Effectiveness of interventions to improve digital health literacy in forced migrant populations: A mixed methods systematic review

Achille Roghemrazangba Yameogo, Carole Délétroz, Maxime Sasseville, Samira Amil, Sié Mathieu Aymar Romaric Da, James Plaisimond, Frédéric Bergeron, Sofia Tadlaoui, Patrick Bodenmann, Marie-Pierre Gagnon

Submitted to: Journal of Medical Internet Research
on: December 10, 2024

Table of Contents

Original Manuscript **5**
Supplementary Files **36**
Multimedia Appendixes **37**
Multimedia Appendix 1 ..... **37**
Multimedia Appendix 2 ..... **37**

Effectiveness of interventions to improve digital health literacy in forced migrant populations: A mixed methods systematic review

Achille Roghemrazangba Yameogo[1, 2]; Carole Délétroz[1, 3]; Maxime Sasseville[2, 1]; Samira Amil[2, 4]; Sié Mathieu Aymar Romaric Da[2, 1]; James Plaisimond[2, 1]; Frédéric Bergeron[5]; Sofia Tadlaoui[2]; Patrick Bodenmann[6, 7]; Marie-Pierre Gagnon[2, 1]

[1]Faculté des Sciences Infirmières Université Laval Québec CA
[2]VITAM - Centre de Recherche en Santé Durable Quebec CA
[3]Haute École de Santé Vaud, Haute école spécialisée de Suisse occidentale Lausanne CH
[4]École de nutrition Université Laval Québec CA
[5]Bibliothèque Université Laval Québec CA
[6]Faculté de biologie et de médecine, Vice-Doyen Enseignement & Diversité University of Lausanne Lausanne CH
[7]Département Vulnérabilités et Médecine Sociale, Unisanté Centre universitaire de médecine générale et santé publique Lausanne CH

Corresponding Author:
Achille Roghemrazangba Yameogo
Faculté des Sciences Infirmières
Université Laval
1050 Av. de la Médecine
Québec
CA

Abstract

Background: Digital health literacy is seen as a health determinant that can influence health and well-being, health equity, and the reduction of social inequalities in health. However, digital health literacy is often limited among forced migrant populations. They do not always have the capacity and skills to understand and evaluate health information or to access and use digital health resources appropriately.

Objective: Our objectives are as follows: (1) identify effective interventions designed to improve digital health literacy among forced migrant populations, (2) define the categories and describe the characteristics of these interventions that are designed to enhance the capabilities of forced migrants or adapt digital health services to meet the needs and expectations of forced migrant populations.

Methods: We conducted a mixed methods systematic review according to the PRISMA 2020 checklist, involving an iterative process among authors. A medical information specialist assisted in developing a search strategy for the six most relevant databases (MEDLINE, Embase, CINAHL, Web of Science, Academic Search Premier, PsycINFO) and the Google Scholar search engine, covering studies published between 2000 and 2022. Pairs reviewers selected, individually and independently, titles, abstracts, and then full texts. Data extraction and quality assessment were performed by two reviewers and validated by a senior researcher. We employed narrative synthesis to provide a comprehensive overview of effective digital health literacy interventions for forced migrant populations, highlighting the success factors of these.

Results: A total of 1,232 studies were identified, with only 6 were finally selected for narrative synthesis. The analysis reveals a diverse methodological landscape with a predominance of qualitative approaches aimed at understanding the challenges and needs of forced migrants concerning digital health literacy. The main challenges were associated with cultural, linguistic, and practical contexts. Interventions targeted various groups, including the elderly, those with low literacy or education, and individuals with limited digital experience. We identified four effective intervention categories to enhance digital health literacy among forced migrants: training, social support, empowerment, and educational, technological, and infrastructural support. Overall, most studies have reported positive results in terms of improving digital health literacy among forced migrants.

Conclusions: This systematic review highlights the importance of improving digital health literacy among forced migrant populations, which enables them to promote their health and well-being. In addition, it provides comprehensive knowledge about effective interventions conducted with these groups. These findings can inform policymakers, care providers, community-based

organizations as well as forced migrant populations themselves on the need to address the issue of low digital health literacy among forced migrant populations. For the future, it is therefore essential for these stakeholders to develop innovative initiatives that rely on holistic approaches and are based on the specific needs of forced migrants to improve equity and health outcomes.

(JMIR Preprints 10/12/2024:69880)
DOI: https://doi.org/10.2196/preprints.69880

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.
No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http

Original Manuscript

Effectiveness of interventions to improve digital health literacy in forced migrant populations: A mixed methods systematic review

Achille Roghemrazangba Yameogo[a,b], MSc, PhD (cand.); Carole Délétroz[a,c], RN, PhD; Maxime Sasseville[a,b], RN, PhD; Samira Amil[b,d], RD, MSc, PhD (cand.); Sié Mathieu Aymar Romaric Da[a,b], MSc; James Plaisimond[a,b,] MSc; Frédéric Bergeron[e], MSI; Sofia Tadlaoui[b,] MSc; Patrick Bodenmann[f,g], MD, MSc; Marie-Pierre Gagnon[a,b], PhD

[a]Faculté des Sciences Infirmières, Université Laval, Québec, QC, Canada
[b]VITAM - Centre de Recherche en Santé Durable, Quebec, QC, Canada
[c]Haute École de Santé Vaud, Haute école spécialisée de Suisse occidentale, Suisse
[d]École de nutrition, Université Laval, Québec, QC, Canada
[e]Bibliothèque, Université Laval, Québec, QC, Canada
fDépartement Vulnérabilités et Médecine Sociale, Unisanté, Lausanne, Suisse
[g]Faculté de biologie et de médecine, Vice-Doyen Enseignement & Diversité, Université de Lausanne, Suisse

Abstract

Background
Digital health literacy is seen as a health determinant that can influence health and well-being, health equity, and the reduction of social inequalities in health. However, digital health literacy is often limited among forced migrant populations. They do not always have the capacity and skills to understand and evaluate health information or to access and use digital health resources appropriately.

Objective
Our objectives are as follows: (1) identify effective interventions designed to improve digital health literacy among forced migrant populations, (2) define the categories and describe the characteristics of these interventions that are designed to enhance the capabilities of forced migrants or adapt digital health services to meet the needs and expectations of forced migrant populations.

Methods
We conducted a mixed methods systematic review according to the PRISMA 2020 checklist, involving an iterative process among authors. A medical information specialist assisted in developing a search strategy for the six most relevant databases (MEDLINE, Embase, CINAHL, Web of Science, Academic Search Premier, PsycINFO) and the Google Scholar search engine, covering studies published between 2000 and 2022. Pairs reviewers selected, individually and independently, titles, abstracts, and then full texts. Data extraction and quality assessment were performed by two reviewers and validated by a senior researcher. We employed narrative synthesis to provide a comprehensive overview of effective digital health literacy interventions for forced migrant populations, highlighting the success factors of these.

Results
A total of 1,232 studies were identified, with only 6 were finally selected for narrative synthesis. The analysis reveals a diverse methodological landscape with a predominance of qualitative approaches aimed at understanding the challenges and needs of forced migrants concerning digital health literacy. The main challenges were associated with cultural, linguistic, and practical contexts. Interventions targeted various groups, including the elderly, those with low literacy or education, and individuals with limited digital experience. We identified four effective intervention categories to

enhance digital health literacy among forced migrants: training, social support, empowerment, and educational, technological, and infrastructural support. Overall, most studies have reported positive results in terms of improving digital health literacy among forced migrants.

Conclusions
This systematic review highlights the importance of improving digital health literacy among forced migrant populations, which enables them to promote their health and well-being. In addition, it provides comprehensive knowledge about effective interventions conducted with these groups. These findings can inform policymakers, care providers, community-based organizations as well as forced migrant populations themselves on the need to address the issue of low digital health literacy among forced migrant populations. For the future, it is therefore essential for these stakeholders to develop innovative initiatives that rely on holistic approaches and are based on the specific needs of forced migrants to improve equity and health outcomes.

Keywords
Digital health literacy; forced migrant populations; refugees; immigrants; interventions; education; systematic review; mixed methods

Introduction

Forced migration is a growing global phenomenon. The International Organization for Migration defined it [1] as “a non-voluntary, coerced, and suffered migratory movement, caused by various factors, but involving the use of force and coercion.” According to Keely and Kraly [2], the reasons for forced migration include wars and armed conflicts, persecution and violence, human rights

violations, climate change, natural disasters, and famine. In 2023, there were approximately 117.3 million forced migrants, accounting for 1 in 69 people in the world [3]. An estimated 68.3 million are internally displaced people, 37.6 million are refugees, and 6.9 million are asylum seekers [3]. On host lands or countries, migrants often live with minimal public services and face many complex problems [4,5]. Due to a lack of regular migration status, discrimination, language, and cultural barriers, as well as low income levels, forced migrants have limited access to social and health services and health promotion interventions [6-8]. All these difficulties negatively affect their physical and mental health and well-being and make them more vulnerable [6,9].

The use of information and communication technologies (ICTs) for health, referred to as digital health or eHealth [10,11], could be a promising avenue to address the challenges faced by forced migrant populations, including internally displaced persons, refugees, asylum seekers, and economic, political, or climate migrants [2, 12-18]. Digital health technologies could play an important role in preventing and promoting the health and well-being of forced migrant populations [19, 20]. They can serve as tools or sources of health information to circumvent barriers in host countries. The Internet is a cost-effective or free alternative to search for web-based health information [21]. A study by Chae et al [21] found that about 3%-6% of Korean women surveyed living in the United States relied on the Internet as their primary source of health information. Accessing health information online can also overcome language barriers by allowing users to utilize either their native language or the language of the host country [22].

Smartphones and digital platforms are technological solutions that may assist forced migrant populations in navigating complex health systems in host countries [13, 18, 23]. These digital tools enable these populations who may be unfamiliar with the organization of health systems in host countries to locate doctors, clinics, and hospitals [18]. They also facilitate access to health services, including appointment scheduling and geolocation, particularly for services near their place of residence [18].

In the face of various stressors and challenges experienced by migrants in host countries, digital technologies serve as resources that can enhance their well-being. The digital resilience of forced migrants has been consistently linked to social ties [18, 24]. Social networks provide digital spaces for forced migrants to strengthen and create cultural connections (or shared identities), and gather emotional, and social support [24]. Connecting with community members who are already settled in the host country fosters feelings of security, trust, belonging, social inclusion, and recognition [24]. Additionally, contact via mobile phones and social media with family and relatives back home is an important source of social support for forced migrants, helping to alleviate physical barriers and feelings of social isolation while managing stress [18, 25].

Despite the opportunities and benefits of ICTs, some barriers may hinder forced migrant populations from accessing and using digital health technologies [26, 27]. Forced migrants with adverse personal characteristics (e.g., advanced age, cognitive impairment, lack of experience, and lack of digital skills) encounter more barriers to using the Internet and apps [28]. For example, older migrants whose health is deteriorating face more barriers to Internet use than their healthier counterparts. The challenges most frequently cited include the complexity of digital tools and security concerns [28]. Another category of barriers relates to their ability to search, find, understand, evaluate, and use health information online. Language barriers, the complexity of health systems organizations in host countries, and specific medical terminologies can limit access to web-based services for forced migrant populations [29-31]. Moreover, faced with the flood of information on social media, forced migrants may lack the skills to assess and differentiate between reliable and unreliable health information [32]. This category of barriers is also observed in the general population of the host land or country [33].

Consequently, low digital health literacy, involving all the above obstacles, is an important issue

among forced migrant populations [30, 34]. Norman and Skinner [35] define digital health literacy as "the ability to search, find, understand and evaluate health information from numerical, electronic sources and use the information to make decisions about one's health." With the continuous evolution of digital as well as the increasing complexity of society and health care systems, forced migrants require additional skills, such as the ability to identify information needs, locate credible web-based health information, and interact effectively with the digital health system to improve their health and well-being [36]. Several authors [36-39] point to the need to conceptualize digital health literacy by considering dimensions such as context (e.g., the ability to recognize the existence of an information need and trust web-based health information) and the interactions between migrants and the digital health system. Low levels of digital health literacy could lead to poor health outcomes [40], and exacerbate disparities in access to digital health services, contributing to health inequalities between communities [33]. Low digital health literacy is not conducive to achieving health equity.

To address these significant challenges, various initiatives aimed at promoting better health behaviors among forced migrant populations have been developed by different stakeholders [14, 37, 40]. A comprehensive understanding of these interventions to support digital health literacy among forced migrant populations and their effectiveness is essential for policymakers to develop tailored programs and interventions. However, to our knowledge, limited literature exists on interventions that enhance the digital health literacy of forced migrant populations, which underscores the interest in a mixed methods systematic review.

Objectives

The overall aim of the mixed methods systematic review is to assess the effectiveness of interventions aimed at improving digital health literacy among forced migrant populations. To achieve this general objective, two specific objectives will be pursued:

- Identify interventions designed to improve digital health literacy among forced migrant populations, including interventions aimed at creating enabling conditions or environments that cater to the needs and expectations of forced migrant populations limited by low levels of digital health literacy, to facilitate their access to, and use of, digital health resources.
- Define the categories and describe the characteristics of these interventions that aim to improve the abilities of forced migrants or adapt digital health services to meet the needs and expectations of forced migrant populations limited by low levels of digital health literacy.

Methods

Study design

We conducted a mixed methods systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist for systematic reviews [41]. We registered the review protocol on PROSPERO under number CRD42022373448. It was also published it on JMIR Research Protocols [42]. The general research question of our review was: how effective are interventions to improve digital health literacy among forced migrant populations, including internally displaced persons, refugees, asylum seekers, as well as economic, political, and climate migrants?

Eligibility Criteria

The eligibility criteria of our study were defined based on the PICOS (population, intervention, comparison, outcomes, and study design) model [1, 2, 43-45] and are described in Appendix 1. We included studies targeting forced migrant populations, including internally displaced persons;

refugees; and asylum seekers; as well as political, economic, and climate migrants. In addition, we included all studies focussed on interventions aimed at improving digital health literacy among forced migrant populations. As for the types of studies, there were no restrictions. We included all quantitative empirical studies, qualitative or mixed methods studies, and studies with or without a control group. We considered only studies published in English or French. We excluded editorials, commentaries, conference abstracts, protocols, and test recordings.

Search Strategy

A librarian from Université Laval (FB), who specializes in medical information and is experienced in systematic reviews, developed the search strategy in collaboration with the research team. In an iterative process between the different authors, we conducted systematic literature research in the following relevant bibliographic databases: MEDLINE (OVID), Embase, CINAHL, Web of Science, Academic Search Premier, and PsycINFO. We also used the Google Scholar search engine. This systematic research covered the period from January 01, 2000, to December 15, 2022, because the concept of "digital health" appeared in the early 2000s [46]. The search terms used were based on a combination of two key concepts, which are "Digital Health Literacy" and "Forced Migrant Population." We developed research terms for each of these concepts from the literature and thesauri. Specific details of the strategies are presented in Appendix 2. The search results were collated and uploaded into EndNote 20 (https://endnote.com/) to remove duplicates were removed manually. The database was then imported to the web-based collaboration tool Covidence (Veritas Health Innovation) [47], where further duplicates were removed using the automation function before the selection of studies was started.

Study Selection and Extraction

Pairs of independent reviewers (AY, CD, SA, SMARD, JP, ST) performed the study selection in Covidence [47], where the inclusion and exclusion criteria were added, first screening abstracts and titles, then the full text of relevant studies. Disagreements were resolved through discussion, and any remaining conflicts were resolved by a third reviewer (MPG). After study selection, we created a data extraction sheet using Excel and Microsoft Office, piloted it on three studies, and refined it for extraction. The final form included study characteristics, health issues and digital health literacy challenges, targeted population, interventions to improve digital health literacy and their characteristics, and study results. Finally, two reviewers (AY, CD) extracted data, and a senior reviewer (MPG) validated them.

Quality data analysis

Quality assessment is used to describe the selected articles and to interpret the data in the synthesis. Two reviewers (AY, SA) independently assessed the quality of studies using the Mixed Methods Appraisal Tool (MMAT) [48]. Using five methodological quality criteria for different designs (qualitative research, randomized controlled trials, non-randomized studies, quantitative descriptive studies, and mixed methods studies), this tool allows the simultaneous assessment of the different types of studies selected, whether qualitative, quantitative, or mixed. To achieve a congruent understanding of the criteria, a pilot test preceded the independent quality assessment by the evaluators. Differences in judgment were discussed, where necessary, to reach a consensus.

Data Synthesis and Analysis

We used narrative synthesis [49] as a method, regardless of the type of study (e.g., quantitative, qualitative, or mixed) to provide a descriptive synthesis of the results of the included studies. We report the study characteristics and methods used in Table 1 with a quantitative approach. We report

the qualitative analysis results in the form of themes. The relevant data from the included studies has been summarised and analyzed in narrative format, with findings grouped or themed wherever applicable: 1) description of target groups and settings, level of study intervention, and digital health literacy challenges; 2) interventions to improve digital health literacy; 3) effectiveness of interventions to improve digital health literacy.

Results

Selection process

The bibliographic searches identified 1845 publications. After removing duplicates, 1232 publications were screened from which 613 were excluded based on title or abstract because they did not meet the inclusion criteria. At the end of this first selection, 82 studies were selected for a review of the full text. At the end of the full texts review, we excluded 76 studies, thus leaving six studies [50], [51], [52], [53], [54] and [55] included in our systematic review.

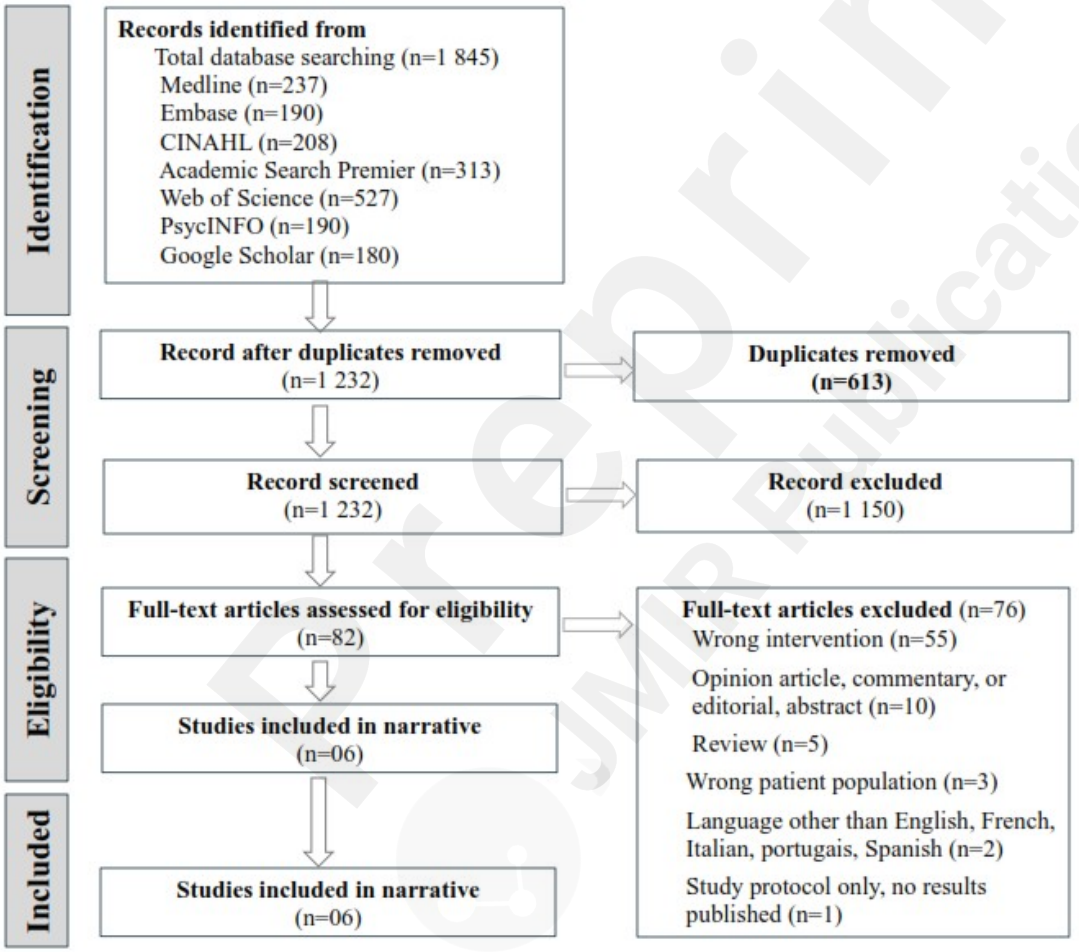

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram template for our Systematic Review.

Characteristics of included studies

The main characteristics and methods used in the included studies are presented in Table 1. The six studies were published in various journals. The oldest was published in 2017 [51] and the most recent in 2021 [55]. Two studies [50, 52] were published in 2019, followed by one study in 2020 [53], and finally another in 2018 [54]. For the country of implementation, two studies were

conducted in the United States of America (USA), two in Europe (1 in Greece and 1 in Spain), one in Australia, and one in the Middle East, specifically in Israel.

Table 1: Characteristics of included studies

Study reference	Journal	Article title	Objective	Country	Study Population (sample size)	Study Design	Challenges of digital health literacy for target populations
Fernández - Gutiérrez et al. 2019	Computers Informatiques Nursing (CIN)	Effect of a mHealth Intervention to Improve Health Literacy in Immigrant Populations: A Quasi-experimental Study	To evaluate the effectiveness of a mHealth intervention to improve the cognitive and social skills that enable migrants to access and use health services.	Spain (Strait of Gibraltar)	Immigrants, 18 –65 years of age, and non-Spanish nationality (Sub-Saharan Africa, China, Eastern Europe, Morocco, and South America) (93)	Quasi-experimental design: one group only pre-post measurements	Measure of health literacy (HL): The mean value obtained using the European survey questionnaire (HLS-EU-Q16), was 9.55 (SD: 4.35), corresponding to a problematic level of HL. With scores ranging from 0 to 16 points, this questionnaire establishes three levels of LS: inadequate (0-8), problematic (9-12), and sufficient (13-16).
Guttman et al. 2017	New Media & Society	"I never thought I could get health information from the Internet!": Unexpected uses of an Internet website designed to enable Ethiopian immigrants with low/no literacy skills to browse	1) To introduce Ethiopian immigrants, mainly those with low/no literacy both in Hebrew and Amharic, to using a new health information website with an interface that does not require reading skills.	Israel	Israeli Ethiopian immigrants, cultural and linguistic minorities facing sociocultural and health disparities (n=225)	A qualitative study on 2 phases: 1) health topics selection (discussions with Tene Briut staff and interviews with Ethiopian community members and practitioners) 2) Qualitative descriptive study (Face-to-face	No measure Low or no literacy skills to browse online health information.

Study reference	Journal	Article title	Objective	Country	Study Population (sample size)	Study Design	Challenges of digital health literacy for target populations
		health information	2) To explore how they would respond to the experience of using the website, its relevance to their lives, and current and potential barriers they might anticipate for future use.			interviews with Ethiopian immigrants to learn about their observations and an analysis and discussion of the findings)	
Johnson Rhonda et al. 2019	Health Literacy Research and Practice	A Novel Approach to Improve Health Literacy in Immigrant Communities	To develop and implement a Peer Language Navigator (PLN) program to improve health literacy in immigrant communities.	USA (Alaska)	Immigrant and refugee communities in Anchorage, Alaska (not specified)	Ripple effects mapping: participatory method of qualitative evaluation of the program	No measure Low health literacy level because of limited English proficiency. Most of the residents are unfamiliar with where or how to obtain health care services.
Kim et al. 2020	International Journal of Medical Informatics	Simple contents and good readability: Improving health literacy for LEP populations	To develop a website that helps populations with limited English proficiency increase health literacy and improve healthcare service access.	USA	Refugees from the Karen ethnic community with limited English proficiency and low health literacy (n=22)	A mixed methods study comprising 3 phases: 1) Needs assessment with community leaders and service providers (qualitative in-depth interviews). 2) Adapted content development from	No measure Limited English proficiency Limited readability of information in English Low/no skills in researching health information and navigating the

Study reference	Journal	Article title	Objective	Country	Study Population (sample size)	Study Design	Challenges of digital health literacy for target populations
						credible sources and tested each item using multiple readability tests (quantitative study). 3) Revision of each item to lower the readability and retest its readability (quantitative study)	healthcare system in English.
Millard et al. 2018	Public Health	The significance of digital citizenship in the well-being of older migrants	To understand the increasingly important role of digital citizenship (the ability to participate in society online) in supporting the well-being of aging migrants.	Australia (Western Australia)	Elderly migrants in Perth, Western Australia, taking part in an "Internet café" to improve their Internet skills and well-being (n=15)	Qualitative study (participant observation, social network mapping, ethnographic and life history interviews)	No measure Age-based digital divide: most participants had little or no experience using digital communication technologies before coming to the Internet café.

Study reference	Journal	Article title	Objective	Country	Study Population (sample size)	Study Design	Challenges of digital health literacy for target populations
Riza et al. 2021	Healthcare	Using an IT-Based Algorithm for Health Promotion in Temporary Settlements to Improve Migrant and Refugee Health	To test the potential of using the electronic algorithm in low-resource primary care settings with the help of health professionals in the settlements to help improve the health status of migrants and refugees, increase health literacy, and facilitate their integration into the host communities.	Greece	Migrants and refugees residing in Reception and Identification Centres (n=82)	Quantitative descriptive study	No measure Cultural, linguistic, and practical obstacles. Most participants had difficulty understanding medical information and didn't know where to seek medical help for a specific health problem.

Regarding the methods used, half (3/6, or 50%) of the studies used qualitative approaches. One of three studies used face-to-face interviews conducted with Ethiopian immigrants in Israel to explore their experiences of using a website [51]. Ripple effects mapping, a participatory qualitative assessment method, was used to assess the effects of the Peer Language Navigator program in the USA [52]. The last method [54] combines qualitative methods (participant observation, social network mapping, ethnographic interviews, and life history interviews). They were used to understand the important role of digital citizenship, including the ability of older migrants to participate in society online to improve their well-being. Then, two studies (33.3%) used quantitative methods. The first tested the use of electronic algorithms to help migrants and refugees improve their ability to understand medical information, assess health status, and navigate the health system [55]. The second examined the level of digital health literacy of migrants and assessed the effectiveness of the mHealth intervention aimed at improving the cognitive and social skills that enable access to and use of health services [50]. Finally, only one study used mixed methods (16.67%), combining interviews to assess the needs of the community and quantitative methods to test and validate the readability of the website's content [53].

Description of target groups, level of intervention implementation, and digital health literacy challenges among forced migrant populations

Table 2 shows that the studies were conducted either at the individual, the community, or the societal level, or simultaneously at all three levels. The target populations were mainly immigrants and refugees. Their number varied in the studies from 15 [54] to 225 [51] (median=82). The populations under review faced some challenges related to digital health literacy (see Table 1). Only one study [50] measured the level of digital health literacy among participants before the implementation of the intervention.

Table 2: Interventions effectiveness to improve digital health literacy

Study reference	Interventions to improve digital health literacy	Intervention category	Intervention action level	Main outcome	Secondary outcomes
Fernández-Gutiérrez et al. 2019	A culturally appropriate mobile application (e_SaludAble) containing health information developed for migrants in Spain (from sub-Saharan Africa, China, Eastern Europe, Morocco, and South America). e_SaludAble features a main menu in six languages, with six sections arranged in a scrolling tree structure designed to promote access and facilitate navigation of the socio-medical system to promote and maintain well-being. In their mother tongue, participants were trained and made aware of the basic content and how to use it. The aim was to improve the cognitive and social skills that enable migrants to access and use health services.	Education and training	Community	**Positive results**: A significant improvement in individuals' health literacy was observed after the intervention, with the mean rising from a problematic level of 9.55 (standard deviation: 4.35) to a sufficient level of 14.03 (standard deviation: 2.68).	The differences between pre-and post-intervention scores were statistically significant for both men and women and for participants of all nationalities, except the Chinese group.
Guttman et al. 2017	Creation of a website with health information presented through videos in Amharic. The website opens with a video explaining the site and how to use it. It has an audiovisual interface with pictures and voice to enable simple navigation among health topics without reading/typing skills. Topics can be heard orally when the “mouse” is moved over a picture/title. The hierarchical design enables navigating	Education and training	Individual, community, and societal	**Positive results:** The experience was generally rewarding, and most participants reacted with enthusiasm and excitement. Some were even overwhelmed by the new opportunity to access detailed health information. Other	Analysis of participants' apprehensions about using the website generated several conceptual developments: (1) the addition of culturally-focused elements to the Technology Acceptance Model (TAM), (2) the identification of users' needs according to their conceptions of their capabilities, (3) the

	from a general topic (e.g. diabetes) to specific topics (e.g. symptoms explained with cultural metaphors). Topics are women's health, nutrition, and diabetes.			participants expressed that the website was "designed for them", addressed their concerns, that the language used was respectful, and that the images represented their culture. **Negative results**: the experience was also marked by apprehension, even frustration, about future use. Participants with low or no literacy skills expressed the need for support and training for future use. Some felt it was too difficult and said they didn't think they could use it. Others felt the website wasn't for them, due to their age and the perception that it was too late for them to learn.	highlighting of ways in which an information site can offer socio-cultural benefits in addition to providing relevant information, including intergenerational communication, and (4) the proposal for the integration of the website into the wider communication infrastructure of a linguistic minority.
Johnson Rhonda et al. 2019	The Peer Language Navigator (PLN) program is an intervention aimed at enhancing health literacy among immigrant and refugee communities in Anchorage, Alaska. This program	Education and social support	Community	**Positive results**: The Peer Language Navigator program has proven its effectiveness	PLNs improve their health literacy, enabling them to become a credible and useful resource for others. At the end of the training, over 90% of PLNs

	trains individuals from these communities about health and wellness topics as well as how to obtain health information from reliable online sources. PLNs serve as navigators to share health information resources with their respective communities.			in providing understandable health information to hundreds of new English language learners in Anchorage, Alaska while guiding them to reliable health and wellness resources they can use for themselves, their families, and their community.	reported feeling confident or very confident in their ability to find health information using an Internet search. PLNs became leaders in their communities and changed their name to Peer Language Navigators. The PLNs' contact logs showed that they communicated with many people in their respective communities. The most recent cohort made up of five PLNs, provided health information to over 150 people over six months. The PLNs' work reached not only individuals but also community organizations and events.
Kim et al. 2020	Development of a web-based health information website specifically designed to assist populations with limited English proficiency (LEP) in increasing their health literacy and improving access to healthcare services. This website is characterized by simplified content, i.e. information presented in a clear, easy-to-read, and easy-to-understand manner. It is an educational and informative resource aimed at providing accessible health information tailored to the needs of immigrants and refugees, particularly the Karen refugee community from Burma.	Enabling and education	Community	**Positive results**: The average reading level of the original 99 subjects was assessed at 10.84 (SD = 3.26). After revisions, we were able to lower the readability level to 8.56 (SD = 2.96), corresponding to a drop of around two grade levels on average.	Web-based health website: A total of 99 health information topics (40 for hospitals, 37 for primary health services, and 22 for Medicaid) were identified, and appropriate content was developed. Most of the feedback received during the post-development evaluation was positive, particularly concerning the health information available on the site. However, average scores could not be reduced below the recommended level for grade 7, as recommended by

					leading organizations such as the American Medical Association and the National Institutes of Health.
Millard et al. 2018	Establishment of an Internet Café that provides digital literacy training specifically for older migrants in Perth, Western Australia. It is based on a social learning approach where participants could develop their digital skills at their own pace by using the Internet and digital technologies, guided by a staff of the organization and fellow patrons (peer learning). By fostering a community of practice, the intervention aimed to improve participants' confidence, autonomy, and access to social networks and essential services through technology.	Educational, technological, infrastructure, and social support	Individual, community, and societal	**Positive results**: With appropriate educational, technological, infrastructural, and social support, digital literacy for elderly migrants can significantly enhance their ability to maintain and expand dispersed support networks, as well as to engage socially and access health services. The “Internet café”, which fosters social learning environments and the creation of communities of practice, contributes to the development of digital literacy among elderly migrants, enabling them to benefit from greater autonomy, i.e. increased motivation and the ability to use the Internet for information	The study showed that: Older migrants want to connect with members of their support networks, whether local or remote, online or offline. When they have access to the tools and skills of new technologies and the Internet, elderly migrants benefit from increased direct access to their social networks, as well as to information, services, and personal interests, even at a distance. As they become more digitally literate, elderly migrants feel a greater sense of autonomy and social participation. Social learning environments, which function as communities of practice, are proving to be effective means of developing digital literacy and digital citizenship. These communities of practice can be supported by qualified ICT and social service professionals, in collaboration with individuals and other members of their respective care networks.

				and communication.	
Riza et al. 2021	IT-based electronic algorithm designed to assess the health status of migrants and refugees residing in Reception and Identification Centres (RICs) in Greece. This intervention involves the use of portable electronic devices, such as tablets, to administer a structured questionnaire that collects data on various health-related aspects, including health literacy, mental health, vaccination history, lifestyle habits, and the presence of diseases. Upon completion of the questionnaire with the help of health professionals, a report can be downloaded stating the health issues in which further action is required, and guidance is given as to where to look for help (healthcare system navigation information).	Education and social support	Individual	**Positive results**: The application of an electronic algorithm has helped to identify gaps in the understanding of health concepts such as understanding medical information in leaflets, and it has provided them with useful links to tools to increase their knowledge in several thematic areas. Using the interactive map, the study participants had the opportunity to locate points of care that they could access to seek professional help for a medical issue.	67.1% of respondents encountered difficulties in understanding medical information, and 57.3% didn't know where to seek medical help for a specific health problem. Four main areas of health problems were identified: (A) mental health concerns, (B) vaccinations, (C) obesity, and (D) dental hygiene, where the assistance of a healthcare professional is required. The “Roadmap and Toolbox” section of the project website gave respondents access to numerous resources and tools to enhance their knowledge in several thematic areas.”

The remaining five studies' participants exhibited personal characteristics that defined their low level of digital health literacy.

At the individual level, the study by Riza et al. [55], which is the only one in this category, individually and directly targeted migrants and refugees residing in Reception and Identification Centers in Greece. They faced cultural, linguistic, and practical barriers. Most of them had difficulty understanding medical information and did not know where to seek medical help for a specific health problem.

At the community level, there were three studies. The study by Fernández-Gutiérrez et al. [50], specifically targeted population groups of immigrants of non-Spanish nationality (Sub-Saharan Africa, China, Eastern Europe, Morocco, and South America) in a particular region (the border area of southern Spain). This study is the only one to have pre-assessment participants of the level of digital health literacy before the implementation of the intervention. Health literacy is measured using the European Health Literacy Survey questionnaire (HLS-EU-Q16), which assigns scores ranging from 0 to 16 points. This questionnaire classifies health literacy into three levels: inadequate (0-8), problematic (9-12), and sufficient (13-16). Analysis of the results showed a problematic level, with an average of 9.55 [standard deviation, 4.35] among these groups. The study by Johnson Rhonda et al. [52] specifically targeted immigrant and refugee populations in Anchorage, Alaska in the USA. Most of these people were newcomers and had little or no English language skills, which is a handicap in understanding online health information, navigating the health system, and accessing appropriate care. In their study, Kim et al. [53] specifically targeted immigrants and refugees with limited English proficiency, particularly the Karen ethnic community from Burma in Asia. They had problems with readability, which is defined as finding the right health information in an accurate, reliable, and easy-to-understand format, which indicates the specific digital health literacy needs of a particular community group.

Finally, two interventions were simultaneously conducted at the individual, community, and societal levels. The intervention in the study by Guttman et al. [51] directly targeted Ethiopian immigrants in Israel with little or no reading skills, thus implying difficulties in accessing online health information. In their efforts, they also involved Ethiopian immigrant organizations and encouraged the use of the website in community contexts. At the societal level, the website was designed to link national information about the specific needs of the immigrant community. As for the study by Millard et al. [54], it directly targeted older migrants to improve their essential digital skills. Most of these migrants had little or no experience in the use of digital communication technologies before coming to the Internet café. The intervention functions as a community of practice where participants learn from each other in a supportive social environment, helping to bridge the digital divide within society.

Interventions to improve digital health literacy

For the improvement of digital health literacy among targeted forced migrant populations, we identified four categories of educational interventions: training, social support, empowerment (enablement), and finally technological, infrastructural, and social support (see Table 2).

In the category of training, two studies were involved: the first intervention consisted of the use by groups of immigrants in Spain of a culturally appropriate mobile application (e_SaludAble) containing health information [50]. e_SaludAble featured a main menu in six languages, with six

sections spread across a drop-down tree structure designed to facilitate access and navigation through the social and health system to promote and maintain wellness. Thus, depending on the mother tongue and nationality, the groups of participants were trained and sensitized on the basic content and its use. The goal was to improve immigrants' cognitive and social skills to access and use health services. The second intervention involved the creation of a website with videos in Amharic that presented health information [51]. The website opened with a video explaining what the site was and how to use it. It also had an audio-visual interface with audio images and voices allowing for simple navigation through health themes without the need for reading skills. The purpose of the website designed to be accessible was to promote access by individuals to online health information. It was considered a community resource.

Social support is the second category with two interventions identified. The "Peer Language Navigator (PLN)" program [52] aimed to improve skills to understand and evaluate health information for immigrant and refugee communities in Anchorage, Alaska. The program trained members of these communities on health and well-being issues, as well as how to obtain health information from trusted online sources. These trained individuals, initially known as PLNs, served as navigators to share relevant health information with their respective communities and helped their peers access health care and services. The second intervention is an electronic algorithm designed in the form of a questionnaire to assess health status [55]. It aimed to help migrants and refugees residing in Reception and Identification Centres (RICs) in Greece to conduct a health self-assessment by answering a personalized questionnaire with the help of health professionals. This tool offered them specific information about their health status, health problems, and tips on where to seek help in the health care system.

The third category is enabling (empowerment), which relates to developing a health information website aimed at providing accessible and adapted information to immigrants and refugees. The content was simplified to present clear, easy-to-read, and easy-to-understand information [53]. This website was specifically designed to help immigrants and refugees with limited English proficiency (LEP), particularly the Karen ethnic community. It aimed to increase their competence to understand health information, navigate the health system, and make informed decisions about their health.

The last category of intervention is technological, infrastructural, and social support, for which one intervention [54] is described. This intervention involved the creation of an Internet café that helped older immigrants in Perth, Western Australia, improve their essential digital skills. It was based on a social learning approach where participants evolve at their own pace and learn from each other. Older immigrants were guided by the organization's staff and peers in the community in their learning. By fostering a community of practice, the intervention aimed to improve confidence, maintain support networks, access essential services, and support older immigrants' autonomy to participate in society online and improve their well-being.

Effectiveness of interventions to improve digital health literacy

All interventions presented in the six studies aimed at improving digital health literacy among forced migrant populations were evaluated. As shown in Table 2, overall positive results were found in five studies. One study, however, had mixed results.

In the category of training, two culturally appropriate interventions were identified and had different results. The study by Fernández-Gutiérrez et al. [50] was successful. The results showed that health literacy improved significantly after the intervention, with the average rising from

9.55, considered problematic, to 14.03, deemed sufficient. The training and awareness raising significantly improved their required cognitive and social skills on the use of the culturally appropriate mobile application (e_SaludAble), enabling them to access health information and health services. These results were valid for both men and women as well as participants of all nationalities, except for the Chinese group. The authors explain this result by the fact that the decision-making process of Chinese people is not always individual, but rather it is influenced by family, peer groups, or community leaders [50]. Thus, the performances of Chinese participants showed different results from those of other nationalities.

The results were mixed in the study by Guttman et al. [51]. Most participants reacted enthusiastically to their experience of using the website. They were delighted by the new possibility to choose detailed health information. They argued that the site addressed their concerns, that the language was respectful, and that the images represented their culture. Other participants, on the other hand, had a negative experience. Some felt that the site was too difficult and that they needed support and training for future use. Other participants thought that the website was not for them because they were too old to learn and didn't think they could use it.

All interventions in the other categories have been successful in improving digital health literacy among forced migrant populations. The Peer Language Navigator (PLN) program in the study by Johnson Rhonda et al. [52] demonstrated a beneficial effect in providing understandable health information to hundreds of new English learner migrants. This program guided them to reliable health and well-being information, enabling them to use it to make informed decisions to manage their health, that of their families, and their communities. The peer navigators improved their skills in understanding information and navigating the health system, allowing them to serve as credible and useful resources for others. More than 90% of them said they were confident or very confident in their ability to find such health information through an internet search.

The study by Riza et al. [55] demonstrated the effectiveness of the electronic algorithm as a tool to improve health literacy. It helped to understand health information and identify areas that need attention, such as mental health support, advice on vaccination, weight management (obesity), and dental care. In addition, the results highlighted gaps in the health of immigrants and refugees. Finally, the algorithm made it possible to provide health information and resources tailored to their personal needs (useful links), strengthening their ability to make informed decisions to better manage their health.

Positive results were also observed in the study by Kim et al. [53] about making more accessible a website for migrants with limited English proficiency. The average reading level of the information was lowered from 10.84 (standard deviation = 3.26) to 8.56 (standard deviation = 2.96), i.e. about two school levels lower, on average. The information on the website was accessible, easy to read, and easy to understand. Most of the feedback received during the post-development evaluation was positive about the understanding of information by immigrants and refugees with limited English proficiency.

The study by Millard et al. [54] was also successful. It demonstrated that the intervention of the Internet café, involving social learning places and communities of practice, has fostered the development of digital literacy and digital citizenship among older migrants, allowing them to maintain their support networks, access to essential information and services as well as enjoy greater autonomy and social participation. The Internet café has improved motivation and ability to use the web for information and communication purposes, such as connecting with members of

their support networks, whether local or remote, online or offline.

Quality assessment of the included studies

Overall, most studies met 80% (n=4) [51], [52], [53], [54] or 100% (n=2) [50], [55] of the quality criteria. On the other hand, some limitations were noted in these studies that do not call into question the quality of the results.

For qualitative studies, the main shortcomings were mainly related to the limitations of generalization of the results. These studies targeted communities in specific contexts such as Ethiopian migrants in Israel [51], migrants and refugees in Alaska [52], and elderly migrants in Western Australia [54]. In addition, the shortcomings were related to the sample size and the selection of participants, thus limiting the representativeness of the results [52, 54]. Some researchers [51] did not have access to the participants' responses in the original language and the participants did not have enough time during the interview to "skim through" all the topics and choose them.

Regarding the two quantitative studies [50, 55], selection biases were also noted, and difficulties in accessing certain categories of targeted populations that are difficult to reach were reported in the study by Riza et al. [55]. Additionally, the Fernández-Gutiérrez et al. study [50] highlights certain limitations associated with the use of the HLS-EU-Q16 questionnaire: the reduction of the number of items from 47 to 16 leads to a considerable loss of information.

Finally, the mixed-method study by Kim et al. [53], focused on a specific group in a single geographic location, i.e., ethnic Karen refugees from Burma with limited English proficiency in a geographic region of the United States. Therefore, the results from this study cannot be generalized.

Discussion

This systematic review explored the effectiveness of interventions aimed at improving digital health literacy in forced migrant populations. The importance of gaining skills is well established for populations with low digital health literacy, such as forced migrants [56-59]. These skills enable forced migrant populations to promote their health and well-being. These people can use digital tools such as the internet, smart and connected objects, mobile applications, and online platforms, to access relevant health information, care, and health services online or remotely. In the age of digital technology and artificial intelligence, it is a major determinant of health for populations [60]. Due to the context of the vulnerability of forced migrants [42], it is essential to support the development of their skills to search, find, understand, and especially, critically evaluate health information. This also includes the ability to apply or create health information for communication and interaction with the health system, to maintain or improve quality of life. Thus, these populations represent important targets for the development of interventions that support their digital health literacy, as well as for evaluating the effectiveness of these interventions.

The existing literature on the subject is quite recent and rare, but it has been growing in recent years [61]. This period coincides with the advent of the COVID-19 pandemic, which marks the beginning of the accelerated shift toward the use of digital tools to access information, care, and health services around the world [30, 62]. This has been the catalyst for the rapid adoption of digital health technologies [61, 63], which has potentially led to an increase in studies and initiatives aimed at strengthening the digital health skills of populations in general, particularly forced migrants.

The analysis of the six included studies shows methodological and diversified richness. The digital health literacy of forced migrant populations is a sensitive topic that requires special attention to individuals' cultural and social contexts, personal characteristics, and environment [42]. The qualitative approaches used focused on participants' experiences, which allowed for an in-depth understanding of their contextual and cultural challenges and specific digital health literacy needs [64, 65]. In general, qualitative approaches capture the complex realities of vulnerable populations, which are often overlooked in quantitative studies [66]. Understanding the specific challenges and needs has made it possible to tailor interventions to the specific realities of forced migrant populations. Conversely, quantitative studies, such as that of Fernández-Gutiérrez et al. [50], have provided empirical data on the health literacy levels of migrants and refugees, which is essential for assessing the effectiveness of interventions [67].

The geographical diversity of the studies, ranging from the United States to Australia, including European and Middle Eastern countries, also highlights varied cultural contexts that influence the results and methods of interventions. These countries have been among the countries that have received the most forced migrant populations in the world in recent years [68]. Adapting interventions to the cultural context of individuals is essential for their success in these host countries [69]. Although the results of the various studies are promising in terms of transferability, it is crucial to consider cultural differences and specific local conditions when adapting interventions. The results of our systematic review show that the main target groups identified varied greatly. These groups included older people, people with lower levels of literacy or education, and people with little or no experience with digital tools. The challenges related to digital health literacy were therefore varied and mainly related to cultural, linguistic, and practical contexts. The individual characteristics of these groups made them more vulnerable and made it more difficult to access health information and services. Previous research indicates that age, level of education, experience, and digital literacy influence the level of digital health literacy of individuals [33, 64, 70]. As a result, these populations faced significant barriers to digital health literacy, highlighting clear digital health literacy needs among these immigrant and refugee groups.

In our research, only one study conducted a screening assessment of digital health literacy needs, highlighting a lack of systematic assessments of digital health skills in this context [71]. The results showed that these populations often have problematic levels of digital health literacy among forced migrant populations, highlighting the importance of designing interventions tailored to the specific needs of these groups. The categories of interventions identified (education and training, education and social support, empowerment and education, and educational, technological, infrastructural, and social support) to improve digital health literacy among forced migrant populations reflect integrated and multidimensional approaches. Each type of intervention has its strengths and weaknesses, illustrating the complexity of the needs of forced migrant populations. Overall, the various interventions were successful. However, those that target certain categories such as older migrants and less educated migrants require increased attention and more robust approaches. The effectiveness of most interventions was found to be contingent upon their cultural and linguistic adaptation to individuals' personal characteristics and specific digital health literacy needs. For some authors [65, 69, 72], adapting interventions to the cultural context of populations is essential for their success, as it is a form of communicating, respecting cultural values, and adjusting actions considering the needs of individuals as well as the diversity of contexts, especially in contemporary societies. This approach not only recognizes the unique challenges faced by forced migrant populations but also leverages their cultural strengths to foster resilience and improve their digital health literacy. Our research has identified

a multitude of cultural and linguistic adaptation considerations.

The first consideration mentioned in the studies was the consideration of appropriate language and medical terms in the design and implementation of interventions. It is an essential part of cultural adaptation [73]. Therefore, linguistic and cultural differences in information understanding and health services are major barriers to individuals' engagement, involving cognitive, affective, behavioral, and contextual dimensions [69]. Our research has demonstrated the effectiveness of education and training. This category has resulted in the organization of training and information sessions in English [52, 53] the mother tongue [50], or local or preferred language [51] of forced migrant populations. In addition, in some interventions such as website creation [54], the level of medical language has been lowered to support populations with limited English proficiency in their empowerment and education. As a result of the different interventions, the cognitive (understanding and evaluating information, informed decision-making) and social (communication, collaboration, and social support) skills of the targeted forced migrant populations improved significantly. These results are consistent with Michie et al. [43, 44] who found in their review that education, training, and empowerment are categories of intervention that improve the abilities, opportunities, and motivation of individuals to change their behaviors, particularly in the context of managing their health and well-being, including the use of digital tools. Language is not limited to a simple vector of communication, but it also conveys cultural values, beliefs, and norms that influence the perception, appropriation of messages, and behavior of individuals [69], and more attention should be paid to medical terminology choice. In sum, an intervention that considers the specific language and language needs of individuals can play a crucial role in improving their level of digital health literacy.

The second consideration in the included studies was the social support provided by family, peers (competent community members), professionals, and community organizations on forced migrants populations. Social support is often cited as an effective method to strengthen individual and community engagement as well as networks [74]. It helped build social capital, which was essential for individuals' well-being and engagement. Forced migrant populations were in a collaborative learning environment with peers, professionals, and community organizations, which provided an opportunity to share knowledge and experiences to address digital health literacy challenges [75]. In addition, institutional and organizational efforts have been made to address gaps in access to relevant health information. Community peers or family members acted as mediators between forced migrant populations and existing resources, allowing information and tools to be adapted to the specific needs of these groups, considering cultural, linguistic, and technological barriers [75].

The third consideration relates to the level of implementation of the interventions presented in the included studies, a factor that directly influences the first two considerations. The studies analyzed identified three levels of intervention (individual, community, and societal). Two studies [51, 54] combined these three levels, highlighting the specificities of interventions to improve digital health literacy among forced migrant populations. The importance of a multi-level approach to supporting digital health literacy among forced migrant populations is clear, so it is essential that interventions are tailored and contextualized, considering their realities and needs [76, 77]. This strategy has the immense advantage of offering holistic and integrated interventions, considering the key dimensions that influence the digital health literacy of forced migrant populations in host countries.

This approach thus has broader implications, i.e. implications that go beyond the individual framework, encompassing the community, institutions, and society [78]. Such interventions allow forced migrant populations to better understand their options, access community and institutional

services, and improve their engagement and digital health literacy.

Strengths and limitations of the study

This study has several strengths, including the systematic analysis of the diversity of approaches and methods adopted in the six included studies, which provides insights into interventions to improve the digital health literacy of forced migrant populations. The variety of approaches and methods used allows for a rich and nuanced understanding of the challenges faced by these groups as well as the effectiveness and impact of interventions. The interventions were found to be culturally and linguistically appropriate to forced migrant populations, thereby enhancing their effectiveness. In addition, several studies have demonstrated positive results in improving digital health literacy, highlighting the concrete impact of these initiatives on improving the health and well-being of participants.

However, the methods adopted have significant limitations. The heterogeneity in study settings and designs limits the possibility of combining results. The focus on forced migrant populations may have excluded relevant interventions targeting other groups that could be relevant to improving digital health literacy in forced migrants.

Given that the studies analyzed focus on specific populations in particular contexts, generalizing the results to other groups or regions could prove problematic. In addition, some studies suffer from selection bias and limited sample sizes, which may affect the robustness of the conclusions. Finally, most studies have not systematically measured the level of digital health literacy among participants before the implementation of interventions, which may limit the ability to accurately assess the effectiveness and impact of interventions.

Future Considerations for Research

For future research, it would be important to adopt approaches and methods that enrich the understanding of the challenges and effectiveness of interventions to improve digital health literacy among forced migrant populations. It would be appropriate to include more diverse and representative samples to ensure that the results can be generalized to broader populations.

Future research could also capitalize on mixed methods to deepen the understanding of individual experiences and challenges that immigrants and refugees face with digital health in host countries, integrating both quantitative and qualitative approaches. Particular attention must be paid to the different dimensions of the vulnerability of forced migrant populations, such as age, level of education, socio-economic status, experience, and digital literacy. Ultimately, it is crucial to consider the broader social, economic, cultural, and environmental determinants of health.

Future research should examine the level of digital health literacy of participants before implementing interventions, which will allow for a real measure of their effectiveness. In addition, longitudinal follow-up of participants could be used to assess the lasting impact of interventions on their digital health literacy.

Finally, studies should use holistic and multilevel approaches including the individual, community, and societal levels to promote a broader impact of interventions.

Conclusion

The study highlights the importance of improving digital health literacy among forced migrant populations, a need that has continued to grow in a global context marked by the accelerated digitalization of health services. While the included studies demonstrate the effectiveness of most interventions, several challenges require attention. The positive results illustrate the potential of

targeted interventions that are culturally and linguistically appropriate to promote better health and well-being among these vulnerable populations. The complexity of these challenges thus underscores the need for contextual adaptation of interventions, whether in the form of training, social support, or technological resources.

However, to ensure sustainable impact, it is essential to conduct rigorous studies that systematically assess digital health literacy levels before and after interventions, while ensuring sample diversity and representativeness.

In addition, the development of innovative solutions, based on integrated and holistic approaches, will be crucial to adequately address the diverse needs of these groups. Promoting digital health literacy tailored to forced migrant populations is imperative not only for their health and well-being but also for their effective integration into host societies and the better functionality of health care services. These initiatives not only address the urgent needs of forced migrant populations but also contribute to building a more equitable and accessible society for all.

Abbreviations
FMP: Forced migrant populations
DHL: Digital health literacy
IDP: Internally displaced persons
ICT: Information and communication technologies
PICOS: Population, intervention, comparison, outcomes, setting or context

Acknowledgments

The authors would like to acknowledge all the resource people who were consulted or involved during this study.

Data Availability

Data relating to the eligibility criteria for the studies in this research are available in Multimedia Appendix 1, and those relating to the research strategy in Multimedia Appendix 2. All data generated or analyzed during this study are included in the submission of the results manuscript in the form of Tables 1 and 2. The PRISMA 2020 [Preferred Reporting Items for Systematic Reviews and Meta-Analyses] flowchart is provided as a figure. Databases created during the data extraction process can be supplied on reasonable request.

References

1. Organisation internationale pour les migrations (OIM). Termes clés de la migration 2021 [Available from: https://www.iom.int/fr/termes-cles-de-la-migration.
2. Keely CB, Kraly EP. Concepts of Refugee and Forced Migration: Considerations for Demographic Analysis. In: Hugo G, Abbasi-Shavazi MJ, Kraly EP, editors. Demography of Refugee and Forced Migration. Cham: Springer International Publishing; 2018. p. 21-37.
3. The UN Refugee Agency (UNHCR). Global Trends report: Forced displacement worldwide in 2023. 2024.

4. Organisation mondiale de la santé (OMS). Statistiques sanitaires mondiales 2021 : suivi de la santé pour les ODD, objectifs de développement durable 2021 [Available from: https://www.who.int/publications/i/item/9789240027053.
5. Nadeem A. The Afghan migrant crisis: An impending threat to Pakistan's health system. Annals of Medicine and Surgery. 2022;80:104180.
6. Matlin SA, Depoux A, Schütte S, Flahault A, Saso L. Migrants' and refugees' health: towards an agenda of solutions. Public Health Reviews. 2018;39(1).
7. Portail sur les données migratoires. Migration et Vulnérabilité, Migration et santé 2021 [Available from: https://www.migrationdataportal.org/fr/themes/migration-et-sante.
8. Yadee J, Bangpan M, Thavorn K, Welch V, Tugwell P, Chaiyakunapruk N. Assessing evidence of interventions addressing inequity among migrant populations: a two-stage systematic review. International Journal for Equity in Health. 2019;18(1).
9. Thomson MS, Chaze F, George U, Guruge S. Improving Immigrant Populations' Access to Mental Health Services in Canada: A Review of Barriers and Recommendations. Journal of Immigrant and Minority Health. 2015;17(6):1895-905.
10. Burmaoglu S, Saritas O, Kıdak LB, Berber İC. Evolution of connected health: a network perspective. Scientometrics. 2017;112(3):1419-38.
11. Omboni S. Connected health: in the right place at the right time. Connected Health. 2021.
12. Bakewell O. Research Beyond the Categories: The Importance of Policy Irrelevant Research into Forced Migration. Journal of Refugee Studies. 2008;21(4):432-53.
13. Bock JG, Haque Z, McMahon KA. Displaced and dismayed: how ICTs are helping refugees and migrants, and how we can do better. Information Technology for Development. 2020;26(4):670-91.
14. Dasuki S, Effah J. Mobile phone use for social inclusion: the case of internally displaced people in Nigeria*. Information Technology for Development. 2021:1-26.
15. Dias S, Gama A, Maia AC, Marques MJ, Campos Fernandes A, Goes AR, et al. Migrant Communities at the Center in Co-design of Health Literacy-Based Innovative Solutions for Non-communicable Diseases Prevention and Risk Reduction: Application of the OPtimising Health Literacy and Access (Ophelia) Process. Frontiers in Public Health. 2021;9.
16. Reed HE, Ludwig B, Braslow L. Forced Migration. Springer Netherlands; 2016. p. 605-25.
17. Shaw BR, Dubenske LL, Han JY, Cofta-Woerpel L, Bush N, Gustafson DH, et al. Antecedent Characteristics of Online Cancer Information Seeking Among Rural Breast Cancer Patients: An Application of the Cognitive-Social Health Information Processing (C-SHIP) Model. Journal of Health Communication. 2008;13(4):389-408.
18. Udwan G, Leurs K, Alencar A. Digital Resilience Tactics of Syrian Refugees in the Netherlands: Social Media for Social Support, Health, and Identity. Social Media + Society. 2020;6(2):2056305120915587.
19. Cultures & Santé. Littératie numérique en santé (n°16) 2021 [Available from: https://www.cultures-sante.be/nos-outils/les-dossiers-thematiques/item/592-litteratie-numerique-en-sante.html.
20. Pottie K, Ratnayake A, Ahmed R, Veronis L, Alghazali I. How refugee youth use social media: what does this mean for improving their health and welfare? J Public Health Policy. 2020;41(3):268-78.
21. Chae S, Lee Y-J, Han H-R. Sources of Health Information, Technology Access, and Use Among Non-English-Speaking Immigrant Women: Descriptive Correlational Study. J Med Internet Res. 2021;23(10):e29155.

22. Wang W, Yu N. Coping with a New Health Culture: Acculturation and Online Health Information Seeking Among Chinese Immigrants in the United States. Journal of Immigrant and Minority Health. 2015;17(5):1427-35.
23. Unwin T. 2022. Available from: https://www.mideq.org/en/blog/how-and-why-do-migrants-use-digital-tech/.
24. Modesti C, Talamo A, Recupero A, Nicolais G. Connections: The Use Social Associations With Migratory Background Make of ICT to Build Social Capital for Newcomers' Social Integration. American Behavioral Scientist. 2020;64(13):1889-905.
25. Nedelcu M. Les migrants roumains online : identités, habitus transnationaux et nouveaux modèles du lien social à l'ère du numérique. Revue d'études comparatives Est-Ouest. 2010;41(4):49-72.
26. Alam K, Imran S. The digital divide and social inclusion among refugee migrants. Information Technology & People. 2015;28(2):344-65.
27. Jauhiainen JS, Özçürümez S, Tursun Ö. Internet and social media uses, digital divides, and digitally mediated transnationalism in forced migration: Syrians in Turkey. Global Networks. 2022;22(2):197-210.
28. Kouvonen A, Kemppainen T, Taipale S, Olakivi A, Wrede S, Kemppainen L. Health and self-perceived barriers to internet use among older migrants: a population-based study. BMC Public Health. 2022;22(1):574.
29. Chesser A, Burke A, Reyes J, Rohrberg T. Navigating the digital divide: A systematic review of eHealth literacy in underserved populations in the United States. Informatics for Health and Social Care. 2016;41(1):1-19.
30. Choukou M-A, Sanchez-Ramirez DC, Pol M, Uddin M, Monnin C, Syed-Abdul S. COVID-19 infodemic and digital health literacy in vulnerable populations: A scoping review. DIGITAL HEALTH. 2022;8:20552076221076927.
31. Kaihlanen A-M, Virtanen L, Buchert U, Safarov N, Valkonen P, Hietapakka L, et al. Towards digital health equity - a qualitative study of the challenges experienced by vulnerable groups in using digital health services in the COVID-19 era. BMC Health Services Research. 2022;22(1).
32. Damasceno CS. Multiliteracies for Combating Information Disorder and Fostering Civic Dialogue. Social Media + Society. 2021;7(1):2056305120984444.
33. Beaunoyer E, Dupéré S, Guitton MJ. COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. Computers in Human Behavior. 2020;111:106424.
34. Gisbert A. La littératie numérique en santé : Des définitions aux moyens d'action, IREPS Auvergne Rhône Alpes. 2019 [Available from: https://ireps-ara.org/portail/portail.asp?recherche=La+litt%E9ratie+num%E9rique+en+sant%E9&x=13&y=12.
35. Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res. 2006;8(2):e9.
36. Martin C, Van den Broucke S. L'impact du niveau de littératie en santé des patients sur l'utilisation des services d'urgences. Faculté de santé publique, [Mémoire de Master en sciences de la santé publique, Université Catholique de Louvain]. 2021.
37. Diviani N, van den Putte B, Giani S, van Weert JCM. Low Health Literacy and Evaluation of Online Health Information: A Systematic Review of the Literature. J Med Internet Res. 2015;17(5):e112.
38. Lee J, Lee EH, Chae D. eHealth Literacy Instruments: Systematic Review of Measurement Properties. J Med Internet Res. 2021;23(11):e30644.
39. Paige SR, Stellefson M, Krieger JL, Anderson-Lewis C, Cheong J, Stopka C. Proposing a

Transactional Model of eHealth Literacy: Concept Analysis. J Med Internet Res. 2018;20(10):e10175.
40. Ferron C. Littératie en santé : une synthèse bibliographique 2017 [Available from: https://www.fnes.fr/outils-et-supports/litteratie-sante-synthese-bibliographique.
41. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Systematic Reviews. 2021;10(1):89.
42. Yameogo AR, Délétroz C, Sasseville M, Amil S, Da SMAR, Bodenmann P, et al. Effectiveness of Interventions to Improve Digital Health Literacy in Forced Migrant Populations: Protocol for a Mixed Methods Systematic Review. JMIR Res Protoc. 2023;12:e50798.
43. Michie S, Atkins L, West R. The behavior change wheel. A guide to designing interventions. (1e éd.). Great Britain: Silverback Publishing, 1003-1010. 2014.
44. Michie S, van Stralen MM, West R. The behavior change wheel: A new method for characterizing and designing behavior change interventions. Implementation Science. 2011;6(1):42.
45. Reed HE, Ludwig B, Braslow L. Forced Migration. In: White MJ, editor. International Handbook of Migration and Population Distribution. Dordrecht: Springer Netherlands; 2016. p. 605-25.
46. Frank SR. Digital Health Care—The Convergence of Health Care and the Internet. The Journal of Ambulatory Care Management. 2000;23(2).
47. Covidence. Veritas Health Innovation [Disponible auprès de : https://www.covidence.org/.
48. Hong QN, Pluye P, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O'Cathain A, Rousseau M-C, Vedel I. Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552), Canadian Intellectual Property Office, Industry Canada.
49. Popay J, Roberts HM, Sowden AJ, Petticrew M, Arai L, Rodgers M, et al., editors. Guidance on the conduct of narrative synthesis in systematic Reviews. A Product from the ESRC Methods Programme. Version 12006.
50. Fernández-Gutiérrez M, Bas-Sarmiento P, Poza-Méndez M. Effect of an mHealth Intervention to Improve Health Literacy in Immigrant Populations: A Quasi-experimental Study. CIN: Computers, Informatics, Nursing. 2019;37(3).
51. Guttman N, Lev E, Segev E, Ayecheh S, Ziv L, Gadamo F, et al. "I never thought I could get health information from the Internet!": Unexpected uses of an Internet website designed to enable Ethiopian immigrants with low/no literacy skills to browse health information. New Media & Society. 2017;20(7):2272-95.
52. Johnson Rhonda M, Shepard L, Van Den Berg R, Ward-Waller C, Smith P, Weiss Barry D. A Novel Approach to Improve Health Literacy in Immigrant Communities. HLRP: Health Literacy Research and Practice. 2019;3(S1):S15-S24.
53. Kim W, Kim I, Baltimore K, Imtiaz AS, Bhattacharya BS, Lin L. Simple contents and good readability: Improving health literacy for LEP populations. International Journal of Medical Informatics. 2020;141:104230.
54. Millard A, Baldassar L, Wilding R. The significance of digital citizenship in the well-being of older migrants. Public Health. 2018;158:144-8.
55. Riza E, Lazarou A, Karnaki P, Zota D, Nassi M, Kantzanou M, et al. Using an IT-Based Algorithm for Health Promotion in Temporary Settlements to Improve Migrant and Refugee Health. Healthcare (Basel). 2021;9(10).
56. Bachmann A, Gasser K, Villard Risse I, Foppa A, Hofmänner I. Compétences en matière

de cybersanté - Aperçu de la littérature récente2019. Available from: https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/2019/F/190520_eHealth_Literacy_Endbericht_def_f_.pdf.
57. Bergman L, Nilsson U, Dahlberg K, Jaensson M, Wångdahl J. Health literacy and e-health literacy among Arabic-speaking migrants in Sweden: a cross-sectional study. BMC Public Health. 2021;21(1):2165.
58. Geltman PL, Hunter Adams J, Penrose KL, Cochran J, Rybin D, Doros G, et al. Health Literacy, Acculturation, and the Use of Preventive Oral Health Care by Somali Refugees Living in Massachusetts. Journal of Immigrant and Minority Health. 2014;16(4):622-30.
59. Makowsky MJ, Davachi S, Jones CA. eHealth Literacy in a Sample of South Asian Adults in Edmonton, Alberta, Canada: Subanalysis of a 2014 Community-Based Survey. JMIR Form Res. 2022;6(3):e29955.
60. Arias López MdP, Ong BA, Borrat Frigola X, Fernández AL, Hicklent RS, Obeles AJT, et al. Digital literacy as a new determinant of health: A scoping review. PLOS Digital Health. 2023;2(10):e0000279.
61. Brørs G, Larsen MH, Hølvold LB, Wahl AK. eHealth literacy among hospital health care providers: a systematic review. BMC Health Services Research. 2023;23(1):1144.
62. Robbins T, Hudson S, Ray P, Sankar S, Patel K, Randeva H, et al. COVID-19: A new digital dawn? DIGITAL HEALTH. 2020;6:2055207620920083.
63. Golinelli D, Boetto E, Carullo G, Landini MP, Fantini MP. How the COVID-19 pandemic is favoring the adoption of digital technologies in healthcare: a rapid literature review. 2020.
64. Fitzpatrick PJ. Improving health literacy using the power of digital communications to achieve better health outcomes for patients and practitioners. Front Digit Health. 2023;5:1264780.
65. Radu I, Scheermesser M, Spiess MR, Schulze C, Händler-Schuster D, Pehlke-Milde J. Digital Health for Migrants, Ethnic and Cultural Minorities and the Role of Participatory Development: A Scoping Review. International Journal of Environmental Research and Public Health [Internet]. 2023; 20(20).
66. Creswell JW, Poth CN. Qualitative Inquiry and Research Design Choosing among Five Approaches. 4th Edition, SAGE Publications, Inc., Thousand Oaks. 2018.
67. Baumeister A, Aldin A, Chakraverty D, Monsef I, Jakob T, Seven ÜS, et al. Interventions for improving health literacy in migrants. Cochrane Database of Systematic Reviews. 2019.
68. Agence des Nations Unis pour les réfugiés (UNHCR). *Données et Statitsiques : Tendances mondiales - Deplacement forcé en 2023.* . 2024.
69. Naderbagi A, Loblay V, Zahed IUM, Ekambareshwar M, Poulsen A, Song YJC, et al. Cultural and Contextual Adaptation of Digital Health Interventions: Narrative Review. J Med Internet Res. 2024;26:e55130.
70. Délétroz C, Bou-Malhab P, Bodenmann P, Gagnon M-P. *Les spécificités de la littératie en santé numérique des patients à l'heure d'Internet et du numérique. In: Bodenmann, P., Jackson, Y.-L., Vu, F., & Wolff, H. (2022). Vulnérabilités, diversités et équité en santé (2e édition). RMS éditions. p75-82*. 2022.
71. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Viera A, Crotty K, et al. Health literacy interventions and outcomes: an updated systematic review. Evid Rep Technol Assess (Full Rep). 2011(199):1-941.
72. Nittas V, Daniore P, Chavez SJ, Wray TB. Challenges in implementing cultural adaptations of digital health interventions. Communications Medicine. 2024;4(1):7.
73. Lane G, Vatanparast H. Adjusting the Canadian Healthcare System to Meet Newcomer

Needs. Int J Environ Res Public Health. 2022;19(7).
74. Drageset J. Social Support. Springer International Publishing; 2021. p. 137-44.
75. Hawkins MM, Schmitt ME, Adebayo CT, Weitzel J, Olukotun O, Christensen AM, et al. Promoting the health of refugee women: a scoping literature review incorporating the social-ecological model. International Journal for Equity in Health. 2021;20(1):45.
76. Busse TS, Nitsche J, Kernebeck S, Jux C, Weitz J, Ehlers JP, et al. Approaches to Improvement of Digital Health Literacy (eHL) in the Context of Person-Centered Care. International Journal of Environmental Research and Public Health [Internet]. 2022; 19(14).
77. Zanchetta M, Poureslami I. Littératie en matière de santé dans la réalité des immigrants, sur le plan de la culture et de la langue. Canadian Journal of Public Health. 2006;97.
78. Koh HK, Brach C, Harris LM, Parchman ML. A Proposed 'Health Literate Care Model' Would Constitute A Systems Approach To Improving Patients' Engagement In Care. Health Affairs. 2013;32(2):357-67.

Supplementary Files

Multimedia Appendixes

Untitled.
URL: http://asset.jmir.pub/assets/e6bc0d9cf1566b0933667b2b0f051a05.docx

Untitled.
URL: http://asset.jmir.pub/assets/e9aa444361cb0717434022856a2f0bbd.docx