Exploring the Impact of Increased Health Information Accessibility in Cyberspace on Trust and Self-care Practices.

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ABSTRACT

More health information is in cyberspace than ever before, presenting both opportunities and challenges for health information seeking and self-care practices, particularly in underserved populations who face health disparities for various reasons including limited healthcare access and high costs. We have investigated the effect of increased health information accessibility in cyberspace on self-care practices and trust in underserved populations of African descent by surveying how increased health information accessibility in cyberspace affects self-care practices and trust in underserved.

Our study observed that online health information seeking is pervasive, growing exponentially, and driven by convenience and accessibility of resources, regardless of access to healthcare providers. However, participants expressed concerns about trustworthiness, accuracy, and potential misdiagnosis or inappropriate treatment choices. So, it is important to focus on enhancing the trustworthiness and quality of online health information, implementing verification mechanisms to reduce misinformation, and addressing underlying factors driving self-medication.

The paper details the result of our study and contributes to the existing literature by providing a deeper understanding of the motivations, experiences, and outcomes of online health information use and self-care practices among underserved communities of African descent. Our investigation also highlights the need for further research and interventions to address the challenges and opportunities that arise from the increased accessibility of health information in cyberspace and self-care practices in underserved populations.

CCS CONCEPTS

• **Privacy and trust → Trust in Cyberspace, Online Health Information and Misinformation**; • **Trusted-computing in CPS**;

KEYWORDS

Online Health Information (OHI), Trust, Cyberspace, Misinformation, Underserved populations

1 INTRODUCTION

The widespread availability of online health information (OHI) through easily accessible online channels such as websites, blogs, forums, social media, apps, and large language models (LLMs like ChatGPT, Gemini, and CoPilot) has transformed how people seek and consume healthcare information and manage their health. While OHI offers potential benefits like improved health literacy and informed decision-making, it also poses risks for self-care practices like self-diagnosis and self-medication, which can have serious consequences [18]; [24]. This is especially true for underserved populations who face barriers to healthcare access or information due to factors like socioeconomic status, location, ethnicity, or lack of insurance coverage. Our primary objective is to explore how OHI influences self-care practices and trust in cyberspace among these populations.

Previous studies reveal that OHI can have both positive and negative effects on self-care practices. On the positive side, OHI can provide valuable insights into health conditions and treatments, enhance health literacy, empowerment, and decision-making among health information seekers [11], [13], [25]. On the negative side, OHI can also lead to misinformation, confusion, and anxiety among health seekers [20]. Moreover, OHI can influence self-care practices such as self-diagnosis and self-medication, which are the practices

of diagnosing and treating one's medical conditions without proper guidance or consultation with a healthcare professional [1]. These practices are prevalent in underserved populations with limited access to healthcare[2].

Self-diagnosis and self-medication can result in misdiagnosis, adverse drug reactions, drug interactions, antibiotic resistance, and addiction [6] and [29]. For example, a participant based in Nigeria reported experiencing adverse symptoms after following online advice to take a specific medication for a broken foot, ultimately requiring hospitalization. Self-medication is a common and often risky phenomenon in some underserved communities, like Nigeria, where limited healthcare access and high costs prevail and medications can be easily purchased without prescriptions, whether from street vendors or over-the-counter outlets, [3] and [26]. This contrasts with stricter regulations governing drug dispensing and use in other countries. The delicate balance between accessibility and responsible use of health information in cyberspace warrants further exploration and consideration.

Research examining the impact of OHI on self-care practices and trust within underserved populations is limited. Existing studies often focus on specific health conditions or platforms in developed nations with higher healthcare access[8], [30], [34]. Therefore, this study seeks to address this gap by exploring how OHI influences self-care practices and trust in cyberspace among underserved populations of African descent, and to answer the following research question: How is readily available health information in cyberspace affecting self-care practices and trust in underserved populations? By understanding this dynamic, we can address concerns about trustworthiness and promote responsible OHI use, ultimately leading to better health outcomes.

2 BACKGROUND AND RELATED WORK

Cyberspace [33], the virtual environment where information and communication technologies operate [27], has emerged as an important source of health information worldwide. With easy access to vast online health resources, including content generated by large language models (LLMs), individuals can explore health topics more comprehensively. This literature review delves into the evolving landscape of online health information seeking, emphasizing its impact on trust and self-care practices. [22] observed a significant shift in online information seeking, with more people using it to delve deeper into health topics. Furthermore, in a survey by Pew Research Center, 72 percent of internet users in the United States [16] have searched for health information online in the past year [13]. Importantly, this phenomenon extends beyond geographical and economic boundaries, as 35 percent of adults in low- and middle-income countries [32] also utilize the internet for health information [23]. This trend aligns with the increased accessibility of digital devices and internet penetration [17], [4].

Online health information (OHI) including content from LLMs can provide valuable insights into health conditions and treatments, benefiting individuals with limited access to traditional healthcare [21] or those facing stigma and discrimination. However, it is crucial to recognize that not all sources are reliable and online health information can also be inaccurate, misleading, incomplete, or outdated [15], and may not reflect the best available evidence or the

individual's specific needs and circumstances and can have serious health consequences [11]. Individuals may solely rely on online health information [19] and engage in unsafe self-care practices, such as self-diagnosis and self-medication [28], bypassing professional consultation [12]. A third of our study respondents reported to using OHI in lieu of seeing a doctor or using it to verify the diagnosis of a doctor which aligns with [14] observation of online information becoming the first point of reference, potentially posing serious risks to their health and well-being, as well as to public health systems.

This study is significant for several reasons. First, it addresses an important public health issue, as the use of cyberspace as a health information source including LLMs necessitates understanding its influence on self-care practices. As online healthcare information evolves, trust [31] becomes paramount. Users' perceived benefits and costs [10] influence their satisfaction with online health communities. The focus should be on enhancing the quality of information on online health information sources to improve user satisfaction. The adoption of Digital Twins (simulating physical environments) [19] in healthcare warrants further investigation, offering opportunities and challenges. Secondly, the paper contributes to existing literature on online health information and self-care practices by providing a deeper understanding of online health information use and self-care practices among underserved populations of African descent. Third, it addresses a gap in the literature by focusing on a specific population that is often neglected or underrepresented in previous studies. Lastly, it provides insights and recommendations for researchers who are interested in developing solutions to enhance the quality, and trustworthiness of online health information, and to support safe and effective self-care practices among vulnerable populations and reduce health disparities.

In summary, while cyberspace provides unprecedented access to health information, users must exercise discernment. Trustworthy sources and informed self-care practices are essential for leveraging the benefits of online health information while avoiding potential pitfalls.

3 METHODOLOGY

We used a basic qualitative research approach, which is suitable for exploring meanings and interpretations that people assign to their experiences and behaviors, and for generating rich and detailed descriptions of the phenomenon under study [24]. We also chose this approach because of its flexibility, and its ability to serve as a good foundation for further study.

3.0.1 Data Collection. We collected data using survey questionnaires, which allowed us to gather in-depth data from a diverse sample of participants across various countries. A survey questionnaire is an appropriate data collection method for this study because we aimed to collect data from a wide range of participants and to measure their opinions, attitudes, and behaviors using standardized questions [9]. The survey questionnaires consisted of 12 open-ended questions, which enabled the respondents to express themselves freely, without being limited by predefined response options. The questions covered the following key topics:

• Demographics: Age, gender, education, location • Online health information use: Frequency, sources, types • Self-care practices:
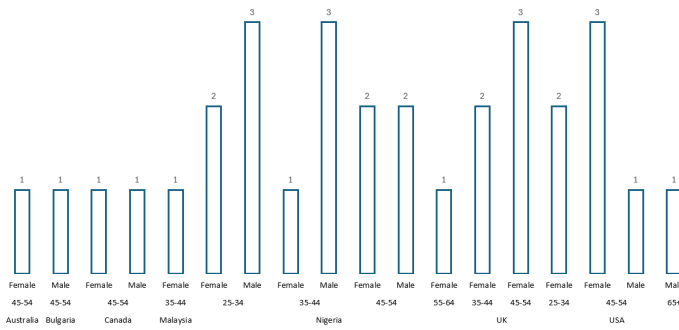
Figure 1: Participant Overview

Figure 2: Relationship between Themes and Codes

Motivations, experiences, outcomes related to self-diagnosis and self-medication based on online information • Trustworthiness of online health information: Perceptions, challenges

3.0.2 Participant Overview. The study involved 31 participants (12 male, 19 female) of African descent residing in different countries: United States (7), United Kingdom (5), Canada (2), Nigeria (14), Malaysia (1), Bulgaria (1), and Australia (1). The mean age of the participants was 35 years (range: 21-65 years). The criteria for selecting the participants were: (a) access to digital devices and the internet, (b) they lived in countries with different types of healthcare systems, ranging from universal to private, (c) the countries were a mix of both developed and undeveloped countries for a global response and (d) they were willing and available to take part in the study.

We used convenience sampling for participant recruitment to quickly gather data from readily available participants due to limited time. We contacted the potential participants through social media forums frequented by Africans based in Nigeria and the diaspora and invited them to participate in the study voluntarily. We informed them about the purpose, procedures, and ethical considerations of the study, and asked them to consent before completing the survey questionnaire using Google Forms. We ensured the confidentiality and anonymity of their responses by not requesting any personal or intrusive information from them. The data collection took place over a period of three weeks.

3.0.3 Data analysis method. We used thematic analysis to explore patterns and themes within the collected data. Thematic analysis involves identifying, analyzing, and reporting recurring themes or patterns within qualitative data. We used NVivo, a specialized software program, to facilitate data organization, coding, and interpretation to streamline the organization, coding, and interpretation of qualitative data from the open-ended questions. Here's how we conducted the analysis following the guidelines outlined by [7]:

• Familiarization: We read and reviewed the data to understand the perspectives of all respondents. • Initial Coding: We created initial codes related to our research question. • Theme Identification: We systematically searched for broader themes that captured the underlying patterns and insights in the data.
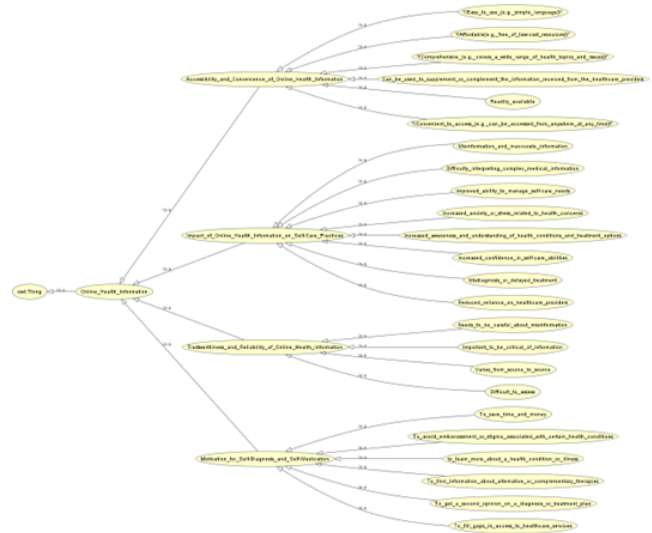
The thematic analysis process yielded a comprehensive and insightful understanding of the participants' experiences and perspectives on online health information, self-care practices, and the potential impact on trust and self-care choices.

4   RESULTS

Our data analysis uncovered four main themes that capture how increased health information accessibility in cyberspace affects self-care practices and trust among underserved populations. These themes are: • Trustworthiness: Participants expressed concerns and challenges regarding the quality, validity, and accuracy of online health information. They reported various levels of trust in different sources, such as government websites, medical journals, patient forums and LLMs. • Accessibility and convenience: Participants valued the availability, ease of use, comprehensiveness, and affordability of online health information. Many participants found it to be a valuable supplement to the guidance received from healthcare providers. • Motivation for self-care practices: Participants' cited reasons and incentives for using online health information to self-diagnose and self-medicate. Their motivations included convenience, cost, availability, privacy, curiosity, and dissatisfaction with their healthcare providers. • Impact of online health information on self-care practices: Participants described their experiences and outcomes of using online health information for self-care. The impact of the information was either positive or negative.

The following paragraphs provide detailed insights into each theme:

Theme 1: Online health information use The study revealed that participants in all countries and across all age groups use online health information widely. All 31 respondents reported using online health information to varying degrees from daily to occasionally, depending on the participants' individual needs and preferences. They sought online health information for a range of reasons, from general information seeking to specific inquiries about a medical condition or a treatment option. For instance, the participant based

Table 1: Healthcare systems in countries of study

s/n	System	Challenges	Strengths
Nigeria	The healthcare system in Nigeria is Public-private mix with a focus on primary care. It is structured into three levels: • Primary Health Care (PHC) operates at the community level and is the first point of contact for patients. • Secondary Health Care is an intermediate healthcare level. • Tertiary Health Care is at the Federal healthcare level.	Underfunding, limited access to quality healthcare, healthcare facilities and specialists especially in rural areas, shortage of qualified healthcare professionals, dependence on out-of-pocket payments, disparities in quality between rural and urban areas, and prevalence of self-medication due to limited access to quality healthcare.	Focus on primary care, free maternal and child health services, and traditional medicine plays a role.
United Kingdom (UK)	The UK's National Health Service (NHS) is publicly funded	While it performs well in some areas, long waiting times for common procedures, non-urgent care, staff shortages, rising costs have been a concern.	It is considered one of the best health systems in the developed world. The NHS offers universal coverage to legal residents, high-quality care, and relatively low out-of-pocket costs. Its performance is assessed based on efficiency, waiting times, financial protection, and health outcomes.
United States (US)	The US has a complex healthcare system is a mix of public and Private-payer system with some government involvement (Medicare for seniors and Medicaid for low-income individuals).	It lacks universal coverage, disparities in access based on income and employment status and access to care can be challenging due to high cost and insurance gaps. The Commonwealth Fund ranked the US lowest among high-income countries in terms of quality, efficiency, access, equity, and healthy lives.	Advanced medical technology and innovation, diverse range of healthcare providers, and access to cutting-edge treatments and access to specialists.
Australia	Australia's healthcare system combines public and private components. Medicare, a government-funded program, provides universal coverage for essential services. Private health insurance supplements this coverage.	Increasing costs, workforce shortages, access to specialists in rural areas.	Australia generally performs well in health outcomes and access to care, and costs.
Canada	Canada has a publicly funded healthcare system known as Medicare. It provides universal coverage for medically necessary services.	Wait times for certain non-urgent procedures can be lengthy, and limited access to specialists in some regions but overall health outcomes are favorable.	Universal coverage, relatively low out-of-pocket costs, focus on preventative care.
Bulgaria	It provides universal coverage with its mandatory social health insurance system -National Health Insurance Fund (NHIF).	Bulgaria's healthcare system faces challenges related to underfunding, long waiting times for non-urgent care, brain drain of medical professionals, infrastructure, and workforce shortages. Quality and access remain areas of concern.	Universal Coverage
Malaysia	Malaysia's healthcare system is a mixed system with both public and private providers.	Unequal access to quality healthcare between urban and rural areas, rising costs. Public healthcare is accessible and affordable, while private healthcare caters to those who can afford it.	Malaysia has made significant progress in health outcomes. Government subsidies, focus on preventative care, increasing access to specialist care.

in Bulgaria said 'Online health information is great to source for alternative medical advice', while the participant based in Australia said 'Speed in getting an accurate response, ability to keep tailoring my question to get better responses and useful research, more

Table 2: List of themes, codes and sub-codes

Themes	Codes	Sub-Codes
Trustworthiness and reliability of online health information.	• Difficult to assess. • Varies from source to source. • Important to be critical of information. • Need to be careful about misinformation.	Criteria for evaluating online health information (e.g., author, date, evidence, references), Strategies for verifying online health information (e.g., cross-checking, consulting experts, using reputable sources), Sources of online health information (e.g., government websites, medical journals, patient forums).
Accessibility and convenience of online health information.	• Convenient to access (e.g., can be accessed from anywhere at any time). • Easy to use (e.g., simple language). • Comprehensive (e.g., covers a wide range of health topics and issues). • Affordable (e.g., free, or low-cost resources). • Readily available. • Can be used to supplement or complement the information they receive from their healthcare providers.	
Motivation for self-diagnosis and self-medication	• To learn more about a health condition or illness • To get a second opinion on a diagnosis or treatment plan • To find information about alternative or complementary therapies • To save time and money • To fill the gaps in access to healthcare services • To avoid embarrassment or stigma associated with certain health conditions.	• Types of health conditions or illnesses (e.g., chronic, acute, common, rare). • Types of self-diagnoses and self-medication (e.g., using online symptom checkers, buying over-the-counter drugs, using herbal remedies).
Impact of online health information on self-care practices.	• Increased awareness and understanding of health conditions and treatment options. • Improved ability to manage self-care needs.	• Benefits of using online health information for self-care (e.g., empowerment, autonomy, satisfaction, prevention, education). • Risks of using online health information for self-care (e.g., harm, error, confusion, distrust, avoidance, dependency).

time to do a deep dive which is better than visiting a GP where it feels rushed or they are accessing the research in your presence. Also online has pictures which capture the range of physical ailments and one can diagnose things that may be embarrassing or work with a young child to identify issues. Much more user friendly'. The participants used a variety of sources to access online health information, including websites, blogs, and social media platforms. Participants accessed information from various sources, including websites (e.g., Google, WebMD, WHO, Mayo Clinic, NHS, Wikipedia), blogs, social media platforms (e.g., Facebook, Twitter), and professional resources (e.g., GP (General practitioner) notebook, FP (Family Practitioner) notebook, NICE (National Institute for Health and Care Excellence) guidelines). Google and WebMD were the most popular sources. Notably, all participants expressed discomfort with using LLMs currently for their health information, a participant from the UK said, 'The technology is not mature yet', another from the US said 'No to AI. No trust as yet.

Theme 2: Trust dynamics in online health information The study findings also revealed that the participants had different perceptions and attitudes towards the quality and trustworthiness of online health information and the availability and accessibility of healthcare services. Some participants particular those based in Australia and the UK , including the one who self-identified as a medical doctor, expressed that 'health information online is more detailed, comprehensive and useful than what they would get from a healthcare professional in a hospital. While some others based in Nigeria, UK, and US, perceived no significant difference between health information obtained online and from healthcare providers.

A participant based in the US opined that 'I only use reputable websites, finding no differences in trust'. Another participant from Nigeria said 'with online information, one needs to learn how to identify credible sources from inaccurate, scaremongering sites. However, online sources can sometimes provide more comprehensive information than what a doctor might provide.' However, the participant based in Malaysia said 'I believe that guidance from health professionals is more crucial, effective and lifesaving to me because it leverages variables such as physical inspection, observation, knowledge of predominant cultural practices (important in some cases) in addition to factual medical diagnostic processes'. All participants from the UK trusted online health sources, although they still recognized the potential for inaccuracies, whereas participants from other countries were split in the middle. Reasons for mistrust were mainly related to misinformation and inaccuracy like a participant from the US said that 'that online information can be misleading or even dangerous if you do not have the right context or are of a sound medical background. For instance, taking supplements recommended online without proper understanding of potential food and drug interactions, or avoiding necessary medical intervention due to misguided or biased opinions presented as facts by people with no medical training, education, or experience'. The participants' views were influenced by various factors, such as their location, education, and personal experiences. The findings suggest a complex interplay between online information access, trust in its accuracy, and trust in healthcare professionals.

Theme 3: Engagement in unsafe self-care practices The study findings reveal varying degrees of self-diagnosis and self-medication

based on online health information with prevalence and types of unsafe self-care practices varied across different countries and contexts. Participants reported engaging in self-care reported practices like utilizing online symptom checkers, purchasing over-the-counter medications, employing herbal remedies, following online recommendations and advice and so on. For instance, all participants based in the UK, including one who identified as a medical doctor, that said 'I'm a doctor and I often use health information online to support what I think may be going on, they also said 'Health online is more detailed than what's given at the doctors'. Among the participants based in Nigeria, ten of them said they had not used online health information for self-treatment, but three of them said they would consider doing so if they could trust the information or if it was a minor ailment. A participant based in Nigeria that said 'Yes I have self diagnosed but I have not treated a health condition based on information I found online', another participant from Nigeria admitted to self-diagnosing and medicating using online information multiple times. A female participant from the UK 'Yes, I have self diagnosed and treated...but only using herbal remedies e.g. during the COVID pandemic. I used online herbal remedies because I believe modern medicine is derived from herbal remedies anyway'. A Nigerian based participant admitted to experiencing a negative impact, saying 'I recently had surgery and I felt my cut was not healing fast. And my doctor said I should stay on my vitamins. But I wanted it to heal fast… that prompted me to search online and was convinced that zinc can help. I didn't consult my doctor and I went ahead and took it. By the time I woke up, I was practically swollen in some part of my body. I was taken to the hospital again.' These findings highlight the diverse engagement in self-care practices but highlight the potential risks associated with self-diagnosis and self-medication based on online information, particularly the lack of professional guidance and the possibility of inaccurate or misleading information.

Theme 4: Influencing factors on online health information reliance Our study revealed that the participants' reliance on online health information was influenced by various factors, such as convenience, cost, and lack of access to healthcare services. These factors varied across demographics and locations. Participants, particularly those based in Nigeria, Canada, and the UK without easy access to healthcare services or direct access to their General Practitioners (due to either unavailability or lack of insurance), emphasized the convenience and ease of access offered by online information. A participant based in Nigeria said 'information is more easily and more readily available than other sources. Access is easier', another participant from the UK said they use online sources because of 'Convenience and a quick answer'. Affordability also influenced participants' choices. In countries where healthcare costs was expensive, individuals turned to online sources as a cheaper alternative. Eight of the participants from Nigeria complained about high costs, as did six from the US, one from the UK and one from Bulgaria. The participant based in Bulgaria said, 'If you are insured, health care is relatively cheap compared to if not insured.' Moreover, the participants' attitudes towards self-diagnosis and trust in online sources differed by countries. Participants based in the UK, US, Australia, and Canada expressed greater trust in online sources than those based in Malaysia, Bulgaria, and Nigeria who were more cautious. The participant based in Bulgaria said, 'sometimes some data may

not be accurate depending on the source', another participant from Nigeria said 'I only use credible sources. There is a lot of harmful and useless information out there.'

Lastly, trust in online health information varied depending on participants' experiences with formal healthcare services. Eleven of the participants based in Nigeria reported their healthcare system as unreliable and inaccessible so relied more on online information, with a participant saying 'in terms of health facilities there are public health clinics, primary health care centers, general hospitals, specialist hospitals, tertiary and teaching hospitals. All levels of facilities but there are not enough of them, and they are poorly funded and poorly resourced. Paradoxically there exist private hospitals which are extremely expensive. You need to be rich to afford them. These are very well resourced. Health insurance exists but is neither adequate nor widespread', while another said, 'professionals are more trustworthy though might be less reliable'. They also said that they resort to online health information as a last option. These findings suggest that online health information can be particularly appealing in situations with limited healthcare access or unreliable healthcare services. However, the study also highlights the potential risks associated with overreliance on online information, especially due to varying levels of trust and the existence of inaccurate or misleading content.

4.0.1 Summary of findings. The study explored the impact of increased health information accessibility in cyberspace on self-care practices and trust among underserved populations. We discovered that online health information was widely used by the participants for various purposes, such as learning about health conditions, understanding symptoms, treatments, and preventive measures. The participants also engaged in self-diagnosis and self-medication based on online health information for various reasons, such as convenience, cost, availability, privacy, curiosity, and dissatisfaction with their healthcare providers. The participants had notable differences in their perceptions and attitudes towards the quality and trustworthiness of online health information and the availability and accessibility of healthcare services. UK based Participants trusted online details due to their detailed nature compared to doctor consultations. While with US and Canadian based participants, there were mixed trust levels; some relied on online information, while others did not. Most Nigerian based participants expressed skepticism due to concerns about information accuracy and reliability and the Bulgarian based participant acknowledged potential inaccuracies depending on the source.

In conclusion, our study highlights the important role of online health information in shaping self-care practices and trust among underserved populations. It also emphasizes the substantial variations in information use, and outcomes across different countries, potentially shaped by location, education, and personal experiences. Further research and targeted interventions are essential to address the challenges faced by these communities and promote safe and effective self-care practices.

Table 3: Respondents view of the trustworthiness of Online Health Information

Factors	Reasons	Respondents and Countries of residence
Source Credibility	Participants prioritized information from established health organizations, government agencies, and reputable medical institutions (e.g., NHS website, Mayo Clinic). These sources were perceived as having more reliable and trustworthy information.	Respondents 3, 6, 9, 15, 23, 29, 30 from USA, Nigeria, UK, Bulgaria, Malaysia, and Australia
Accuracy	Participants valued information that is well-researched, evidence-based, and reflected current medical knowledge.	Respondents 1, 8, 15 from UK, and Nigeria
Transparency	Some participants looked for information from sources with clear authorship from medical professionals or organizations held accountable for providing accurate data.	Respondents 15, 23, 29 from UK, Bulgaria, and Malaysia

Table 4: Participants view of Online Health Information.

Positive views of Online Health Information	Negative views of Online Health Information
Participants find online health information convenient and accessible (Responses 5, 8, 15, 20, 28, 30 from Canada, Nigeria, UK, and Australia).	There is a concern about the accuracy and trustworthiness of online information, especially from non-reputable sources. (Responses 1, 3, 6, 7, 8, 9, 11, 18, 23, 25, 27, 29 from UK, USA, Nigeria, Bulgaria, and Malaysia) Examples of Quotes Highlighting Inaccuracy Concerns: • "Online health information is more detailed than what's given at the doctors, but it can be inaccurate." (Response 1) • "There are many illnesses that have similar symptoms so you need to go to the hospital to know better" (Response 4) • "Misleading or even dangerous if you do not have the right context of a sound medical background" (Response 6) • "With online information, one needs to learn how to identify credible sources from inaccurate, scaremongering sites." (Response 9)
Online resources are helpful for understanding health conditions (Responses 3, 6, 14, 21, 22 from – USA, UK, Canada, and Nigeria).	While many participants use online resources for information gathering, most avoid self-diagnosis based solely on that information. They emphasize the importance of consulting a doctor for proper diagnosis and treatment. (Responses 3, 4, 5, 6, 10, 14 from USA, Canada, UK, and Nigeria). Examples of Quote: • "There are many illnesses that have similar symptoms so you need to go to the hospital to know better" (Response 4)
Many participants view online health information to better understand their health, prepare for doctor visits, and make informed decisions. (Responses 5, 9, 21, 22, 29, 30 from Canada, Nigeria, Malaysa, and Australia).	Misinformation can lead to negative health consequences (Response 6,7,11 from USA and Nigeria).
Online resources can be a good starting point to identify potential causes of symptoms (Responses 11, 14, 27, 30 from Nigeria, UK, USA, and Australia).	Reliance on online information can delay seeking professional medical help (Response 3 from USA).
	LLMs are not yet seen as reliable sources of health information. Participants either avoid them entirely or use them with caution due to concerns about accuracy and reliability. (Responses 25, 26, 27, 30 from USA and Australia).

5 DISCUSSION

The findings revealed that cyberspace is a common source of health information for all the participants, regardless of their age or country of residence. Participants used cyberspace for various health-related purposes, such as seeking a second opinion, supplementing their professional healthcare, or self-diagnosing. Notably, some participants admit to occasionally or frequently practicing unsafe self-care activities like self-diagnosis and self-medication, based on the online health information they accessed, either frequently or occasionally, citing reasons such as convenience, cost, privacy, or dissatisfaction with their existing healthcare services.

The findings also found that trust in online health information varied across countries and individuals, depending on the source and quality of the information, as well individual influences. While

participants were aware of potential risks and limitations of using online health information, they still used it due to the perceived benefits, such as convenience, cost, and because of lack of access to quality healthcare services. However, most of the participants drew a line at using less tested sources such as LLMs. The findings suggest that:

The increased accessibility of online health information has a dual impact on underserved populations. On one hand, it heightens the risk of unsafe self-care practices, particularly among those facing barriers to quality healthcare access which can lead to adverse health outcomes due to misinformation, misdiagnosis, or delayed treatment, For instance, a US based participant said, 'I had an accident and waited to self-observe because it costs a fortune riding in an ambulance', a Nigeria based participant that said 'I use self medication before seeking professional medical care', and another that said 'One time all my symptoms online where pointing to a life-threatening issue...', in contrast, a UK based participant said 'If I'm ill and the online diagnosis points to something serious, it prompts me to see my GP.' Conversely, online health information can empower underserved populations to manage their health conditions effectively, saving time and money. However, this depends on their trust in online information as well as their ability to evaluate the information.

Trust in online health information varied with participants from certain countries expressing more trust than others. Participants based in the UK, US, Australia, and Canada were generally more trusting of online health information than participants based in Malaysia, Nigeria, and Bulgaria, who expressed more doubts about the accuracy and reliability of online health information. This may highlight a digital divide and its impact on information access and evaluation.

The study also shows that the increased accessibility of online health information is influencing the relationship between underserved populations and healthcare providers. Participants attested to using online information to complement or supplement advice from professionals, to fill the gaps in their access to health or challenge advice from their providers. Exemplified by a US based participant that said online health information influenced their use of doctors 'because you have to make a doctor's visit count for what you'll have to pay for'. A Malaysia based participant said, 'In times when home remedies gotten online solved the health problem, I cancelled the idea of or bookings for a medic.' However, this dynamic pose both positive and negative consequences. Furthermore, Australia based participant said 'research online made it clear a recurring problem with my daughter was a particular infection she'd had before. We only saw the Dr for a prescription which ended up confirming our research. I've also used it to redirect a family member to alternative health provider; acupuncture when Drs and physiotherapist said they couldn't offer much help besides surgery for an elderly parent (88 yrs old) and surgery wasn't recommended.' While online information can empower patients to participate more actively in their healthcare, Misinformation or misinterpretation can challenge trust in providers and lead to conflicting information.

The findings of this study are consistent with the literature that suggests that online health information seeking is a prevalent and influential phenomenon in contemporary society [4], [23], [17]. The findings also confirm the literature that indicates that online

health information can have both positive and negative effects on self-care practices, depending on the quality and credibility of the information, the nature and urgency of the health issue, and the individual's health literacy and decision-making skills [13], [23], [5], [12].

In conclusion, the study findings underscore the nuanced impact of online health information accessibility on self-care practices and trust among underserved populations. Factors such as health condition severity, healthcare availability, information trustworthiness, and individual capabilities shape this impact. The study provides new and interesting insights into how Africans and African diaspora substitute professional care with information from cyberspace in situations where the latter is inaccessible, unaffordable, or unavailable or where they lack trust in healthcare providers. It also highlights the need for further research and targeted interventions to address challenges arising from increased online health information accessibility in these communities.

5.0.1 Recommendation of study. To address the identified risks and promote safe and effective self-care, we propose several recommendations:

1. Enhance the quality, reliability, and trustworthiness of health information in cyberspace: • Support and incentivize credible sources: Provide resources and incentives for healthcare organizations, and interested stakeholders to vet health websites, and to create and maintain high-quality, evidence-based, and up-to-date health information in cyberspace. • Implement fact-checking and verification mechanisms: Develop systems to flag and remove misinformation or inaccurate health information in cyberspace, collaborating with social media platforms and search engines and promote trustworthy sources through algorithms, user reviews, and expert verification.

2. Address underlying factors contributing to unsafe self-care: • Improve access to affordable healthcare: Reduce barriers in underserved communities by expanding insurance coverage, increasing healthcare provider availability, and addressing cost-related challenges. • Promote trust and communication between patients and healthcare providers: Foster open communication between patients and healthcare professionals to address concerns about healthcare costs, accessibility, and perceived quality of care. Encourage patients to share and discuss the health information they obtain from cyberspace with their healthcare providers and seek their guidance before engaging in any self-care practices.

3. Develop innovative digital tools to support safe online health information seeking and use: • Develop a web-based digital health tool: Explore the potential of a web-based digital health tool that personalizes and optimizes online health information access and use for users based on their needs and health conditions, promotes trust through ratings and verification, and fosters connections to healthcare providers. Such an application will prioritize ethical considerations by ensuring data privacy, user security, and transparency in the development and deployment. Leverage NLP, machine learning and knowledge graphs to curate reliable health information, recommend credible sources, and provide personalized health advice while ensuring user privacy and data security. • Connect users to healthcare resources: Integrate the web-based digital health tool with healthcare provider directories, telehealth services, and appointment booking systems to bridge the gap between health

information and professional care. Enable users to easily access and communicate with healthcare providers, and to share and discuss the health information they obtain from cyberspace with them.

By implementing these recommendations, we can create a safer and more responsible online health environment, mitigate the potential risks, and leverage the opportunities that arise from the increased accessibility of health information in cyberspace, especially in underserved populations. This multifaceted approach will bridge the gap between health information in cyberspace and professional healthcare, promoting a balanced and collaborative model of self-care across diverse communities and improve overall health outcomes.

6 CONCLUSION

The study highlights that the increasing prevalence of selfcare using health information found in cyberspace is a complex issue with no easy solutions. It reveals that the increased accessibility of health information in cyberspace can have both positive and negative effects on self-care practices and trust among underserved populations depending on factors such as the type and severity of the health condition, the availability and affordability of professional healthcare, the trustworthiness and accuracy of the online source, and the individual's ability and motivation to seek and use health information from cyberspace.

As the volume of health information in cyberspace and online information seeking behaviors continues to rise, so will the prevalence of self-diagnosis and self-medication based on online health information. The study concludes that rather than viewing health information accessibility in cyberspace as a purely positive or negative phenomenon, a more nuanced approach is needed. This approach should focus on enhancing the quality and trustworthiness of health information in cyberspace, while also promoting information literacy and access to quality healthcare services.

By addressing the challenges and leveraging the potential of health information in cyberspace, we can empower individuals, particularly in underserved communities to make informed health decisions and improve their health outcomes.

6.0.1 Future research. This study sheds light on the relationship between online health information (OHI), self-care practices, and trust, particularly in underserved communities. Building on these valuable insights and foundation, several avenues for future research emerge to address identified challenges and opportunities:

1. Representative Sampling: Expand studies to include larger, more diverse, and more representative samples across different countries and backgrounds. This will enhance the generalizability and validity of the findings, providing a more comprehensive picture of online health information usage across various demographics, especially in underserved populations. 2. Mixed Methods Approach: Adopt a mixed-methods approach that combines quantitative and qualitative data collection. This will offer deeper and richer insights into the motivations, experiences, and outcomes of health information seeking and use behaviour, as well as the factors that influence them. This will also allow for statistical analysis and generalization of findings, as well as the identification of patterns and trends across different groups and contexts. 3. Web-Based Digital Health Tools: Investigate the potential of personalized

web-based digital health tools that can support safe and effective health information seeking and use behaviour, especially in underserved populations. This tool could: • Promote trust: Incorporate user ratings, verification systems, and connections to healthcare providers, enhancing the credibility and reliability of health information sources and fostering collaboration and communication between users and professionals. • Personalized information: Adapt to individual needs and health conditions, providing relevant, timely, and tailored health information and advice. • Leverage AI: Utilize NLP, machine learning, and knowledge graphs to curate reliable online information, recommend credible online sources, and offer personalized health advice while safeguarding user privacy and data security. • Bridge the gap: Integrate with healthcare provider directories, telehealth services, and appointment booking systems to facilitate connection between online information and professional care.

Evaluating the Tool: Conduct rigorous evaluations to assess the effectiveness and usability of such a tool in improving online health information-seeking and use behavior, as well as self-care practices and trust, particularly among underserved populations. Evaluate the tool using various methods and metrics, such as user feedback, usability testing, user satisfaction, user engagement, health literacy, health outcomes, and cost-effectiveness.

By addressing these key areas, future research can contribute significantly to bridging the gap between health information accessibility in cyberspace and safe self-care practices, empowering individuals to make informed health decisions and ultimately improving health outcomes, especially in underserved populations.

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