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Improving health literacy in rural Africa through mobile phones: a systematic literature review

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Abstract. Background and Purpose: Mobile phones have been used to support healthcare systems through various mobile health (m-health) applications. In Africa, m-health initiatives have been used in many interventions, including education and awareness, clinical and non-clinical decision support systems, epidemic outbreak tracking, training of healthcare workers and remote monitoring, and many others. But despite the great enthusiasm around m-health, few studies have examined the use of mobile phones to improving health literacy in rural areas in Africa.
Methods: We performed a literature review using SCOPUS and Google scholar, combined with manual searching methods to search for studies related to m-health initiatives in Africa. The systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) protocol. Four steps were followed to identify relevant publications related to the contribution of mobile technologies in improving health literacy :(1) Database selection (2) Keyword search, (3) Study selection and (4) Data extraction.
Results: In our study, we found 5 studies related to health literacy and mobile technologies in Africa. However, none of them were focused on health literacy and mobile technologies in rural areas of Africa. This result provides insights of future studies to conduct.
Conclusions: We found that m-health initiatives were so far not inclusive. It appears that few m-health solutions integrate local languages in the development of m-health solution. The mhealth initiatives need to be implemented based on the local realities, so experimental studies are desired to test the adaptability of mhealth projects and to explore any adjustments required.

Keywords: mhealth, health literacy, mobile phone, rural areas, Africa.

1. Introduction

Much research has developed around the concept of health literacy, defined as a set of cognitive and social skills that determine an individual's motivation and ability to access, understand, evaluate, and use the information and services necessary for their health [1]. It is usual to distinguish three dimensions of health literacy: the capacity to obtain information (communicative literacy), to understand it (functional literacy) and to use it (critical literacy). Health literacy refers to the ability of individuals to access, understand, assess and use the information and services necessary for their health. since the launch of mobile phones three decades ago; the latter has been used to support healthcare systems through various mobile health (m-health) applications. Despite this great enthusiasm around m-Health, few studies have examined the use of mobile phones to improve health literacy in Africa. This PhD project aims to explore the use of mobile health to improve health literacy in rural communities that will lead to a design of a mobile health implementation framework based on literature reviews, field studies, and feedback from knowledgeable professionals in Sub-Saharan African countries, as well as global experts. We suggest that by integrating local languages and considering local realities in the implementation of mobile health projects, health services will be more accessible to rural communities, and that they contribute to a better common futureand a

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sustainable development for all. To address these challenges, in September 2015, the United Nations (UN) adopted 17 goals to be achieved by 2030 to ensure sustainable development for all. Achieving “Good Health and Well-being" for all is part of the importance of these goals. In recent years, evidence from many reports has demonstrated the crucial role that mobile phones can play in achieving sustainable development goals [2]. By taking advantage of the rapid growth of mobile phones in recent years, Africacould achieve the Sustainable Development Goals by improving health literacy in rural areas. While mobile technologies offer these new opportunities for accessing health information and self-managementof health conditions, as far as we know, few studies have examined so far, the use of mobile phones to improve health literacy in Africa.

2. Current status of health literacy in sub-saharan Africa

Every day, everyone is called upon to make decisions that influence their health and that of those around them: seeing a doctor, walking to work, eating more fruit, seeing friends, requesting a help service for their accommodation, undergoing medical treatment. To make enlightened choices in an increasingly complex society, we need to have information. Learning to promote health requires the mobilisation, sometimes simultaneous, of many skills: reading, writing and calculating, but also communicating, solving problems, evaluating the information found, applying information based on one's own life context.

The Agency for Healthcare Quality and Research (AHQR) published a report on Health Literacy [3], which shows that very few developing countries have objectively measured health literacy or its impact of health.

A multinational study was conducted in 14 countries in sub-Saharan Africa to measure health literacy. This large Survey examined the demographic characteristics associated with health literacy in Africa. The data used to measure health literacy was collected between 2006 and 2015. The total number of people included in the study was 224,751 people aged between 15 to 49[4].. The prevalence of health literacy was found to be high at 35.77%. For women, it was 34.08% and 39.17% for men; less than or equal to primary education 8.93%, is part of secondary education 69.40% and completes secondary 84.35% [4]. But it should be notated that health literacy levels variated from country to country, from 8.51% in Niger to 63.89% in Namibia[4]. E-health solutions, linked to the increasing digitization of the country (95% mobile penetration), are a way to overcome the challenges of rural health literacy.

3. Mobile phones as health literacy enabler in rural areas

Over the past decades, Africa has experienced a rapid transition in terms of mobile connectivity. For instance, the number of smartphone owners has almost doubled between 2016 (336 million) and 2020 (660 million), with a penetration rate of 55% [5]. The penetration and growth rates of mobile technologies has resulted in a serious impact on the healthcare sector. According to the mobile industry Group Special Mobile Association (GSMA, 2016), more than 1123 mobile phone-based projects were planned to be implemented to improve healthcare systems and service delivery [6]. These projects, known as “m- Health” projects, have mostly invaded the health landscape of developing countries as eight out of ten projects are based in Africa. In 2015, South Africa alone registered more than 81 projects (GSMA, 2015). In term of investment, the global market of m-Health in Middle-East and Africa reached USD 1.23 Billion and projected to reach USD 5.78 Billion by 2025[7]. This enthusiasm around m-Health follows aspirations of healthcare actors to provide more effective, efficient and equitable healthcare services and information—especially to the most disadvantaged communities in rural areas. With the complexity of healthcare systems nowadays, healthcare services are spending less time to support patients. In rural areas, patients with limited resources face multiple challenges to acquire, understand and use the information they need to make decisions related to their health (health literacy). Consequently, it is about 83% of African population (from rural areas) that are excluded from healthcare services because of the low health literacy level[8]. According to the World Wellbeing Association (WHO), wellbeing education alludes to "the intellectual and social abilities that decide the inspiration and capacity of people to acquire, comprehend, and use data in a way that advances and keeps up great wellbeing" [9]. Mobile technologies can enable patients especially with low health literacy, to gain rapid access to the information patients want and need to maintain and improve

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their health. Mobile health (m-health) describes the use of portable electronic devices with software applications to provide health services and manage patient information. In Africa, the high penetration rate of mobile phones and the increasing coverage of the mobile network bring prospects, and mobile devices can no longer be ignored in health delivery and disease prevention workflows. The global m-health market is predicted to grow to 213.6 billion by 2025, and Sub-Sahara Africa (SSA) is forecast to be the fastest growing region in the world[10]. Opportunities for mobile technologies to play a formal role in health services are increasingly being recognised. At this point, it is worth acknowledging some initially celebrated m-health successes in Africa were built on the unprecedented uptake of mobile services. For instance, the use of mobile phones and social networks in Nigeria has recently been particularly helpful in fighting efficiently against the Ebola outbreak in the country [11].

4. Methods

To answer our first question about the existing m-health and health literacy-related initiatives in rural Africa, a systematic literature review was performed following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) methodology [12]. We searched for studies related to the terms “health literacy” and “mobile technology”. The following protocol, which consists offour steps, was followed: (1) database selection; (2) keyword search; (3) study selection; and (4) data extraction and analysis.

4.1. Database Selection

To perform our systematic review, we used the SCOPUS database [13] and Google Scholar [14]. These databases provide access to science, technology and medicine (STM) journal articles and to the references included in these articles allowing researchers to search both forward and back in time.

4.2. Keyword Search

We performed our study on 10 February, 2020 using Boolean Operators (“AND”, “OR”) with selected keywords to search in the titles, abstracts and keywords of every published article related to health literacy and mobile technology. These following combinations were used to perform our search in the Scopus database:

(TITLE-ABS-KEY (“health literacy” OR “ALL synonyms of health and literacy”) AND (“mhealth” OR “Mobile health” OR “mobile technolog*” OR "telemedicine”))

For Google Scholar, the same combination was used, and we added some additional keywords:

“health literacy” OR “ALL synonyms of health and literacy”) AND “mobile health” OR “mobile technology” OR “e-health” AND “Africa” AND “ALL synonyms of rural area”

4.3. Study Selection

After performing the keywords search, we chose to select only English language publications. Due to the rapid growth of mobile technology, we limited our literature review to studies published between 2011 and2021. No author restriction was imposed.

4.4. Data Extraction

We exported data related to the “title”, “abstract”, “keywords”, “author”, “publication date”, “country of origin” to a coma separated format. Then, we screened the full text of all publications according to the following criteria:

- Studies focused on mobile technology and health literacy; otherwise they were excluded.
- studies targeting public health issues in Africa;

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- studies related to health literacy and mobile technology in rural areas were included;

We carefully analysed the publications according to the criteria mentioned above, and the resulting selecteddata were changed to CSV format files [15]. We excluded studies that do not meet the above criteria.

5. Results and discussion

5.1. Results

By performing our research using the identified keywords, 1139 publications were found in the Scopus database and 67 in Google Scholar. Once the duplicates were removed, there were 1206 articles left for screening. We screened titles and abstracts of all 1206 articles, and we found that 1052 studies from the Scopus database and 37 from Google scholar were not related to mobile technology and health literacy in Africa. Therefore, we excluded 1089 articles in total, and 117 were left for full-text screening.

After screening the full text of the 117 articles, we included 48 studies. After a second screening, we found that only five were related to health literacy and mobile technology in rural areas. After analysing these five studies, we noticed that they were not specifically intended to improve health literacy in rural areas or communities. Figure 1 summarises the method used and our findings. The initial lookup query for the review displayed 1206 results for the two databases. After the principal stage (title and dynamic assessment and disposal of copies), the number was decreased to five. When we started the full-text survey, we zeroed in our investigation on distributions that addressed the utilisation of versatile innovation to improve wellbeing proficiency in rustic zones of Africa.

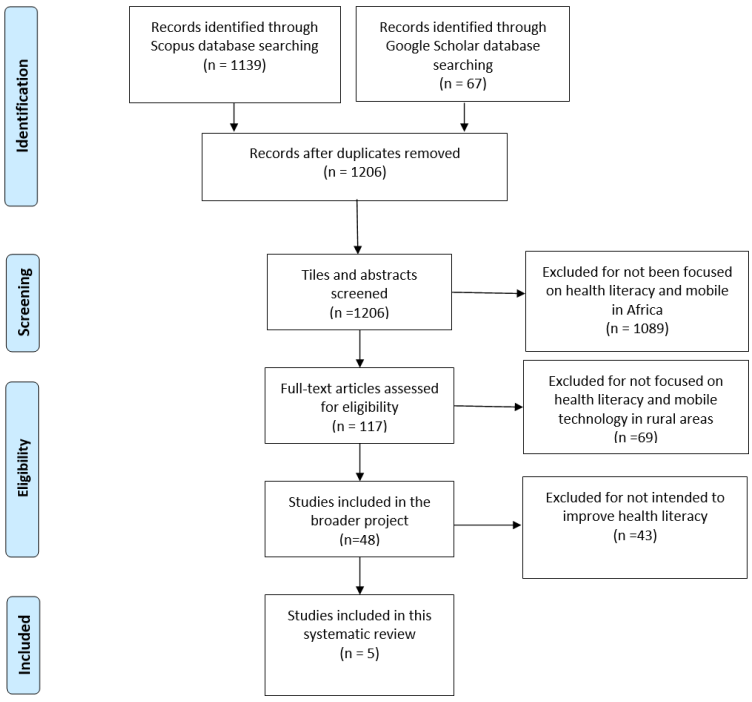

Figure 1. The method used for the systematic literature review.

5.2. Discussion

Over 1206 publications, we only detected 5 (0.41 %) articles that were related to mobile technology and health literacy in rural areas of Africa. The other reviewed articles 1201 (99.58%) were not intended to improve health literacy in rural areas of Africa. This finding highlights the need for conducting studies related to improving health literacy in rural communities of Africa. E-health solutions, in connection with

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the growing digitisation of the country (95% mobile penetration). Mobile health is a way to overcome challenges in rural areas, even as private and public actors seek to intensify their digital transformation. For developing countries and in Africa in particular, this technology requires the direct involvement of populations. Some of the benefits for the African health system will include:

- Participate in the inclusion of rural communities into the health service through the use of locallanguages.
- Facilitate the accessibility of information through the availability of low-cost technology like mobile phones.
- Improve public health surveillance through awareness and campaigns carried out in local languages.

To transform these advantages, especially for the benefit of rural populations in Africa, more study has to be done. Most studies we found in this review were conducted in English speaking countries in Africa although a few field studies were in French speaking countries in West Africa. Our future study will address this literature gap.

6. Conclusions, limitations and future research

Between 2011 and 2021, 1206 different publications related to health literacy and mobile technology were published in the SCOPUS and Google Scholar databases. All these studies confirmed the significant role that mobile technologies can play to improve health literacy. However, the existing studies on mobile technologies were country or continental level. The five studies we found which focused on Africa, provided a comprehensive overview of mobile technologies in health systems in African countries. Unfortunately, we did not find specific frameworks that address the use of mobile technologies in improving health literacy in rural areas.

To fill this literature gap, our next study would be to design an implementation framework for mobile technologies in rural areas. The results obtained from the literature review indicate that despite the enthusiasm that mobile health technologies have persisted in Africa in recent years, very few previous studies have examined the contribution of them to improving health literacy in rural areas of Africa. This literature review also shows the need for more precise studies on the integration of local languages into mobile technologies to improve health literacy. Finally, it highlights the important role that health literacy plays in achieving the 2030 SDGs. This research has some limitations because we used only one database to conduct our systematic literature review, so we could not find more studies. For our future studies, we should consider doing a combination of many databases, not on a single database.

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