Awareness and Utilization of Artificial Intelligence-Based Systems in Biomedical Translation in Nigeria

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Abstract

Good communication can enable better diagnosis, increases patient compliance with treatment recommendations, reduce the medical errors committed by personnel, and stirs positive mood and satisfaction in patients. However multilingual capabilities of AI can facilitate translations into local languages, making healthcare information accessible to a broader patient population.

The study investigated the extent of awareness and utilization of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State. Descriptive survey design was adopted for this study. Two research questions were raised to guide the study. The population of the study comprised all three hundred and forty-three professionals in the three medical tertiary institutions in Bayelsa State. A sample of 299 respondents were drawn from the population using systematic random sampling technique. The instrument for data collection was a "Awareness and Utilization of Translation APP Scale (AUTAS)" developed by the researcher and validated by experts. The reliability co-efficient of 0.82 was obtained using Cronbach Alpha formula which was considered appropriate for this study. The research questions were answered using mean and standard deviation. The findings revealed that the level of awareness and the extent of utilization of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State is low. It was recommended among others that medical professionals should be effectively exposed to artificial intelligence-based systems in biomedical translation as this will enhance sustainability medical practice in Nigeria.

Keywords: Awareness, Utilization, Translation, Apps, Medical, Professionals

Introduction

Although Biomedical translation does not occupy the most central position in the world of medicine, it certainly plays an important role in knowledge mediation, which involves sharing medical research results, publicizing new findings in the international scientific community and marketing new medical products and services. It is an important area of medical science that has significantly encouraged the consumption of medical research globally. However, Padilla-Cabello (2022) observed that one of the greatest limitations to the practice of biomedical translation is the challenge of language barrier. Also, Korošec (2011) noted that the full benefit of the intent of biomedical translation cannot be harnessed in any system where language expertise is absent.

Communication remains an indispensable endeavor in human existence. It is a social skill that cuts across all areas of human endeavor. These skills are of particular importance to human focused professions, such as nursing, pharmacy, medical laboratory science, etc (Truglio, et. al., 2018). Ineffective communication between a patient and members of a therapeutic team can negatively affect the treatment outcomes. Foronda, et. al., (2016) reported that deficiencies in communication also lead to conflicts between members of the therapeutic team and increase aggressive behaviour of the staff towards patients. It is worthy to note that the presence of conflicts and aggression promotes the development of avoidance which in turn can cause a deterioration of long-term relationship between collaborators and patients in long term and it is considered as one of the rationales for professional burnout.

Alternatively, Ellison, (2015) submitted that good communication can enable better diagnosis, increases patient compliance with treatment recommendations, reduce the medical errors committed by personnel, and stirs positive mood and satisfaction in patients. Sequel on the above, the task to improve the quality of communication between medical practitioners and patients has become a global priority at such translation has been recognized as a mean to bridge language barrier for enhanced communication.

Teibowei (2023) disclosed that effective communication of medical information is pivotal for ensuring optimal patient care and outcomes. In Nigeria, a country characterized by linguistic diversity and a growing healthcare demand, accurate translation of biomedical content is essential. The emergence of artificial intelligence-based systems, such as machine translation and natural language processing, offers innovative solutions to overcome language barriers and enhance healthcare communication. AI-based systems have the potential to improve translation accuracy and speed, enabling healthcare professionals to access critical information more rapidly and accurately. The multilingual capabilities of AI can facilitate translations into local languages, making healthcare information accessible to a broader patient population.

The Nigerian government recognizes the importance of artificial intelligence (AI) as a tool for development of the country. It has stressed that AI has a role to play in education both directly as a subject and indirectly as a tool to assist in education delivery and management. As a way to match actions with words, different projects have been launched to enhance the adoption of AI in various sectors in the country, of which the health sector is a part. Observations have shown that despite the level of understanding of the benefits of AI for enhanced sharing of information amongst medical personnel in developed nations and its availability, the developing countries of which Nigeria is part off, are still not putting it to expected use. This article delves into the awareness and utilization of AI-based systems in biomedical translations within Nigeria, shedding light on the potential benefits, challenges, and implications for healthcare professionals and translators.

Purpose of Study

The main purpose of this study is to investigate the extent of awareness and utilization of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State. Specifically, the study achieved the following:

i.   To determine the level of awareness of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State.

ii.   To determine the extent of utilization of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State.

Research Questions

The following research questions were formulated to guide the study:

1. What is the level of awareness of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State?
2. To what extent are the artificial intelligence-based systems in biomedical translation utilized amongst professionals in medical tertiary institutions in Bayelsa State?

Conceptual Framework

FIGURE 1: SCHEMATIC

Figure 1: Shows Variables of the study depicting the conceptual framework

Artificial Intelligence-Based Systems in Biomedical Translation

An artificial intelligence (AI)-based system in biomedical translation refers to a technology that utilizes artificial intelligence techniques, particularly those related to natural language processing (NLP), to facilitate the translation of medical and healthcare-related content between different languages. These systems are designed to improve communication, knowledge sharing, and accessibility in the field of biomedicine, where accurate and efficient translation is crucial for effective healthcare delivery, research collaboration, and dissemination of medical information. UNESCO (2021) outlined characteristics of AI-based systems in biomedical translation as:

Natural Language Processing (NLP): These systems leverage NLP algorithms to understand the linguistic nuances of medical texts, research papers, patient records, and other healthcare-related documents. NLP enables them to comprehend context, terminology, and domain-specific jargon.

Machine Translation: AI-based biomedical translation systems often employ machine translation techniques to automatically convert text from one language to another. These systems can handle various forms of text, such as medical literature, patient information, and research findings.

Contextual Understanding: Advanced AI systems in biomedical translation aim to maintain contextual understanding during translation. They consider the broader context of the content being translated to ensure that the meaning remains accurate and relevant.

Domain Expertise: These systems are trained on large datasets of biomedical and healthcare texts to acquire domain-specific knowledge and terminology. This ensures that the translated content is accurate and aligned with medical standards.

Specialized Glossaries: Some AI-based biomedical translation systems incorporate specialized medical glossaries and terminologies to enhance the accuracy of translation. These glossaries help maintain consistency in terminology across different languages.

Customization: Depending on the system, users might have the ability to customize translation preferences, choosing between formal and informal language, specifying the target audience, or even adjusting the level of technical detail.

Real-Time Translation: Some systems offer real-time translation capabilities, which can be particularly useful in healthcare settings where immediate communication is crucial, such as doctor-patient interactions or remote consultations.

Post-Editing Support: Certain systems provide options for post-editing, allowing users to review and refine the translated content to ensure accuracy and appropriateness.

Multilingual Support: These systems can support translation between multiple languages, catering to the diverse linguistic needs of patients, healthcare professionals, and researchers in a global context.

Integration with Healthcare Systems: AI-based biomedical translation systems can be integrated with electronic health record (EHR) systems, patient portals, research platforms, and medical communication tools, enhancing the accessibility of medical information across languages.

In essence, AI-based systems in biomedical translation harness the power of artificial intelligence and natural language processing to bridge language barriers in the healthcare domain. They contribute to more effective patient care, global collaboration among researchers, and the dissemination of medical knowledge across linguistic boundaries.

Examples of AI-Based Systems in Biomedical Translations

Artificial intelligence-based systems have made substantial contributions to biomedical translations, enhancing communication, research, and healthcare delivery. Teibowei (2023) and Prendes and Cerdán (2020) identified some examples of **AI-Based Systems in Biomedical Translations as:**

Machine Translation Systems: AI-driven machine translation systems, such as Google Translate and Microsoft Translator, can quickly translate medical texts, research papers, and patient records across languages, facilitating global collaboration and dissemination of knowledge.

Language-Specific Medical Databases: AI-powered platforms like PubMed and Embase incorporate natural language processing to index and retrieve medical literature, making it easier for researchers to access relevant articles across different languages.

Clinical Documentation Software: AI-enhanced electronic health record (EHR) systems can automatically translate patient data and medical notes into multiple languages, ensuring accurate communication between healthcare providers and patients who speak different languages.

Language-Adaptable Chatbots: Chatbots equipped with AI and NLP capabilities can provide real-time medical information and support to users in various languages. They offer accessible healthcare advice, schedule appointments, and answer queries across linguistic barriers.

Medical Image Analysis: AI-driven systems like deep learning algorithms can analyze medical images, such as X-rays, MRIs, and histopathology slides, and automatically provide translated diagnostic reports in different languages.

Clinical Trials Recruitment: AI platforms can match eligible participants to clinical trials based on their medical history and preferences, supporting global recruitment by offering translations of trial information.

Patient Education and Information: AI-powered platforms can generate patient education materials and medical information in multiple languages, ensuring that diverse populations receive accurate and culturally sensitive healthcare guidance.

Genomic Data Interpretation: AI-based systems can interpret and annotate complex genomic data, helping researchers and clinicians understand genetic variations and their implications for personalized medicine, regardless of language barriers.

Translation of Research Findings: AI-driven translation tools can convert scientific research findings into layman's terms, enabling easier comprehension and dissemination of important biomedical breakthroughs to the public.

Cross-Linguistic Collaboration: AI tools and platforms can facilitate collaborative research and data sharing among researchers from different linguistic backgrounds by automatically translating communications and documents into the participants' preferred languages.

These examples highlight how AI-powered systems are revolutionizing biomedical translations, making healthcare information and research accessible to a wider audience while enabling efficient cross-cultural collaboration in the field.

Methodology

Descriptive survey design was adopted for this study. Kondo, et al., (2020), referred to descriptive survey design as a design in which a group of people or item is studied by collecting analyzing data from only a few individuals or items considered to be representatives of the entire group. The population of the study comprises of all the three hundred and forty-three professionals in the three medical tertiary institutions in Bayelsa State. In other to ensure greater representation of the sample relative to the population and guarantees that minority constituents are well represented, the proportionate stratified random sampling technique with a sample fraction ratio of 0.02 was used to draw out 299 respondents. The instrument for data collection was a "Awareness and Utilization of Translation ARTIFICIAL INTELLIGENCE-BASED SYSTEMS IN BIOMEDICAL TRANSLATION Scale (AUAIBSTS)" developed by the researcher. It consists of three (3) sections, namely, Section A, B, and C. Section A measured the demographic variables of the respondents, Section B consist of 10-items on the respondents' awareness level. Section C consist of 10-items on extent of utilization. The content and face validity of the instrument was done by two experts in test and measurement. The instrument was trial tested using twenty (20) respondents that did not participate in the research but possess the same characteristics of the population of interest. The reliability co-efficient of 0.82 was obtained using Cronbach Alpha formula which was considered appropriate for this study. The

researcher administered questionnaire to the respondents directly. In all, 100% return rate was achieved. The research question was answered using mean and standard deviation.

Mean values of 2.50 and above were considered high extent or level of awareness, while the values below 2.50 were considered low extent low level of awareness.

Results and Discussion
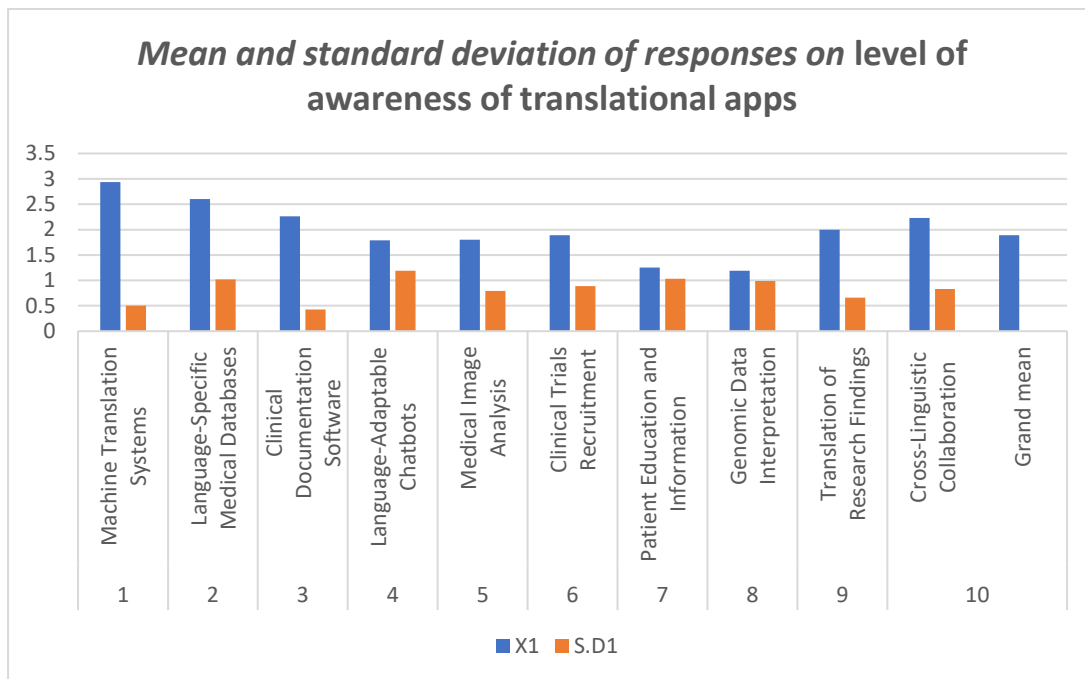
Results

Research Question 1

1. What is the level of awareness of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State?

Table 1: Mean and standard deviation of responses on level of awareness of translational

S/N	ITEMS	X_1	$S.D_1$	REMARK
1	**Machine Translation Systems**	2.94	0.501	A
2	**Language-Specific Medical Databases**	2.60	1.02	A
3	**Clinical Documentation Software**	2.26	0.43	NA
4	**Language-Adaptable Chatbots**	1.79	1.19	NA
5	**Medical Image Analysis**	1.80	0.79	NA
6	**Clinical Trials Recruitment**	1.89	0.89	NA
7	**Patient Education and Information**	1.25	1.03	NA
8	**Genomic Data Interpretation**	1.19	0.99	NA
9	**Translation of Research Findings**	2.00	0.66	NA
10	**Cross-Linguistic Collaboration**	2.23	0.83	NA
	Grand mean	1.89		LE

*Source: Fieldwork (2023). *A=Aware, NA=Not Aware*

Figure 2: Mean and standard deviation of responses on level of awareness of translational

Mean and standard deviation of responses on level of awareness of translational apps

*Source: Fieldwork (2023). *A=Aware, NA=Not Aware*

The table 1 above shows the mean response of respondents on the level of awareness of artificial intelligence-based systems in biomedical translation amongst health professionals in medical tertiary institutions in Bayelsa State. The aggregate of 1.89 show that the level of awareness of artificial intelligence-based systems in biomedical translation amongst professionals in medical tertiary institutions in Bayelsa State is low.

Figure2 above indicate the variation between mean deviation and standard deviation for sector of biomedical translation. While the mead deviation for biomedical machine systems indicates a 3.0 on the mean deviation bar, the language specific medical database indicates a 2.5 marker on the mean deviation bar. However, the reverse is the case for the standard deviation marker for biomedical machine systems of 0.5 and 1.0 for language specific medical database.

Research Question 2

To what extent are the artificial intelligence-based systems in biomedical translation utilized amongst professionals in medical tertiary institutions in Bayelsa State?

Table 2: *Mean and standard deviation of responses on the extent to which* **translational apps utilized**

S/N	ITEMS	X_1	$S.D_1$	REMARK
1	**Machine Translation Systems**	2.66	0.46	HE
2	**Language-Specific Medical Databases**	2.92	0.47	HE
3	**Clinical Documentation Software**	1.50	0.51	HE
4	**Language-Adaptable Chatbots**	1.50	0.49	HE

5	Medical Image Analysis	1.97	0.47	HE
6	Clinical Trials Recruitment	1.31	0.48	LE
7	Patient Education and Information	1.39	0.48	HE
8	Genomic Data Interpretation	1.66	0.46	HE
9	Translation of Research Findings	1.92	0.47	HE
10	Cross-Linguistic Collaboration	1.63	0.49	HE
	Grand mean	1.95		LE

*Source: Fieldwork (2022) *LE=Low Extent, HE=High Extent*

Figure 3: *Mean and standard deviation of responses on the extent to which* **translational apps utilized**
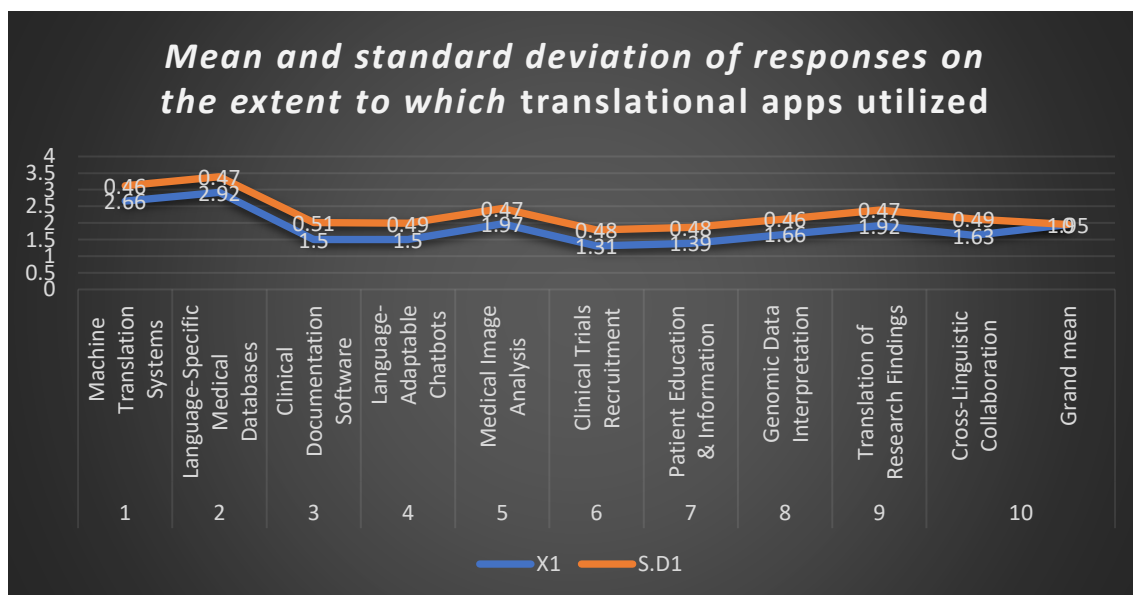
*Source: Fieldwork (2022) *LE=Low Extent, HE=High Extent*

The table above shows the mean response of respondents on the extent of utilization of artificial intelligence-based systems in biomedical translation amongst professionals in medical tertiary institutions in Bayelsa State. The aggregate of 1.95 show that the extent of utilization of artificial intelligence-based systems in biomedical translation amongst professionals in medical tertiary institutions in Bayelsa State is low.

Figure 2 above indicate the variation between mean deviation and standard deviation for sector of biomedical translation. While the mead deviation for biomedical machine systems indicates a 2.66 on the mean deviation bar, the language specific medical database indicates a 2.92 marker on the mean deviation bar. However, the standard deviation for the biomedical machine systems and language specific medical database are similar. The standard deviation marker for biomedical machine systems of 0.46 and 0.47 for language specific medical database.

Discussion of Findings

The results in research question 1 revealed that the level of awareness of artificial intelligence-based systems in biomedical translation amongst professionals in medical tertiary institutions in Bayelsa State. The results in research question 2 revealed that the extent of utilization of artificial intelligence-based systems in biomedical translation amongst professionals in medical tertiary institutions in Bayelsa State. These findings are consistent with that of Teibowei (2023) and Siregar (2021) who reported that the use of artificial intelligence induced system is relatively low amongst medical practitioners. Also, Charles-Owaba (2020) and Larkin & Milford (2018) reported that there is a general challenge amongst educators in Bayelsa state on the use of modern technologies for enhanced service delivery.

Conclusion and Recommendations

The awareness and utilization of AI-based systems in biomedical translations within Nigeria demonstrate a dynamic landscape with both opportunities and challenges. As healthcare communication continues to evolve, collaboration between AI-driven tools and human expertise becomes crucial. The findings emphasize the need for targeted training programs, continuous quality assessment, and an understanding of the unique linguistic and cultural context of Nigeria. By harnessing the potential of AI-based systems while addressing challenges, the future of biomedical translations in Nigeria holds the promise of improved patient care, effective communication, and enhanced healthcare outcomes.

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