic due to fewer Lung or HRST need to be considered.

The identification and diagnosis of PIBO are possible with careful history, pulmonary function tests, and HRCT. With further research and studies, prediction models may be helpful and aid in early diagnosis and management. The management guidelines are not standardised, but anti-inflammatory and supportive therapy play a role. Newer modalities based on miRNA need confirmation, and further research as an aberrant miRNA expression profile has been found in PIBO.

## REFERENCES

1. Vásquez D, M., Lay-Son R, G., Vial U, F., Boza C, M. L., Contreras E, I., Lozano C, J., Zenteno A, D., & Repetto L, M. G. (2012). Expanding the CFTR mutation spectrum in Chilean patients with cystic fibrosis. *Revista Chilena De Enfermedades Respiratorias*, *28*(2), 99–103.

2. Bandeira, T., Negreiro, F., Ferreira, R., Salgueiro, M., Lobo, L., Aguiar, P., & Trindade, J. C. (2011). Clinical, radiological, and physiological differences between obliterative bronchiolitis and problematic severe asthma in adolescents and young adults: The early origins of the overlap syndrome? *Pediatric Pulmonology, 46*(6), 573–580. doi: 10.1002/ppul.21405

3. Teper, A. M., Kofman, C. D., Maffey, A. F., & Vidaurreta, S. M. (1999). Lung function in infants with chronic pulmonary disease after severe adenoviral illness. *The Journal of Pediatrics, 134*(6), 730–733. doi: 10.1016/s0022-3476(99)70289-1

4. Haran Jogeesvaran, K., & Owens, C. M. (2010). Chronic diseases of lung parenchyma in children: the role of imaging. *Pediatric Radiology, 40*(6), 850–858. doi: 10.1007/s00247-010-1615-9

5. Zhang, L., Irion, K., da Silva Porto, N., & e Silva, F. A. (1999). High-Resolution Computed Tomography in Pediatric Patients With Post-infectious Bronchiolitis Obliterans. *Journal of Thoracic Imaging, 14*(2), 85–89. doi: 10.1097/00005382-199904000-00003

6. du Plessis, A., Andronikou, S., Machemedze, T., Griffith-Richards, S., Myer, L., Mahtab, S., & Zar, H. J. (2019). High-resolution computed tomography features of lung disease in perinatally HIV-infected adolescents on combined antiretroviral therapy. *Pediatric Pulmonology, 54*(11), 1765–1773. doi: 10.1002/ppul.24450

7. Castro-Rodriguez, J. A., Giubergia, V., Fischer, G. B., Castaños, C., Sarria, E. E., Gonzalez, R., Mattiello, R., Vega-Briceño, L. E., & Murtagh, P. (2014). Post-infectious bronchiolitis obliterans in children: the South American contribution. *Acta Paediatrica, 103*(9), 913–921. doi: 10.1111/apa.12689

8. Maia, S. A., Eli, D., Cunha, R., Bitencourt, E., Riedi, C. A., Chong Neto, H. J., Silva, D. C. C. e, & Rosário Filho, N. A. (2019). Clinical, functional, and cytological evaluation of sputum in post-infectious bronchiolitis obliterans: a possible overlap with asthma? *Jornal Brasileiro de Pneumologia, 45*(5). doi: 10.1590/1806-3713/e20190060

9. Zhang, X.-M., Lu, A.-Z., Yang, H.-W., Qian, L.-L., Wang, L.-B., & Zhang, X.-B. (2018). Clinical features of post-infectious bronchiolitis obliterans in children undergoing long-term nebulisation treatment. *World Journal of Pediatrics, 14*(5), 498–503. doi: 10.1007/s12519-018-0193-z

10. Kim, Y. H., Shin, H. J., Sol, I. S., Kim, S. Y., Kim, J. D., Yoon, H., Kim, K. W., Kim, M.-J., Lee, M.-J., & Sohn, M. H. (2017). Lung Clearance Index and Quantitative Computed Tomography of Post-Infectious Bronchiolitis Obliterans in Infants. *Scientific Reports, 7*(1). doi: 10.1038/s41598-017-15330-8

11. Mattiello, R., Vidal, P. C., Sarria, E. E., Pitrez, P. M., Stein, R. T., Mocelin, H. T., Fischer, G. B., Jones, M. H., & Pinto, L. A. (2016). Evaluating bronchodilator response in pediatric patients with post-

infectious bronchiolitis obliterans: use of different criteria for identifying airway reversibility. *Jornal Brasileiro de Pneumologia, 42*(3), 174–178. doi: 10.1590/s1806-37562015000000065

12. Zhang, J., Zhu, Y., Zhou, Y., Gao, F., Qiu, X., Li, J., Yuan, H., Jin, W., & Lin, W. (2023). Pediatric adenovirus pneumonia: clinical practice and current treatment. *Frontiers in Medicine*, 10. doi: 10.3389/fmed.2023.1207568

13. Teper, A., Colom, A. J., Schubert, R., & Jerkic, P. (2023). Update in post-infectious bronchiolitis obliterans. *Pediatric Pulmonology*. doi: 10.1002/ppul.26570

14. Behrendt, A., & Lee, Y. (2023, May 1). *Swyer-James-MacLeod Syndrome*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK554442/

15. Pandey, S. (2023). Comment on "Post-infectious bronchiolitis obliterans in children: Clinical and radiological evaluation and long-term results." *Heart & Lung, 58*, 254–255. doi: 10.1016/j.hrtlng.2022.09.013

16. Lee, E., Park, S., & Yang, H.-J. (2022). Pulmonary Function in Post-Infectious Bronchiolitis Obliterans in Children: A Systematic Review and Meta-Analysis. *Pathogens, 11*(12), 1538. doi: 10.3390/pathogens11121538

17. Kang, M., Ahn, H., Lee, S., Yeom, J., Kim, K., & Hong, S. (2022). TGFβ1 and POSTN as biomarkers of post-infectious bronchiolitis obliterans and asthma in children. *Pediatric Pulmonology, 57*(12), 3161–3164. doi: 10.1002/ppul.26139

18. Zhang, D., Chen, Y., Shi, T., Fan, H., Tian, X., Zhou, R., Huang, L., Yang, D., & Lu, G. (2022). Severe pneumonia caused by human adenovirus type 55 in children. *Frontiers in Pediatrics, 10*. doi: 10.3389/fped.2022.1002052

19. Lee, E., & Choi, I. (2022). Clinical Usefulness of Serum Lactate Dehydrogenase Levels in Mycoplasma Pneumoniae Pneumonia in Children. *Indian Journal of Pediatrics, 89*(10), 1003–1009. doi: 10.1007/s12098-022-04205-0

20. Flanagan, F., Casey, A., Reyes-Múgica, M., & Kurland, G. (2022). Post-infectious bronchiolitis obliterans in children. *Paediatric Respiratory Reviews, 42*, 69–78. doi: 10.1016/j.prrv.2022.01.007

21. Yu, X., Ma, Y., Gao, Y., & You, H. (2021). Epidemiology of Adenovirus Pneumonia and Risk Factors for Bronchiolitis Obliterans in Children During an Outbreak in Jilin, China. *Frontiers in Pediatrics, 9*. doi: 10.3389/fped.2021.722885

22. Jerkic, S. P., Koc-Günel, S., Herrmann, E., Kriszeleit, L., Eckrich, J., Schubert, R., & Zielen, S. (2021). Long-term course of bronchial inflammation and pulmonary function testing in children with post-infectious bronchiolitis obliterans. *Pediatric Pulmonology, 56*(9), 2966−2972. Portico. doi: 10.1002/ppul.25547

23. Yazan, H., Khalif, F., Shadfaan, L. A., Bilgin, S., Nursoy, M., Cakir, F. B., Cakin, Z. E., Uzuner, S., & Cakir, E. (2021). Post-infectious bronchiolitis obliterans in children: Clinical and radiological evaluation and long-term results. *Heart & Lung, 50*(5), 660–666. doi: 10.1016/j.hrtlng.2021.05.001

24. Jimenez, A., & De Jesús-Rojas, W. (2021). Mycoplasma pneumoniae and Bronchiolitis Obliterans: How a Common Organism Leads to a Rare Pulmonary Disease in Pediatrics. *Cureus*. doi: 10.7759/cureus.17193

25. Weng, T., Lin, X., Wang, L., Lv, J., & Dong, L. (2021). Follow-up on the therapeutic effects of a budesonide, azithromycin, montelukast, and acetylcysteine (BAMA) regimen in children with post-infectious bronchiolitis obliterans. *Journal of Thoracic Disease, 13*(8), 4775–4784. doi: 10.21037/jtd-20-3195

26. Fujita, Y., Miyamoto, K., Imataka, G., & Yoshihara, S. (2021). Post-infectious Bronchiolitis Obliterans Misdiagnosed as Bronchial Asthma in a Pediatric Patient. *The Tohoku Journal of Experimental Medicine, 254*(4), 257–260. doi: 10.1620/tjem.254.257

27. Lee, E., & Young Lee, Y. (2020). Risk factors for the development of post-infectious bronchiolitis obliterans after Mycoplasma pneumoniae pneumonia in the era of increasing macrolide resistance. *Respiratory Medicine, 175*, 106209. doi: 10.1016/j.rmed.2020.106209

28. Chen, X., Shu, J., Huang, Y., Long, Z., & Zhou, X. (2020). Therapeutic effect of budesonide, montelukast and azithromycin on post-infectious bronchiolitis obliterans in children. *Experimental and Therapeutic Medicine*. doi: 10.3892/etm.2020.8983

29. Jerkic, S.-P., Brinkmann, F., Calder, A., Casey, A., Dishop, M., Griese, M., Kurland, G., Niemitz, M., Nyilas, S., Schramm, D., Schubert, R., Tamm, M., Zielen, S., & Rosewich, M. (2020). Post-infectious Bronchiolitis Obliterans in Children: Diagnostic Workup and Therapeutic Options: A Workshop Report. *Canadian Respiratory Journal, 2020*, 1–16. doi: 10.1155/2020/5852827

30. Kavaliunaite, E., & Aurora, P. (2019). Diagnosing and managing bronchiolitis obliterans in children. *Expert Review of Respiratory Medicine, 13*(5), 481–488. doi: 10.1080/17476348.2019.1586537

31. Kim, J., Kim, M.-J., Sol, I. S., Sohn, M. H., Yoon, H., Shin, H. J., Kim, K. W., & Lee, M.-J. (2019). Quantitative CT and pulmonary function in children with post-infectious bronchiolitis obliterans. *PLOS ONE, 14*(4), e0214647. doi: 10.1371/journal.pone.0214647

32. Rodrigues, C. M. B., Schiwe, D., Campos, N. E. de, Niederauer, F., & Heinzmann-Filho, J. P. (2019). Exercise Capacity In Children And Adolescents With Post-Infectious Bronchiolitis Obliterans: A Systematic Review. *Revista Paulista de Pediatria, 37*(2), 234–240. doi: 10.1590/1984-0462/;2019;37;2;00017

33. Xie, B.-Q., Wang, W., Zhang, W.-Q., Guo, X.-H., Yang, M.-F., Wang, L., He, Z.-X., & Tian, Y.-Q. (2014). Ventilation/Perfusion Scintigraphy in Children with Post-Infectious Bronchiolitis Obliterans: A Pilot Study. *PLoS ONE, 9*(5), e98381. doi: 10.1371/journal.pone.0098381

34. Yoon, H. M., Lee, J. S., Hwang, J.-Y., Cho, Y. A., Yoon, H.-K., Yu, J., Hong, S.-J., & Yoon, C. H. (2015). Post-infectious bronchiolitis obliterans in children: CT features that predict responsiveness to pulse methylprednisolone. *The British Journal of Radiology, 88*(1049), 20140478. doi: 10.1259/bjr.20140478

35. Yu, J. (2015). Post-infectious bronchiolitis obliterans in children: lessons from bronchiolitis obliterans after lung transplantation and hematopoietic stem cell transplantation. *Korean Journal of Pediatrics, 58*(12), 459. doi: 10.3345/kjp.2015.58.12.459

36. Tanou, K., Xaidara, A., & Kaditis, A. G. (2015). Efficacy of pulse methylprednisolone in a pediatric case of post-infectious bronchiolitis obliterans. *Pediatric Pulmonology, 50*(5), E13–E16. doi: https://doi.org/10.1002/ppul.23157

37. Mattiello, R., Mallol, J., Fischer, G. B., Mocelin, H. T., Rueda, B., & Sarria, E. E. (2010). Função pulmonar de crianças e adolescentes com bronquiolite obliterante pós-infecciosa. *Jornal Brasileiro de Pneumologia, 36*(4), 453–459. doi: 10.1590/s1806-37132010000400010

38. Kearns, G. L., Lu, S., Maganti, L., Li, X. (Susie), Migoya, E., Ahmed, T., Knorr, B., & Reiss, T. F. (2008). Pharmacokinetics and Safety of Montelukast Oral Granules in Children 1 to 3 Months of Age With Bronchiolitis. *The Journal of Clinical Pharmacology, 48*(4), 502–511. doi: https://doi.org/10.1177/0091270008314251

39. Yalçın, E., Doğru, D., Haliloğlu, M., Özçelik, U., Kiper, N., & Göçmen, A. (2003). Post-infectious Bronchiolitis obliterans in Children: Clinical and Radiological Profile and Prognostic Factors. *Respiration, 70*(4), 371–375. doi: 10.1159/000072900

40. Zhang, L., & Silva, F. A. e. (2000). Bronchiolitis obliterans in children. *Jornal de Pediatria, 76*(3), 185–192. doi: 10.2223/jped.49

41. Yan, S., Sun, C., & Jiang, K. (2023). A Diagnostic Nomogram for Early Prediction of Post-Infectious Bronchiolitis Obliterans in Severe Pneumonia. *Journal of Inflammation Research, 16*, 2041–2050. doi: 10.2147/jir.s406375

42. Bisgaard, H., Flores-Nunez, A., Goh, A., Azimi, P., Halkas, A., Malice, M.-P., Marchal, J.-L., Dass, S. B., Reiss, T. F., & Knorr, B. A. (2008). Study of Montelukast for the Treatment of Respiratory Symptoms of Post–Respiratory Syncytial Virus Bronchiolitis in Children. *American Journal of Respiratory and Critical Care Medicine, 178*(8), 854–860. doi: 10.1164/rccm.200706-910oc

43. Onay, Z. R., Ramasli Gursoy, T., Aslan, A. T., Sismanlar Eyuboglu, T., Kibar, B. S., Pekcan, S., Hangul, M., Kose, M., Budakoglu, I. I., & Gokturk, B. (2020). Post-infectious bronchiolitis obliterans masked by misdiagnosis as asthma. *Pediatric Pulmonology, 55*(4), 1007–1011. doi: 10.1002/ppul.24690

44. Peng, L., Liu, S., Xie, T., Li, Y., Yang, Z., Chen, Y., Deng, L., Huang, H., Ding, X., Chen, M., Lin, L., Wei, S., & Zhong, L. (2023). Construction and analysis of a nomogram prediction model for post-infectious bronchiolitis obliterans in children with adenovirus pneumonia after invasive mechanical ventilation. *BMC Pediatrics, 23*(1). doi: 10.1186/s12887-023-03883-9

45. Manganotti, P., Garascia, G., Furlanis, G., & Buoite Stella, A. (2023). Efficacy of intravenous immunoglobulin (IVIg) on COVID-19-related neurological disorders over the last two years: an up-to-date narrative review. *Frontiers in Neuroscience, 17*. doi: 10.3389/fnins.2023.1159929

44. Lee, E., Park, S., Kim, K., & Yang, H.-J. (2022). Risk Factors for the Development of Post-Infectious Bronchiolitis Obliterans in Children: A Systematic Review and Meta-Analysis. *Pathogens, 11*(11), 1268. doi: 10.3390/pathogens11111268

45. Zheng, H., Yu, X., Chen, Y., Lin, W., & Liu, L. (2022). Effects of Inhaled Corticosteroids on Lung Function in Children With Post-infectious Bronchiolitis Obliterans in Remission. *Frontiers in Pediatrics, 10*. doi: 10.3389/fped.2022.827508

46. Jung, J. H., Kim, G. E., Min, I. K., Jang, H., Kim, S. Y., Kim, M. J., Kim, Y. H., Shin, H. J., Yoon, H., Sohn, M. H., Lee, M., & Kim, K. W. (2020). Prediction of post-infectious bronchiolitis obliterans prognosis in children. *Pediatric Pulmonology, 56*(5), 1069–1076. doi: 10.1002/ppul.25220

47. Yu, X., Wei, J., Li, Y., Zhang, L., Che, H., & Liu, L. (2021). Longitudinal Assessment of Pulmonary Function and Bronchodilator Response in Pediatric Patients With Post-infectious Bronchiolitis Obliterans. *Frontiers in Pediatrics, 9*. doi: 10.3389/fped.2021.674310

48. Li, Y.-N., Huang, F., Ma, Y.-C., & Wang, F. (2021). Clinical analysis of adenovirus post-infectious bronchiolitis obliterans and nonadenovirus post-infectious bronchiolitis obliterans in children. *Lung India, 38*(2), 117. doi: 10.4103/lungindia.lungindia_374_20

49. Jat, K., Gulla, K., Lodha, R., & Kabra, S. (2020). Clinical profile and course of children with post-infectious bronchiolitis obliterans from a tertiary care hospital. *Lung India, 37*(1), 8. doi: 10.4103/lungindia.lungindia_145_19

50. Onay, Z. R., Ramasli Gursoy, T., Aslan, A. T., Sismanlar Eyuboglu, T., Kibar, B. S., Pekcan, S., Hangul, M., Kose, M., Budakoglu, I. I., & Gokturk, B. (2020). Post-infectious bronchiolitis obliterans masked by misdiagnosis as asthma. *Pediatric Pulmonology, 55*(4), 1007–1011. doi: 10.1002/ppul.24690

51. Chen, I.-C., Hsu, J.-S., Chen, Y.-W., Liu, Y.-C., Wu, Y.-H., Hsu, J.-H., Cheng, Y.-F., & Dai, Z.-K. (2020). Post-infectious Bronchiolitis Obliterans: HRCT, DECT, Pulmonary Scintigraphy Images, and Clinical Follow-up in Eight Children. *Frontiers in Pediatrics, 8*. doi: 10.3389/fped.2020.622065

52. Rosewich, M., Zissler, U. M., Kheiri, T., Voss, S., Eickmeier, O., Schulze, J., Herrmann, E., Dücker, R. P., Schubert, R., & Zielen, S. (2015). Airway inflammation in children and adolescents with bronchiolitis obliterans. *Cytokine, 73*(1), 156–162. doi: 10.1016/j.cyto.2014.10.026

53. Moonnumakal, S. P., & Fan, L. L. (2008). Bronchiolitis obliterans in children. *Current Opinion in Pediatrics, 20*(3), 272–278. doi: 10.1097/mop.0b013e3282ff62e9

54. Weng, T., Lin, X., Wang, L., Lv, J., & Dong, L. (2021). Follow-up on the therapeutic effects of a budesonide, azithromycin, montelukast, and acetylcysteine (BAMA) regimen in children with post-infectious bronchiolitis obliterans. *Journal of Thoracic Disease, 13*(8), 4775–4784. doi: 10.21037/jtd-20-3195

55. Abtahi, H., Peiman, S., Foroumandi, M., & Safavi, E. (2016). Long Term Follow-Up of Sulfur Mustard Related Bronchiolitis Obliterans Treatment. *Acta medica Iranica*, *54*(9), 605–609.

56. Yilmaz, A. İ., Gül, Y., Kapaklı, H., Ünal, G., Çağlar, H. T., Ercan, F., Reisli, İ., Keleş, S., Poyraz, N., & Pekcan, S. (2023). Successful treatment of post-infectious bronchiolitis obliterans with gamma globulin in a tertiary center: 10 years of experience. *Pediatric Pulmonology, 58*(10), 2769–2776. doi: 10.1002/ppul.26577

57. Duecker, R. P., De Mir Messa, I., Jerkic, S., Kochems, A., Gottwald, G., Moreno-Galdó, A., Rosewich, M., Gronau, L., Zielen, S., Geburtig-Chiocchetti, A., Kreyenberg, H., & Schubert, R. (2022). Epigenetic regulation of inflammation by microRNAs in post-infectious bronchiolitis obliterans. *Clinical & Translational Immunology, 11*(2). doi: 10.1002/cti2.1376

# Antimicrobial and Isolation of Stigmasterol from Ethyl Acetate Extract of Musa Acuminate Calla Flowers

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**Abstract.** Banana blossom is traditionally used in northern Nigeria to treat a variety of ailments, including microbiological infections; reduces menstrual bleeding; aids in the treatment of diabetes, anaemia, and ulcers. Reduces anxiety, aids in weight loss, and produces an undetermined amount of filtrate decoction to facilitate conception. As a result, the study intends to isolate secondary metabolites to identify the bioactive compound(s) present in banana flowers. Based on the antimicrobial activity results, the highest inhibitory concentration for ethyl acetate extracts of the Banana blossom flower is 12.5 mg/ml, as indicated below.

Compounds are isolated using column chromatography. Isolation was performed using an ethyl acetate extract of the banana blossom flower. The fractions from the column are subjected to TLC testing to determine the separation of the component combination using a thin stationary phase supported by an inert backing, resulting in BF16 fractions. The goal of TLC is to produce well-defined, well-separated spots. Each component has a retention factor (RF), which joins fractions with equal RF values. We extracted stigmasterol from *Musa acuminata calla* ethyl acetate extracts and analysed it using NMR spectroscopy and FT-IR.

**Keywords:** Musa acuminata calla; antimicrobial activities; stigmasterol; extraction.

## INTRODUCTION

Bananas (including plantains) are one of the world's most significant and oldest food crops, with evidence of cultivation dating back to 4,000 BC in New Guinea, and are thought to have originated in Southeast Asia's hot, tropical regions [1]. Malaysia is believed to be the origin of *Musa acuminata*, which moved to India and Burma, where *Musa balbisiana* is the native species. Malaysia and Indonesia are regarded as the diversity hotspots. Human mobility was most likely the sole cause of dispersal from Asia. There are thousands of domesticated Musa cultivars, and their genetic diversity is high, indicating various origins from diverse wild crosses between two main ancestral species [2]. *Musa acuminata* is the most common among the Musa species [1]. Dwarf Cavendish is the most extensively distributed banana.

*Traditional uses***.** Many conventional banana applications have been extensively documented. For example, the leaf and stem are used to treat diarrhoea; the stem is helpful for asthenia and wounds; and the leaf is useful for inflammation, headache, and rheumatism [3]. Previous studies reported that *Musa Paradisiaca* had antimicrobial and healing activities. Nevertheless, only a few studies have reported on the efficacy of this plant against nematodes – various parts of *Musa Paradisiaca* have been used for medicinal purposes [4]. It has traditionally been used for antidepressant, antibacterial, antihypertensive, antiulcerogenic, urolithiasis, laxatives, antihelmintic, analgesic, antifungal, constipation, wound healing,

fevers, burns, diarrhoea, inflammation, pains and antivenom for snake bites. Flowers are used in dysentery and menorrhagia. Stem juice of fruited plants treats diarrhoea, dysentery, cholera, otalgia, and haemoptysis and flowers in dysentery, diabetes and menorrhagia. The root is used for antihelmintic, blood disorders and venereal diseases [3].

*Banana blossom***.** The plant stem, upon maturing, gives rise to a bunch of rolled leaves and then protrudes as a dark purple bud that is elongated and oval-shaped, known as inflorescence or flower or banana blossom. Blossom has two main parts: Bract is an outer sheath-like substance that ranges in hue from reddish to purple. Florets are the inner little tubular-toothed whitish flowers positioned along the floral stacks. Every time a banana blossom is generated, a banana stem is produced beside it. After removing the fruits from the stem, the flowers and other leftovers of the banana plant are typically discarded [5].

*Florets or flowers***.** The flowers of the banana plant are one of the widely consumed vegetables in several cuisines in Asian countries. The male flowers are usually creamy white, while the stigma is orange or rich golden. The basal flowers have female hands that vary in quantity from 1 to 10 and are placed in 2 rows per bract, while male flowers are found in the upper hands and have around 20 florets arranged in 2 rows per bract. The compound tepal is about 2.5 cm long, white, yellowish, or somewhat purple, with a white or yellow tip and lobes, and is made up of translucent free tepals that are roughly half the length of the compound tepal. It has pale green, yellowish green, or purplish ovaries that are either glabrous or have a few fine hairs near the base. Male buds in the advanced blooming stage are ovoid to turbinate. The stamens and perianth are the same length, and their anthers usually turn pink before dehiscence [5]. South Asians and Southeast Asians use banana flowers raw or steamed with dips (as vegetables) in curries, soups, fried foods, etc. The flavour of the flowers resembles artichokes [6].

Authors [7] the 100 g of banana flower offers a lot of nutritious benefits like 51 kcal, 1.6 g of Protein, 0.6 g of Fat, 9.9 g of Carbohydrates, 5.7 g of Fiber, 56 mg of Calcium, 73.3 mg of Phosphorous, 56.4 mg of Iron, 13 mg of Copper, 553.3 mg of Potassium, 48.7 mg of Magnesium and 1.07 mg of Vitamin E [6].

Common flower uses include allergies, infections, bronchitis, dysentery, joint pain, and improved blood circulation [8]. The flowers are also used to manage diabetes and anaemia, help nursing mothers, boost mood and reduce anxiety, and help reduce free radical activity and menstrual bleeding [6]. The major bioactive principles in the flowers' methanol extract were glycosides, tannins, saponins, phenols, steroids and flavonoids.

*Plant collection*. Banana Blossom was collected from Song, a local government area in Adamawa State. The plant part was authenticated by the Department of Biology (Botany), School of Physical Science, Modibbo Adama University Yola, Nigeria.

*Sample Preparation***.** The Banana Blossom was thoroughly washed with tap water to remove dust and impurities, while some impurities were carefully picked and rinsed with tap water again. The plants are air-dried at ambient temperatures to a constant weight over four weeks. It was powdered in a wooden mortar and then blended.

*Sample Extraction*. The extraction was done using 1 kg of powdered sample, poured into a glass container, and macerated successively with 1200 mL of each distilled hexane, ethyl acetate, and methanol. Each extraction cycle was carried out for three days with occasional shaking, after which it was filtered, and the filtrate evaporated at room temperature to obtain crude extracts [9].

*Column Chromatography*. Extracts of banana flowers 6 g of distilled hexane, ethyl acetate, and methanol extracts were individually adsorbed onto Celite by dissolving the extract in minute volumes of solvent and thoroughly mixing with 10 g of Celite, following which the adsorbed extract was crushed into powdery form and dried entirely. A little piece of cotton wool was inserted at the base of the column and gently tapped with a rubber applicator. A silica gel slurry was created by combining 50 g (230-400 mesh ASTM) with n-hexane and stirring with a glass rod. Allow it to cool for about fifteen minutes before swiftly transferring to the column.

More of the solvent was added to rinse the slurry down the column and tapped with a rubber applicator to make the bed compact and remove any air bubbles. A beaker was placed under the column, and then the tap was allowed to run until the solvent got close to the top level of the bed. The sample was then loaded into the column

carefully while the tap was closed. To start elution, solvent mixtures were added. 20 $cm^3$ vials were used to collect fractions from the column [9].

*Thin Layer Chromatography (TLC)*. Thin layer chromatographic analysis was performed on the hexane, ethyl acetate, and methanol plant extracts to determine which solvent system would better separate the components. This will enable the use of pre-coated TLC plates. A small sample solution was spotted on TLC pre-coated (MERCK) plates and developed with several ratios of organic solvents (hexane, ethyl acetate, methanol, and chloroform), considering their polarity. The solvent system that can separate components with high resolution was considered. The plates were illuminated with visible and UV light (366 and 254 nm, respectively). The plates were sprayed with 10% sulphuric acid in methanol and heated at 100 °C for 1–5 minutes. The fractions were taken from the column that TLC monitored. The fractions with the same retention factor Rf values $\left(\frac{\text{distance move by solvent}}{\text{distance move by sample}}\right)$ was pooled and concentrated, and the spots and observations were recorded [9].

*Spectroscopic Measurement*. The final products of the fractions BF 16 were analysed spectroscopically using a JEOL-LA-400 MHz FT-NMR spectrophotometer at SIPBS, University of Strathclyde, Glasgow, UK. Fourier-transform infrared (F-TIR) measurements were performed using a Shimadzu FTIR-8400 S Spectrophotometer.

*The antimicrobial screening***.** The antimicrobial activities of the BF16 compound were determined using some pathogenic microbes. The microbes were obtained from the Department of Medical Microbiology ABU teaching hospital Zaria.

The 0.001 mg of the compound was weighed and dissolved in 10 ml of DMSO to obtain a concentration of 100 µg/ml. This was the initial concentration of the compound used to determine its antimicrobial activities. The diffusion method was used to screen the compound. Mueller Hinton agar and Sabouraud dextrose agar were the media used to grow the microbes. The media were prepared according to the manufacturer's instructions, sterilised at 121 °C for 15 mins, poured into the sterile Petri dishes, and allowed to cool and solidify.

The sterilised media were seeded with 0.1 ml of the standard inoculum of the test microbe, and the inoculum was spread evenly over the surface of the media with a sterile swab. A standard cork borer of 6 mm in diameter was used to cut a well at the centre of each inoculated media. 0.1 ml of solution of the 100 µg/ml concentration compound was then introduced into the well on the inoculated media. Incubation was made at 37 °C for 24 hr for the bacteria and at 30 °C for 1-7 days for the fungi, after which the plates of the media were observed for the zone of inhibition of growth. The zone was measured with a transparent ruler and recorded in millimetres [10].

*Minimum Inhibition Concentration*. The minimum inhibition concentration of the compound was determined using the broth dilution method. Mueller Hinton broth and Sabouraud dextrose broth were prepared, 10 ml were dispensed into test tubes, sterilised at 121 °C for 15 mins, and the broth was allowed to cool. MC-farland's turbidity standard scale number 0.5 was prepared to give a solution. Normal saline was prepared, 10 ml was dispensed into a sterile test tube, and the microbe was inoculated and incubated at 37 °C for 6 hrs. Dilution of the microbe was done in the normal saline until the turbidity marched that of the MC-Farland's scale by visual comparison at this point, the test microbe has a concentration of about $1.5X10^8$c/ml.

Two-fold serial dilution of the compound was done in the sterile broth to obtain 100, 50, 25, 12.5 and 6.25 µg/m concentrations. The initial concentration was obtained by dissolving 0.001 mg of the compound in 10 ml of the sterile broth. Having obtained the different concentrations of the compound in the sterile broth, 0.1 ml of the test microbe in the normal saline was then inoculated into the other concentrations; incubation was made at 37 °C for 24 hrs for the bacteria and at 30 °C for the fungi, after which the test tubes of the broth were observed for turbidity (growth) the lowest concentration of the compound in the sterile broth which shows no turbidity was recorded as the minimum inhibition concentration [10].

*Minimum bactericidal /fungicidal concentration (MBC/MFC)*. MBC/MFC were carried out to determine whether the test microbes were killed or only their growth was inhibited. Mueller Hinton agar and Sabouraud dextrose agar were prepared and sterilised at 121 °C for 15 mins, poured into sterile Petri dishes, and cooled solidly. The contents of the MIC in the serial dilutions were then subcultured onto the prepared media;

incubation was made at 37 °C for 24 hrs for the bacteria and at 30 °C for the fungi, after which the plates of the press were observed for colony growth, MBC/MFC were the plates with the lowest concentration of the compound without colony growth [10].

## RESULTS AND DISCUSSION

Yield of extract banana blossom. The air-dried powdered Banana blossom flowers (1 kg) were extracted by excellent maceration method to yield Ethyl acetate 9.2 g dark green (529 nm) Colorimeter was used to identify the colour wavelength above. The solvent was removed by evaporating the extracts in a rotary evaporator under vacuum. To get rid of any solvent.

Fractions BF15 with a retention factor of 0.55 were sent for analysis with the confirmation of thin layer chromatography using a solvent system of hexane and ethyl acetate (1:2) 20 ml displayed apparent single spots that were also confirmed by antimicrobial tests (zone of inhibition/sensitivity test, MIC, and MBFC).

Table 1 – Zone of inhibition/sensitivity test of the compound and the control against the test microorganism

| Test Organism | BF16 | Ciprofloxacin | Fluconazole | Fulcin |
|---|---|---|---|---|
| *MRSA* | 22 (S) | 34 (S) | 0 (R) | 0 (R) |
| *VRE* | 0 (R) | 0 (R) | 0 (R) | 0 (R) |
| *Staphylococcus aureus* | 27 (S) | 30 (S) | 0 (R) | 0 (R) |
| *Escherichia coli* | 0 (R) | 40 (S) | 0 (R) | 0 (R) |
| *Klebsiella pneumonia* | 0 (R) | 0 (R) | 0 (R) | 0 (R) |
| *Proteus mirabilis* | 28 (S) | 32 (S) | 0 (R) | 0 (R) |
| *Pseudomonas aeruginosa* | 26 (S) | 0 (R) | 0 (R) | 0 (R) |
| *Candida albicans* | 28 (S) | 0 (R) | 34 (S) | 0 (R) |
| *Candida krusei* | 22 (S) | 0 (R) | 32 (S) | 0 (R) |
| *Aspergillus fumigatus* | 0 (R) | 0 (R) | 0 (R) | 32 (S) |
| *Aspergillus flavus* | 0 (R) | 0 (R) | 0 (R) | 30 (S) |
| *Microsporum canis* | 25 (S) | 0 (R) | 0 (R) | 29 (S) |

Notes: S – Sensitive=Resistance

Table 1 deals with pathogens to determine whether they are sensitive to fractions collected from the plant extract and their zone of inhibition. It was determined that the fractions BF 15 show the zone of inhibition (ZOI) sensitivity against *Methicillin-resistant staph aureus (*MRVA*)* 22 mm and 24 mm, respectively. In comparison, the drug control (Ciprofloxacin) is 34 mm. *Staphylococcus aureus* is 27 mm and 22 mm, the drug control (Ciprofloxacin) is 30 mm. *Candida albicans is* 28 mm and 26 mm, respectively, while the drug control (Fluconazole) is 34 mm. *Candida krusei* is 22 mm and 24 mm, respectively, while the drug control (Fluconazole) is 32 mm. *Microsporum canis* is 25 mm and 20 mm, respectively, while the drug control (Fulcin) is 29 mm.

BF16 revealed *Escherichia coli* 27 mm while 40 mm drug control (Ciprofloxacin) showed *Proteus mirabilis* BF15 28 mm while 34 mm drug control (Ciprofloxacin), *Aspergillus flavus*. *Vancomycin-resistant enterococci* (VRE*) Klebsiella pneumonia* and *Aspergillus fumigatus* were resistant to the fractions. *Pseudomonas aeruginosa* of BF15 show sensitivity of 26 mm and 23 mm, respectively.

The fractions' minimum inhibition concentration (MIC) ranged from 6.25 to 100 µg/ml. The *Escherichia coli,* and *Candida albicans* have the highest minimum inhibition concentration of 12.5 µg/ml in BF 25 and *Staphylococcus aureus*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Candida albicans* 12.5 µg/ml in BF15.

The lowest minimum inhibition concentration of *Methicillin resistant staph aureus* (MRVA), *Staphylococcus aureus, Pseudomonas aeruginosa, Candida krusei, Aspergillus flavus, and Microsporum canis* is 25 µg/ml in BF15. While *Vancomycin resistant enterococci* (VRE), *Klebsiella pneumonia*, *Proteus mirabilis* and *Aspergillus fumigatus* in BF15 were resistant to the fraction Table 2.

Table 2 – Minimum inhibition concentration of the compound against the test microorganism, μg/ml

| Test Organism | 100 | 50 | 25 | 12.5 | 6.25 |
|---|---|---|---|---|---|
| *MRSA* | - | - | 0* | + | ++ |
| *VRE* | | | | | |
| *Staphylococcus aureus* | - | - | 0* | + | ++ |
| *Escherichia coli* | - | - | - | 0* | + |
| *Klebsiella pneumonia* | | | | | |
| *Proteus mirabilis* | | | | | |
| *Pseudomonas aeruginosa* | - | - | 0* | + | ++ |
| *Candida albicans* | - | - | - | 0* | + |
| *Candida krusei* | - | - | 0* | + | ++ |
| *Aspergillus fumigatus* | | | | | |
| *Aspergillus flavus* | - | - | 0* | + | ++ |
| *Microsporum canis* | - | - | 0* | + | ++ |

Notes: "-" No turbidity (no growth); "0*" MIC, "+" Turbid (light growth); "++" light turbidity

The fraction's minimum bactericidal/fungicidal concentration ranged from 6.25 to 100 μg/ml. The *Methicillin-resistant staph aureus* (MRVA*)*, *Escherichia coli, Candida albicans* and *Candida krusei* show 50 μg/ml in BF15.

The lowest minimum bactericidal/fungicidal concentration of the *Staphylococcus aureus*, *Pseudomonas aeruginosa, Aspergillus flavus* and *Microsporum canis* is 100 μg/ml in BF15. At the same time, Vancomycin-resistant enterococci (VRE), Klebsiella pneumonia, Proteus mirabilis and Aspergillus fumigatus in BF 16 and Vancomycin-resistant enterococci (VRE) were resistant to the fraction Table 3.

Table 3 – Minimum bactericidal/fungicidal concentration of the compound against the test microorganism, μg/ml

| Test Organism | 100 | 50 | 25 | 12.5 | 6.25 |
|---|---|---|---|---|---|
| *MRSA* | - | 0* | + | ++ | +++ |
| *VRE* | | | | | |
| *Staphylococcus aureus* | 0* | + | ++ | +++ | +++ |
| *Escherichia coli* | - | 0* | + | ++ | +++ |
| *Klebsiella pneumonia* | | | | | |
| *Proteus mirabilis* | | | | | |
| *Pseudomonas aeruginosa* | 0* | + | ++ | +++ | +++ |
| *Candida albicans* | - | 0* | + | ++ | +++ |
| *Candida krusei* | - | 0* | + | ++ | +++ |
| *Aspergillus fumigatus* | | | | | |
| *Aspergillus flavus* | 0* | + | ++ | +++ | +++ |
| *Microsporum canis* | 0* | + | ++ | +++ | +++ |

Notes: "-" No colony; "0*" MBC/MFC; "+" Scanty colony growth; "++" Moderate colony growth; "+++" Heavy colony growth.

*Characterisation of BF16 as stigmasterol*. From the positive tests for steroids given by the compound, it is assumed to be a compound containing a steroidal nucleus. The compound has Rf value of 0.54 (EtAc/Hex: 2/3). Regarding IR spectroscopic analysis, the observed absorption bands are 3456.17, which is characteristic of O-H stretching. Absorption at 973.80 is due to cyclic olefinic –HC= CH- structure and 2871.31 assigned to C-H structure. 1468 is a bending frequency for cyclic $CH_2$ and 1373.37 for $–CH_3$. The absorption frequency at 728.22 is aromatic. These absorption frequencies resemble the absorption frequencies observed for stigmasterol. The proton NMR showed the proton of H-3 appeared as a multiplet at δ 3.53 ppm and revealed the existence of signals for Olefinic proton at δ5.08 (m), 5.20 (m), and 5.37 (m) - angular methyl proton at 1.03 and 0.72.

Table 4 – Experimental and literature data for stigmasterol $^1$H NMR

| [11] | [12] | $^1$H NMR Experimental data | Type of carbon absorption on FT-IR |
|---|---|---|---|
| 3.53 (m, 1 H) | 3.53 (m 1 H) | 3.53 (m 1 H) | CH |
| 5.38 (s, 1 H) | 5.38 (s, 1 H) | 5.37 (s, 1 H) | C=CH |
| 1.29 (d, 3 H) | 1.29 (d, 3 H) | 1.28 (d, 3H) | $CH_3$ |
| 0.74 (d, 3 H) | 0.74 (d, 3 H) | 0.72 (d, 3H) | $CH_3$ |
| 1.20 (d, 3 H) | 1.20 (d, 3 H) | 1.21 (d, 3H) | $CH_3$ |
| 5.07 (m, 1 H) | 5.07 (m, 1 H) | 5.08 (m, 1 H) | C=C |
| 5.20 (m, 1 H) | 5.20 (m, 1 H) | 5.20 (m, 1 H) | C=C |
| 0.84 (d, 3 H) | 0.84 (d, 3 H) | 0.83 (d, 3 H) | $CH_3$ |
| 0.97 (d, 3 H) | 0.97 (d, 3 H) | 0.98 (d, 3 H) | $CH_3$ |
| 1.04 (t, 3 H) | 1.40 (t, 3 H) | 1.03 (t, 3 H) | $CH_3$ |

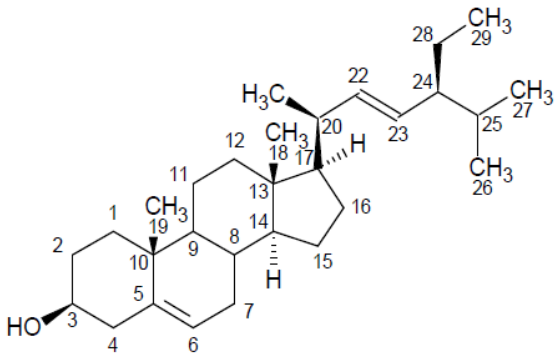

Figure – Stigmaterol

## CONCLUSIONS

*Musa acuminate calla* flower fraction was tested against seven bacteria and five fungi for its antimicrobial activities. The sample fraction was compared with the positive control. The ethyl acetate fraction of plant isolate has the highest minimum inhibitory concentration, 12.5 mg/ml. The sterols were isolated from the commercial extract obtained from the *Musa acuminate calla* flower. The structure of the isolated new compound was identified as stigmasterol based on FT-IR, spectroscopic and by comparing their physical properties reported in the literature.

The study of *Musa acuminate calla* has yielded three known compounds. It is recommended that more work should be carried out on the plant to isolate more compounds. Other assays such as antimalarial, anthelmintic, anti-inflammatory and cytotoxicity tests may be carried out on the extracts.

## REFERENCES


1. Ghosh, S. (2022). *Tropical fruit crop: Theory to Practical*. New Delhi: Jaya.
2. Elaveniya, E., & Jayamuthunagai, J. (2014). Functional, Physicochemical and Anti-oxidant properties of Dehydrated Banana Blossom Powder and its Incorporation in Biscuits. *International Journal of Chemtech Research*, *6*(9), 4446-4454.
3. Marie-Magdeleine, C., Udino, L., Philibert, L., Bocage, B., & Archimede, H. (2014). In vitro effects of Musa x paradisiaca extracts on four developmental stages of Haemonchus contortus. *Research in Veterinary Science, 96*(1), 127–132. doi: 10.1016/j.rvsc.2013.12.004
4. Newman, D. J., & Cragg, G. M. (2020). Natural Products as Sources of New Drugs over the Nearly Four Decades from 01/1981 to 09/2019. *Journal of Natural Products, 83*(3), 770–803. doi: 10.1021/acs.jnatprod.9b01285
5. Mathew, N. S., & Negi, P. S. (2017). Traditional uses, phytochemistry and pharmacology of wild banana (Musa acuminata Colla): A review. *Journal of Ethnopharmacology, 196*, 124–140. doi: 10.1016/j.jep.2016.12.009
6. Netmeds.com. (2020). *7 Brilliant Health Benefits of Banana Flowers*. Retrieved from https://www.youtube.com/watch?v=1NqHaLiiLGc&ab_channel=Netmeds.com
7. Shwetha, A., Humeera, T., & Preethi, B. (2019). *Review on: Production of Natural Banana Blossom Concentrate*. Retrieved from https://www.researchgate.net/profile/Humeera-Tazeen/publication/333641058_REVIEW_ON_PRODUCTION_OF_NATURAL_BANANA_BLOSSOM_CONCENTRATE/links/5cf8a75c4585153c3db7408a/REVIEW-ON-PRODUCTION-OF-NATURAL-BANANA-BLOSSOM-CONCENTRATE.pdf
8. Liyanage, R., Gunasegaram, S., Visvanathan, R., Jayathilake, C., Weththasinghe, P., Jayawardana, B. C., & Vidanarachchi, J. K. (2016). Banana Blossom (Musa acuminate Colla) Incorporated Experimental Diets Modulate Serum Cholesterol and Serum Glucose Level in Wistar Rats Fed with Cholesterol. *Cholesterol, 2016*, 1–6. doi: 10.1155/2016/9747412
9. Cyprian, T. A., Sewuese, S., & Akacha, L. U. (2019). Preliminary Phytochemical Screening and Thin Layer Chromatography Analysis of Stem Bark Extracts of African Mistletoe Parasitic on Vitellaria paradoxa, Piliostigma thonningii and Combretum fragrans. *Asian Journal of Applied Chemistry Research*, 1–6. doi: 10.9734/ajacr/2019/v3i230087

10. Dikko, Y., Khan, M., Tor-Anyiin, T., Anyam, J., & Linus, U. (2016). In vitro Antimicrobial Activity of Fruit Pulp Extracts of Azanza garckeana (F. Hoffm.) Exell & Hillc. and Isolation of One of its Active Principles, Betulinic Acid. *British Journal of Pharmaceutical Research, 14*(1), 1–10. doi: 10.9734/bjpr/2016/30152

11. Okoro, I., Tor-Anyiin, T., Igoli, J., Noundou, X., & Krause, R. (2018). Isolation and Characterisation of Stigmasterol and β–Sitosterol from Anthocleista djalonensis A. Chev. *Asian Journal of Chemical Sciences, 3*(4), 1–5. doi: 10.9734/ajocs/2017/37147

12. Pierre, L. L., & Moses, M. N. (2015). Isolation and Characterisation of Stigmasterol and B - Sitosterolfrom Odontonema Strictum (Acanthaceae). *Journal of Innovations in Pharmaceuticals and Biological Science, 2*(1), 88-95.