

The Rising Implementation of Digital Health Platforms and Its Associated Inequities Among Patients with Mental Disorders: A Literature Review

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Abstract

Introduction: Online health networks are a recent phenomenon and relevant research exploring the consequences of inequities marginalized groups may face in the context of digital health platforms is lacking. This paper aimed to address this gap by providing an introduction to the inequities that may be perpetuated through the increased use of digital health platforms with a focus on mental health disorders. Health inequities are important to study considering the rapid implementation of telemedicine and how they may potentially affect the usage and comprehension of digital platforms.

Methods: PubMed was searched for articles examining health inequities in patients with mental health disorders. Our results yielded a total of 232 papers. Of these, twelve were included in the analysis.

Results: Four major inequities were identified when assessing telemedicine in the mental health disorder populations: digital and medical literacy, age, socioeconomic factors and geographical location. Digital and medical literacy and age were reported to be perpetuated with the implementation of telemedicine. In contrast, socioeconomic difficulties and geographical location, rurality in particular, were in part resolved by the implementation of telemedicine.

Discussion: The review shows that patients with mental health disorders experience the perpetuation or resolution of four major inequities through the use of telemedicine; digital/medical literacy, older age, socioeconomic factors and geographical location. Based on the literature, one may suggest modifications to user interfaces, increased digital support and income support, decreased cost to access and improved cellular coverage. As technological usage relating to access to medical services is ever-increasing, there is a pressing need for further investigation into the consequences and inequities that may be perpetuated or introduced.

Conclusion: Future studies should look into other inequities and continue to explore potential solutions to reduce problems uncovered. Our research helps elucidate the potential paths that should be further explored and considered when implementing digital health platforms in order to efficiently and equitably help patients with mental health disorders.

Keywords: inequities; eHealth; digital health; telemedicine; mental health; mental disorder

Introduction

Good health is necessary to live a satisfactory quality of life in the absence of pain and disease [1]. However, inequities may impede people from accessing necessary healthcare. Health inequities can be described as the differentiation between the distribution of health-related resources or health status relating to people of various populations stemming from social conditions concerning a patient's birthplace, current city of residence, employment situation and age [2].

In a study conducted across 22 European countries [13], researchers found lower socioeconomic status to be correlated with higher death rates, exemplifying the importance of studying inequities within healthcare systems. Over the years, researchers have addressed numerous inequities in healthcare, such as patient exposure

to higher education and health literacy [4,5]. In a study addressing health inequities [6], findings demonstrated that interventions helping combat specific inequities positively impact a patient's health & spending on health-related necessities. Such research demonstrates that inequities can negatively impact patient health and reinforces a need for further investigation of these inequities in the context of digital health.

In an increasingly technological world, the rapid implementation of telemedicine, defined as medical services provided and accessed through digital healthcare platforms, may contribute to the introduction or perpetuation of various inequities [7]. Research has shown that digital health platforms can be beneficial to individuals as they can lower healthcare-related costs, improve efficiency and reduce medical errors [8]. However, the

perpetuation of inequities remains a cause for concern. Inequities in healthcare may be further developed by the implementation of new technology and are often overlooked in spite of their high prevalence rate among society [9].

In particular, patients with mental health disorders may be in more vulnerable positions when consulting professionals through digital health platforms as particular difficulties in administering necessary treatments requiring physical or manual adjustments may arise. A reduced quality of life and obstacles caused by disease have been reported by patients suffering from mental disorders [10]. Such patients may face other difficulties regarding education, social circumstances, abuse, discrimination, and many others [10]. With telemedicine being a more recent advancement in the distribution of medical attention, some of these difficulties may be enhanced by the new interfaces and require more effort and learning to master. Mental health disorder patients may be further challenged by eHealth platforms in ways we have yet to discover and can be a population overlooked even though representing a significant part of the population. A mental health disorder is defined as a syndrome affecting the psychological, biological, or developmental mechanisms underlying mental functioning and is characterized by clinically significant disruption in the memory, emotion control, or actions of a person [11]. In 2008-2009, approximately 14% of the Canadian population, or nearly five million people, were using health services for mental illness and many paid out of pocket for private practitioners [12]. Previous research suggests telemedicine can be an efficacious and modern solution to issues and difficulties faced by different disadvantaged populations [13].

As the implementation of telemedicine is a relatively new phenomenon, information surrounding the inequities patients with mental disorders may face when using these digital platforms is lacking. The purpose of this study is to assess the relevant inequities being perpetuated through the use of telemedicine amongst mental health disorder patients. This paper explored literature to answer the following questions: (1) What inequities do patients with mental health disorders experience in the context of using telemedicine? (2) What changes are recommended in the literature to decrease the identified inequities?

We hypothesized that populations suffering from mental health disorders will experience greater difficulties with digital literacy, older age and lower socioeconomic in relation to telemedicine. We hypothesized that telemedicine would improve the access to mental healthcare for those living in remote regions. Furthermore, we hypothesized that previous research would suggest increased support for mental health disorder patients to facilitate the use of digital

healthcare platforms. Due to the recency of digital healthcare platforms, our research will look at both clinical and non-clinical patients to account for a more inclusive overview of this topic. This research will help provide guidance and educational reflection when introducing telemedicine to patients suffering from mental health disorders.

Methods

The literature search for this review focused on papers reporting information on the perpetuation of inequities through digital health platforms in populations with mental health disorders. Research papers were found using the following search terms in the PubMed database; (Inequities) AND (eHealth OR digital health OR telemedicine) AND ((mental health) OR (mental disorder)). Only published and peer-reviewed papers were considered during the screening. Research design and ethics were considered when reviewing papers to ensure a thorough critical evaluation of the quality of the papers, as were sample size and control of confounding variables. Text and Opinion papers were the only ones we accepted without a given sample size to allow for a wider view of the potential benefits/difficulties regarding telemedicine for patients with mental health issues. Research published prior to 2010 was not considered as this paper aims to focus on recent advances in telemedicine which is a relatively new field. Our research was also limited to papers published in English. Due to the recency of the topic and the limited amount of relevant research, we decided to include studies contrasting both non-clinical and clinical patients.

Our search uncovered 232 papers. In order to decrease potential bias, each abstract was screened by two independent reviewers. During each screening, the reviewers evaluated each paper separately. Each paper was evaluated based on the inclusion of the key search terms, the population, the ethics, research design and outcomes of the research, making sure that each paper focused on our research topic. Upon completing individual screening, the reviewers came together to evaluate and come to a final decision on any conflicts. In the first screening, 199 papers were excluded as their content did not address all of digital health, mental disorders and inequities in their text. During the second screening, the entirety of the paper was read and further considered for eligibility. After the screening process, twelve papers met the inclusion criteria. The search was conducted over a period of one month (September to October 2020). Information was organized in a data extraction table. Key themes and patterns were noted, and main inequities were extracted from each paper. Our results were then arranged by inequity in order to compare the information found in all the papers.

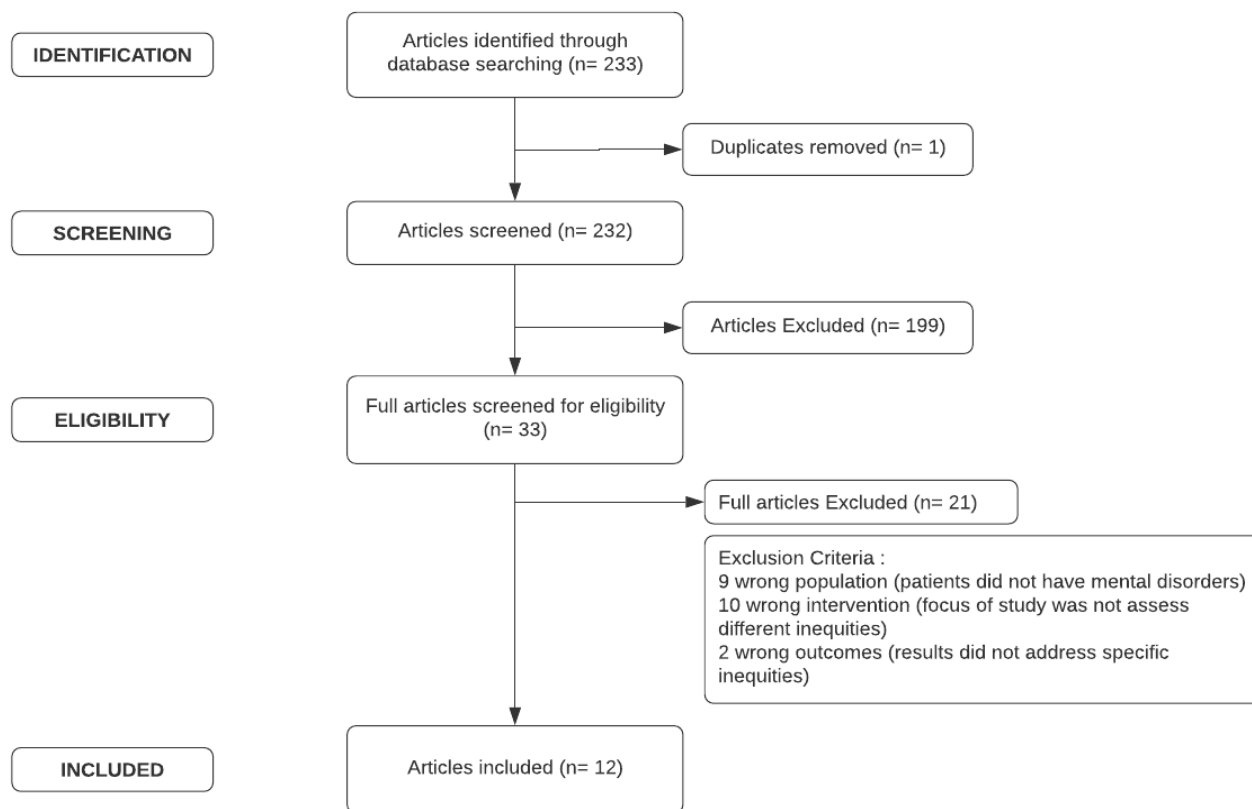


Figure 1. Consort Diagram.

Results

We identified twelve studies and reviews concerning inequities perpetuated through digital health platforms in the mental health disorder population. Throughout the papers, we identified several recurring inequities. Of the

twelve included papers, five addressed digital and medical literacy, six addressed age, six addressed socioeconomic factors, six addressed geographical location and two addressed other factors.

Table 1. Description of Studies

Study	Country	Population	Design Method	Inequities	Main Findings	Statistical Methods
Athanasopoulou et al., 2016	Greece & Finland	Adults with schizophrenia spectrum disorders from two distant European regions: Finland (FI) and Greece (GR) (N=229)	Survey/Questionnaire (Cross-Sectional)	Digital/Medical Literacy, Geographical location	The country where a patient is from can be a significant predictor of eHealth literacy. Frequent internet use is associated with higher eHealth literacy skills.	Evaluation of frequencies and group comparisons with multiple linear and logistic regression models
Chen & Zhu, 2016	China	Permanent residents and migrants aged 18 or older residing in the urban centre using mental health platforms (N=2446)	Survey/Questionnaire (Cross Sectional) & Interview	Age, Socioeconomic factors, Other - Migration	Younger age and higher socioeconomic status are significant predictors of good internet use and access for mental health purposes. eHealth can be a good low-cost platform and can be	Multinomial logistic regressions

Study	Country	Population	Design Method	Inequities	Main Findings	Statistical Methods
					more easily obtainable.	
Ennis et al., 2012	UK	Non-psychosis community mental health and EI patients (N=121)	Cross-Sectional Survey	Age, Socioeconomic factors, Geographical location	Older psychosis patients have a general desire to increase their skill in technology. Those who show less interest in engaging are mostly “self-excluders”. However, the cost and/or lack of skills - not indifference - are the reasons why the older population is not engaging with computers.	Logistic regression
Farooq et al., 2015	Australia	Patients with mental disorders (N/A)	Text & Opinion	Age, Digital/Medical Literacy	Digital inclusion requires training for digital literacy skills. Interventions and improvements should focus on the individual, institutional and professional levels. User interfaces should be adapted for those that may be older, have learning difficulties and/ or cognitive impairments.	N/A
Greer et al., 2019	UK	Mental health service users, specifically patients suffering from mental disorders (N=20)	Interview	Geographical location, Socioeconomic factors, Age, Digital/Medical Literacy, Other - General difficulties in mental health	Three main reasons for continued digital exclusion were reported: lack of knowledge, inability to access the internet and/or its required resources and barriers due to general difficulties associated with mental health.	Thematic Analysis
Jain et al., 2015	India	eHealth services users, specifically patients with severe mental illnesses (N=201)	Survey/Questionnaire (Cross-Sectional)	Socioeconomic factors, Geographical location	Lower and middle-income countries have mobile phone access which helps facilitate access to help in mental health for those in rural areas. However, substantial monetary requirements can create barriers for those in need.	Frequency distributions
Naslund et al., 2017	US	Patients with serious mental disorders such as depression and substance abuse patients (N=33,176)	Narrative Review of Literature	Socioeconomic factors	Technology used for mental health care delivery in low-income and middle-income countries serves as a cost-effective and promising solution.	N/A

Study	Country	Population	Design Method	Inequities	Main Findings	Statistical Methods
Robotham et al., 2016	UK	Patients with mental disorders (variety) (N=241)	Survey/Questionnaire (Cross-Sectional)	Age, Digital/Medical Literacy	Though digital exclusion may be decreasing, some individuals still remain excluded. Facilitating inclusion among patients with mental disorders includes helping them develop skills that may help give them confidence in using technology. This is particularly relevant for older populations of people suffering from mental illness.	Regression analysis
Rojas et al., 2019	Chile	Patients with mental disorders in developing countries (N=5,989)	Narrative Review of Literature	Geographical Location	eHealth for mental health problems can be a reasonable way of helping populations in developing countries where access to mental health resources can be difficult. Research on internet-based interventions is lacking as it is in an early stage of development.	N/A
Seifert et al., 2019	Switzerland & Germany	Older adults with mental disorders (N/A)	Text & Opinion	Age	eHealth platforms for older adults with mental disorders can be beneficial yet challenging due to lack of skills in technology and limited access to resources.	N/A
Sood et al., 2016	Low/middle-income countries	Resident of low-income countries with mental health problems (N/A)	Text & Opinion	Socioeconomic factors, Geographical location	eHealth is beneficial as it improves accessibility for hard-to-reach services however, requires significant financial outputs. Affordable, efficient and convenient platforms may help raise awareness about mental illness.	N/A
Stone & Waldron, 2019	Australia	Research done keeping mental healthcare users as a reference for literacy levels (N/A)	N/A	Digital/Medical Literacy	Availability does not mean accessibility. Individuals with mental disorders may have cognitive difficulties that impede them from having the literacy level needed to understand medical platforms.	N/A

Digital and Medical Literacy

Five studies addressed the topic of digital and medical literacy. Three of these five studies [14-16] identified digital exclusion in their results. Greer et al. [14] conducted interviews with twenty mental health service users and reported that 85% of the users said a lack of knowledge prevented them from comfortably using the internet. Fifty percent of patients reported a fear of technology. Similarly, Robotham et al. [15] reported that over 40% of patients coping with psychosis found a lack of digital knowledge to be a major barrier to accessing digital healthcare platforms. Combined with the issue of digital literacy is that of medical literacy. Stone and Waldron [17] identified patients having difficulty interpreting the sentences and terminology when accessing online platforms.

As some of the technical language was found to be at university level, researchers suggested the reading level be brought down to aid those with cognitive difficulties. Farooq et al. [16] suggested strategies to help close the digital gap in patients with mental health disorders. The researchers concluded that training must be provided for patients to develop digital literacy skills in addition to personalized plans for each patient's mental disorder [16]. After collecting surveys from patients diagnosed with schizophrenia spectrum disorders, Athanasopoulou et al. [18] found that patient populations who were frequent internet users scored higher in eHealth literacy than those who did not use the internet as often. The researchers suggest a need for training in eHealth skills to improve patients' literacy by adapting user interfaces to tailor to the various cognitive difficulties faced by people with mental disorders [17].

Age

Six studies identified age to be a significant barrier in accessing telemedicine. The primary focus of the majority of these papers turned towards barriers in *older* age. Chen and Zhu [19] conducted a household survey of 2558 Beijingers, focusing on demographic factors influencing online information search for mental disorders, and found that older adults were less likely to use internet platforms and have access to the internet at all. Seifert et al. [20] confirmed the less frequent use of technology in older adults and suggested that a lack of skill may be why older adults are less likely to engage with telemedicine [20].

Reasons for the lack of skills include older adults not using digital technologies, a lack of social support, digital literacy levels and socio-economic barriers preventing the comprehension of new technology [14-16,20,21]. Confirming these results, Ennis et al. [21] conducted a cross-sectional survey of patients with recent onset of psychosis and reported that lower knowledge, access and use of digital technology were deterrents for older patients. Addressing in part the reasoning behind the gap in usage of telemedicine in older age, Robotham et al. [15] found that older age, in particular older adults with psychosis, was

correlated with reduced confidence in using mobile phones, access to mobile phones, and limited access to a computer. Technology itself was a factor found to exclude older patients with psychosis and the mobility of technology could potentially further exclude such groups.

Three papers reported the presence of motivation to become familiar with digital health among older adults with mental disorders [14,20,21]. In contrast, the study by Greer et al. [14] found some older adults to be comfortable with digital exclusion. Three of the six studies outlined the importance of increasing support, training, and/or facility of user interfaces to accommodate older adults with mental disorders [14,16,20].

Socioeconomic Factors - Income

Through our literature review, we found five papers discussing socioeconomic status in relation to digital mental health platform use. While socioeconomic status is a broad term composed of many factors, including education and employment, the studies identified in this review primarily focused on income. While digital health platforms were found to be a cost-effective solution for mental health care, adequate funds to acquire the necessary material for eHealth usage is a barrier to access [22]. According to a study by Sood et al. [23] focusing on low-resource settings, income was determined to be a factor directly predicting eHealth usage. Specifically, Chen & Zhu [19] and Sood et al. [23] found higher-income to be correlated with being more open to using phones for managing psychiatric disorders. Moreover, they also associated higher income with increased internet access and use [19,23].

In India, Jain et al. [24] gathered information relating to mobile phone use for serious mental health illnesses and found affordability to be a barrier to receiving eHealth care. Furthermore, Ennis et al. [21], Greer et al. [14] and Jain et al. [24] determined fees associated with using mobile health services, internet access, phone plans, and internet-enabled devices to be a significant financial barrier, leading to the digital exclusion of individuals with a lower socioeconomic status. In the United Kingdom, Sood et al. [23] focused more specifically on the accessibility of technology for mental health service users and determined Black and minority ethnic groups to be more likely to access computers outside of their own homes. The papers identifying income to be a barrier called for decreased user fees to increase access.

Geographical Location

Four papers addressed the inequity of location among digital mental health platform users. Specifically, Ennis et al. [21] and Greer et al. [14] found that living in rural areas led mental health patients to be digitally isolated. Worldwide, 84% of the population is covered by a mobile network, however, there is a concern surrounding signal strength in rural areas [23,24]. According to Jain et al. [24] nearly 24% of the rural Indian participants indicated poor

signal strength in their locality. Despite these challenges, Sood et al. [23] found positive health outcomes being associated with using mobile health technology to manage mental health in patients living in geographically isolated communities.

Out of four studies discussing geographical location, Sood et al. [23] and Rojas et al. [25] determined that most mental health centres were located in urban areas, often requiring those in rural areas to travel long distances. By way of mobile health, patients and their families can save time while having access to good quality health services from specifically trained doctors in urban hospitals [23,25]. Rojas et al. [25], focusing on the Chilean population, found eHealth to be particularly helpful in accessing mental health care in developing countries where health resources and trained professionals are traditionally difficult to acquire. Within a wider geographical context, Athanasopoulou et al. [18] found the country of origin of schizophrenic patients to be a significant predictor of eHealth literacy and Internet use. Finnish patients, who tend to score high in terms of internet usage, scored higher in eHealth literacy compared to Greek patients who scored lower and reported lower internet use [18].

Other

Two papers addressed two additional inequities; general mental health difficulties and migration (paired with *hukou* status) [14,19]. Greer et al. [14] found digital exclusion to be related to three themes: knowledge, personal circumstance and mental health, which was not reported in other papers. Patients reported difficulties with mental health such as relapses or hallucinations to impede their ability to use digital health platforms [14]. As some of the mental disorders affected patients' memory, patients reported difficulties in retaining information they had received on how to access the internet and use digital platforms. In a second study by Chen & Zhu [19], researchers in part aimed to see if migration and household registration/official residency (called *hukou status* for Beijing) in China could be a barrier to accessing digital health platforms. Once socioeconomic factors were accounted for, they found that the digital divide in migration and *hukou* status was less likely among urban-to-urban migrants. Though the results of migration and *hukou* status are specific to China, researchers reported these findings to be important to other countries undergoing the rapid development of urban living and massive migration.

Discussion

Our research identified digital and medical literacy, age, socioeconomic status (income) and geographic location as prevalent health inequities in the literature when accessing digital platforms. Furthermore, our review also found recommendations such as training patients and healthcare personnel and increasing access to the internet in rural regions to decrease the identified inequities.

Digital literacy and medical literacy were identified to be significant impediments to accessing digital health platforms [14-16]. Accessing digital health resources requires a basic knowledge of technology and self-sufficiency, however, patients with mental health disorders may experience cognitive difficulty that further reduces their ability to effectively access digital care. Research suggested a need to revisit the interfaces and provide training for patients on how to use digital health interfaces [17]. In papers addressing age, there was a large amount of data suggesting patients with mental disorders of older age had more difficulty with digital health platforms than younger patients and could contribute to the digital exclusion of this population. Digital literacy and age were inequities that were perpetuated through the use of digital health platforms.

Socioeconomic status, particularly income, and geographical location were determined to be important inequities in the context of eHealth applications for mental disorder patients. The implementation of eHealth services was seen as a cost-effective solution in one study but as a barrier in others due to the affordability of all the required devices for accessing online care. Two papers determined residing in rural areas as a factor increasing the chances of patients being digitally isolated. Another study, however, determined certain factors, such as better care and decreased travel time, as positive impacts to those geographically isolated. Other inequities such as general difficulties with mental health and migration were also identified. These inequities were less present in research. Patients explained that general difficulties with mental health such as memory difficulties, relapses or inpatient care made it difficult to understand technology and access it. Migration and status demonstrated different trends in internet usage for mental health purposes depending on where patients came from (urban/rural) and where they went (urban/rural).

Our research also found overlap between several inequities. Many of these inequities influence each other. For example, patients of older age reported digital literacy as one of their greatest limitations in accessing digital health platforms. Older adults report difficulties with technology which may be explained by difficulties in cognition with age or cohort effects (being born in a time where such technology was not available). Athanasopoulou et al. [18] demonstrates an exploration of the overlap between inequities, exemplifying the correlation between one's geographical location, an individual's country in this case, and the level of digital literacy. Certain countries had a higher rate of digital literacy. External factors may be in play but the overlap in inequities is still present in many cases. These results shed light on the importance of further exploring the relationship between inequities and digital care for mental health disorder patients.

Limitations

The review aimed to identify key inequities that may be perpetuated by the increased use of telemedicine platforms

for mental health disorder patients. A primary limitation of our study is the limited number of inequities addressed and discussed. Moreover, as our research encompassed a wide range of mental health disorders, our conclusions are broad-ranging and, thus, our conclusions cannot be applied to those suffering from specific types of mental health disorders. Our literature review and research were also conducted on uniquely one database which could have limited the number of papers obtained. However, due to the recency of the topics on both mental health disorders and eHealth platforms, it is expected that not much will be available. For a more precise look at mental disorders, it may be useful to use specific populations and ensure that research focuses on experimental, data rather than a wider scope of literature.

Future Research

The topic of mental health has long been overlooked and especially lacks research in the context of digital health. eHealth platforms are a recent phenomenon and more systematic studies are required to better understand the utility of online platforms for those experiencing mental health disorders. As inequities may influence each other, future research should look at the interactions between inequities. Researchers looking into this topic should consider quantifying the impact of the inequities being investigated. Finally, a focus on the solutions being provided by the implementation of digital health platforms for mental disorder patients should be explored.

Conclusions

This study identified four main inequities being perpetuated through the increased use of digital health platforms on mental health disorder patients: digital and medical literacy, age, socioeconomic factors, and geographical location. Digital and medical literacy, as well as age, were perpetuated through digital health platforms, whereas in certain cases socioeconomic factors and rurality were in part reduced by the implementation of said platforms. These findings demonstrate a need for further research to reduce inequities in digital health. Attempts to support patients with mental disorders must address the numerous inequities impeding their usage of digital health platforms for treatment and assistance and user interfaces should be adapted to the needs of patients with cognitive difficulties.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Ethics Approval and/or Participant Consent

This study did not require ethics approval and/or participant consent as it was a review of literature.

Authors' Contributions

CB: contributed to acquisition and analysis of the literature and interpretation of the results, helped draft the research paper and gave final approval of the version to be published.

SS: contributed to acquisition and analysis of the literature and interpretation of the results, helped draft the research paper and gave final approval of the version to be published.

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