

Understanding barriers of receiving short message service appointment reminders across African regions: a systematic review

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ABSTRACT

Objective Patients frequently miss their medical appointments. Therefore, short message service (SMS) has been used as a strategy for medical and healthcare service appointment reminders. This systematic review aimed to identify barriers to SMS appointment reminders across African regions.

Methods PubMed, Google Scholar, Semantic Scholar and Web of Science were used for searching, and hand searching was done. Original studies written in English, conducted in Africa, and published since 1 December 2018, were included. The standard quality assessment checklist was used for the quality appraisal of the included studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart diagram was used for study selection and screening, and any disagreements were resolved via discussions.

Results A total of 955 articles were searched, 521 studies were removed due to duplication and 105 studies were assessed for eligibility. Consequently, nine studies met the inclusion criteria. Five out of nine included studies were done by randomised control trials. The barriers that hampered patients, mothers and other parental figures of children when they were notified via SMS of medical and health services were identified. Among the 11 identified barriers, illiteracy, issues of confidentiality, familiarised text messages, inadequate information communication technology infrastructure, being a rural resident and loss of mobile phones occurred in at least two studies.

Conclusions SMS is an effective and widely accepted appointment reminder tool. However, it is hampered by numerous barriers. Hence, we gathered summarised information about users' barriers to SMS-based appointment reminders. Therefore, stakeholders should address existing identified barriers for better Mhealth interventions.

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INTRODUCTION

Patients frequently miss and arrive late for their scheduled medical appointments. Missing medical appointments can be caused by several factors, including forgetfulness, confusion, miscommunication on medical appointment details, feeling better and

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In developing regions, patients miss their medical appointment schedules and are less likely to use health services. Though short message service (SMS) has been effective in reminding patients of their medical appointments, it is not yet optimal and not fully functioning.

WHAT THIS STUDY ADDS

⇒ This study incorporates comprehensive information about barriers to SMS-based medical appointment reminders. We indicated possible solutions to fix the identified barriers. We presented the impact of SMS on appointment reminders according to the reports of each study.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study provides good insight into readers about the barriers to SMS. To overcome the identified barriers and adopt digital technology in the healthcare system, stakeholders would use this reviewed work as a state-of-the-art synthesis and the best source of evidence.
⇒ Researchers may use this evidence as input for future research on mobile-based health intervention, remote patient counselling and home-based care.



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difficulty in tracking appointment schedules.¹ For instance, of the total medical appointments, more than 3 out of 10 medical appointments are missed by patients.² Access to healthcare services and medication is significantly hampered by missing medical appointments. Therefore, patients who regularly miss their appointments use healthcare services less³ and have poor health outcomes.⁴ In Africa, the problem is prevalent.⁵ Therefore, mobile technologies and telecommunications have been integrated into the healthcare industry as promising tools for bridging communication gaps, fostering behavioural change, overcoming

missed medical appointments and other challenges that developing regions face.⁶

A short message service (SMS) is used as the medical appointment reminder method for better healthcare outcomes, enhancing appointment attendance⁷ mitigating missed medical appointments⁸ and treating individuals with health and psychological problems.⁹ SMS is a convenient mode of communication that is widely used and is an effective strategy to reach a large population.¹⁰ However, the implementation, adoption, scale-up and sustainability of mobile-based appointment reminders are challenging.¹¹ SMS-based appointment reminders disintegrated with other digital technology (healthcare system application software) in resource-limited settings.¹² SMS-based appointment reminders are not yet optimal. Patients rarely and never reschedule their medical appointments.¹³ Though SMS provides instant and asynchronous communication, it is not standardised and fully functional across different health institutions.¹⁴

The rationale of the study

Mobile technology utilisation in the healthcare system is inadequately limited to specific functions for health interventions in the developing world compared with other developed regions. Conclusive evidence for health policymakers and professionals is required. Reliable guidelines are developed through research and evaluation to implement mobile-based health interventions and to tackle the possible challenges. However, studies of barriers to SMS-based appointment reminders across African regions were inadequate, and previous work was limited to a study setting. Previously reviewed work has not synthesised evidence on the significant barriers that affect patients, mothers or other parental figures of children to SMS-based appointment reminders. This study provides comprehensive information on the objectives of this study by critically evaluating and synthesising existing primary studies. Therefore, this study aimed to identify patients', mothers' or other parental figures of children's barriers to SMS-based medical or health service appointment reminders. The objectives of this study were: (1) to identify patients', mothers' or other parental figures of children's barriers to SMS-based appointment reminders, (2) to create an understanding of the identified barriers and provide alternative solutions to fix barriers.

METHODS

Protocol and registration

The systematic review protocol was registered in the PROSPERO database. Retrieved from https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022296559.

Study design

A systematic literature review was conducted on different articles in the African regions and published in peer-reviewed journals. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹⁵ were

used to map the number of records identified, included and excluded in the review process.

Inclusion criteria

Studies that meet the following inclusion criteria were included for review:

Types of study

Original studies that were conducted based on randomized control trial (RCT), experimental and quasi-experimental, observational, cross-sectional and qualitative research designs, written in English, and peer-reviewed were included. Studies that report barriers to SMS-based appointment reminders among patients, mothers or other parental figures of children were included.

Type of study participants

Studies that examined SMS appointment reminders on any patients, mothers or other parental figures of children who were notified via SMS of their medical, maternal and child care services were eligible in the present systematic review.

Period of publication

To identify the most up-to-date evidence and as we had limited time for database search, articles published since 1 December 2018 were included in this systematic review.

Study areas

Studies conducted across African regions were included.

Intervention

SMS text message-based appointment reminders.

Comparator

Usual patients' appointment reminder systems.

Outcome

The primary outcome was the effect of SMS or text messaging for appointment reminders. The secondary outcome was appointment attendance without SMS or text messaging.

Exclusion criteria

Types of studies

Duplicated studies in preprint, conference and reviewed papers on text message appointment reminders, books, diaries, commentaries and letters about text message appointment reminders; and studies that do not report barriers to SMS-based appointment reminders were excluded from this systematic review. In addition, since we did not have the financial and human resources to translate, papers written in non-English languages were also excluded.

Period of publication

Studies published before 1 December 2018 were excluded due to the limited time we had, and we believed that

Table 1 Synonyms

Keyword	Receive	SMS text message	Reminders	Patients
Synonyms	<ul style="list-style-type: none"> ▶ Acceptance ▶ Uptake ▶ Approval 	<ul style="list-style-type: none"> ▶ Text message ▶ Short text message ▶ Short message service 	<ul style="list-style-type: none"> ▶ Memorandum ▶ Notification 	<ul style="list-style-type: none"> ▶ Mothers

SMS, short message service.

studies published since 1 December 2018 provide up-to-date information.

Study areas

Study participants might not face the same barriers in receiving SMS-based appointment reminders. Therefore, studies conducted outside African regions were excluded.

Information source and search strategy

An electronic database search technique was used to identify peer-reviewed articles. PubMed, Google Scholar, Semantic Scholar and Web of Science were used for study searching. Gray literature on other relevant internet engines and hand searching using the references of the included studies were conducted. The studies, published until 28 February 2022, were identified by searching these electronic databases following systematic review searching procedures. Snowballing was used to look through the references of recognised publications for studies that might be relevant. For studies that might be pertinent, snowballing was employed to search through the references of reputable publications. Possible search words (synonyms) and mesh terms for each keyword were defined (table 1, box 1). Each keyword or term was searched using Boolean operators (OR, AND) in combinations. Specifically, (Receive OR Acceptance OR Approval OR Uptake) AND (Short message services OR text messages OR Short text messages) AND (Reminders OR Memorandums OR Notifications) AND (Patients OR Mothers). The Mesh terms of the PubMed database are presented in table 2.

Condition/domain studied

For this study, SMS is defined as a text message sent to a mobile phone, which includes any Mhealth interventions performed for patients, mothers or other parental

figures of children either manually or automatically. Therefore, this systematic review considered original studies conducted on SMS-based appointment reminders for patients, mothers or other parental figures of children as a domain to be explored.

Review and selection process

A Preferred Reporting Item for Systematic Review and Meta-Analysis Protocol was used for study selection and screening.¹⁵ A total of 955 studies were searched. The search results were exported to Endnote V.X9 software, and 521 duplicates were removed. Then studies were examined according to the selection criteria. Titles and abstracts were independently examined for the probability of eligibility by authors (AWD and MDT). Accordingly, a total of 324 studies were removed for a reason. At this stage, disagreements were resolved through discussion. After discussion, six studies were removed since titles and abstracts did not provide adequate information to decide, and ambiguities and uncertainties happened. A total of 104 articles had undergone full-text screening. In the second stage, full-text screening was done independently by authors (AWD and ADW). As a result, 67 articles were removed. Discrepancies between authors were resolved through discussion, and so 18 studies were removed since they dealt with an automated text-generating system. Finally, nine studies were included and reviewed to identify barriers to SMS-based appointment reminders (figure 1).

Data extraction and analysis

Data extractions were done on the included studies. The data extraction process was also done by authors (AWD and SMW) independently using predefined criteria. Discrepancies between authors were resolved through discussion. The studies' characteristics, such as authors name, publication year, study design, data collection methods, study participants, sample size and sampling technique, were extracted independently to describe the included studies. The impacts of SMS and mobile technology on health interventions were assessed according to the included study report. Content analysis was used to group barriers based on their concept of relationship.

Quality assessment and appraisal

Quality assessment criteria were established for studies that reported barriers to SMS-based appointment reminders. Joanna Briggs Institute quality assessment checklists were used to appraise the quality of the included studies.¹⁶

Box 1 The search strategy

A search strategy for PubMed
 (((((((Receiving [(All Fields)] OR Acceptance [(All Fields)]) OR Uptake [(All Fields)] OR Approval [(All Fields)]) AND ("text messaging"[(MeSH Terms)] OR Short message service [(Text Word)]) OR ("text messaging"[(MeSH Terms)] OR Text Message [(Text Word)]) OR (Short [(All Fields)] AND ("text messaging"[(MeSH Terms)] OR text message [(Text Word)])) AND Reminder [(All Fields)] OR Notification [(All Fields)]) AND ("patients"[(MeSH Terms)] OR Patient [(Text Word)]) OR ("mothers"[(MeSH Terms)] OR Mother [(Text Word)]))

Table 2 Characteristics of included studies of SMS-based appointment reminders among patients

Author/publication year/country	Study participant/sample size	Study design/methods of data collection/sampling method	Barriers to SMS-based appointment reminders	The impacts of SMS according to the objective of each study
Geldof/2020/Burkina Faso ¹⁷	People living with HIV/3800	RCT/semi-structured interviews and focus groups/purposive	<ul style="list-style-type: none"> ▲ Insufficient ICT literacy skill ▲ Linguistic diversity ▲ Unable to read the messages 	Examine SMS to improve antiretroviral (ARV) retention and adherence
Nhavoto/2018/Mozambique ¹⁸	HIV, TV patients+HCWs/141+40=181	RCT/semi-structured interview/ not stated	<ul style="list-style-type: none"> ▲ Matters of confidentiality ▲ Loss of phone (Stolen) 	Use of SMS for reminding appointments, medications, and sending motivational texts
Salihu/2019/Nigeria ¹⁹	Patients/200	RCT/questionnaire/random	<ul style="list-style-type: none"> ▲ Being a rural resident ▲ Lack of money ▲ Being of none educated ▲ Lack of transport, ▲ Work and time constraints ▲ Poor awareness of the disease 	Role of SMS reminders on the uptake of glaucoma screening
Schroeder/ 2021/Tanzania ²³	A child with cancer/40	Gross-sectional survey/questionnaire/ purposive sampling	<ul style="list-style-type: none"> ▲ Low literacy ▲ Being a rural resident 	Assessment of mobile phone ownership, use, and acceptability of an m-health intervention
Adewuya/2019/Nigeria ²⁰	Adults with depression/895	RCT//stratified random sampling	<ul style="list-style-type: none"> ▲ Lack of smartphone 	Effectiveness and acceptability of mobile telephone adherence support for the management of depression
Mekonnen/ 2021/Ethiopia ²⁴	Mothers/23	Qualitative/interview/purposive	<ul style="list-style-type: none"> ▲ Low mobile phone ownership ▲ A mobile network, ▲ Electricity, illiteracy ▲ Inadequate ICT infrastructure 	Explore acceptability, barriers and facilitators' text message reminders system
Moodley/2019/South Africa ²⁵	Cervical cancer precursor/364	Mixed method/in-depth interview, FGD and questionnaire/stratified and purposive	<ul style="list-style-type: none"> ▲ Confidentiality ▲ Loss/theft of mobile phones, ▲ Lack of clarity of language ▲ Low education, literacy 	Feasibility of m-health technology to improve management and follow-up of clients
Dissieka/2019/Cote d'Ivoire ²¹	Mothers/1596	RCT/questionnaire	<ul style="list-style-type: none"> ▲ Lack of familiarity with text messaging ▲ Challenges of reading and understanding written messages ▲ Low levels of education and literacy 	Assess the effect of mobile voice or SMS reminders messages on health facility attendance
Endebu/2019/Ethiopia ²²	HIV clients/420	Gross-sectional, qualitative/ questionnaire and FGD/random	<ul style="list-style-type: none"> ▲ Confidentiality 	Acceptability and feasibility of SMS to improve ART medication adherence
FGD, Focus Group Discussion; ICT, Information Communication Technology; RCT, randomised control trial; SMS, short message service.				

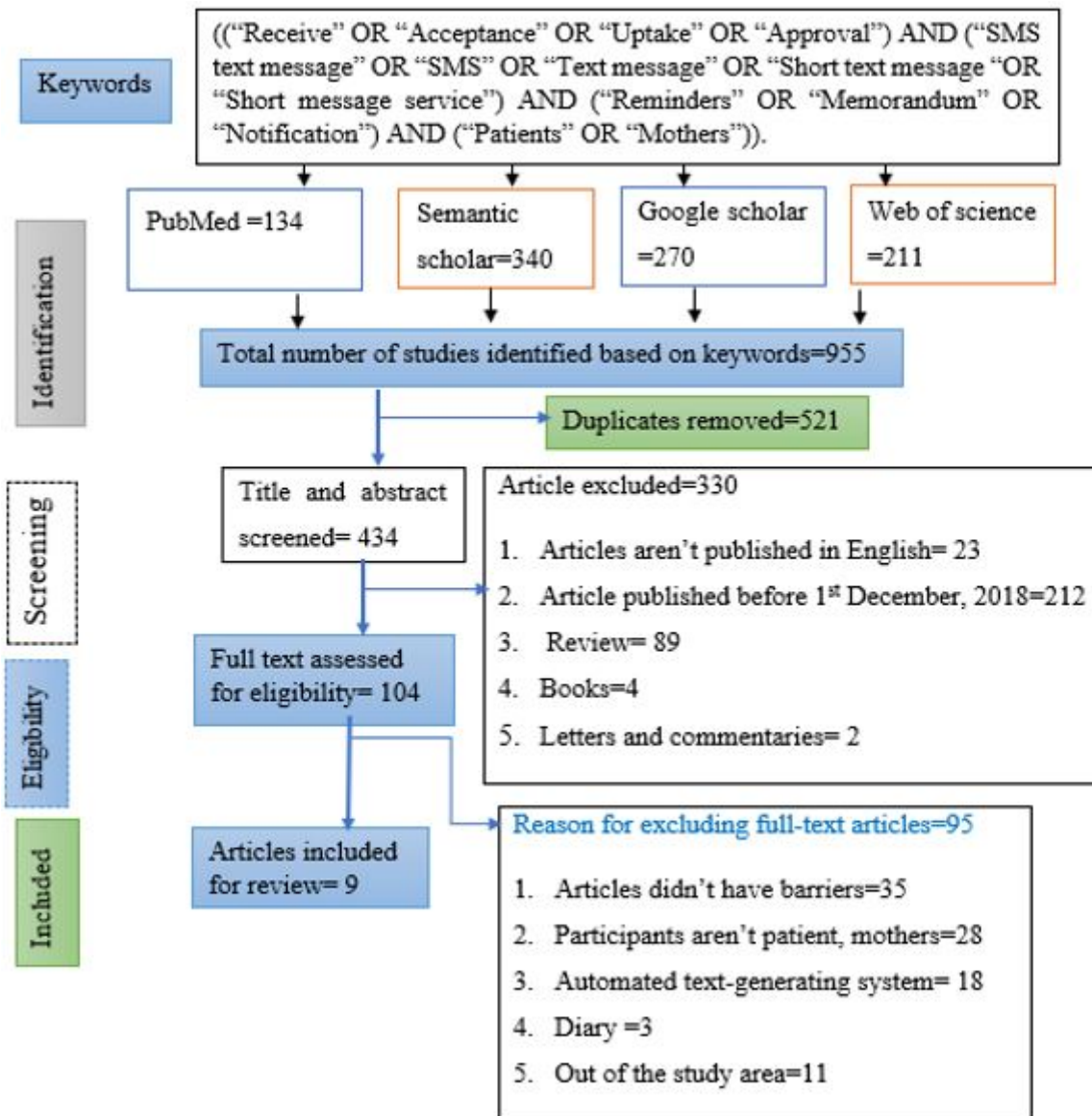


Figure 1 PRISMA flowchart diagram of the studies' selection and screening. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Issues that led to possible bias that occurred at all stages of the review were reduced and addressed. For instance, to address location and selection bias, studies published in an international electronic database were retrieved, and authors (AWD and MDT) assessed the quality of the studies independently. The authors met periodically to discuss biased concepts, and a consensus was reached according to the authors' discussion. There is no validation of the agreement between the authors for each disagreement.

RESULTS

A total of 955 studies were identified through search strategies. From a total of 955 studies, 521 were removed due to duplication. The remaining 434 studies were screened for further processing, and 329 were excluded after reviewing the titles and abstracts due to being unable

to meet the inclusion criteria. Then, 105 full-text articles were assessed for eligibility based on the predefined criteria, and 95 articles were excluded for a reason. Overall, nine studies met the eligibility criteria and were included in this systematic review (figure 1).

Features of the included studies

Of the total of 955 identified studies, nine studies were selected and reviewed for the synthesis of evidence after excluding ineligible studies. The study design of the included articles was RCT, qualitative, mixed and cross-sectional. Five out of nine studies (55.6%) were done by RCT.¹⁷⁻²¹ Two out of nine studies (22.2%) were done with a cross-sectional study design,^{22 23} whereas the remaining two studies (22.2%) were done by qualitative methods²⁴ and a mixed method²⁵ of study design accounted for one in each study design. Four out of nine studies (44.4%) were done in Nigeria^{19 20} and Ethiopia^{22 24} accounted

for two studies in each country. The remaining five out of nine studies (55.6%) were done in Burkina Faso,¹⁷ Mozambique,¹⁸ Tanzania,²³ South Africa²⁵ and Cote d'Ivoire²¹ with one in each country. From the quantitative studies included, the maximum sample size was 3800, which was done in Cote d'Ivoire to assess the effect of SMS on health facility attendance among people living with HIV.²¹ According to the publication year, five out of nine (55.6%) studies were published in 2019.^{19–22 25} Two out of nine studies (22.2%) were published in 2021,^{23 24} and the remaining two out of nine studies (22.2%) were published in 2018,¹⁸ and 2020¹⁷ accounting for one for each year (table 2).

The impact of SMS and mobile technology on health interventions

According to included studies report, SMS and mobile technology had an impact on improving antiretroviral retention and adherence,¹⁷ sending motivational texts,¹⁸ assessment of mobile phone ownership and use of SMS for health interventions,²³ effectiveness, feasibility and acceptability of mobile telephones for adherence support, depression management.²⁵ SMS-based reminder messages had a positive effect on health facility attendance and uptake of health services.²¹ The studies suggest that SMS-based text message is an acceptable mobile health strategy for health interventions and it is feasible, and effective in terms of scheduling appointments, receiving follow-up messages and health facility visits, for appointment cancellations, communication and information sharing (table 2).

Identified barriers for patients and mothers while they receive SMS-based appointment reminder messages

As presented in table 2, barriers to patients, mothers or other parental figures of children while they receive SMS-based medical or healthcare service appointment reminders were identified across nine included studies. Though content analysis is usually used for qualitative research studies, the identified barriers were grouped based on their concept of relationship. Overall, 11 barriers were identified based on their concepts of relationship across the nine included studies.

Of these, illiteracy was one of the barriers to SMS-based appointment reminders, as reported by six studies.^{17 19 21 23–25} In this systematic review, patients' inability to use mobile phones or text message reminders, poor awareness and knowledge of the disease, being unable to respond with SMS message information, having no or low-level education, being unable to read and write the SMS message and being unable to understand and comprehend SMS messages were grouped as illiteracy. So, illiteracy was the first most common barrier, occurring six times out of the nine included studies (54.6%). Confidentiality issues^{18 22 25} were the second most common barrier, occurring three times out of the nine included studies (27.3%). In this study, confidentiality was understood as the intentional disclosure and access of health

information and mobile phones without the users' consent, including privacy and security issues.

Inadequate ICT infrastructure^{17 24} including poor access to electricity and network; unfamiliarity with text messages,^{21 25} including unclear language, impersonal nature and negative, meaningless and uninterpretable SMS messages; and being a rural resident^{19 23} were the third most common barriers, occurring two times out of the nine included studies (18.18%). Unfamiliarised (with) SMS messages in this systematic review means the negative and impersonal nature of messages, SMS messages that are inadequate to add insights, and uninterpretable messages. Loss of mobile phones in this systematic review included loss of mobile phones, and their function as well as being stolen.^{18 25} Low mobile phone ownership,²⁴ linguistic differences, that is, the presence of different languages in the country,¹⁷ lack of money, lack of transport, work and time constraints²⁶ were the least frequent (9.1%) barriers, occurring once out of the nine included studies (figure 2).

DISCUSSION

In this systematic review, original studies focused on SMS-based medical and health service appointment reminders for any Mhealth intervention among patients, mothers or other parental figures of children across African regions were included for review. Accordingly, 9 out of the 955 searched studies were included and reviewed. A total of 11 barriers have been identified that could potentially hinder patients, and mothers from receiving SMS-based appointment reminders.

Of those barriers, illiteracy was the first main barrier to patients, mothers or other parental figures of children receiving SMS-based appointment reminders, which occurred six times out of the nine included studies.^{17 19 21 23–25} This evidence is the same as a study report that highlights illiteracy among a large population as a barrier to mobile health wallet implementations.²⁷ This barrier might occur when literacy rates and educational status are low.²⁸ Illiteracy in this systematic review incorporates patients' inability to use mobile phones or text message reminders, insufficient skill, poor awareness and knowledge of the disease and being unable to operate mobile phones and respond with SMS message information. Therefore, enhancing the educational status of mobile phone users, sending SMS messages based on the receiver's preferences and giving them training about how they use and operate mobile phones might be solutions.

Three studies reported that confidentiality was highlighted as one of the second-most common barriers to SMS-based appointment reminders.^{18 22 25} This finding is similar to a review report.²⁹ Although it may be an unintentional disclosure of an individual's health status, the study participants (patients with HIV and TB) were concerned and feared unauthorised access to their text messages.²¹ The finding is also similar to health

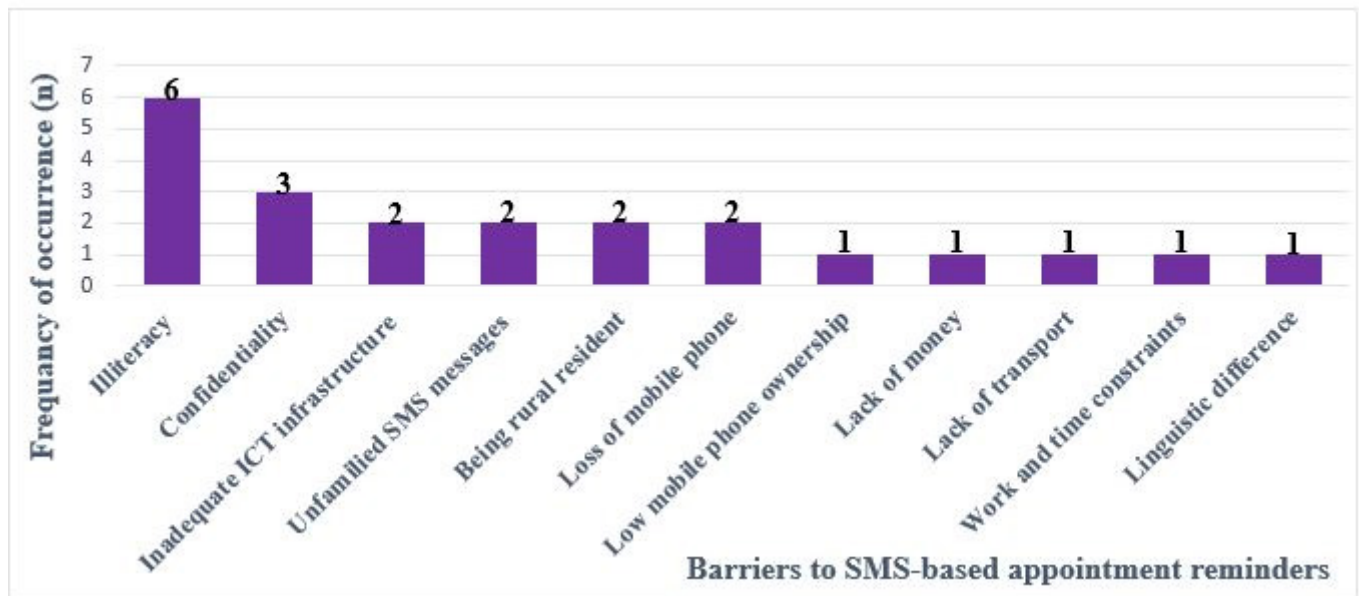


Figure 2 The frequency of occurrence of identified barriers to SMS-based appointment reminders. SMS, short message service.

professionals' confirmations that communicating via SMS can breach the confidentiality of patient information when SMS messages are sent to patients.²⁵ A patient with HIV stated that receiving SMS text messages disseminates and discloses health information to others.²² This is because of using shared phones to receive SMS reminders, accessing one's phone without consent; leaving a mobile phone with a neighbour to charge the battery,^{18 22 25} and unclear privacy and security regulations.¹² Untrained users may find it difficult to deal with smartphone technology. Unsecure wireless networks and leave the mobile phone where others can access and read SMS messages; health information may also be at risk if stored in a non-secure location.³⁰ As a result, confidentiality issues make many patients abandon and give up their treatment, and they are less likely to receive SMS-based appointment reminders. Under this systematic review, confidentiality issues include the intentional disclosure of health information, privacy and security problems and accessing information and mobile phones without the users' consent. So, an agreed code and a real-time communication system would maintain patients' confidentiality issues.

Unfamiliarity with text messages, insufficient ICT infrastructure, being a rural resident and phone losses were significant barriers to SMS-based appointment reminders. Unfamiliarised text messages were identified as a barrier according to two studies' reports.^{21 25} In this systematic review, unfamiliar SMS messages indicate a lack of language clarity, negative messages, inadequate to add insights and uninterpretable SMS messages. Hence, patients are challenged to read and understand the SMS text messages and face a problem communicating with a service provider about the timing of facility visits.²¹ Therefore, sending clear SMS messages that would

enhance patients' insight, having oral communication (phone calls) with patients, developing mobile apps for visual communication and sending code and image-based reminder systems are preferred to overcome such barriers.

Inadequate ICT infrastructures like poor access to networks and electricity were identified as barriers to SMS-based appointment reminders.^{17 24} A study has also shown that unreliable ICT infrastructure and a shortage of apps and hardware devices are challenges for Mhealth implementation.³¹ Though ICT infrastructures are prerequisites for advanced technology, lack of ICT infrastructure coverage and inaccessibility of technologies such as reliable networks, the internet and electricity access are the main challenges to SMS-based appointment reminders.^{32 33} We recommend that stakeholders instal a reliable network that covers large geographic areas with adequate and reliable Information Communication Technology (ICT) infrastructure to support mobile phone users and enhance mobile-based health interventions.

Two studies reported that being a rural resident is highlighted as a barrier to SMS-based text message medical appointment reminders.^{19 23} Since infrastructure in rural communities is the main challenge, mobile networks and electric power in rural communities are less accessible. So, the government should instal networks and electric power for rural communities and expand 4G and 5G coverage in these areas. The loss of a mobile phone is a barrier to SMS-based medical appointment reminders.^{18 25} Even if 98% of women with cervical cancer own mobile phones, only 50% of them attend their appointments, and 58% of them miss their appointments due to theft or loss of a mobile phone.²⁵ In this systematic review, the loss of a mobile phone means the loss of a mobile and its function as well as being stolen by another person. We recommend

that mobile phone users take care to prevent theft and protect their mobile phones and SIM cards from failure and loss.

In this systematic review, lack of money is identified as a barrier to SMS-based appointment reminders. Lack of money includes absence and insufficient birr, resource, financial and mobile card problems. This happens when there are financial problems, the high cost of mobile phone ownership and operation and the low amount of a person's income necessary to connect to technology.²⁶ So, supporting users in cash and with a free mobile package of services. Lack of transport, work and time constraints were barriers for patients, mothers or other parental figures of children to receive SMS-based appointment reminders. As clearly presented in the reviewed article, being too far from the hospital and having a long travel time were the constraints for the patients, which explained why they failed to attend their medical appointment.¹⁹ This might be associated with how often and when receivers are notified via SMS.²⁹ Therefore, reducing travel distance and travel time by constructing nearby health facilities and giving free transport services will increase patients', mothers' or other parental figures' attendance at the health facilities. Additionally, stakeholders should send SMS reminder messages frequently at a convenient time for the recipients.

In this study, linguistic diversity was defined as the presence of different languages in the country and was declared a barrier to SMS-based appointment reminders.¹⁷ This finding is supported by a report stating that patients' inability to communicate in their national language is a challenge for the implementation of mobile phone reminders.³⁴ This might be because the presence of different languages in the country makes SMS-based appointment reminder interventions and their design difficult to target all the patients or mothers. Some languages might be used only in oral communication, and the presence of cultural and linguistic differences among study subjects is a problem for SMS-based interventions.¹⁷ So, using meaningful picture messages might be the best solution.

The lack of mobile phone ownership was mentioned as a barrier to SMS-based appointment reminders.²⁴ This finding is similar to reports that suggest the present lack of mobile phone ownership is a challenge for the implementation of Mhealth.^{27 34} Although more than half of the world's population has access to and owns a mobile phone, a large proportion of the population shares a mobile with other people, and husbands frequently have access to the phone.³⁵ This is why it is difficult to deliver Mhealth interventions involving sensitive information and why husbands restrict their wives from using mobile phones. Low ownership of a mobile phone might lead to multiple users of one phone.

Strengths and limitations of the study

This study provides compiled evidence on barriers to SMS-based appointment reminders. This systematic review did

not limit itself to specific groups of populations or studies that looked at specific disease patterns. At the healthcare institution level, there is a need to summarise information on challenges to mobile-based health interventions. Therefore, this study would provide evidence for stakeholders to combat the identified barriers.

This systematic review focused on varieties of interventions that were dissimilar from each other in terms of study design and population. This was a challenging task. Future systematic reviews should better focus on specific interventions and populations. Even if the impacts of SMS or mobile technology for health interventions require a search strategy, we presented it as a feature of the included studies. Due to a lack of human capital to translate, studies written in non-English languages were excluded, and meta-analysis was not conducted due to the dissimilarity of the included studies. Plus, this systematic review was limited by the studies' publication dates.

CONCLUSION

In this systematic review, we identified barriers that may potentially impede patients, mothers or other parental figures of children from receiving SMS-based appointment reminders across nine included and reviewed studies. Illiteracy, confidentiality issues, inadequate ICT infrastructure, unfamiliarity with text messaging, being a rural resident, loss of mobile phones, low mobile phone ownership, linguistic differences, work and time constraints were barriers to receiving SMS-based appointment reminders.

SMS-based text messages are an efficient and effective tool for reminding patients of medical appointments and improving health interventions. However, it is not interactive. Therefore, we recommend health policy planners work cooperatively with vendors to advance the SMS function to be interactive (two-way communication). We believed that the evidence presented in the present systematic review would provide credible evidence for better routine health interventions through mobile technology and technology adoption. This would be crucial for health policymakers, and stakeholders to address the existing identified barriers. This study would provide evidence for future research on similar topics.

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