UNIVERSITY OF PAVIA – IUSS SCHOOL FOR ADVANCED STUDIES PAVIA

Department of Brain and Behavioral Sciences (DBBS)

MSc in Psychology, Neuroscience and Human Sciences

mHEALTH Interventions That Support Mental Health of People Living with HIV and on AntiRetroviral Therapy; A Narrative Literature Review

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ABSTRACT

Background: HIV has been a world pandemic since the 1980's and still it's an ongoing worldwide public health issue with Sub-Saharan Africa as the hotspot for the virus. Mental health is another challenge that continues to be a major public health issue. Living with Hiv has proved to have an impact on an individual's daily functioning and this has been observed and documented by studies. The introduction of Mobile Health(mHealth) in 2014 offered a promise of interventions for mental health challenges faced by this population. This narrative review aims to identify and evaluate existing mHealth interventions that specifically support mental health for people living with HIV(PLHIV).

Aims: This study aims to systematically identify and evaluate mHealth mental health interventions for PLHIV. It seeks to identify, explore the features, assess the usability and effectiveness of the interventions. It also aims to investigate access/applicability of these interventions in the Sub Saharan African(SSA) region. The goal of this study is to play a pivotal role in the development of evidence based intervention and support for this population in Botswana.

Objectives: The primary objective of this study is 1) to identify mHealth interventions aimed at supporting mental health of PLHIV, 2) to evaluate the features and functioning of the apps, 3) to assess their usability and access to SSA, 4) to ascertain effectiveness of the apps in improving the mental health of PLHIV.

Methods: A systematic search will be conducted using electronic databases search including: PubMed, PsyciNFO, JMIR and app reposition using keywords that will be predetermined. Studies published from January 2014 to July 2024 will be included. The screening of titles, abstracts, features and ratings will be evaluated by the author and approved by the supervisor. Collected data will be synthesised from various sources to investigate through comprehensive analysis of the Apps. A rigorous quality assessment framework will be established to evaluate mental health tracker apps tailored for PLHIV to ensure methodological robustness in assessing their efficacy, access, user experience, and alignment with evidence-based approaches.

Conclusion: This narrative review will offer a comprehensive review of mHealth interventions that support mental health of PLHIV, offering valuable insights for PLHIV, healthcare providers, researchers, policy makers and governments. By identifying gaps and strengths in existing interventions, this review will inform future research directions and contribute to the development of tailored interventions to enhance the mental well-being of PLHIV. By assessing the accessibility of these interventions, this review will inform policy makers and intervention developers to design interventions that can be applicable and translated to the context of different counties but more especially access in the SSA.

Keywords: Mental Health, Interventions, PLHIV, mHealth, Support, Sub Saharan Africa

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ACRONYMS AND ABBREVIATIONS

HIV- Human immunodeficiency Virus

PLHIV- People/person Living With HIV

AIDS- Auto Immunodeficiency Syndrome

mHealth- Mobile Health

ARV/T- AntiRetroViral/Therapy

WHO- World Health Organisation

SSA- Sub-Saharan Africa

ALWH- Adolescents Living with HIV

MAHILA- Mobile Phone-Based Approach for Health Improvement, Literacy and Adherence

PMTCT- Prevention of Mother to Child Transmission

PrEP-Pre-Exposure Prophylaxis

NGO-Non Governmental Organisation

CBSM- Cognitive Behavioral Stress Management

SMS- Short Message Service

BOTSWANA ORGANISATIONS

NAHPA- National AIDS and Health Promoting Agency

RADP- Remote Area Development Programme

DEFINITIONS OF TERMS

mHealth; a subset of Telemedicine and Telehealth which are healing at a distance through the use of information communication technologies to improve health outcomes(WHO, 2010). mHealth enables practice of medicine or public health through mobile devices like cell phones, tablets(WHO, 2011).

ART/V; Is a treatment for HIV but it does not cure the HIV infection instead it boosts and allows the infected person's immune system to get stronger and fight other infections. It can also be used for prevention for example prevention of mother to child transmission on HIV positive expectant mothers(WHO, 2024).

HIV; according to WHO Human immunodeficiency virus (HIV) is a virus that attacks the body's immune system while Acquired immunodeficiency syndrome (AIDS) occurs at the most advanced stage of infection.

Mental health; APA dictionary of psychology(2018) defines mental health as a state of mind characterised by emotional well-being, good behavioural adjustment, relative freedom from anxiety and disabling symptoms, and a capacity to establish constructive relationships and cope with the ordinary demands and stresses of life.

SSA; Normally used in the context of HIV and politics. The African Union Region Information defines these are countries that share a geographic location and socio-economic status. They include all countries located south of the Sahara Desert (Southern African, East, West and Central Africa)

CHAPTER ONE

INTRODUCTION

HIV continues to be a continuous worldwide burden to public health (WHO, 2022) with its treatment reaching more people than before (WHO, 2022) but HIV related deaths continue to be brutally high (Clair-Sullivan et al., 2019, Kruse et al., 2023) estimated at 630 000 in the year 2020 (WHO, 2022). The current world health protocol for the management of the virus is to eliminate the virus with the next progress update set for 2025 and 2030 respectively (WHO, 2022).

Globally there is an estimate of 39 million people living with HIV of which 86% of the PLHIV are aware of their status(WHO, 2022). WHO's goal with regards to management of HIV is to have stronger efforts to reach the whole population and treat all (WHO, 2022). Despite current efforts to combat the virus, the current global response is not significant enough to meet the ambitious targets of HIV public health sector strategies(WHO, 2022).

The introduction of ART has shifted the trajectories of HIV related deaths to its lowest since 1994 (WHO, 2022) and prolonged life expectancy of PLHIV ((Clair-Sullivan et al., 2019, Reynolds et al., 2016, Westergaard et al., 2017, Cooper et al, 2017). ART is a good tracer and indicator of measuring progress(WHO, 2022) because not all PLHIV take treatment. The demands of ART treatment created a platform to involve PLHIV in their treatment plan (Clair-Sullivan et al., 2019, Cooper et al, 2017).

Access to mobile phones has drastically increased (Betjeman et al, 2013) as a result countries have been implementing mHealth to manage, treat and track health but mostly to reduce health burdens(WHO, 2022 & Aboye et al., 2023)). According to Jongbloed et al (2020) a phone is not just primarily for calls but has health benefits and there is a new strive now of using mobile technologies for prevent and care interventions for youth (Giovenco et al., 2021, Jongbloed et al., 2020, Aboye et al., 2023). Early mHealth interventions have proven with other diseases to be beneficial contributing to better health outcomes (Clair-Sullivan et al., 2019, Kruse et al., 2023, Cooper et al., 2017, Betjeman et al., 2013, Aboye et al., 2023).

HIV has been here for quite a while and the achievements seen so far (Clair-Sullivan et al., 2019) are living proof that innovative technologies improve treatment outcomes and save lives (WHO, 2022). In light of that, the WHO (2022) has highlighted that strategic innovation shifts are needed to protect the progress that has been made so far.

Current approaches to health have moved towards a people -centred approach to treatment of HIV (WHO, 2022) which also requires integrating service delivery elements in new ways (WHO,2022) and customisation to the populations need and disease specifics (Giovenco et al, Paul et al, 2021, Betjeman et al, 2013). Countries have also changed priorities and approaches mainly to address common comorbidities to HIV (WHO, 2022). At the end of it treatment of HIV requires dedication to address the specific gaps for each disease area (WHO, 2022, Paul et al, 2021.))

There is a stigma that comes from people knowing an individual's HIV status and because of the stigma PLHIV normally suffer in silence fearing the stigma and need for confidentiality and privacy (Chory, et al., 2021). Most studies focused on youth interventions to address stigma, confidentiality and minimising psychological burdens of living with HIV (Giovenco et al.,Chory, et al., 2021). Already access to mental health is poor in middle-income countries which call on cost effective ways((Chandra et al., 2018)) so catering specifically for PLWHIV violate their very own top priority being confidentiality/privacy.

Mental health and psychological well are paramount factors to consider when treating HIV (Chandra et al., 2018, Reynolds et al., 2016, Chandra et al., 2018, Chory, et al., 2021) reveleaved that PLHIV reported emotional burdens of sadness, loneliness, anger among others. While Reynolds et al., (2016) highlighted that little attention has been given to depression while there is evidence that people diagnosed with HIV are prone to depression. Cooper et al (2017) on the other side lamented that a shift into this could bring better health outcomes for PLHIV. Westergaard et al (2017) & Cooper et al, 2017) argue that mHealth facilitates daily upkeep of self care of PLHIV.

For over two decades the SSA region has been primarily focused on the control of new infections; managing the virus in those infected and eliminating death. Previous interventions were focused on text which did not assess psychological issues (Chandra et al., 2018,Cooper et al., 2017, Chory, et al., 2021) but rather focused on prevention information dissemination, adherence tracking issues and other tertiary interventions. Hence a need for research that addresses and balances satisfaction of end users of ART (Giovenco et al.) because there has

been little research on low middle income countries(Chandra et al., 2018) in regards to mHealth interventions that support mental health of PLHIV.

STATEMENT OF THE PROBLEM

SSA is the world's epicentre for HIV/AIDS. Its approach to mHealth is that it is only used for two reasons: consultations and diagnosis which translates to simply informing or reminding and sometimes to monitoring health (Aboye et al., 2023) which is not helping. There is a need for an alternative model of delivery (Chory, et al., 2021) and mHealth has full potential to create a care system that involves monitoring, education and mental health support (Kruse et al., 2023) on top of the two that SSA mHealth systems are already doing well on.

Having an HIV positive diagnosis, being on ART/V for the rest of your life and having timely visits to the hospital comes with other demands as well((Aboye et al., 2023). There is likely to be an emotional and mental health response experienced by PLHIV because of the discrimination and lack of support they feel (Chory, et al., 2021). It carries along with it an emotional response to talks about it (Chory, et al., 2021)) and a lot of stigma **(**Clair-Sullivan et al., 2019), Participants in a study conducted in one of the SSA countries did report feelings of stress, fear, loneliness and challenges with mental health (Chory, et al., 2021).

The perspective of HIV positive people hasn't really been understood much (Chandra et al., 2018). Most of the HIV population are women and children(Aboye et al., 2023) who are already considered vulnerable populations. In SSA resources are focused on results of an HIV test and that also includes HIV literacy (Chory, et al., 2021, Chandra et al., 2018). That can be seen with lots of funds that the governments channel only into prevention and ART/V treatment (Kruse et al., 2023).

Just like the rest of the world SSA recently adopted the treat all policy which comes with challenges of its own. Which has brought in a problem of Poor adherence and adherence issues later exposed the mental health problems PLHIV face. In Kenya one study expressed that reasons for poor adherence was stigma and hiding the status and pills(Chory, et al., 2021).

Although 22% of mHealth systems in SSA are HIV related (Aboye et al., 2023) they don't address mental health. Looking at the state of mHealth systems in SSA, it is clear that the discrepancies may not be effectively tackling the most persisting health problem SSA struggles with (Aboye et al., 2023). They continue to state that mHealth can be explored to address the gap of mental health in the treatment of HIV. So mHealth has a possibility of

giving us solutions to address mental health struggles faced by PLHIV (Aboye et al., 2023, Kruse et al., 2023).

We are basically at a state where it is clear that mHealth is not a luxury anymore but a necessity (Aboye et al., 2023). There is a need for a safe space to have a feeling of support (Chory, et al., 2021) and have a safe place where their mental health can be supported.

Therefore this study departs from the premise that an HIV positive diagnosis comes with mental burdens that are seldom addressed and/or included in the management of the virus yet the mental health is a vital aspect of managing the self and following the strict adherence plan necessary to suppress the virus. The better control, management and treatment of the virus fully depends on a holistic approach. The one piece that is lacking in holistic treatment is mental health and since we are moving with digital times mHealth interventions may be our best bet that we can add to the holistic cocktail.

RESEARCH QUESTION

GENERAL QUESTION

Are there mHealth intervention specific to support of PLHIV

SPECIFIC QUESTIONS

1. what feature and functions are in the interventions

2. Are the interventions usable and applicable to the context of Sub Saharan Africa

3. Are they effective in improving mental health of PLHIV

RESEARCH OBJECTIVE

SPECIFIC OBJECTIVE

Identify mHealth interventions for mental health support of PLHIV

SPECIFIC OBJECTIVES

1. evaluate their features and functioning

2. assess their usability and access to Sub Saharan Africa region

3. to ascertain their effectiveness in improving mental health of PLHIV

SIGNIFICANCE OF STUDY

This study will inform policy makers in Botswana on the Mental health of PLHIV and give it the attention it needs and motivate creation of interventions specifically aimed at mental health support for PLHIV. The results of this study will guide the National AIDS and Health Promoting Agency (NAHPA) as an HIV treatment governing body to give PLHIV's mental health the priority it deserves in the treatment, funds allocation and research licences. It will also assist NAHPA to make informed decisions about resources allocations to address gaps, inequalities and improve access to mental health care specific to their target population as a governing body.

The findings of this study will also give the ministry of health in Botswana a scope of possible mHealth intervention that supports mental health of PLHIV and is translatable to the context of Botswana. The ministry as the financing body, governing and mother body can influence the other key stakeholders under them which their speciality is HIV to include mHealth interventions that supports PLHIV's mental health in their proposals requesting for funds from the ministry.

The knowledge from this study will assist policy makers, health ministry, NAHPA and other key stakeholders to understand mental health, its relationship with HIV and depth of mental health changes that come with an HIV positive status or ARV/T treatment. All stakeholders will also understand the importance of communication, holistic approach and moving with the digital world. PLHIV will understand mental health and how best to take care of themselves while managing with ART/V.

It is important to have a holistic approach when managing HIV/AIDS because it's the only way to have the best results in the management of the virus. Adding mental health in treatment/management of HIV plan is a crucial point because Botswana has exhausted all its effort to end the virus and although they have made a significant improvement they still failed to achieve an HIV free generation due to a non holistic approach that did not include among other things mental health support specific to PLHIV.

The study will also help with identifying evidence-based interventions and thus save the government funds and time but mostly save PLHIV the burden of being on many study trials which could be tiring. This is to simply say this study will benefit the whole country at large because public funds will be used in a positive way and both the government and the people

can account for funds. Also because this will allow the government to focus on other aspects of HIV that lack behind like: pill fatiques and risky sexual behaviours among tertiary study, intergenerational sexual relations and other HIV talks in RADP areas

Finally, there is a research gap in on mental health support for PLHIV, mHealth and the combination of the two, so this study will aid by filling the research gap that has already been noticed and help NGOs as a key stakeholder to disseminate information and design interventions as they are the ones that mostly hands on with PLHIV.

CHAPTER TWO

THEORETICAL UNDERPINNING

This study is informed by a theoretical model that highlights that immediately after an HIV positive diagnosis there are internal and external factors that elicit negative emotions attached to the care and/or management of HIV. The factors do not have an order, either can come first but at the end they lead an individual to have negative emotions attached to HIV care and or management. The negative emotions then eventually graduate into mental health concerns in PLHIV.
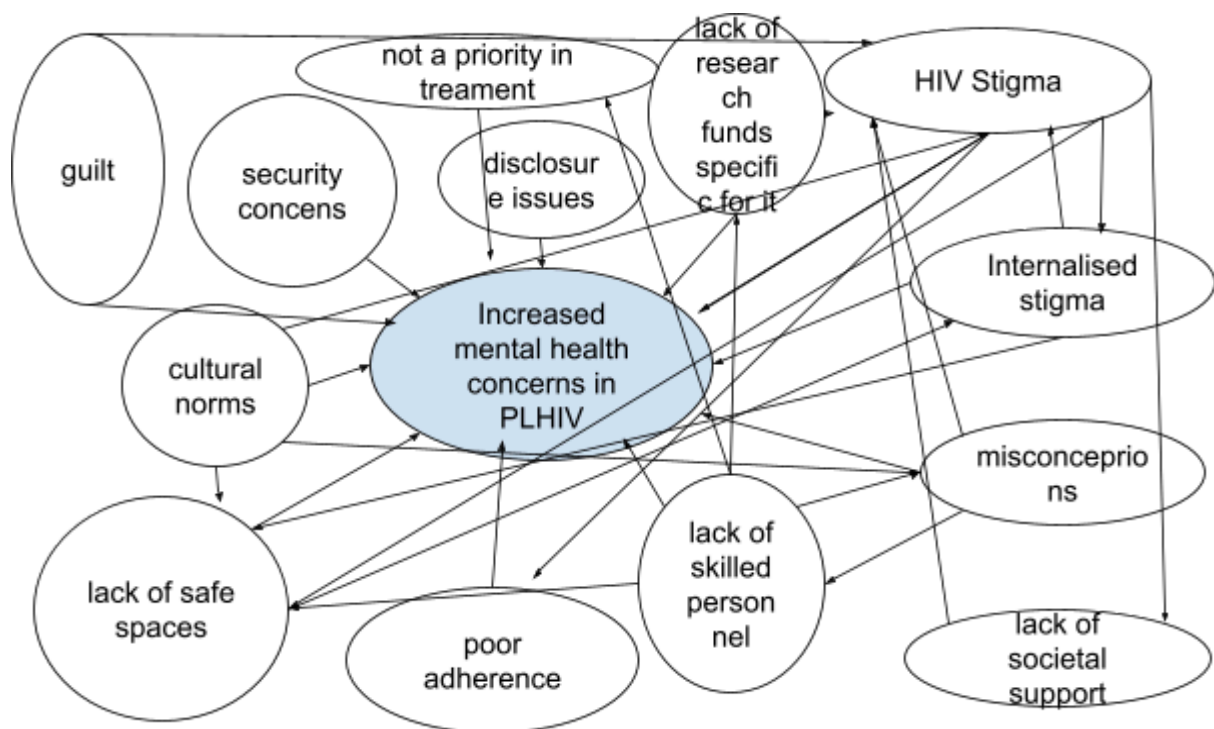

Figure 1: Spaghetti that explore factors leading to increased mental health concerns in PLHIV
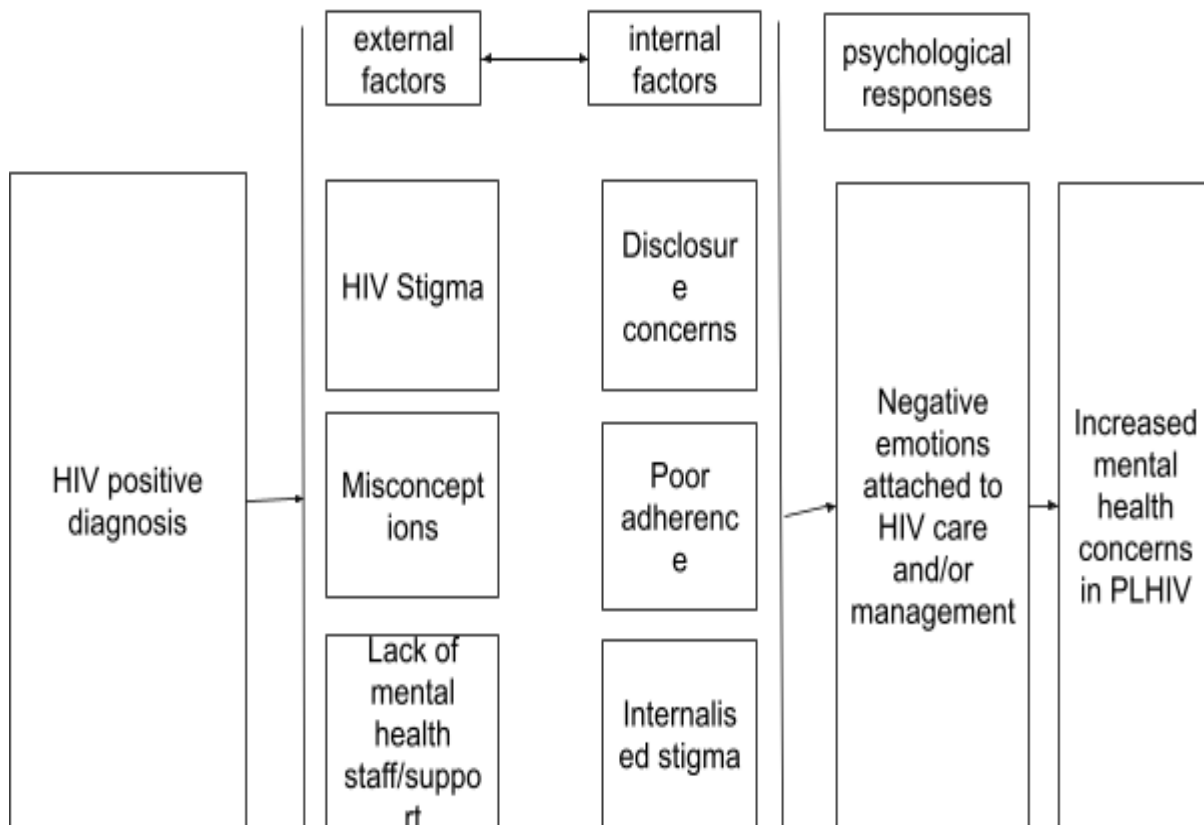
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┌──────────────┐      ┌──────────────┐        ┌──────────────┐
│   external   │◄────►│   internal   │        │ psychological│
│   factors    │      │   factors    │        │  responses   │
└──────────────┘      └──────────────┘        └──────────────┘

┌──────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│          │  │              │  │  Disclosur   │  │              │  │              │
│          │  │  HIV Stigma  │  │      e       │  │   Negative   │  │  Increased   │
│          │  │              │  │   concerns   │  │   emotions   │  │   mental     │
│   HIV    │  └──────────────┘  └──────────────┘  │  attached to │  │   health     │
│ positive │  ┌──────────────┐  ┌──────────────┐  │   HIV care   │  │  concerns    │
│ diagnosis│─►│ Misconcept   │  │    Poor      │─►│   and/or     │─►│  in PLHIV    │
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│          │  │  mental      │  │              │  │              │  │              │
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│          │  │ staff/suppo  │  │  ed stigma   │  │              │  │              │
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Figure 2: Increased mental health concerns in PLHIV theoretical model

METHODOLOGY

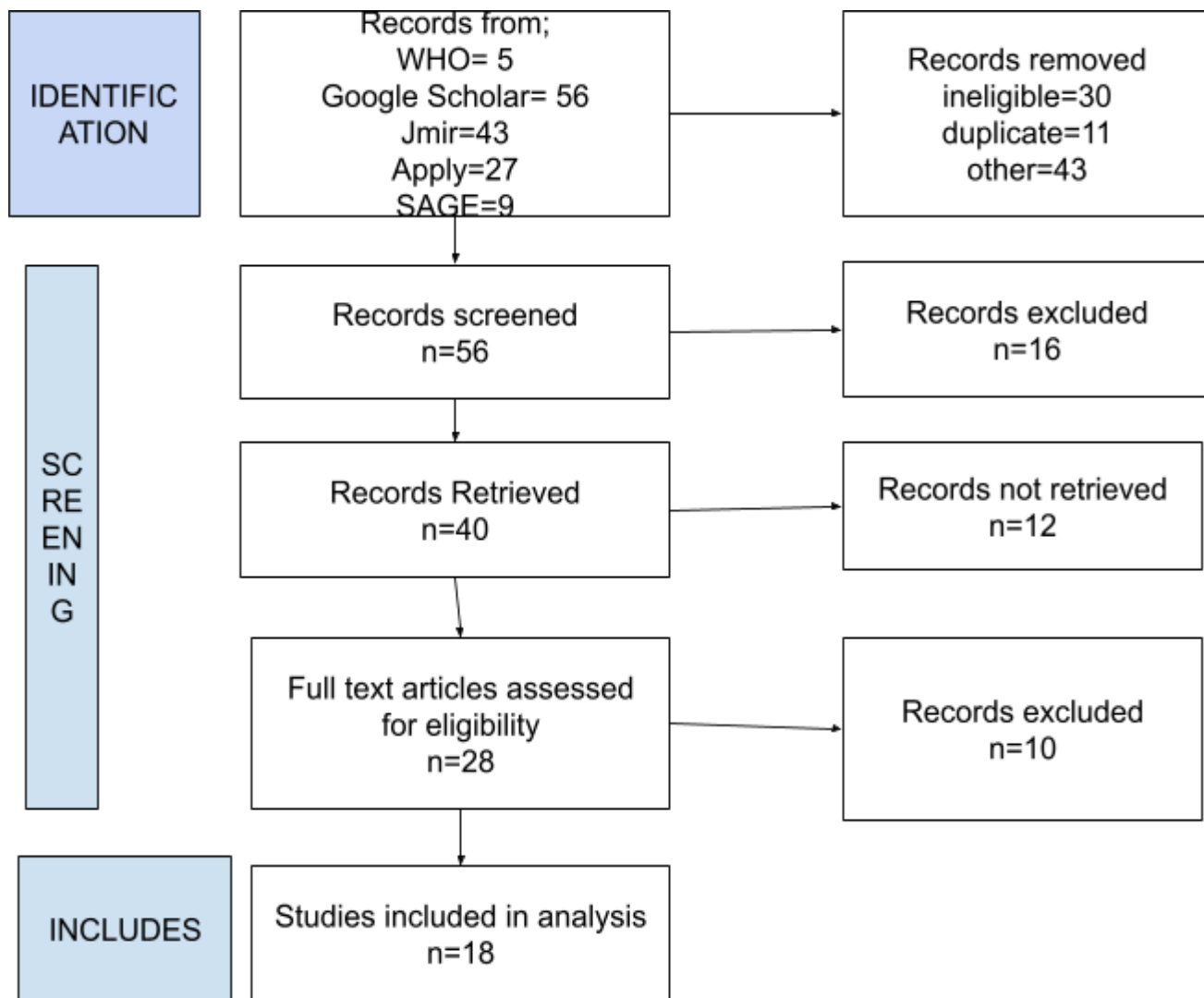IDENTIFICATION OF STUDIES VIA DATABASE SEARCH/WEBSITES

Figure 3: illustrates the study selection processes. Four database searches resulted in a total of 140 studies.

The main goal was to identify studies conducted from 2014 on the mHealth interventions that support mental health of people living with HIV. Firstly Scorpus was used to look for articles and titles. Next WHO as the governing body of HIV treatment was queried to get up to date data, policies and projects. Next Google Scholar, JMIR, APPLY, SAGE and JSTOR were argued because they provided comprehensive access to peer-reviewed journals and relevant articles in HIV, mHealth and mental health. A combination of the keywords to the study were

used to search for studies. HIV, ART, ARV and PLHIV were run separately with other keywords to cover all bases. Time filters were also put in place to studies from 2014 as the beginning of mHealth and 2024 as the most recent mHealth interventions. The study was only interested in scientific papers and peer-reviewed papers only. The exclusion criteria was non-peer reviewed articles, ART/ARV adherence and HIV testing mHealth apps articles. With HIV it was of paramount importance to avoid confusion between mental health and stigma associated with HIV, support for mental health and adherence because there were many studies on adherence.

RESULTS

Table 1: mHealth intervention's authors, participants, features, results and mental health outcome

Authors	Participants	Type of mHealth intervention	Features	Results	Mental Outcome
(Chory, et al., 2021)	-30 Adolescents Living With HIV (ALWH) on ART aged 10-19 years and provided with a smartphone with the WhatsApp preinstalled, a SIM card, and phone Credit	-Whatsapp chart group -2 whatsapp groups (15 each) based on age.	- HIV adherence and disclosure counsellor facilitating the WhatsApp® groups -native language used -psychoeducation -HIV literacy -structured curriculum to encourage positive support between members.	-Gaps discovery in critical area of HIV knowledge -Use of pseudonyms allowed participants to speak freely and share experiences without fear of retribution.	Participants identified a need for a place to ask questions, find solutions to problems, and foster feelings of support. Fear of stigmatisation is a major reason for nondisclosure of status among ALWH

(Chandra et al., 2018)	120 -HIV-infected women of age 18 or older -Depression screening	MAHILA study (Mobile Phone-Based Approach for Health Improvement, Literacy and Adherence) 2 groups (60 each): treatment as usual (TAU) or TAU plus the mobile phone intervention	-Trained basic nurses delivered the theory-guided, standardised phone intervention for mental health and psychosocial	-Depression was observed on 11 participants. -At least one psychosocial vulnerability factor was noted in 58 women. -most calls were not nurse-initiated, - transcripts recorded the use of words like depression, stigma, social support concerns and disclosure which were all patient-initiated.	-The number of calls and expressions of interest meant that the intervention was making some changes hence the calls were initiated mostly by the patients and not the nurse.
(Zhu et al., 2019) **Run4Love**	-300 Chinese participants aged 18 years and above. -Both genders -HIV positive and on ART	We Chat 2 groups(150 each): experimental and waiting list.	-Adapted a Cognitive Behavioural Stress Management (CBSM) course which had 9 sessions and 3 reviews -Coping skill and stress reduction skills Audio clips, articles, posters and phone calls	-change due to mediators of positive coping -reduced stigma to HIV	Reduction in depressive symptoms

(Reynolds et al., 2016)	120 Indian women, HIV + and on ART. -18 years or older -Tested positive in depression screening.	-MAHILA -2 groups(60 each); experimental and control. . .	-Nurse initiated calls at baseline and at least two times per week. -language adaptable -the call included counselling to engage and develop the individual's capacity for productive self-care behaviour	ongoing	ongoing
(Nabunya et al., 2024)	200 Ugandan youths aged between 14 and 17 years -HIV+ and on ART -Have depression.	App 2 groups Suubi-Mhealth and broken into 20 modules.	text, video, and audio format Evidence-Based Multimedia Psychoeducational Content to Reinforce Treatment Plans Educational content Features that Enable Self-Management Clinical Dashboard to Monitor Participants' Use of Suubi-Mhealth		
(Kreniske et al., 2023) **KIRABO**	-200 Ugandan Adolescents -10-19 years	SMS text message–based groups???	linking adolescents and young adults to health services, including HIV testing and mental health	ongoing	

	-HIV positive		counselling.		
(Step et al., 2022) **The Positive Peers Apps (PPA)**	-259 Participants of 13-34 years -HIV +	Free APP 2 groups; 114 PPA users and 145 non users	Audio computer-assisted self interviews system	Improved HIV-related clinical outcomes For young people living with HIV	

SUMMARY OF ANALYSIS

Table 2: Summary analysis of mHealth interventions

Authors	Intervention theme	Results Theme	Patient Satisfaction theme	Facilitator Themes	Barrier Themes
(Chory, et al., 2021)	mHealth App	-Increased knowledge of HIV -Better response to stigma and adherence -Increased mental health literacy and conditions	Satisfied	-No stigma associated with the Whatsapp group -Meets the preference of the age group -Care engagement -Convenience	-Cost -Training of facilitator
(Chandra et al., 2018)	Telephone	-Internalised and stigma by others explored -Increased mental health literacy	Satisfied	-Fear associated with the intervention -Convenient	Security concerns
(Zhu et al., 2019) **Run4Love**	mHealth App	-Increased positive coping -Decreased depression symptoms and hiv related stigma	satisfied	-Convenient -No stigma associated with the intervention	-Training for better use and understanding

		-No change in negative coping			24
(Reynolds et al., 2016)	Telephone	Increased mental health coping skills -	-	-	-
(Nabunya et al., 2024) **Suubi m-Health**	mHealth App	-Reduced: *psychological distress *HIV stigma -Increase social support -Improve quality of life	-	-Convenient -Self care stimulated	Stigma associated with recruitment clinic centre
(Step et al., 2022) **The Positive Peers Apps (PPA)**	mHealth App	-Increased engagement, care and viral load suppression -Increased engagement of both genders	-	Convenient	-Cost -Stigma associated with recruitment clinic -Security concerns
(Kreniske et al., 2023) **KIRABO**	mHealth SMS	-	-	-	-

DISCUSSION OF RESULTS

This narrative literature review analysed 18 studies and focused on seven mHealth interventions published over the last ten years(2014-2024) to identify mHealth interventions, assess their features and usability in the SSA region and the feedback given by the end users.

Three mHealth intervention themes were identified: mHealth SMS, mHealth App and mHealth telephone. The most common being mHealth apps, seconded by mHealth telephone and lastly mHealth SMS.

There are a lot of features in the apps that specifically address mental health. Firstly for some there is depression screening (Reynolds et al., 2016, Nabunya et al., 2024 and Chandra et al., 2018) which is a good starting point for continuity/symptom tracking. Some of the interventions had a counsellor as a facilitator which was helpful in fact check and general psychoeducation which was also one feature found in most of the interventions. Mental health knowledge among adolescents and sometimes people in rural areas in some studies were below par (Chory, et al., 2021) as observed by the questions and misconceptions they brought forward. As part of the intervention people were taught about mental health which made them aware of it and with awareness comes better response.

The interventions were also designed and adapted to the mother tongue of the country (Chory, et al., 2021, Reynolds et al., 2016) and target population. For better understanding and full self expression, the language adaptations make the interventions even more suitable to address deep seated issues that participants may have because participants did not have to struggle first to adopt a new language, try to understand or make communication using it. Basically being lost in translation was eliminated by having the language adaptations. Mental health concerns are sensitive and it is always better when they are addressed in the participant's comfort language.

HIV literacy was also an interesting feature in almost all the interventions. The HIV positive diagnosis does not always mean an individual has fully comprehended and understood what HIV is. In the SSA region in the past, HIV had a lot of misconceptions mostly because people did not understand it, there was little to no information about it and people ended up defining it themselves. Over the years the region had strived to provide and inform people about HIV. Although a lot of education has been done on the virus, the misconceptions have

somehow been passed on to the next generations as observed in one intervention which was specifically designed for adolescents. Furthermore, there is a stigma associated with HIV which makes requesting information about it to be hard and almost impossible because people fear stigma and what others think or how they are viewed by others.

The interventions also fostered support among PLHIV (Nabunya et al., 2024). Support among each other could be one of the best active studies ever. Theory can never compare to real life lived experiences hence support among the PLHIV was featured in the interventions because of the power it holds. PLHIV knows better how it feels, challenges and how they overcame them and sometimes someone's lived experience testament is all the intervention that is needed to assist someone to battle everyday challenges that come with HIV positive diagnosis.

All the interventions had a specific target group and all groups and ages had an intervention specific to them. This meant involvement of all people in the population of PLHIV in addressing mental health concerns. Another feature that was observed was treatment adherence. There are a lot of mHealth interventions for adherence, it's actually the most advanced aspect of living with HIV in terms of apps. It being merged with mental health is a win because an individual has to have their normal daily functioning to be able to adhere to their medication and follow up with medical appointments

Furthermore one feature that also stood out was the self management feature in all the interventions. As much as the medical and mental staff is important in the management of HIV, it is the sole responsibility of a PLHIV to manage themselves. This featured empowered and equipped participants to be able to self manage with HIV and its demands.

USABILITY IN SSA

SSA is still a developing region and whatever mHealth is designed for the region has to make a lot of considerations to make the interventions applicable and adaptable to the context of the region.

mHealth SMS can be applied to the context of SSA. Mostly because SMS does not require an expensive uptodate smartphone. Poverty is a fact that we cannot ignore. Not all households can afford a smartphone and the costs that come with it. With a normal phone an SMS can be received and sent. The cost of the SMS is also a factor to consider as well based on the household incomes. The SMS looks to be the most convenient and cost effective although it

seems impersonal. With an SMS an individual will just be receiving pre recorded messages that are not personalised to the individual and that can be an issue because people are social beings and always strive for a connection. Another issue that arises with SMS intervention is disclosure issues if the phone is accessed by another person other than the owner.

mHealth App also can be applied to the context of SSA with a lot to be considered while planning, implementing and designing. Apps work effectively on smart phones and not everyone in the SSA can afford it and the cost that comes with maintaining it. The Internet is needed to successfully run the smart phone and not all households have it nor can afford it. This one fact makes Apps a thin ground to skate on when thinking about adopting or designing an App for the SSA region because the internet is the heart of functionality of the smartphone.

mHealth telephone interventions have the same advantage as the SMS which is just a normal phone. Although it has one more advantage over the SMS; it would be a real person on the other side of the phone or a real person's voice if it's artificial intelligence. Human beings need to connect and feel like the person they are talking to understands or at least can feel what they are feeling. Also if the basics of the intervention is that the participants only have to wait for a call then it cancels the worry about cost except if they would like follow up in betweens scheduled calls. Which is less strenuous financially as compared to if the participants had to carry the sole responsibility of maintaining the interventions through calls.

In general mHealth has the potential to help SSA's HIV care and management. With more studies and interventions people can adopt and prioritise their health as they manage the little resources that they have to better their lives. Also governments can prioritise technological developments that support better health because they are overwhelmed due to lack of resources, skilled personnel and limited funds. mHealth has a wider coverage which is exactly what most SSA governments need and not only for mental health but the entire health systems.

REDUCTION OF MENTAL HEALTH CONSTRAINTS IN PLHIV

A lot of participants expressed satisfaction with mHealth interventions as firstly they offer them the safe space (Chory, et al., 2021) to talk about HIV, their everyday life and burdens that come with the HIV positive diagnosis. Secondly, the interventions assisted with HIV

literacy to PLHIV which is always assumed that they know while they don't more especially the adolescents. Furthermore it also helped with mental health literacy of the population. A lot of participants had reported all the emotions, feelings and fears they had that came with the HIV positive diagnosis. They got to understand that it is normal to have emotions attached to the diagnoses and way of life.

Participants in all interventions also reported stigma associated with HIV and they were equipped on how to tackle it as it mostly affected adherence which is a vital point in managing HIV. The participants in studies that had depression screening in the beginning also reported a decline in depression symptoms after the intervention.

The mHealth interventions not only tackled mental health, they engaged participants in their own care. At the end of the day PLHIV are the ones to take ART everyday, face stigma and have their everyday interrupted by medical checkups, blood drawn every often to check the viral load and sometimes have side effects caused by the ART. When it comes to mental health care they are the ones who lead their care which gives them power and some control over living with HIV.

mHealth interventions for mental health also cover the whole population. Each intervention has a specific target but at the end of the day everyone in the PLHIV population is covered. With mHealth there is not a huge gap between the genders as compared to physical mental health service seeking behaviours.

One final observation made by the author is that a lot of studies in mHealth, mental health and PLHIV are currently ongoing in the SSA but in East Africa.

CHAPTER THREE

CONCLUSION

In conclusion, there are interventions specifically designed to support PLHIV's mental health. They can be apps, phone calls and SMS among others. The diagnosis of HIV positive comes with a stigma attached to it which affects people's adherence to the ART, their normal daily functioning and general mental health. mHealth interventions are convenient because of their easy accessibility and usability. Some mHealth interventions have depression screening, psychoeducation and coping skills education.

The interventions can apply to the context of SSA but caution would have to be exercised because the region is not technologically advanced. Not everyone owns a smartphone nor can afford internet to sustain the smart phone use. Also economies are not doing so well which can cause an issue of affordability even for a normal phone. Participants had expressed satisfaction with the interventions with some studies showing a decrease in depressive symptoms after mHealth intervention. mHealth also reported a participation of both genders which is not always the case when it comes to normal physical mental health care where the ratio between men and women has high differences.

This study was conducted with the sole purpose of starting a new era in Botswana's care for HIV. Botswana has a generation in which the majority of them were born with HIV because PMTCT was not discovered yet. After that generation the goal was to have an HIV free generation but because of intergeneration sexual relations, risky sexual behaviours among the current young adults and misinformation the goal slipped away from Botswana. Both the generations are burdened with mental health problems because of the Virus and pill fatigue. Currently the country has some funds reserved for HIV research in angles that have never been covered before to end the Virus in the country.

Studies done in Botswana about HIV had been mostly medical; viral load, prevention interventions (PMTCT and PrEP) and risky sexual behaviours as a major risk factor for contacting the virus. The University of Botswana as the leading academic institution also has

limited studies about mental health of PLHIV. As the world is adopting a holistic approach to eradicate HIV it is of paramount importance that mental health be at the centre of the interventions as a person's normal daily function affects all the other aspects of HIV care.

There has been a transition in research funds and themes for the past two decades in Botswana. The early 2000's focused on PMTCT which saved a lot of babies from the virus. The generation of babies born in the 2000's are called HIV free babies. The last half of the decade saw a change in the theme to risky sexual behaviours as a risk to contracting the virus as studies observed that mostly people contracted the virus through risky sexual behaviours with more focus on reducing the number of sexual partners an individual had.

The 2010's theme focused more on the negative population of the country and HIV negative partners in a relationship with HIV positive partners. Also in this decade the country adopted a new treatment approach which is the Treat All(all those who test HIV positive start treatment immediately). The focus of most studies conducted were on PrEP. In all these themes mental health was never featured which is why it's an important theme to be explored in the 2020's.

Mental health has always lacked behind in Botswana with a fair number of the population not aware of it. To demonstrate the severity, the country has currently been recently label suicide and rape paradise and there is still no centre to asssist the victims and/or survivors. The only approach is medical care, breaking news and appealing for the citizens to be vigilant which is still not wholly addressing the situation.

The country also has a shortage of skilled manpower in the field of mental health. The university of Botswana has only 1 program for psychology and seats are limited in it as they accept less than five students per year. The only field highly recognised is Clinical Psychology and it still has a shortage of stuff. There is only one clinical psychologist in a district hospital. A rural district has roughly 50 000 people while an urban district has over 300 000 people. With some districts having no clinical psychologist at all.

With such a strain it is hard to have a mental health specialist specifically for the care of PLHIV. That is where mHealth can alleviate the burden from the country. mHealth as already mentioned by the literature is the best bet at reaching the whole community at a go with limited resources like Botswana has in the field of mental health.

mHealth can save the country money and time. Training mental health professionals will take a while as there is still a significant shortage even now. With mHealth interventions it would take a few months to set it up to the specific needs of Batswana.

It can also save Batswana some money. Those without a mental health professional in their region have to travel long distances for help but with mHealth they are only a phone away from help. It is also convenient and an individual can always reach the app for mental health support at any time they seem fit.

Majority of Batswana own a phone. The first generation to have HIV own phones but they are not smartphones. For this generation telephone calls would be the best intervention for them. Also this is a generation that has been through the worst because of HIV. They had to go through stigma, pill fatigue, grief of losing close friends and relatives. So, phone calls would be more personalised and they would be able to find support for all the traumas and what they had to survive through. SMS would be hard because not all of them are literate.

The AIDS Babies generation own a phone but because of high unemployment rates in the country they may have a smartphone without internet connection. For this generation as SMS, phone call and App intervention would work based on the individual's personal preferences and circumstance. This is the generation that was born with the virus, which fueled anger, pill fatigue, disclosure issues, young adults missing out, blame and stigma as well.

The AIDS free babies own smartphones and have internet access. mHealth App intervention would be better suited for them because all they have known is technology and it would be a strain to take them back to phone call or SMS. With them security issues are also high because they are cool kids and wouldn't want their peers to know their HIV status.

While mHealth may be the best antidote to mental health problems of PLHIV, for it to be adopted in Botswana there is one challenge that the government and AIDS coordinating agency would have to anticipate and put in mind while adopting mHealth; Technology. Technology in Botswana is not as advanced as it is in the first world countries. There are still major problems with network coverage in rural areas and the internet in the whole country.

NGOs could also be involved in the mHealth pursuit because at this point they know the needs, struggles and wants of PLHIV better than the government, AIDs coordinating agency

and mental health experts. For the past 4 decades they have been dedicated to the support of PLHIV with or without government funds.

RECOMMENDATIONS

- The government of Botswana and NAHPA should invest in ART pharmaceuticals who have mHealth apps that not only focus on adherence but mental health as well.
- NAHPA should involve NGOs in the funds to come up with mHealth interventions for PLHIV because NGOs have all the information of NAHPA's target population.
- The government of Botswana should reserve some research funds and licences specifically for mental health of PLHIV.
- The government of Botswana should also reserve funds for mental health professions education.
- The practising mental health professionals should consider specialising in HIV care as an area that desperately needs personnel.

CHALLENGES AND LIMITATIONS

Limited data: there is a huge research gap on mHealth support of mental health of PLHIV. There is a fair number of researches conducted on mental health of PLHIV and they are more specific on either one of the three terms: depression, substance abuse and stigma related to HIV positive diagnosis. So, when it comes to mHealth there has not been much research conducted. The researcher had a narrow information to work with although the aim was to stretch the more on the topic and adopt it to the context of Botswana.

Balancing personal and academic voice: My country's long standing experience with the fight against HIV has equipped me with so much information which in most cases is not academically backed. It was a battle to find a ground where I can express the reality of the disease in the context of Sub Saharan Africa and evidence based information.

Secondary sources: this study is sorely based on secondary data. It is possible that some important data may have been missed or overlooked. Future research should focus on primary data abstraction from the SSA.

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