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A qualitative study assessing acceptability and appropriateness of a technology-assisted mental health intervention by community frontline workers: *mPareshan* implementation research in rural Pakistan

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Abstract

Background With a shortage of mental health specialists and a significant rural population in Pakistan, leveraging community-based healthcare workers becomes crucial to address mental health needs. Equipping the healthcare workers with digital tools such as mobile applications have the potential to increase access to mental health support in low-resource areas. This study examines the acceptability, appropriateness, barriers, and facilitators to implementing a technology-assisted mental health intervention (*mPareshan*) delivered by Lady Health Workers (LHWs) in rural Pakistan.

Methods This is a qualitative study embedded within a larger implementation research trial assessing the feasibility of an mHealth intervention aimed at improving anxiety and depression. 8 focus group discussions and 18 in-depth interviews were conducted. Perceptions were sought before and after intervention from stakeholders comprising of policymakers, LHWs, Lady Health Supervisors (LHSs), and community participants. Data underwent thematic analysis using the RE-AIM framework.

Results Six main themes emerged from the data. All participants had realization of rising burden of mental illnesses and identified key determinants for mental ill-health. Delivery of mental health counselling by LHWs through a technology-assisted intervention was deemed acceptable and appropriate. LHWs were considered capable and trustworthy by the community to deliver a home-based mHealth intervention, given their easy accessibility as residents of the same community. The technology demonstrated potential for easy adoption as these frontline health workers were already familiar with smartphone technology. Some barriers identified during implementation roll-out included heavy workload of LHWs and difficulty in internet connectivity. Use of videos for counselling, and supportive supervision by LHSs emerged as key facilitators for implementation.

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Conclusion This study highlights that a technology-focused mental health intervention is feasible, acceptable, and appropriate to be implemented by community frontline workers in resource-constrained rural Pakistani settings. The *mPareshan* intervention can be easily adopted within the LHW-P. Further research should investigate how implementation barriers can be addressed for successful delivery.

Keywords Acceptability, Appropriateness, Adoption, mHealth, Mental health, Lady health workers

Background

Mental disorders contribute to 14% of the global burden of disease [1]. In 2019, mental disorders ranked as the second leading cause of Years Lived with Disability, posing significant challenges to health systems, particularly in low and middle-income countries (LMICs) [2–4]. LMICs have a 10–14% prevalence of depressive disorders [5] and 76–85% of the people living here with mental illness have unmet need for treatment [6]. Barriers to accessing mental-healthcare facilities in LMICs are poor resource distribution, cost, and geographical distance to community-based facilities [7, 8]. The social burden of mental disorders is exacerbated by ignorance, misdiagnosis, and inappropriate treatment [8].

Pakistan is an LMIC of 220 million with 38% of the population living below the poverty line [9, 10]. Studies conducted over the last decade estimate the burden of depression and anxiety between 22 and 60% [11]. Poverty, political turmoil, insecurity, natural disasters, socioeconomic challenges, and gender inequality are essential contributors [1]. Recently, COVID-19 has worsened the situation [12].

There are only 520 practicing psychiatrists in Pakistan, resulting in a ratio of 2 psychiatrist per 1 million people [13, 14]. Unfortunately, the available mental health services are either privately-run clinics or psychiatry units in urban tertiary care hospitals [15]. It is notable that around 60% of the population in Pakistan resides in rural and peri-urban areas, while most psychiatrists practice in urban areas privately or in large tertiary care hospitals [15–17]. This uneven distribution further exacerbates the limited access to mental health services across the country.

Recently, digital/mobile health (mHealth) innovations such as web-based and mobile phone programmes have repeatedly been seen as a promising means of enhancing evidence-based treatments [18]. The latest Lancet Commission on Global Mental Health has emphasized the importance of exploring digital tools for enhancing mental health research [19]. Meta-analyses report that mobile app-delivered interventions can be effective in decreasing anxiety and depression symptoms [20–22].

To improve the delivery of mental healthcare in limited resource areas, incorporating mental health programmes into regular primary health facilities has been recommended [1, 23]. A Peruvian study incorporated a technology-based mental health assessment programme into standard primary healthcare practice. They reported that using a screening app, supported with training and supervision, was feasible and revealed a high prevalence of previously undetected psychological symptoms in primary care settings [24].

The first contact for individuals seeking healthcare in the developing world are the Frontline Health Workers (FHWs) [25]. A systematic review on the feasibility of using mHealth strategies by FHWs in developing countries indicated that irrespective of prior training or education, FHWs can effectively utilize mobile phones for the collection of data and surveillance in healthcare delivery [26].

In Pakistan, a well-structured Community Health Worker (CHW) programme already exists since 1994, called the Lady Health Worker Programme (LHW-P) [27]. It offers preventive and promotive Maternal and Child Health services at the primary care level [28]. The LHW-P covers 85% of the rural population in Pakistan through 115,000 LHWs [29]. Each LHW is supervised by a Lady Health Supervisor (LHS). LHSs are responsible for offering supportive supervision to 20–25 LHWs. LHWs have at least 8 years of education, prior work experience and live within the locality [30]. Mental health however is not a part of their service mandate currently [30]. Nevertheless, a study in Pakistan has explored the use of technology to scale-up monitoring and training of CHWs in psychosocial treatment of perinatal depression [31].

Despite its potential, the evidence supporting the feasibility of mHealth interventions is limited [32]. Few studies have documented end-user experiences, operability, usability, and interactions with mobile applications [33, 34]. A study attributed technology failure to a disregard for user requirements and experience [35].

To bridge this gap in provision of mental health services, a customized app was developed in a feasibility trial (*mPareshan*). The app delivered psychosocial counselling through LHWs in rural Sindh to reduce anxiety and depression [36]. Using the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework [37], this study specifically reports on the qualitative assessments conducted before and after *mPareshan* intervention to gauge the acceptability, appropriateness, and potential of technology adoption by relevant stakeholders and additionally understand the barriers and facilitators to implementation roll-out.

Methods

Study setting

mPareshan trial was conducted in Badin - a rural district in the southern part of Sindh, Pakistan. Badin's total population is 1.8 million and the literacy rate is 34% [38]. The district's 1100 LHWs are working under the supervision of 36 LHSs [30, 39].

Participants

Study participants for qualitative assessment included provincial policy makers, district health managers of the LHW-P, LHSs, LHWs from the delivery perspective and community participants (CPs) from the end-user perspective. Additionally, those screen-positive participants (SPs) identified to be mild and/or moderately anxious or depressed through Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7), were also included as community participants after the intervention.

A list of all the stakeholders was prepared. LHW-P managers, LHSs and LHWs were selected based on convenience sampling subject to their availability and willingness to participate. CPs and SPs were randomly selected based on a list provided by the LHWs.

Pre-intervention recruitment criteria

Permanently employed LHWs and LHSs, who regularly attended LHW-P meetings, conducted household visits, and reported back to their supervisors were selected and invited to participate. CPs included religious scholars and teachers, who could provide informed viewpoints. Inviting religious scholars and teachers as CPs before the intervention was important, as they are considered influential in rural communities like Badin. Their involvement ensured cultural sensitivity and alignment with local beliefs, crucial for the intervention's acceptance and success. Additionally, their broader perspective provided insights into community-wide mental health concerns. Policymakers as interview participants included key decision-makers at the Provincial Department of Health and the Provincial Program Implementation Unit of LHW-P, Badin. These individuals have a strong role in designing and over-seeing health policy and interventions. They were interviewed in the pre-intervention phase only.

These stakeholders' views helped to implement the app-based intervention and assess acceptability, appropriateness, and potential of technology adoption.

Post-intervention recruitment criteria

After intervention, qualitative assessments were repeated to ascertain the feasibility of intervention uptake and understand facilitators and barriers in implementation roll out. Key stakeholders included those LHSs and LHWs who delivered the counselling sessions of the *mPareshan* intervention; therefore, they were not all the same as pre-intervention. Moreover, to understand the facilitators and barriers and acceptance of this technology after the intervention, it was meaningful to interview SPs only from the community (those who received the counselling intervention) depending on their availability.

The *mPareshan* app-based intervention

The intervention was delivered over the course of 6 months with SPs receiving one home-based counselling session per month by the LHWs. The *mPareshan* app was designed based on feedback received from stakeholders in the formative qualitative phase. It consisted of 3 segments: tracking, counselling, and referral. The tracking segment recorded information on participant recruitment, retention, and consent. The referral segment identified danger signs related to suicidal ideation, self-harm and harm to others and then guided appropriate referrals to the nearest mental health facility. In the absence of danger signs, the LHW facilitated psychoeducation for SPs through audio and video features using the counselling segment. Each session lasted 20–25 min. The SPs were involved in breathing exercises and pleasant activities to help them cope with anxiety and depression symptoms. The app could be downloaded on an android tablet and accessed without internet (Fig. 1). The detailed protocol of the *mPareshan* intervention trial is available elsewhere [36].

Study framework: RE-AIM

An unresolved issue in the field of implementation research is how to conceptualize and evaluate successful implementation. This paper advances the concept of "implementation outcomes" and works through the lens of RE-AIM framework [37, 40] to report on acceptability, adoption, and appropriateness of the proposed intervention prior to implementation [41]. Additionally, it also reports on the challenges and facilitating factors for successful implementation roll out.

RE-AIM serves as both a theoretical lens and an evaluation framework in the dissemination and implementation of health interventions such as *mPareshan*. As a theoretical perspective, RE-AIM helps to understand the complex factors influencing intervention success, emphasizing the need to consider the broader context and the involvement of multiple stakeholders. The components of RE-AIM – Reach, Effectiveness, Adoption, Implementation, and Maintenance – represent key constructs that aid in explaining and predicting the intervention outcomes.

As an evaluation framework, RE-AIM provides a practical, structured approach to assess these five components, allowing for the identification of strengths, weaknesses, and areas for improvement. It is versatile,

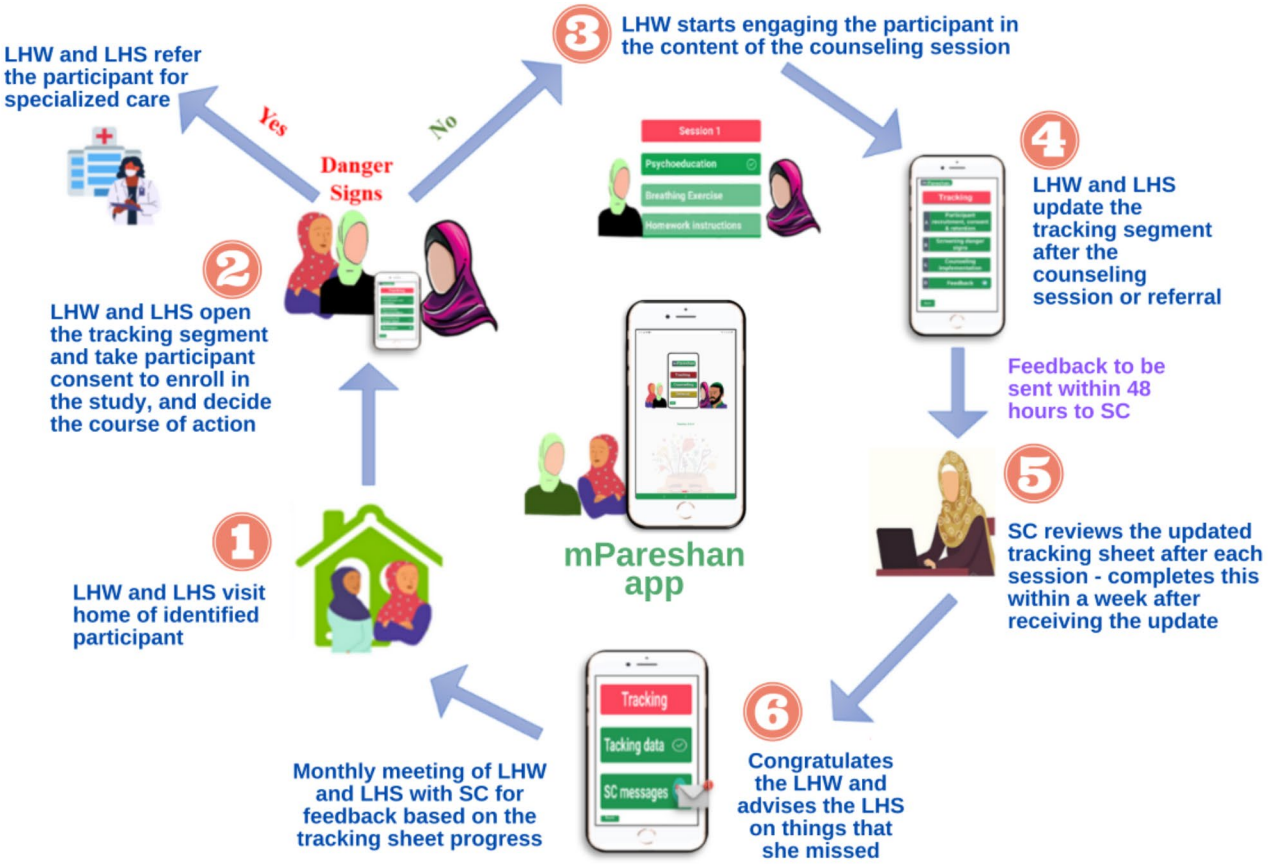

Fig. 1 *mPareshan* intervention workflow

applicable across various evaluation designs, including qualitative, quantitative, and mixed-methods studies. Utilizing RE-AIM in both capacities (as in this study) enables the development of more effective interventions by integrating theoretical constructs and the broader context during the planning phase. Concurrently, it facilitates comprehensive evaluations that highlight areas for refinement, supporting efforts toward the sustainability and scalability of interventions.

Data collection

A semi-structured topic guide was developed specifically for this study and used for the first time by the research team to facilitate Focus Group Discussions (FGDs) and In-Depth Interviews (IDIs) with relevant stakeholders. Using the RE-AIM framework, the guide was developed to assess acceptability, appropriateness, and potential of technology adoption before intervention and barriers and facilitators to implementation roll out after intervention. The interview guide had a pre-set list of open-ended questions, organized in a logical pattern with relevant probes that align with components of the RE-AIM framework (Table 1; also see supplementary material). The guide was used for all the stakeholders mentioned above and not modified at any stage of data collection. While the interview guide included predetermined themes to ensure that key RE-AIM domains were covered, we remained open to new themes emerging during the data collection process. This flexible approach allowed us to capture additional insights that were not initially anticipated. The main themes in the guide covered:

- Burden and perceived determinants of mental health.
- Acceptability and appropriateness of delivering a mental health intervention.
- Adoption and task-technology shift of mHealth intervention delivered by LHWs.
- Uptake of intervention.
- Barriers and facilitators to implementation roll-out and sustainability.

The interviews were conducted and moderated by the core research team members (SA and JN) who were highly skilled in qualitative research. A relationship of trust was established with participants prior to the commencement of qualitative inquiry through community liaising, informal talks, and by introducing the study objective. All participants provided written consent

Table 1 Probes in focus group discussions and in-depth interview guides

Sections	Themes	Main probes
1	Burden and perceived determinants of mental health	• Perceptions of participants about mental health burden and its determinants. • Availability of mental health services in the community.
2	Acceptability and appropriateness of delivering a mental health intervention	• Rapport of LHWs as front-line health care providers in rural areas • LHW-P capacity to address mental health. • Capacity of LHWs to deliver mental health intervention • Acceptability of intervention among policy makers, LHWs and community
3	Adoption and task-technology shift of mHealth intervention delivered by LHWs	• LHSs awareness regarding android phone technology for provision of mHealth services. • Willingness of LHWs to provide mental health services utilizing technology-assisted app.
4	Uptake of intervention	• Experience of LHWs, LHSs and community participants • Views regarding app features, usage, and content • Views on the benefits of intervention.
5	Barriers to implementation roll-out and sustainability	• Barriers experienced by stakeholders during intervention roll out. • Suggestions for improvement and sustainability.
6	Facilitators in implementation roll-out	• Factors that facilitated implementation roll-out • Importance of LHSs as supervisors of LHWs

before starting the interview. Qualitative interviews lasted about 30–45 min, or until the point of saturation. Pre-intervention qualitative assessments took place from January to February 2022 and the post-intervention assessments were conducted from October to December 2022. FGDs with health workers and IDIs with CPs and SPs were held at the District LHW-P office in Badin. Policy makers were interviewed in their working spaces. Some of the post-intervention assessments were also conducted online due to COVID restrictions. No stakeholder groups as defined above were excluded during the data collection process. All FGDs and IDIs were audio recorded, transcribed verbatim, and translated into English. Field notes were also made during the interviews. Identifiable information was removed from the interview transcripts to maintain anonymity.

Data analysis

The qualitative data (interview transcripts and notes) were analysed using a combination of manual thematic analysis and QSR NVivo version 10, following Braun and Clarke's framework for thematic analysis [42]. After transcription, the researchers (SA and JN) conducted a detailed review of each transcript. They engaged in an iterative process of reading and re-reading the transcripts to achieve a deep understanding of the content. Initial patterns and ideas were noted through manual coding. SA and JN independently coded the data. The manual coding process, supported by QSR NVivo version 10, enabled a comprehensive exploration of information and facilitated the organization and management of codes. Subsequently, the codes were organized into potential sub-themes and overarching themes by collating data relevant to each theme and exploring how different codes interrelated. NVivo's coding queries and visualization tools were instrumental in managing and visualizing the relationships between codes and finalizing the themes.

Themes were identified that emerged from the data and then clustered according to the RE-AIM framework components. Thus, the RE-AIM framework was used to organize and structure our findings ensuring that each theme is aligned with the relevant component of the framework. Themes underwent rigorous revision and refinement to ensure they accurately reflected the information and were both coherent and distinct. This review process involved regular team discussions to reach consensus, ensuring the themes captured the data's complexity. The analysis was reviewed and revised for the final write-up by FR and AS. A thematic map with the corresponding codes was generated through NVivo and is provided in the supplementary material. The results section includes the main themes with participant's verbatim quotes.

Researcher bias was minimized using various approaches. Multiple researchers (SA, JN, FR, and AS) were involved at various stages of the study. This collaborative approach helped incorporate diverse perspectives and reduce the risk of individual biases affecting both the data collection and analysis processes. Methodological triangulation was done as data was collected using both FGDs and IDIs from various stakeholder groups. Once the researchers explained the participant recruitment criteria, the field coordinator independently invited the willing stakeholder participants to various FGDs and IDIs. The researchers conducting the interviews were blinded to the actual selection process.

Results

All participants who took part in the 8 FGDs and 18 IDIs before (N=44) and after (N=30) the intervention consented for the interviews. Details on the types and numbers of participants and their interview methods are presented in Fig. 2.

LHSs and LHWs formed a homogeneous group in terms of demographics, experiences, and roles, as they

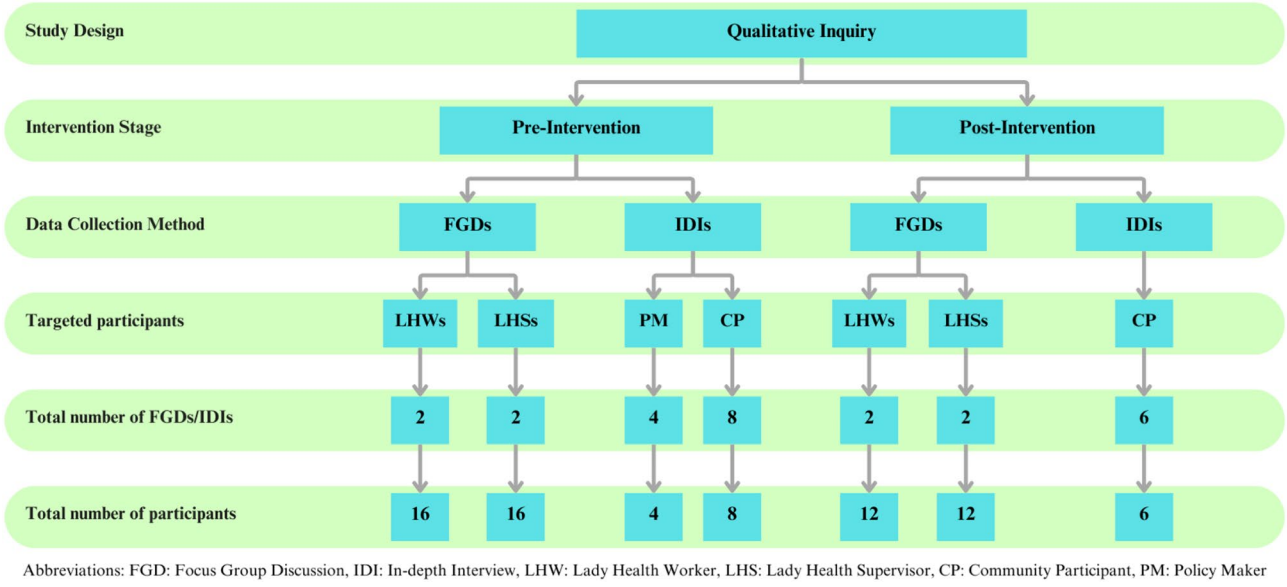

Fig. 2 Summary of data collection phases and methods

had similar training and responsibilities. Therefore, conducting 2 FGDs with each group, both pre- and post-intervention, was sufficient to reach data saturation. It was evident while the FGDs and IDIs were being conducted and notes were recorded daily, that the same information and themes were repeatedly emerging. A peer debriefing with the senior-most LHS who resides within the same district, confirmed these findings and perspectives hence the researchers were confident that they have not missed anything. Secondly, our research questions were quite specific and focused. Therefore, it helped to gather sufficient data to answer the research questions relatively quickly. Interviewers encouraged open discussion and effectively probed the stakeholders. The analysis of the 8 FGDs and 18 IDIs assured the researchers that no new themes and insights were emerging for each of the stakeholder groups. Pre-intervention CPs included 3 women who had children, while post-intervention SPs included 2 women with children - therefore their perspectives were also well-captured. However, it is to be noted that the *mPareshan* intervention catered to the general adult population, instead of focusing on women only. Demographic data regarding stakeholders is displayed in Table 2.

The thematic analysis resulted in six main themes; (1) *The burden of mental health and its perceived determinants*, (2) *Acceptability and appropriateness of delivering and receiving a mental health intervention*, (3) *Adoption and task-technology shift of an mHealth mental health intervention*, (4) *Experiences regarding uptake and fidelity to intervention*, (5) *Barriers to implementation roll out; sustainability and scalability*, *and* (6) *Factors facilitating implementation roll out*, which are presented below.

The burden of mental health and its perceived determinants

To understand why such an intervention needs implementation in this setting, it was imperative to first understand people's perceptions about mental health. This helped to assess the magnitude of the problem and lack of specialized care when it comes to the community. All participants demonstrated a comprehensive understanding of mental health, and how it affects their daily lives.

> *"About 70–80% of the people are mentally ill in Badin. We don't even have a government hospital at the district. Private doctors visit on Sundays, but their fees are unaffordable." (Community Participant, IDI, Pre-intervention).*

An LHW commented on the impact of mental illnesses on her community.

> *"In some cases, people reach a point of extreme desperation, and this may result in suicidal actions. I believe that depression can lead to changes in behaviour towards family and friends." (LHW, FGD, Pre-intervention).*

Participants highlighted some of the possible stressors that contribute to mental ill-health and reasons for not accessing mental health services.

> *"If the person supporting the family is struggling with money and there are kids to take care of, it can make the whole family feel uneasy." (LHW, FGD, Pre-intervention).*

Table 2 Sociodemographic characteristics of participants*

	Pre-Intervention				Post-Intervention		
	FGDs (*n* = 4)		IDIs (*n* = 12)		FGDs (*n* = 4)	IDIs (*n* = 6)	
	LHWs *N* (%)	LHSs *N* (%)	PM *N* (%)	CP *N* (%)	LHWs *N* (%)	LHSs *N* (%)	CP *N* (%)
Gender							
Female	16 (100)	16 (100)	0	3 (37.5)	12 (100)	12 (100)	2 (33.3)
Male	0	0	4 (100)	5 (62.5)	0	0	4 (66.7)
Age, years – Median	33	37			33	37	
Range *(Min-Max)*	22–55	29–45	30–50	35–45	22–55	29–45	35–45
Highest level of education†	*Matric*	*Matric/ Intermediate*	*Post-graduate training*	*Matric/ University degree*	*Matric*	*Matric/ Intermediate*	*No formal qualification*
Occupation	Health workers	Health workers	Govt. of Sindh, Dept. of Health officials: Directorate General of Health Services, Deputy, Assistant & Additional Directors (Reproductive, Maternal, Newborn, & Child Health/ LHW-P)	Teachers, social activists, politically active individuals	Health workers	Health workers	Farmers/ agricultural workers, daily wage labourers
Experience in current role (median years)	12		5–15 (min, max)				
Experience with using digital apps before	Yes	Yes	Yes	No			

*Data was not always collected individually. Values presented where available

†Matric is GCSE equivalent, Intermediate is A levels equivalent

"Due to poverty and large families with 10–12 members, individuals suffer from mental illness." (Community Participant, IDI, Pre-intervention).

Fear of being stigmatized also prevented people from accessing mental health services.

"People with mental illnesses tend to suppress their feelings and fear being labelled as 'dewana/pagal' (mad/insane)" (LHS, FGD, Pre-intervention).

Acceptability and appropriateness of delivering and receiving a mental health intervention

For assessing the acceptability and appropriateness of LHWs as providers of mental health services, it was important to first judge the rapport of LHWs as frontline CHWs. There was general satisfaction with the services provided by LHWs in their community, and how they provide them with necessary advice and support. Community participants commented.

"We are absolutely satisfied with the LHWs. They visit every household in our village, and it feels like they are a part of our family." (Community Participant, IDI, Pre-intervention).

"LHSs and LHWs are highly regarded in the community, considered almost like doctors." (Community Participant, IDI, Pre-intervention).

Policy makers also displayed strong confidence in LHWs' capabilities and role in social mobilization and raising awareness. They believed that these efforts could bring about a positive impact.

"Our LHWs are akin to our army; they work tirelessly and consistently." (Policy maker, IDI, Pre-intervention).

"LHWs can make a big difference by mobilizing the community and creating awareness. They act as a bridge between us and the community." (Policy maker, IDI, Pre-intervention).

LHWs expressed satisfaction with their work, noting that serving in their catchment areas was easier due to the support they received from their communities.

"(Families) listen and understand what we suggest. If our way of counselling is effective, the people will surely stand by us." (LHWs, FGD, Pre-intervention).

Researchers further sought participant's views regarding the appropriateness of LHWs delivering a mental health intervention. The majority expressed confidence in

LHWs' ability to effectively deliver mental health counselling services.

> *"If (LHWs) are assigned to care for a mentally ill person, they would excel at it because they are already familiar with our community." (Community Participant, IDI, Pre-intervention).*

Policy makers acknowledged LHWs as a valuable resource for identifying cases and educating people about mental health.

> *"LHWs are an essential resource. They can go door-to-door to identify cases and educate people about mental health." (Policy maker, IDI, Pre-intervention).*

Stakeholders also highlighted some areas of concern in the implementation of the *mPareshan* intervention. Anticipated challenges included inadequate service coverage as well as the heavy work burden on LHWs due to their involvement in various health programs, including vaccination and COVID-related tasks. Some stakeholders emphasized the need for a well-thought-out strategy to achieve better outputs in such circumstances.

> *"I doubt that LHWs cover 100% of the area. Coastal regions are quite distant from the city." (LHW, FGD, Pre-intervention).*

> *"The primary concern here is that LHWs have a heavy workload. They are engaged in tasks related to polio, family planning, measles, and now COVID. However, if we want to involve them in mental health service provision, we need to find a feasible strategy (easy to understand and user-friendly)". (Policy Maker, FGD, Pre-intervention)*

Adoption and task-technology shift of an mHealth mental health intervention

Health workers' views regarding the task-technology shift of adopting the mHealth intervention were explored. Their prior experience of using digital technology before (Table 2) was a conducive factor in assessing the feasibility of rolling out the *mPareshan* digital intervention within the context of this rural setting. It is to be noted that LHWs know how to operate the Android tablets/devices but have only used it previously for tracking immunization and delivering MNCH-related health education messages. They uniformly did not have any experience of facilitating mental health counselling sessions through an app.

> *"If LHWs use mobile devices, it should work smoothly. We've already established WhatsApp groups, and since they (LHWs) are using touchscreen phones, they can easily perform tasks. They also use their phones to share videos." (LHS, FGD, Pre-intervention).*

> *"We will visit them repeatedly and show content in app, so why wouldn't this have a positive impact? It's quite likely to be beneficial, without doubt." (LHWs, FGD, Pre-intervention).*

> *"We can understand English and operate mobiles since its the era of mobile technology. Main video content should be in Sindhi (local language) for the sake of clarity." (LHWs, FGD, Pre-intervention).*

> *"Our role involves presenting the counselling video and explaining its contents. If they (SP) make an effort, they will experience improvement." (LHWs, FGD, Pre-intervention).*

Some emphasis on proper training was noted to execute the intervention successfully.

> *"No task is ever easy, especially before proper training." (LHW, FGD, Pre-intervention).*

Experiences regarding uptake and fidelity to intervention

Data on intervention effectiveness (as measured through change in anxiety and depression scores), and participant adherence (e.g., session attendance and completion rates) are being published elsewhere as part of the quantitative results of *mPareshan* [60]. As part of this qualitative inquiry, stakeholders were asked about their experiences during the implementation phase.

> *"We are completely satisfied with the app. It has effectively addressed our mental health concerns." (LHWs, FGD, Post-intervention).*

> *"Previously, she (SP) used to spend her time alone and displayed no interest in anything. However, after receiving intervention, she took up sewing and embroidery." (LHWs, FGD, Post-intervention).*

> *"As I gradually committed myself, I realized its inherent benefits. The initial difficulties faded as I recognized the value it brought to me." (SP, IDI, Post-intervention).*

Some LHWs noted a gender disparity in the uptake of intervention.

"Feedback from women was notably more positive than that from men. Some men expressed concerns about time constraints." (LHWs, FGD, Post-intervention).

Screen positive participants also highlighted that regular visits by LHWs and LHSs helped to deliver the intervention effectively. This demonstrates that the protocol was followed, with health workers reinforcing the intervention, ensuring participant engagement as designed.

"We diligently followed the advice presented in the videos, which were further reinforced by visits from the LHS and LHW." (SP, IDI, Post-intervention).

Barriers in implementation roll-out; sustainability and scalability

Health workers underlined some technological barriers during the implementation roll-out.

"In the first session, submitting feedback (through the designated app portal) was a bit challenging." (LHW, FGD, Post-intervention).

"Prolonged power outages render our mobiles powerless and disrupt internet connectivity." (LHW, FGD, Post-intervention).

Existing workloads and lack of dedicated time to conduct counselling sessions emerged as constraints in successful intervention delivery.

"Having a 20-minute session was suitable for SPs, but for us, it wasn't just 20 minutes. Our journey took time. After reaching, we had to wait for ½ hour if the SP was occupied. Some time went into building trust and allaying any concerns" (LHS, FGD, Post-intervention).

"She (the LHW) is extremely occupied. She's been engaged non-stop since the start of the pandemic." (LHS, FGD, Post-intervention).

Health workers shared their opinion on the intervention's prospects for sustainability and scalability in the future.

"Young generation faces considerable anxiety. If a portion of college/high school teachers could be trained (in mPareshan app), it might be beneficial in the future." (LHS, FGD, Post-intervention).

"Breathing exercises were explained through audios. Incorporating more videos/visual aids would have enhanced clarity, especially for less literate (SPs)." (LHW, FGD, Post-intervention).

Factors facilitating implementation roll-out

Supportive supervision by LHSs during implementation was considered positively.

"Working as a team with our LHSs was more effective than us going alone. Presence of LHSs helped in answering participant queries and motivating (SPs) to take part in intervention." (LHW, FGD, Post-intervention).

"When Baji (LHS) is with us, our responsibilities diminish. Baji takes care of the technical aspects, and we know we can rely on her for guidance." (LHW, FGD, Post-intervention).

"Due to our presence, LHWs did well and got a positive response from SPs, reinforcing our role as supervisors." (LHSs, FGD, Post-intervention).

It was highlighted that LHWs felt supported in the presence of LHSs, especially when counselling male SPs.

"Since my LHW deals with all male SPs, having a supervisor (like me) present during her sessions provides her courage and a sense of ease." (LHS, IDI, Post-intervention).

One SP conveyed his perspective regarding the feasibility of the counselling session.

"Duration of counselling is appropriate. It didn't interfere with our daily work; in fact, it was quite effective." (SP, FGD, Post-intervention).

Participants undergoing intervention showcased their optimistic response regarding the improvement of their mental well-being. They shared that videos on the *mPareshan* app were particularly effective in providing clear guidance and practical strategies for managing anxiety.

"Video counselling was particularly helpful, guiding us to alleviate anxiety." (SP, IDI, Post-intervention).

Separate perspectives of end-user community participants, health workers who delivered the intervention and policymakers are summarized in Table 3.

Table 3 Summary table outlining perspectives of qualitative interview participants

Theme	CPs/SPs	Health Workers (LHWs and LHSs)	Policy makers
Burden of mental health and its perceived determinants	CPs highlighted the significant prevalence of mental health issues in their region, attributing it to poverty, large family sizes, and lack of healthcare infrastructure. Stigma surrounding mental illness further prevents individuals from seeking help. *"Due to poverty and large families, individuals suffer from mental illness." (CP, IDI)*	Health workers noted that mental health issues, like depression, severely impact behaviour and relationships within the community. *"Depression can lead to changes in behaviour towards family and friends." (LHW, FGD)*	No significant information.
Acceptability and appropriateness of delivering and receiving a mental health intervention	The community expressed strong trust and satisfaction with LHWs, who are seen as integral and respected members of the community, capable of delivering mental health interventions. *"We are absolutely satisfied with the LHWs." (CP, IDI)*	Health workers felt confident in their ability to gain community trust, though some noted challenges in reaching remote areas and managing their already heavy workload. *"Families listen and understand what we suggest." (LHW, FGD)*	Policymakers showed strong confidence in LHWs, viewing them as essential to social mobilization and community outreach, but recognized the need for strategies to manage their workload effectively. *"LHWs are akin to our army, they work tirelessly." (Policy maker, IDI)*
Adoption and task-technology shift of an mHealth mental health intervention	CPs were generally positive about LHWs delivering mental health care through mobile technology, given their familiarity with the community. *"If LHWs are assigned to care for mentally ill persons, they would excel at it." (CP, IDI)*	Health workers were optimistic about adopting the mHealth intervention, citing their experience with mobile technology and the potential for improved mental health outcomes. However, they emphasized the need for content to be in the local language and for adequate training. *"LHWs use mobile devices smoothly; they've established WhatsApp groups." (LHS, FGD)*	No significant information.
Experiences regarding uptake and fidelity to intervention	SPs noticed positive changes in behaviour and engagement in activities. *"As I gradually committed myself, I realized its inherent benefits. The initial difficulties faded as I recognized the value it brought to me." (SP, IDI, Post-intervention)*	Health workers reported satisfaction with the intervention's impact, particularly noting its success among women, though they observed some gender disparities in uptake, due to time constraints. *"Previously, she (SP) used to spend her time alone and displayed no interest in anything. However, after receiving intervention, she took up sewing and embroidery." (LHWs, FGD)*	No significant information.
Barriers in implementation roll-out; sustainability and scalability	No significant information.	Health workers identified challenges such as technical difficulties, power outages, and time constraints due to existing workloads. They also expressed concerns about the sustainability of the intervention without ongoing support. *"Having a 20-minute session was suitable for SPs, but for us, it wasn't just 20 minutes. Our journey took time. After reaching, we had to wait for ½ hour if the SP was occupied. Some time went into building trust and allaying any concerns" (LHS, FGD)*	No significant information
Factors facilitating implementation roll-out	Community participants appreciated the structured video counselling sessions and found them effective without disrupting their daily activities. *"Video counselling was particularly helpful, guiding us to alleviate anxiety. We diligently followed the advice presented in the videos, which were further reinforced by visits from the LHS and LHW." (SP, IDI)*	Health workers found that supportive supervision from LHSs during the intervention facilitated better outcomes and provided them with confidence, particularly when dealing with male participants. *"Working as a team with our LHSs was more effective than us going alone. Presence of LHSs helped in answering participant queries and motivating (SPs) to take part in intervention." (LHW, FGD)*	No significant information.

CP: Community Participant, FGD: Focus Group Discussion, IDI: In-depth Interview, LHS: Lady Health Supervisor, LHW: Lady Health Worker, SP: Screen-positive

Discussion

This study is among the first of its kind to explore perceptions about acceptability and appropriateness of a digital mental health intervention prior to implementation and identify barriers and facilitating factors for smooth implementation roll-out.

All stakeholders displayed a comprehensive understanding of mental health, emphasizing its importance. They agreed that it significantly contributes to the disease burden and expressed concerns that mental health issues are rising. Various perceived determinants of mental illnesses were identified including poverty, stigmatization in seeking care and large family sizes etc. These findings align with literature from other LMICs like Indonesia, Iran, and Nepal where similar determinants have been noted [43–46].

In the current study, both policy makers and community participants considered LHWs as a trusted human resource to deliver mental health services. A previous study in India and Pakistan showed that community participants favoured frontline workers who were residents of the same area [47]. In the absence of specialized workers, similar findings reported in Pakistan and Africa show that these frontline workers are trusted as peers and empower their communities [48, 49].

LHWs demonstrated a willingness to deliver the services while the community indicated their acceptability to receive it. The intervention was timely and appropriate given the rural context where mental health services are neither available nor easily accessible. Evidence from the Eastern Mediterranean Region shows that rural areas remain limited in terms of mental healthcare access [50]. A previous narrative review from LMICs has supported the role of frontline non-specialist workers to bridge this mental health treatment gap by delivering low-intensity psychosocial interventions [51].

The task-technology shift of delivering digital mental health services through LHWs was found to be relatively feasible. Fidelity to the intervention was reflected by the LHWs adopting to the technology easily since they are already using smartphones for maternal and child healthcare and are familiar with digital data entry systems [52]. Earlier studies in rural Sindh have demonstrated successful implementation of mHealth applications by LHWs for home-based pregnancy care and tackling childhood diarrhoea [53, 54]. Similarly, a pilot study in rural Tanzania showed that health workers effectively used a tablet-based platform for preventing mother-to-child transmission of HIV services [55].

However, these results should be interpreted with caution. Concerns about the heavy workloads of LHWs were voiced by the stakeholders. There were also some issues with sub-optimal coverage and accessibility of health workers in remote areas. Similar challenges for sustainability of such interventions have been highlighted before in studies in Pakistan and Myanmar, where conflicting pressures often lead them to become agents of the state, burdened with directives and programmes without adequate training and equipment [56, 57]. Another study in Niger also showed the geographical coverage of CHWs being less than optimal despite efforts to upscale [58]. To counter these scalability challenges, deployment strategies need to be revisited by the government to streamline the integration of additional responsibilities with LHW's routine work.

Given several strategic advantages, LHWs remain a feasible option for scaling up mental health interventions like *mPareshan*. This is due to their existing infrastructure of more than 100,000 LHWs working in Pakistan who are effectively reaching rural and underserved populations. They are a trained workforce already equipped with basic health training and trusted community relationships which facilitates mental health discussions. Their proximity to the communities they serve minimizes logistical barriers and enhances cost-effectiveness by utilizing existing resources. Backed by the government and a policy framework that could integrate mental health services, LHWs are well-positioned for community acceptance due to their familiarity and cultural sensitivity. They also have the potential for task-sharing, managing straightforward mental health cases while referring complex ones to specialists. This enables a scalable and flexible response to evolving community mental health needs, as evident in the mPareshan intervention.

Some issues with internet connectivity were noted which were resolved with prior downloading of content and uploading of data when connectivity resumed. Previous studies from Pakistan and Africa have highlighted similar concerns [53, 59].

Following insights from stakeholders prior to intervention, the app content was designed in Sindhi language. Hence, language did not appear as a barrier during intervention roll-out. However, for sustainability and future scaling up, it was suggested that the video content should replace some of the audio sessions. This is understandable given the greater penetration and impact of the latter, especially amongst low-literacy populations.

Supportive supervision provided by the LHSs to LHWs was perceived as an important facilitating factor to implementation, particularly while dealing with male SPs. Such supportive supervision by LHSs has shown to work well previously in rural Pakistan [29, 49, 54].

One of the limitations of the study was the inability to conduct IDIs with policy makers post-intervention, due to their involvement in disaster management of floods in the district. The *mPareshan* trial used mixed methods of data collection. This paper only reports on the qualitative inquiry. Hence, the effectiveness of the intervention can

only be judged once the complete study results are published, and findings are triangulated. Moreover, findings of this pilot feasibility trial in Badin, Sindh may be limited and not directly applicable to other settings or populations as the context may be different.

While comparing across age and prior experience with digital apps was not the primary focus of this qualitative inquiry, a review of the transcripts revealed consistent perceptions across different age groups and experience levels. This consistency likely stems from our study's objectives, which centred on the acceptability and appropriateness of a digital mental health application at the community level, and the homogeneity of our purposefully selected sample. In qualitative research, the emphasis is on thematic saturation and understanding participants' experiences within their specific contexts. Given our small sample size and the nature of our inquiry, an analysis based on age and experience with digital apps would not have added significant depth or new insights. Consequently, these were not critical factors in our analysis.

Conclusion

Using the RE-AIM implementation outcomes, the formative (pilot) assessment in the pre-intervention phase of this qualitative inquiry helped to co-design the mHealth intervention with input from relevant stakeholders. Meanwhile, the post-intervention assessments assisted in understanding the barriers and facilitators to implementation roll-out in the real-life setting. Given the lack of resources, we believe that the task-technology shift (as demonstrated by *mPareshan* project) of utilising LHWs in delivering mental health screening and counselling services at community doorsteps is quite feasible, acceptable, and appropriate. It can be easily adopted within the context of LHW-P. Implemented at scale, this intervention has the potential to improve mental health at the primary care level.

Abbreviations

CHWs	Community Health Workers
CPs	Community Participants
FGDs	Focus Group Discussions
FHWs	Frontline Health Workers
IDIs	In-Depth Interviews
LHSs	Lady Health Supervisors
LHW-P	Lady Health Worker Programme
LHWs	Lady Health Workers
LMICs	Lower middle-income countries
PMs	Policy Makers
RE-AIM	Reach, Effectiveness, Adoption, Implementation, and Maintenance
SPs	Screen Positives

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

All authors (S.A., F.R., J.N., A.S., Z.M) made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas. All authors reviewed the manuscript.

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Data availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethical Review Committee of Aga Khan University (ERC# 2021-6570-20015). All participants provided written informed consent before starting interviews.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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