



A Scoping Review to Explore Monkeypox Investigation Research in Bangladesh

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Abstract

This scoping review conducted a thorough search of electronic databases and original articles to compile the results of researches on monkeypox investigation in Bangladesh in terms of knowledge, attitudes, and practices; epidemiology; and prevention and treatment. The final analysis included 12 studies that satisfied the inclusion criteria. The PRISMA 2020 guidelines served as the basis for data extraction. All included articles were retrieved from PubMed, BanglajOL, Google Scholar, Embase, Web Sciences, Cochrane Library and other databases up to October, 2024. The present study found a good knowledge of monkeypox in the Bangladeshi nurses and a moderate in the university students, respectively. Besides, a positive attitude towards monkeypox was identified in nurses, students and general public. Doctors were more optimistic about the prevention of this outbreak. A high level of vaccine perception in the Bangladeshi adult male population was also observed. Vaccine and antiviral development are the central to the ongoing research efforts aimed at combating monkeypox. Bangladeshi researchers identified specific B and T cell epitopes on the monkeypox virus's surface proteins that may serve as potential targets for vaccine formulation. Understanding public perception and intention regarding vaccination is crucial for the success of vaccination campaigns. It is essential to highlight the significance of improved surveillance, healthcare worker safety, and public health initiatives in order to reduce the hazards. Therefore, it is urgent to undertake several preventive measures to reduce the mpox infection. [*Bangladesh Journal of Infectious Diseases, December 2024;11(2):196-204*]

Keywords: Monkeypox; knowledge and attitude; epidemiology; prevention and treatment; Bangladesh

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Introduction

Human monkeypox (HMPX) is a zoonotic infection caused by the monkeypox virus (MPXV), a member

of the genus Orthopoxvirus, which exhibits symptoms and signs similar to smallpox. Africa's Central and Western regions are home to the majority of it¹. Comparable to smallpox include the

timing of rash appearance, distribution, and commencement of disease^{1,2}. Numerous outbreaks and isolated cases of HMPX have been reported in Central and Western African countries since the first case was reported in the Democratic Republic of the Congo in 1970³. In 2003, the United States of America reported the first instances of human monkeypox outside of Africa. From a public health perspective, HMPX is now considered the most relevant orthopoxvirus due to the sharp rise in cases over the last 20 years^{1,3}.

Monkeypox can spread from human to person or from animal to animal. Nosocomial and congenital transmission are also possible⁴. Direct contact with infectious rashes, scabs, or sore fluid can also spread the monkeypox virus. There have been reports of transmission through saliva and respiratory secretions during extended intimate physical contact, including intercourse¹. People who care for diseased animals, live in a forested area, or are around affected people during the infectious period (21 days) are more likely to contract the disease.

Pregnant women, children, and immunocompromised patients, including those with HIV, are more vulnerable to MPXV infection⁴. Bangladesh has not yet been exposed to situations where monkeypox could cause harm. Nonetheless, the nation is experiencing stress and worry due to the illness. Because it examines people's norms and behavioral concerns around the spread of infection, an understanding of monkeypox knowledge, attitudes, and practices (KAP) is essential in societal situations. People's ideas, worries, and beliefs about a condition can be effectively explored using this non-therapeutic approach⁵⁻⁶.

Previous research on monkeypox revealed a lack of understanding among doctors, healthcare professionals, students, and the general public⁷⁻¹⁰. One of the factors that made it difficult to prevent the disease from reoccurring was a lack of awareness about monkeypox, particularly among healthcare professionals⁵. One of the most important aspects of the surveillance system is improving the capacity of medical personnel to detect cases and enhance patient care. To stop the spread of monkeypox, medical practitioners, particularly physicians, should be aware of its clinical symptoms so they may quickly identify, record, and treat new cases^{5,6}.

In severe cases of monkeypox, supportive treatment, along with the management of systemic consequences and subsequent bacterial infections,

remains the cornerstone, whereas minor cases are treated with symptomatic measures¹¹. As of right now, no antiviral treatment has proven successful against monkeypox in human clinical studies¹². Since the virus is new to our healthcare system, it is important to be aware of the antiviral medications that are accessible¹³. Additionally, in order to stop the outbreak, it is crucial to comprehend monkeypox. Thus, the purpose of this study was to compile data from research projects carried out in Bangladesh. In the future, it will aid in the management and treatment of monkeypox.

Methodology

We used the five-step methodological methodology recommended by Arksey and O'Malley to carry out this scoping review¹⁴.

Research Question Identification: The quality of a scoping review is reflected in a well-written research question. Therefore, the first step in initiating a scoping review is to formulate a meaningful, unambiguous, and explicit inquiry. The goal of the current study was to compile the main conclusions from past research on monkeypox conducted in Bangladesh. In order to investigate the existing literature in Bangladesh, we came up with the following research questions: What information is available on the study of monkeypox from the full corpus of literature that has been done in Bangladesh?

Relevant Studies Determination: Research pertaining to the examination of monkeypox in Bangladesh before to October 2024 was obtained from several web databases. PubMed, BanglaJOL, Google Scholar, Embase, Web Sciences, and the Cochrane Library were searched for English-language publications that satisfied specific criteria. We gathered information by conducting searches for "monkeypox/ Mpox/outbreak/ endemic/ epidemic/ prevalence," "knowledge, attitude and practices towards monkey pox," "epidemiology of monkeypox," "risk factors," "treatment and management," "clinical sign and symptoms," and so on. Only information from studies carried out in Bangladesh was gathered. In order to identify any pertinent missing articles, we looked through the references of the chosen articles and reviews that were written about this topic.

Study Selection: Several criteria were used in order to collect data from the selected papers. A few publications that didn't meet the predetermined criteria were eliminated from the study. The studies

included in the current scoping review satisfied the following eligibility requirements: This study only covered original research and online databases; studies carried out in Bangladesh were considered for inclusion; and one of our primary inclusion criteria was the use of English. However, research involving animal samples, narrative reviews, comments, editorials, papers with insufficient information or unrelated to the topic addressed, and studies carried out outside of Bangladesh were not included in this scoping review.

Data Extraction: In order to enter the collected data and objectively extract relevant information, each author constructed an MS Excel file. Any anomalies discovered during data collection were eliminated following a collective discussion among the authors. Basic details about the included studies, such as the author's name, the population of Bangladesh, the year of publication, the sample size, the participants' ages, the study type, the study design, the setting, and the study location, were included in the pre-made Excel spreadsheet. The purpose and findings of the selected research, along with the eligibility requirements for the current investigation, were considered during the data extraction procedure.

Interpretation and Reporting Results: A scoping review's objective is to provide a more thorough and comprehensive overview of the research conducted on a particular topic. We employed a thematic synthesis approach to describe the research landscape and give a summary of the monkeypox screening research conducted in Bangladesh.

Results

Literature Review of Selected Studies: When screening the papers that were part of the current investigation, we adhered to the PRISMA standards (Figure I). We found about 81 papers in several online databases, including the Cochrane Library, Google Scholar, EMBASE, PubMed, and others. After the duplicate articles were removed, over 45 studies were collected. About 31 abstracts and titles were carefully examined to identify the targeted papers following the elimination procedure.

About 19 studies were then examined to determine the anticipated results. In order to extract the main findings and objectives of the included investigations, only 11 papers were included in this analysis¹⁵⁻²⁵. For the analysis of the epidemiology, prevention and treatment, and knowledge, attitude,

and practices (KAP) related to monkeypox infection in the Bangladeshi population, approximately 5, 1, and 5 papers were chosen, respectively. The remaining studies were not included in the current scoping review since they did not satisfy the anticipated data collection requirements.

Themes Derived from The Chosen Studies: We thematically categorized the material based on our scoping review's study purpose. We used the findings of our scoping review to categorize the data because we lacked any predefined themes. In order to help readers, grasp the extent of the work that has been done and what more needs to be done in the future, we tried to identify any gaps in the literature and inform the readers about those studies. We found that research studies on monkey pox in Bangladesh could be divided into three main categories: (1) Epidemiology (2) Knowledge, attitude, and practice (3) Prevention and treatment

Theme1: Knowledge, attitudes, and practices of monkey pox screening in Bangladesh

After conducting a thorough review, we identified five studies that evaluated various aspects of monkeypox screening knowledge, attitudes, and practices of the Bangladeshi population¹⁵⁻¹⁹. These studies' main objective was to evaluate Bangladeshis' attitudes, practices, knowledge, and awareness to monkey pox. The goals and key findings of the chosen studies are summarised in Table 1.

This theme examines the level of understanding and perceptions of monkeypox among general public and medical professionals in Bangladesh. Sources revealed that while there was a generally positive attitude toward preventive measures, there's a need for more knowledge and awareness in the mass people of Bangladesh. Among medical professionals, the present study recorded a relatively lower level of knowledge of human monkeypox than attitudes toward its prevention.

Despite their glaring ignorance, doctors were more optimistic about preventing. However, a research on nurses showed a good level of knowledge and a highly positive attitude towards monkeypox. Besides, Bangladeshi university students also had a moderate knowledge, attitude and practices toward the monkeypox. Although there was a moderate degree of vaccination intention, there was a high level of vaccine perception in the Bangladeshi adult male population.

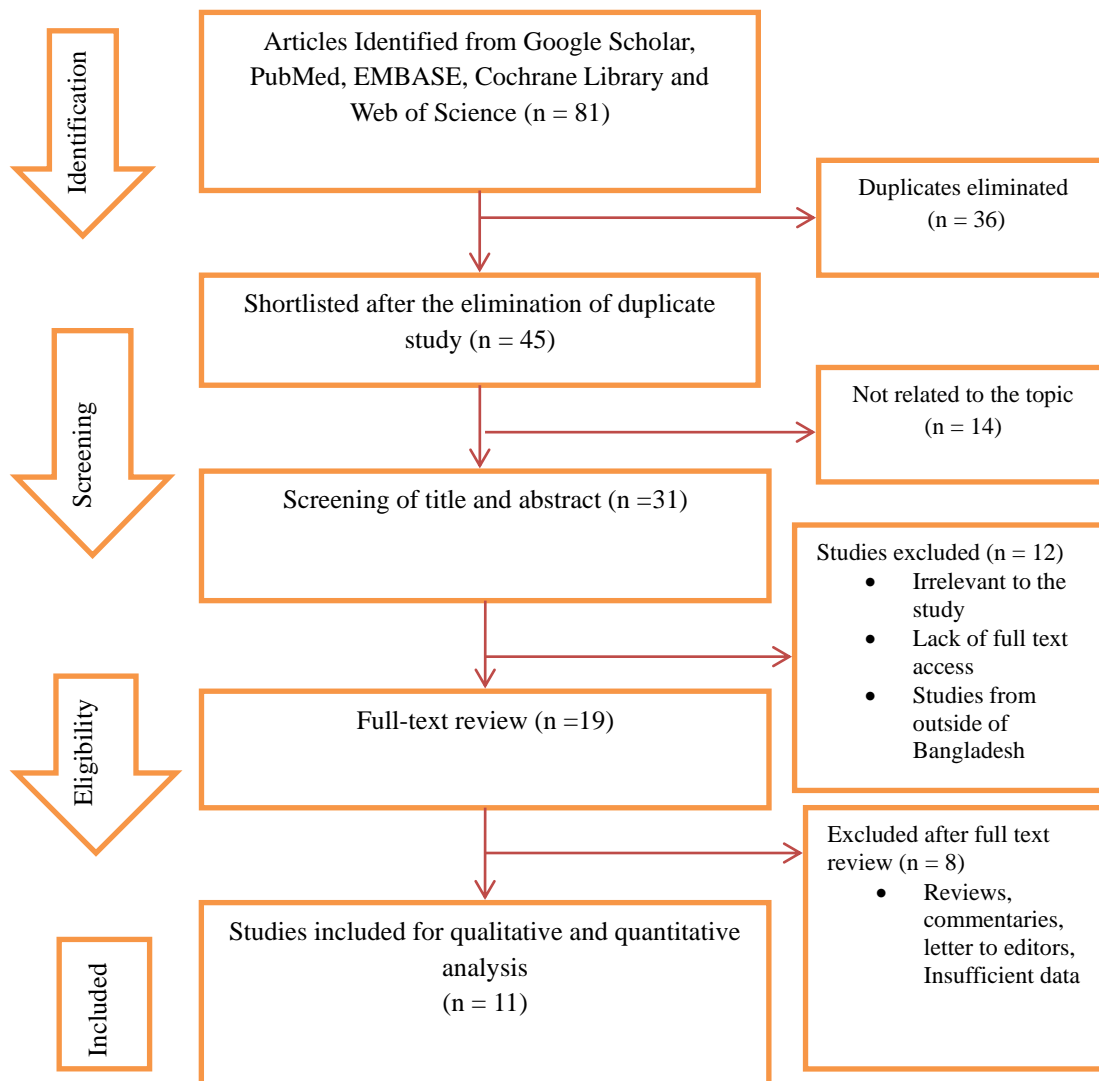


Figure I: Flow Diagram of The Study Selection

Table 1: Studies Exploring Knowledge, Attitudes, and Practices Toward Monkey Pox

Author Name	Aim of the Study	Major Finding
Hasan et al ¹⁵	To assess the preparedness of Bangladeshi medical doctors by assessing their knowledge and attitude regarding monkey pox.	Medical professionals in Bangladesh had a relatively lower level of knowledge of human monkey pox than attitudes toward its prevention. Despite their glaring ignorance, doctors were more optimistic about preventing monkey pox.
Imran et al ¹⁶	To assess the existing knowledge about monkey pox among health professionals in Bangladesh	Out of the 223 responses, only 53% were well-versed in monkey pox. Out of the responders, 47% had poor knowledge.
Islam et al ¹⁷	To explore the knowledge, attitudes, and practices (KAP) concerning monkey pox among university students in Bangladesh.	Of the pupils, 74.9% had a positive attitude regarding the risks connected with monkey pox, and 63.6% had quite excellent knowledge ratings. When it came to monkey pox, 51.8% of students scored highly on practice.

Author Name	Aim of the Study	Major Finding
Rony et al ¹⁸	To investigate the knowledge and attitudes (KAs) of Bangladeshi nurses regarding monkey pox infectious disease.	The study found that 57.97% of nurses had good knowledge, while 93.12% exhibited a positive attitude towards monkey pox, highlighting the need for further training
Islam et al ¹⁹	To evaluate the Mpox vaccine perception and vaccination intention of the Bangladeshi adult male population.	The participants' opinion and intention to acquire the Mpox vaccine were significantly correlated with their sociodemographic factors. Although there was a moderate degree of vaccination intention, there was a high level of vaccine perception.

Table 2: Study Exploring Epidemiology of Monkey Pox

Author name	Aim of the study	Major finding
Islam et al ²⁰	To provide the epidemiology, virology, clinical features, pathogenesis, and treatment of MPX	Increased human-to-human transmission is a defining feature of the 2022 MPX outbreak, which emphasises the need for thorough surveillance, quick diagnosis, and the creation of novel therapeutic and preventive measures. Safe sex behaviours should be given priority in public health interventions, and people should be made more aware of MPX transmission.

Theme 2: Epidemiological Analysis of Monkey Pox from the Bangladeshi Studies

This theme (Table 2) focused on the comprehensive examination of monkeypox (MPX) through an epidemiological lens, addressing its historical context, transmission dynamics, and the factors contributing to its resurgence, particularly in non-endemic regions. It highlighted the critical need for enhanced surveillance, rapid diagnostic capabilities, and public health interventions to mitigate the spread of the virus. The theme underscored the importance of understanding the interplay between human behaviour, viral evolution, and public health policies in shaping the epidemiology of monkeypox. By analysing these elements, the theme aimed to inform effective strategies for prevention, control, and response to monkeypox outbreaks globally.

This theme delved into the various factors that contribute to the transmission and resurgence of monkeypox, particularly in non-endemic regions. It aimed to analyse the patterns of human-to-human transmission observed during recent outbreaks,

emphasizing the role of close contact and specific behaviours, such as safe sex practices. It is essential to highlight the significance of improved surveillance, healthcare worker safety, and public health initiatives in order to reduce the hazards.

Theme 3: Prevention and treatment

The emergence of monkeypox as a public health concern has prompted a surge of research aimed at developing innovative strategies for its prevention and treatment. This theme (Table 3) encapsulates a comprehensive approach that integrates vaccine development, antiviral drug discovery, viral protein characterization, and public perception analysis. Vaccine and antiviral development are the central to the ongoing research efforts aimed at combating monkeypox. This study investigated the research conducted in Bangladesh for creating effective immunological and pharmacological interventions to prevent and treat the disease. The integration of various scientific disciplines and methodologies is crucial for developing comprehensive strategies that can address the complexities of monkey pox.

Table 3: Studies Related to The Prevention and Treatment of Monkey Pox

Author name	Aim of the study	Major finding
Mazumder et al ²¹	To identify the B and T cell epitopes on the cell surface binding protein of the Monkey pox virus and design an epitope-based peptide vaccine.	The monkey pox virus's cell surface binding protein has 30 B cell and 19 T cell epitopes; the epitope "ILFLMSQRY" is one that could be used as a target for a peptide vaccine.
Akash et al ²²	To investigate effective and potent antiviral medications for Monkey pox by adding functional groups to the side chain of pinocembrin.	The research discovered that pinocembrin replaced with various functional groups had great binding affinity against the monkey pox, as well as a high pass prediction score for antiviral efficacy.
Hosen et al ²³	To characterize the structure and function of a hypothetical protein (accession no. URK21192.1, PDB ID 6zyc.1) of the Monkeypox virus.	It is proposed that the putative protein with the Chordopox-A20R domain is essential for both host-pathogen interactions and viral replication, and that it could be a target for future therapeutic development.
Bhattachajee et al ²⁴	To identify potential drug repurposable small molecules against monkey pox disease using a proteome-based investigation.	According to the study, zidovudine, an antiretroviral, and fludarabine, an antitubercular, may be used again to treat monkey pox.
Miah et al ²⁵	To identify novel drug candidates against the A36R protein of MPXV using peptide and small molecule databases.	The MPXV A36R protein's active site residues have a robust interaction with the peptide compounds SATPdb10193, SATPdb21850, and SATPdb26811. Z55287118, Z18483535, and Z97653013 are examples of small molecule compounds that exhibit strong affinity for the A36R protein's active regions.

Bangladeshi researchers identified specific B and T cell epitopes on the monkeypox virus's surface proteins. This process involves mapping the immune response to these epitopes, which can lead to the design of peptide-based vaccines that effectively stimulate the immune system. The goal was to create vaccines that can elicit a robust immune response, providing long-lasting protection against monkeypox. The identified epitopes serve as potential targets for vaccine formulation, aiming to enhance both humoral and cellular immunity. Modification of existing compounds: research is focused on modifying compounds like pinocembrin to enhance their antiviral properties. By adding functional groups to the molecular structure, scientists aimed to improve binding affinity and efficacy against monkeypox. The study also explored the potential of repurposing established antiviral drugs, such as zidovudine and fludarabine. This approach allowed for quicker deployment of treatments, leveraging existing safety data and

mechanisms of action. Characterizing the structure and function of viral proteins is essential for identifying therapeutic targets. By studying proteins involved in viral replication and host interactions, researchers can develop strategies to inhibit these processes, potentially leading to effective antiviral therapies. Understanding public perception and intention regarding vaccination is crucial for the success of vaccination campaigns. The present study also identified the research in this area that examined how sociodemographic factors influence attitudes toward the Mpox vaccine, providing insights that can inform public health strategies and communication efforts.

Discussion

A comprehensive analysis of several aspects of monkeypox screening, epidemiology, prevention, and treatment has been prompted by the disease's rise to public health concern in Bangladesh. A

complicated environment with disparate knowledge, attitudes, and practices among various population segments—such as the general public, medical professionals, and university students—was shown by the investigations. Our study's results showed that Bangladeshi doctors knew very little about monkeypox and were more hopeful about prevention. Nonetheless, nurses and college students had a very positive attitude toward monkeypox and a good and moderate degree of understanding, respectively. The adult male population in Bangladesh had a high level of vaccine perception despite a moderate level of vaccination intention. According to a study done in the US state of Ohio, clinicians had similar knowledge of monkeypox, but they had differing opinions regarding the threat posed by monkeypox and its final management²⁶.

Nearly half of Chinese medical students were well-informed about and had a favorable attitude toward monkeypox²⁷. Most Pakistani university students had mediocre general knowledge of monkeypox, with significant gaps in most areas of understanding. In a same vein, the majority of respondents had neutral opinions on monkeypox generally, whereas the fewest had unfavorable opinions²⁸. Similar results were also found in a global meta-analysis by Jahromi et al. among clinical health workers²⁹. Consequently, there should be a greater understanding of monkeypox and a greater emphasis on the significance of taking preventative action³⁰. This group is especially significant since they will make up the healthcare workforce of the future and have the power to change public attitudes and behavior.

The epidemiological study of monkeypox in Bangladesh identifies a number of important causes for the disease's recurrence, particularly in areas where it is not endemic. Significant factors contributing to the increasing occurrence of monkey pox include changes in human behavior, increased worldwide travel, and the end of smallpox vaccine campaigns. The current study showed how crucial intimate contact and particular behaviors—like safe sex practices—are in promoting the spread of monkeypox from person to person. Several earlier researches carried out outside of Bangladesh documented similar findings regarding the prevalence of monkeypox³¹⁻³⁴. Therefore, early detection and outbreak response depend on improved surveillance and quick diagnostic capabilities.

One proactive strategy to combat monkeypox is the continuous research into vaccine development and

antiviral therapies. One possible approach to developing potent vaccinations is the discovery of particular B and T cell epitopes on the monkey pox virus. This study looked into research being done in Bangladesh to develop efficient pharmacological and immunological treatments to prevent and cure the illness. Researchers from Bangladesh discovered particular B and T cell epitopes on the surface proteins of the monkeypox virus. Furthermore, the investigation of altering current antiviral substances and repurposing well-known medications shows a dedication to identifying workable therapy alternatives. In order to guarantee precise monkeypox targeting and effective transmission to the infection site, a different study also recommended that medications ought to be specific and efficient in their administration. Furthermore, investigating the creation of sequential and combination medication treatments need to improve efficacy against various monkeypox infection phases and their variations³⁵.

Previous smallpox vaccination may ameliorate clinical signs of infection and provide protection against monkeypox virus^{36, 37}. The majority of monkeypox patients heal without medical intervention. To reduce gastrointestinal fluid losses, patients experiencing gastrointestinal symptoms (such as vomiting or diarrhea) will need oral or intravenous rehydration³⁸. Furthermore, even without a specialized treatment, many people experience a moderate, self-limiting course of the disease; nonetheless, the prognosis for monkeypox can vary depending on a number of factors, including prior immunization history, baseline health, and coexisting conditions or comorbidities.

Therefore, the most sensible approach seems to be to create customized treatments according to each person's risk of experiencing a serious illness³⁹. Rapid advancements in the creation of potent anti-monkeypox medications will aid in preparing for upcoming difficulties and offer more dependable public health protection⁴⁰. For vaccination efforts to be successful, it is essential to comprehend how the general population feels about vaccinations. According to the studies, sociodemographic variables have an impact on these views, indicating the need for specialized communication techniques to dispel myths and worries.

To the best of our knowledge, this is the first comprehensive analysis of the scientific literature on the examination of monkey pox carried out in Bangladesh. It should be mentioned that despite its thoroughness, this review has some limitations. A limitation that may have resulted in the omission of

some relevant studies is the exclusion of papers published in local journals that are not indexed and in languages other than English. Additionally, this scoping review did not do a quality assessment of the included studies, which could have impacted the reliability of the results.

Conclusion

The findings of this scoping study indicate that university students and Bangladeshi nurses had moderate and good awareness of monkeypox, respectively. Additionally, nurses, students, and the general public were shown to have good attitudes regarding monkey pox. Doctors were more hopeful that this pandemic might be avoided. Researchers from Bangladesh discovered particular B and T cell epitopes on the surface proteins of the monkeypox virus that could be used as targets for the creation of a vaccine. Understanding public perception and intention regarding vaccination is crucial for the success of vaccination campaigns.

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None

Conflict of Interest

The author has no relevant conflicts of interest to declare. The corresponding author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported and that no important aspects have been omitted.

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Contribution to authors

MSH contributed to the conceptualization and designed of the study. AH and SYT contributed to extract data from the included studies. MSH design methodology. AH and SYT contributed to write the original draft. MSH validated and supervised the study, edited the manuscript and verified the data. All authors critically reviewed and approved the final manuscript.

Data Availability

Not applicable

Ethics Approval and Consent to Participate

Not applicable

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