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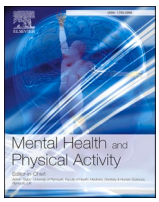

Barriers & facilitators to physical activity in people with depression and type 2 diabetes mellitus in Pakistan: A qualitative study to explore perspectives of patient participants, carers and healthcare staff

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ABSTRACT

Background: The health benefits of physical activity in adults with depression and type 2 diabetes mellitus (T2DM) are well established, however people with depression and T2DM do not generally reach recommended levels of physical activity. Evidence on how to support physical activity in this group is limited; this is particularly the case in low- and middle-income countries. To develop interventions to promote physical activity, it is important first to understand the barriers and facilitators in this population.

Methods: A qualitative study was conducted in Pakistan using semi-structured individual interviews. Adults diagnosed with depression and T2DM, their carers, and healthcare staff were included. Interviews were audio-recorded and transcribed verbatim. Inductive thematic analysis was used to identify themes.

Results: Twenty-three participants (12 male; 11 female) were recruited. Five themes were generated from the data: 1) Cultural and religious norms and practices influence physical activity behaviours 2) Availability of resources and the potential for incorporating physical activity into routine life determine physical activity behaviours 3) Available healthcare resources can be used to promote physical activity 4) Patients' individual-level characteristics affect their physical activity behaviours 5) Technology-based interventions may be used to promote physical activity.

Conclusion: Individual, cultural, and healthcare system level barriers and facilitators can affect the participation of people with depression and T2DM in physical activity. Religious, social, cultural, domestic, and occupational activities provide opportunities to perform physical activities. Furthermore, harnessing routinely available healthcare resources and the use of technology-based interventions can facilitate the promotion of physical activity.

1. Introduction

Evidence suggests that there is a bidirectional association between depression and type 2 diabetes mellitus (T2DM) (Khaledi et al., 2019; Wang et al., 2019). It is estimated that adults with depression have a 34% higher risk of developing T2DM while people with T2DM have a 28% higher risk of developing depression (Zhuang et al., 2017). The prevalence of depression among people with T2DM in low- and middle-income countries (LMICs) is reported to be 44.5% (Farooqi et al., 2022; Kalra et al., 2020), while a meta-analysis of 83 studies reported a prevalence of 40% in 3 South Asian countries (Pakistan, Bangladesh, India) (Uphoff et al., 2019), considerably higher than the estimated global prevalence.

In addition to pharmacotherapy and psychotherapy, the management of depression in T2DM includes supporting self-care and promoting positive lifestyle changes including increasing physical activity (Hoogendoorn et al., 2021). The antidepressant effects of physical activity are well established in the general population (Kandola et al., 2019; Narita et al., 2019). Studies suggest that these positive effects are also seen in people with depression and T2DM (Arsh et al., 2023; Narita

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et al., 2019). In addition, physical activity can help improve glycaemic control in T2DM (Shah et al., 2021).

Despite these well-reported health benefits, few people, particularly in LMICs, adhere to regular physical activity routines (Katzmarzyk et al., 2022; Liu et al., 2022). Although physical activity levels among people with depression and T2DM in Pakistan have not been estimated, it has been suggested that physical activity might be much lower in this population compared to that observed in the general population (Arshad et al., 2016). Non-availability of resources is generally considered the main barrier to physical activity and exercise in LMICs (Elshahat et al., 2020; Muzenda et al., 2022). However, evidence suggests that low to moderate level, non-structured physical activity which does not require too many resources might be sufficient to alleviate depressive symptoms in this population (Arsh et al., 2023; de Groot et al., 2019; Kim, 2018).

Research from LMICs suggest that environmental interventions (public parks, playgrounds, green spaces, swimming pools), social interventions (walking or cycling groups, worksite physical activity) and behavioural interventions (goal setting, education, reinforcement of positive behaviours) can assist in the promotion of physical activity. Nonetheless, these studies primarily focused on the general population (Barbosa Filho et al., 2016; Chang et al., 2019; Raskind et al., 2020). There are few studies which have either assessed facilitators or barriers to physical activity, or described interventions and mechanisms to promote physical activity, specifically in people with depression and T2DM living in LMICs. In Pakistan, a LMIC with limited healthcare resources, promotion of physical activity is seldom considered in the healthcare system. This is particularly the case in some parts of the country, such as Khyber Pakhtunkhwa province, where Pashtuns are the predominant ethnic group. Pashtuns in general, and female members of this ethnic group in particular, tend to strongly observe their cultural and religious codes. Therefore, existing cultural and religious principles may influence their physical activity behaviours. We need to better understand the barriers and facilitators specific to this population to design cultural and resource- appropriate interventions. Therefore, the current study was designed to explore experiences, perceptions and attitudes of people with depression and T2DM, their carers, and healthcare staff about supporting physical activity in people with depression and T2DM in Khyber Pakhtunkhwa, Pakistan.

2. Material and methods

2.1. Study design

A qualitative study was conducted using semi-structured individual interviews from May 2022 to January 2023.

2.2. Participants identification

Participants were people with depression and T2DM, their carers, and health care staff supporting this population. Participants were identified from Abaseen Institute of Medical Sciences (AIMS) Diabetes Hospital & Research Centre Peshawar, Khyber Pakhtunkhwa Pakistan. AIMS hospital, also known as Sugar hospital, is a specialized diabetes care facility, which is sponsored by a non-government organization (NGO) "AIMS Pakistan" and provides a full range of diabetes care services at an affordable cost.

2.2.1. Patient-participants

Individuals with a physician confirmed diagnosis of T2DM, aged 18–65 years, diagnosed with major depressive disorder as defined by the Structured Clinical Interview for DSM-V disorders, and who consented to participate in the study were included. Patients from the designated study sites were identified with the help of healthcare staff. The researcher informed the healthcare staff about the study to ensure they were aware of the selection criteria and had sufficient information to answer any questions patients had about the study. Potential participants were provided an envelope containing a cover letter and a participant information sheet. A contact number and email address were provided for the patients use if they wished to participate.

2.2.2. Carers

Individuals, aged 18 and above, nominated by the patients as a carer, who provide care to a family member with a clinical diagnosis of depression and T2DM, and were able to provide informed consent, were included. Carers were identified with the help of healthcare staff and patients participating in the study. Carers identified by healthcare staff were approached using the same procedure described for the patient-participants. Carers identified by patient-participants were provided a sealed envelope containing a cover letter and a participant information sheet, with a contact number and email address to use if they wished to participate.

2.2.3. Healthcare staff

Diabetes specialists (diabetologist/endocrinologist), mental health specialists (psychiatrists/psychologists), and other health care staff (nurses, nutritionists, physical therapists, and paramedical staff), involved in the care of people with depression and T2DM were included. Leaflets and participant information sheets containing information about the research study and information on how to get involved were distributed among healthcare staff at the study sites.

2.3. Recruitment

When potential participants made contact, a researcher scheduled meetings with them to confirm their eligibility and answer any queries about the study. Participants were given sufficient time to review the participant information sheet and discuss their potential participation with their family members or healthcare providers. Eligible participants were asked for their preferred date, time, and location for the interview. Depending on literacy levels, participants provided either thumbprints or signatures to confirm written informed consent.

2.4. Data collection

Separate interview guides were used for each group of participants (patients, carers, healthcare staff). The documents (interview guides, participant information sheets, consent form) were translated to Urdu by a researcher with proficiency in both English and Urdu.

Individual interviews were conducted with each participant in a comfortable, private space. Participants were interviewed either at Khyber Medical University Peshawar or at the recruiting study site (as agreed between the researcher and participants). The interviews were conducted in Urdu or Pashto (depending on participant preference) and were audio-recorded with permission. Interviews were transcribed verbatim in the local language and later translated to English. The transcription and translation of the interviews was performed by a researcher with proficiency in both English and local languages. An independent team member reviewed the accuracy of transcribed and translated transcripts against the recorded audios. For confidentiality purposes, any identifiable information was removed from the final transcripts. The recruitment of participants continued until it was determined that new interviews added limited new information to the existing data. The author AA informed the research team about the possible saturation of the data after interviewing 21 participants. The research team discussed the value of balancing the resources for further interviews and the possibility of the new themes emerging. Two more interviews were conducted, and the recruitment ceased after a consensus meeting.

2.5. Data analysis

Inductive thematic analysis was used following the six steps for

thematic analysis described by Braun and Clarke (Braun & Clarke, 2006, 2022). In the first step, AA studied the transcribed and translated interviews to become acquainted with the data. During the first stage of data analysis, recurring concepts were highlighted with different colours. After familiarization with the data, a coding scheme was developed based on recurring concepts identified in step one. In step two, initial codes were generated by AA according to the coding schemes. These were shared with the research team and were revised following feedback. In the third step, repeated and converging codes were grouped into secondary codes, subthemes and themes by AA and were presented to the research team in a tabulated form, along with supporting quotes from participants. In step four, secondary codes, subthemes, and themes identified at step three were reviewed by the research team and were further refined. In the fifth and sixth steps, themes were named, and the final report was produced.

2.6. Reflexivity

Several factors may have influenced the study findings. The principal author (AA) is a physical therapist by profession and has a personal preference for physical activity as an intervention to prevent and manage chronic conditions. In addition, AA is from the same cultural and religious background in Pakistan as that of the participants and has witnessed low levels of physical activity in the Pakistani population, especially in women. Being of a similar background to the participants, AA has personal experiences of physical activity facilitators and barriers. Furthermore, one of AA's family members (mother) has depression and T2DM. After noticing a decline in her physical activity levels, AA tried to support his family member to increase her physical activity, by streamlining her existing activities to achieve her desired physical activity goals. These experiences gave AA some insight into promoting physical activity in people with depression and T2DM. As a healthcare professional, AA used personal contacts to help with the recruitment of participants, especially recruitment of other healthcare professionals, although none of the participants were the researcher's friends or family. It is possible that participants may not have been as open discussing facilitators and barriers if the researcher had not been a healthcare professional (as participants usually trust healthcare professionals and think they might help improve their condition).

2.7. Ethics approval

Ethics approval was obtained from the Health Sciences Research Governance Committee University of York United Kingdom (Reference No. HSRGC/2022/498/A, dated 6th May 2022) and Ethics Board of Khyber Medical University Pakistan (Reference No. DIR/KMU-EB/CB/00115, dated 23rd May 2022).

3. Results

3.1. Participants

A total of 23 participants were interviewed, including 11 patient participants (6 female and 5 male), 8 healthcare staff (3 female and 5 male) and 4 carers (2 female and 2 male) (Table 1). All 23 participants were of Pashtun ethnicity.

3.2. Themes

Five broad themes and 17 subthemes were generated from the data (Fig. 1).

Table 1
Demographic information of the participants (n = 23).

S. No.	Role	Age (years)	Gender	Education	Occupation/ speciality
1	Patient-participant	48	Male	Matric	Security guard
2	Patient-participant	51	Male	Primary (5th class)	Shopkeeper
3	Patient-participant	56	Male	Religious education (Dars-e-Nizami)	Khateeb (religious scholar)
4	Patient-participant	42	Female	Bachelor (14 years of education)	Housewife
5	Patient-participant	61	Male	PhD	Retired Professor
6	Patient-participant	54	Female	Master (16 years of education)	School Teacher
7	Patient-participant	40	Male	Uneducated	Farmer/ labourer
8	Patient-participant	63	Female	Intermediate	Retired schoolteacher
9	Patient-participant	55	Female	Uneducated	Housewife
10	Patient-participant	50	Female	Matric	Housewife
11	Patient-participant	44	Female	BS computer science (16 years of education)	Computer operator
12	Healthcare staff	38	Male	MBBS, FCPS	Diabetologist
13	Healthcare staff	33	Male	MS clinical psychology	Psychologist
14	Healthcare staff	30	Female	MS Physical Therapy	Physical Therapist
15	Healthcare staff	42	Male	MBBS, FCPS	Psychiatrist
16	Healthcare staff	29	Female	MS clinical psychology	Psychologist
17	Healthcare staff	28	Female	BS nutrition sciences	Nutritionist
18	Healthcare staff	35	Male	MBBS, FCPS	Endocrinologist
19	Healthcare staff	27	Male	BS nursing	Nurse
20	Carer (wife)	50	Female	Matric	Housewife
21	Carer (husband)	56	Male	MPhil	School Teacher
22	Carer (son)	31	Male	PhD	Lecturer
23	Carer (wife)	54	Female	Bachelor (14 years of education)	School Teacher

3.2.1. Theme 1: cultural and religious norms and practices influence physical activity behaviour

3.2.1.1. Cultural, religious, and social activities provide opportunities to perform physical activities. Participants emphasized that religious and social obligations, such as praying five times daily, social gatherings (hujra system), attachments with religious and political groups, and frequent visits to religious schools (called masjids/ madrassas) for religious sermons (dars) enabled them to perform some physical activity on a daily basis.

> *(I) agree, that I don't like to do anything [pause], but you know I never miss my prayers. [With smile] this (regular praying) gives me satisfaction that at least I am doing something [long pause]. It is an exercise; do you think so, it is, no?* **[Patient participant, male]**

One participant mentioned her daily visits to a religious school:

> *we (women) together go there (for religious sermon) daily to madrassa.* **[Patient participant, female]**

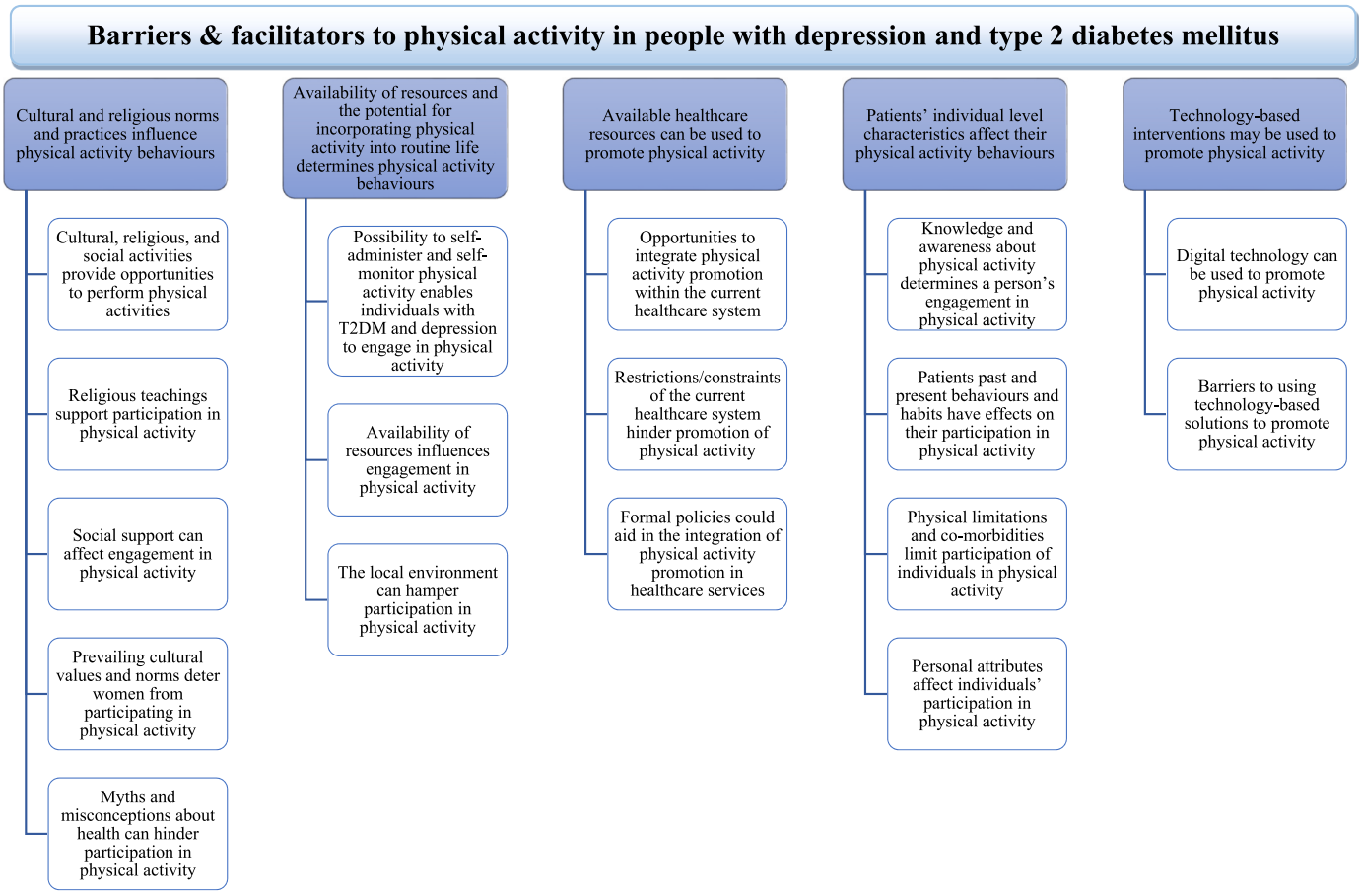

Fig. 1. Themes and subthemes generated from the data.

Cultural ceremonies, such as marriage, and other cultural activities, such as *enquiring after a sick person and* frequent visits to neighbours, friends and relative's homes, also provided opportunities to perform physical activity. In addition, cultural dance on certain occasions also enabled people to be physically active.

> *I love to go to functions. Last week, my nephew had a wedding and I danced there a lot [laughing], [In enthusiastic tone], though I was not feeling well but I am always okay for dancing……though I am ill, but I never sit at home, doing something or the other ….on those events we have a lot of guests and we cook and other things late at night [with smile] and (you) know what, when I am doing all this, I do not remember that I have problems (diabetes and depression).* **[Patient participant, female]**

3.2.1.2. Religious teachings support participation in physical activity. Participants reported that religion supported engagement in physical activity. A female participant added that a religious scholar motivated people to perform household chores, as it provides an opportunity to be physically active and do a good deed as well:

> *No, no, I am not saying that [pause], last week when I went there (to madrassa for dars), baji (female religious scholar) says that you can win heavens, if you do khidmat (services/ household chores) in the home, you know she says that it is exercise ….so, what I get from her is that we have to do work at home with heart, it is a good deed as well as a way of (performing) physical activity.* **[Patient participant, female]**

Participants reported that Islamic teachings and the Quran encouraged physical activity and physical fitness.

> Oh, this is clear, Islam never stops you from doing something for yourself. Even it (religion) says that people should be strong (healthy) …. just open the Quran and you will see that there are many places where people are guided to prepare yourself and do activities and take care of your health …. if you are doing it (physical activity) with good intention, it is (considered) a good deed. If you want to be healthy and take care of your health, you will be rewarded for that. **[Patient participant, male]**

3.2.1.3. Social support can affect engagement in physical activity. Support and advice from family members (spouse/ children/ siblings/ other relatives) and friends appeared to be a key facilitator for physical activity.

> *(It) depends how your close one (family) thinks about it (physical activity)… take me, so my family knows it is a good thing for me, so it helps me to do it, it is not true for all of us.* **[Patient participant, female]**

A participant mentioned support from friends:

> *for me, my friends' advice is always there …. they help me in all this …. if they did not, I would not be like this…they compel me to stay active.* **[Patient participant, male]**

Participants highlighted how patients share experiences with each other, and support/advice from fellow patients with the same conditions can motivate them to be physically active.

> *My sister-in-law also has diabetes, she told me that the doctor told (her) that a walk is good for diabetes.* **[Patient participant, female]**

Compliments from community members also played crucial role in motivating patients to be physically active.

Simple comments, such as you are looking smart, after exercise can help them to stay connected with it (physical activity). **[Healthcare worker, male]**

Negative remarks such as verbal bullying due to body size, shape, clothing, or any other reason hindered participation in physical activity.

It depends how people treat you [smile], just listen to this; once I was running in a park in chappals and one of my neighbours was there. When he sees me, he comes closer and told me with a smile, don't run in chappals, it is not appropriate and from that day onward, I never go to the park again. **[Patient participant, male]**

Due to strong connections with family, friends, relatives, neighbours and the community, people sometime prioritized others' opinions, concerns, and problems, instead of focusing on their own health. Thus, strong connections with others appeared to be a barrier as well.

When I look at my mother, so I can say it is not easy for women to care for themselves, they (women) have to care for their husband, their children, their relatives and husband's relatives [pause], and all the family. **[Carer, male]**

People perceived that physical activity is not culturally valued and that cycling or walking was considered a sign of low status and poverty. This perception can negatively affect participation in physical activity.

Imagine, if you are using a bicycle there, what others will think. [smile] At least you have to care about social status …. people's minds cannot be changed, it (culture of physical activity) can come but it takes time. **[Healthcare worker, male]**

3.2.1.4. Prevailing cultural values and norms deter women from participating in physical activity. The most important barrier related to culture was the stereotype of femininity. Bad experiences in public spaces, being stared at by men, the lack of available recreational spaces for women, and domestic pressures on women are some of the barriers women experience in relation to being physically active.

Ahh, I am (maybe) wrong but you cannot go to the park alone in this situation …. I always explained to myself that there is nothing wrong in it (going out from home) but still I am afraid what they (community) will think…you go anywhere, you will find them (male) and when they see women [laughing], (they stare so much that you will think that) they have never seen them (women) before. **[Patient participant, female]**

Women must wear specific clothes according to cultural norms (burqa, hijab, full coverings) if they are going outside the home, and these clothes may not be suitable for physical activity. Women living in rural areas face additional barriers as they have limited opportunities for outdoor physical activity.

We have all this there (recreational areas in village), no one will take (me) to it, you know there is strictness at home as we (female) should be at home ….my husband goes to millas (local musical concert), (but) they do not allow women to go to it ….they (male) can do anything, but not me. **[Patient participant, female]**

3.2.1.5. Myths and misconceptions about health can hinder participation in physical activity. Participants emphasized that some people in Pakistan think that mental health issues, such as depression, may be due to supernatural powers or magic, leading to people with mental health issues being confined to their homes.

Personally, I have seen people who believe that mental health issues are caused by jinnat (demon/elves) or some other things (supernatural powers) or magic or taweez (amulet/mascot) ……just tell me [long pause] how you will tell them about these things (physical activity/exercises), if they are not taking (understanding) their condition (mental health issues). **[Healthcare worker, female]**

Similarly, it is commonly believed that mental health issues and diabetes are worsened by physical activity.

Sometimes I want to do (perform) it (physical activity) and go out (of home) and go to the market and [long pause] do what I did before (in the past before they were ill), people say no take rest as it (doing physical activity) can worsen your condition (diabetes and depression) **[Patient participant, female]**

3.2.2. Theme 2: availability of resources and the potential for incorporating physical activity into routine life determines level of physical activity

3.2.2.1. Possibility to self-administer and self-monitor physical activity enables individuals with depression and T2DM to engage in physical activity. Participants discussed the possibility of incorporating physical activity into routine activities, such as routine duty work (profession), household chores and other activities (social, religious, domestic activities). Participants also mentioned the possibility of performing physical activities through pleasurable activities, such as playing with children, having fun with family members, and other recreational and leisure activities.

(I think) to do it (physical activity) is not that different [pause], you do things (anything), it is exercise ……going to work is exercise, walking to market is it, everything can (provide the opportunity to do) it (exercise). **[Patient participant, male]**

A female participant described her pleasurable activity as:

Let me tell you something interesting, I have grandchildren at homes, and I always play with them, isn't this enough exercise for me (because) when I play with them, I feel very much relaxed. **[Patient participant, female]**

Physical activity can be carried out independently, without any supervision, with a flexible physical activity schedule, which can help facilitate physical activity for people with depression and T2DM.

I like it (physical activity) as I can do it anytime, in (my) home, in (my) office …. It is not necessary to have that many instruments (devices), simply walk and walk and walk, it is exercise, you can do it (physical activity) without any thing. **[Patient participant, male]**

The possibility to monitor and grade physical activity, either with the help of a mobile app/self-help workbook/diary or with the help of traditional methods like counting tasbeeh (string of beads/ rosary) or noting time was highlighted by the participants.

I (have my) own way to monitor it (physical activity). You know, what I do, I count tasbeeh, when I walk, so it gives me the sense (idea) that how much I do it (walk/physical activity) ……so, if (you) ask me, I will say it is easy to count (monitor) it (physical activity) because you can do it without any thing (device). **[Patient participant, female]**

Participants also discussed the possibility of providing personalized physical activity protocols i.e., physical activity appropriate for different fitness levels and physical limitations.

So simple is that if you provide personalised treatment, it works more, it is not rocket science because you can (suggest) activities that are appropriate for their (patients) individual needs and preferences. **[Healthcare worker, female]**

3.2.2.2. Availability of resources influences engagement in physical activity. It appeared that resources (equipment, sportswear, facilities) required for physical activity are expensive, unavailable, or inaccessible.

We all know that patients do not have access to resources [pause] (and) if there are no proper equipment or resources needed for (specific) exercises, then how can we tell them (patients) to perform exercises **[Healthcare worker, female]**

Nonetheless, participants highlighted that available resources/places for physical activity in urban and rural areas can be used for physical activity. For example, in urban areas, public parks, jogging tracks, gyms and swimming pools are available, some of which are specified for female use only.

It depends on how people find ways (resources for physical activity), [pause] there is a female park near our home, but my heart says not to go there but sometimes I go there and sometimes sit there or walk there. **[Patient participant, female]**

In rural areas, availability of natural resources like hills, farms and lakes/ canals/ creeks/ streams can help them perform physical activity.

I am always doing something in the village, go with friends to a nearby hill in the evening …. there is a canal in our village, so I go with them (friends) in the afternoon …. look, I work on the farms, and I take care of cattle, so I am busy with them (with cattle) all day, so this is what I am doing. **[Patient participant, male]**

Houses are large in villages, which can help increase physical activity within the home.

We don't live in small houses like you [pause], we have large houses (with more open areas) in the village…just going (moving) from one side to other takes a long time. **[Carer, female]**

Lack of a proper public transport system in rural areas appeared to be a facilitator to physical activity, because people must walk if they cannot find public transport.

If I am travelling in the morning from the village, I have to walk 30 to 40 minutes to reach the bus stop because you cannot find a vehicle there **[Patient participant, male]**

3.2.2.3. The local environment can hamper participation in physical activity. High crime rates, limited availability of security personnel, fear of violence and stray dogs can hamper participation in physical activity.

(I) tell you something, [pause] I used to go to the gym almost 5 years (ago) …. when I came out (from the gym), two men snatched my mobile …. well, that day and today, I never go there again **[Healthcare worker, male]**

In Pakistan, there is extreme heat in the summer season, leading to people avoiding physical activity in the summer season.

Oops, so do you want me to run in this (hot) weather, well, I am never ready for it. **[Patient participant, male]**

3.2.3. Theme 3: available healthcare resources can be used to promote physical activity

3.2.3.1. Opportunities to integrate physical activity promotion within the current healthcare system. Participants discussed the possibility of delivering physical activity interventions in the current health care system by training the existing healthcare force.

Why not, it is possible to do it here (in the existing healthcare system), you know it is already used but by providing training and support to them (healthcare workers), it can be brought into action **[Healthcare worker, female]**

An important facilitator highlighted by the participants was that healthcare workers have autonomy to advise/prescribe physical activity.

The good thing is that the doctor is free (autonomous), if we do it (advise/ prescribe physical activity), no one will ask us why we do that, they will even say it is good (doing a great job) **[Healthcare worker, male]**

Participants suggested that advice and/or prescriptions for physical activity, by the treating physician, is a facilitator to engaging in physical activity, because patients remember and follow advice/prescriptions from doctors during consultation.

When you say, physical activity is told (advised/prescribe) by the doctor, it means a lot, whenever a doctor says anything, I do what he suggests, you can say (ask) why (I follow the doctors' advice) but because he knows everything about me (my disease condition) … even if he told me to run for a while, I cannot ignore that **[Patient participant, male]**

Healthcare workers act as role models for patients and patients may try to adopt healthy lifestyle behaviours due to the lifestyle, personality, and habits of healthcare workers.

Sometimes when I see them (female doctors and nurses) and they are so much more active and (they are) running in the hospital, I say they are also (humans) like me, so why can I not be (so active) like them? **[Patient participant, female]**

Lack of proper training of healthcare workers about physical activity appeared to be a barrier to providing advice and/or prescribe physical activity in clinical set-ups.

Just do a simple survey and ask them (medical doctors/healthcare professionals) how much knowledge they have about it (physical activity), and you will be surprised that most of them don't have (the required knowledge or skill) to advise or prescribe it **[Healthcare worker, female]**

The availability of materials/brochures/ study materials in healthcare facilities explaining the concepts of physical activity can be helpful to spread awareness about the importance of physical activity among patients and their carers. In addition, participants discussed how patients with diabetes frequently visit diabetes specialists, so patients can be educated about physical activity either at their diabetes clinic or they can be referred to a physical activity specialist.

Personally, (I have) one visit a month, but there is no information about exercise, which means you can say, it's simple, they (may) put some material (leaflets) with related information here (referring to the counter) and when we are waiting for the doctor, it can be studied …. It's easy, if someone cannot read, a helper can help talk about it **[Patient participant, male]**

3.2.3.2. Restrictions/constraints of the current healthcare system hinder promotion of physical activity. Participants highlighted the challenges of communication between health care professionals and the lack of proper referral mechanisms in the current healthcare system. In addition, participants emphasized that dedicated staff for prescribing physical activity in healthcare centres are not available.

So, you tell me who is responsible for that (to advise/prescribe physical activity to patients) here (in hospital), if you know, also tell me …..they (patients) come there (to diabetes OPD), so I cannot go there and catch him by the arm and say do this and do this **[Healthcare worker, male]**

Provision of proper guidance about physical activity is time consuming and healthcare workers don't have enough time to properly advise or prescribe physical activity in clinical settings.

Exactly, how much time will it take to assess current (levels of) physical activity, then make a plan for him (patient), in this much time, (I can) assess many patients, as it is not possible to do it properly **[Healthcare worker, female]**

Lack of organizational and management support, unmanageable

patient burden and workforce shortages appeared to be barriers to the promotion of physical activity in the healthcare system.

Here we don't have time within patient consultations, we check more than 250 patients in a day in OPD and if, say, (it) takes 1 minute (to advise/ prescribe) about physical activity, [long pause] we need extra hours for it, will you pay for that extra time? **[Healthcare worker, male]**

3.2.3.3. Formal policies could aid in the integration of physical activity promotion in healthcare services. It appeared that physical activity is not considered a priority in existing healthcare systems and there is a lack of effective supportive policies for physical activity.

It (physical activity) is not considered a priority in our healthcare system, just tell me if the Govt. have allocated anything for prevention ….how it works is difficult to imagine, look, if we don't have any policy, you see, it is not possible to even think about it and if ever they (government) give (formulate) some (policy), who will implement it? I cannot see any (mechanism) here that we trust to be useful (for implementing policies) **[Healthcare worker, male]**

Currently there are no policies or initiatives to assess or prescribe physical activity in clinical settings.

The concept that exercise is medicine is new here (in Pakistan) [pause] but you know one day you will have policy on it to properly prescribe it (physical activity) to patients, but it will take some time **[Healthcare worker, male]**

3.2.4. Theme 4: patients' individual level characteristics affect their physical activity behaviours

3.2.4.1. Knowledge and awareness about physical activity determines a person's engagement in physical activity. Awareness about the benefits of physical activity is a facilitator:

Why I love it (physical activity), you see, I want to look smart…my son also told me that walking can help reduce it (referring to belly) and improve my mind. **[Patient participant, female]**

Compared to medication, participants preferred physical activity as it is cost effective and has no side effects.

If you tell me that this (physical activity) can help me (in managing) my sugar and other things and my mood, then why would I, [smile] lose my money on tablets, and it (physical activity) doesn't have side effects. **[Patient participant, male]**

3.2.4.2. Patients past and present behaviours and habits have effects on their participation in physical activity. Patients' motivation, habits, behaviours, diet, and sleep routine play an important role in engaging them in physical activity.

Let me give an example, so if patients walk to their appointments or to the store, they will be more likely to be healthy and active than those who drive everywhere. **[Healthcare worker, male]**

Previous positive experiences with physical activity can boost a person's motivation to perform physical activity.

It is true, I go to the park with him (son) and stay there for a while, it automatically affects my mood… so with time I tell you that it (physical activity) can have a positive effect on my low mood. **[Patient participant, female]**

The will to recover previous physical fitness appeared to be a facilitator.

(before diabetes), I did many things and was active [pause], do not look at me now [laughing] I was so slim and active. (I) want to (be) like that (again). **[Patient participant, female]**

However, patients with certain personality characteristics may be reluctant to perform physical activity in front of others.

I am sure that you have the idea that we each have different personality traits, so how would someone recommend it (physical activity) to an introvert ….my experience says you can never convince him just by simple advice ….so simply saying that many successful players are introverts is not enough because your patient population is totally different……what I want to convey is that patients with certain characteristics may be difficult to accept it (physical activity). **[Healthcare worker, female]**

3.2.4.3. Physical limitations and co-morbidities limit participation of individuals in physical activity. Severity of depression and T2DM is a major barrier to physical activity.

(It) needs to be known (emphasized) that self-care works up to some level, now if a patient is severely depressed [pause], or he has uncontrolled sugar and he is bed ridden, so how you can tell him about self-care and physical activity. **[Healthcare worker, female]**

3.2.4.4. Physical symptoms such as pain and comorbidities can impede participation in physical activity

I (have) sugar, I also have knee pain, also have (low) mood (depression), also have gas (stomach problems), [long pause] if I continue, there is a long list, (still) you say do exercise …. I cannot move myself, so how I run in the parks …. once I am completely okay (cured), then I will start exercises **[Patient participant, male]**

Lack of confidence in performing physical activity due to fear of falls/ injury restricts patients' participation in physical activity.

You will laugh at me, but I avoid it (physical activity) because I am afraid of it …. sometimes I think that if I do it, my bones will be broken (fractured) **[Patient participant, female]**

Personal attributes affect individuals' participation in physical activity.

Low socioeconomic status/ poverty, low literacy, having a private car/vehicle, and marital status were some of the points highlighted by participants that might impede participants from performing regular physical activity.

I am sure you have an idea about how difficult it is to explain something to illiterate patients, and it becomes even more difficult when they are not interested in it **[Healthcare worker, male]**

Workload, extended duty hours, shift duty, working in the private sector, social and family commitments and other responsibilities were some of the reasons mentioned by the participants as to why they could not find time to be physically active

One of the biggest challenges I face when it comes to exercise is finding the time to do it… the confusion is whether I should earn or focus on myself. It is easy to, say, find time for yourself but, it would not work **[Patient participant, male]**

3.2.5. Theme 5: technology-based interventions may be used to promote physical activity

3.2.5.1. Digital technology can be used to promote physical activity. Mobile apps, websites, social media and YouTube are facilitators for increasing physical activity because they can assist in learning about different physical activities.

No need for any teacher (coach), a mobile can be your teacher, search (exercises) and do as they do (teach). **[Patient participant, male]**

Mobile apps and websites can be used to track physical activity levels, assess progress, set goals, and schedule physical activity.

(I) also note how many steps I take on a daily basis on this (using mobile app) ….so I say, I will take 10000 steps and I walk and walk to complete it…good thing is it tells me (gives reminder) when I am not doing it **[Patient participant, male]**

Media campaigns can spread awareness about the benefits of physical activity. In addition, exercise classes on television can guide patients on how to do specific exercises. Furthermore, mass media can be used to eradicate myths about mental health and physical activity.

Some time ago there was something, a movie, or some other thing which I saw, in which a doctor told people to walk while talking on a mobile, [pause] it means that doctor told people (that) when talking on a mobile, walk with that and then his idea is spread throughout the area, and everyone starts walking and then they show in it that diseases are reduced. [With smile] so I want to say that such kinds of things (mass media campaigns/dramas/movies) can help in spreading awareness (about physical activity) **[Carer, male]**

Electronic devices are also facilitators for physical activity because they can be used for physical activity monitoring (e.g., pedometers) and can be used to perform a physical activity directly (e.g., treadmills).

So, what else, electronic devices can be used for it (to monitor physical activity), such as pedometers can be used to track activity, it can also help to motivate them (patients) to be more active. It (devices) can encourage them (patients) to do more and more exercises **[Healthcare worker, female]**

In addition, participants mentioned how electronic video games and virtual reality can be used to motivate patients to engage in physical activity.

Now, people do exercises with the help of video games and that 3D motions (virtual reality), not to (go) outside (of the) home. **[Healthcare worker, male]**

3.2.5.2. Barriers to using technology-based solutions to promote physical activity. Difficulties in understanding instructions and options, particularly by patients with literacy difficulties, limits the use of technology-based solutions.

Simply because [long pause], people have difficulties when trying to use devices (related to physical activity) …they (patients) cannot use a device that they do not understand **[Healthcare worker, female]**

Poor internet connectivity, particularly in rural areas, appeared to be a barrier to promoting physical activity through technology-based solution.

When I am there (in the village), their internet is not working properly and I cannot note it (physical activity in mobile app) **[Patient participant, male]**

Resources required for technology-based solutions/interventions are expensive, unavailable, or inaccessible.

But you have to think about it from our perspective, these things (devices for performing or monitoring physical activity) are expensive [pause], it can be used, but not for all (patients) **[Healthcare worker, male]**

4. Discussion

Numerous individual, healthcare and wider cultural and environmental-level facilitators and barriers influence physical activity in people with depression and T2DM in KP province, Pakistan. These included cultural and religious norms and availability of resources, such as public spaces for physical activity. Individual characteristics e.g., knowledge and awareness of physical activity, physical limitations and co-morbidities, and domestic and occupational responsibilities were also thought to determine engagement in physical activity. Moreover, participants suggested that available healthcare resources and emerging technology-based solutions and interventions could be better utilised to promote physical activity.

Despite the well-established health benefits of physical activity, people with depression and T2DM do not generally reach recommended levels of physical activity. Our findings support those reported in previous studies, and also provide additional insights into factors that may influence physical activity. Evidence suggests that a myriad of factors affect participation in physical activity and, therefore, facilitators and barriers to promote physical activity vary for individuals, societies, and cultures (Elshahat et al., 2020). Numerous studies have attempted to identify these facilitators and barriers, but the majority have been conducted in high resource settings. The few studies conducted in LMICs have primarily focused on physical activity promotion in the general population (Banavali et al., 2021; Hoodbhoy et al., 2018; Raskind et al., 2020). The current study is one of the first to report the potential facilitators and barriers to physical activity promotion in people with depression and T2DM in an LMIC, specifically Pakistan.

The findings suggest that religious obligations and activities, such as praying five times a day, provide an opportunity to perform regular low-intensity physical activity. The different postures and positions (standing, bowing, prostration, and sitting) adopted during Muslim prayer involve movements of all body parts at regular intervals. Prayers may also provide benefits associated with spirituality and may improve mental and physical health through additional mechanisms. In addition, we found that religious scholars encourage people to perform physical activity. The finding that religiosity has a positive influence on in engagement with physical activity is again consistent with the published literature. A review which assessed cultural factors associated with physical activity in people living in the United States of America reported that religious teachings and attachments, spirituality, and belief in God promotes physical activity (Mathew Joseph et al., 2018). Some individual studies also support the notion that religion is helpful in promoting physical activity (Aljayyousi et al., 2019; Rubio-Rico et al., 2021; Shuval et al., 2008).

Cultural and social activities also provide an opportunity to perform physical activity. Although, cultural norms were supportive of physical activity from men's perspectives, it appeared that they deterred women's participation in physical activity. There are consistent reports in the literature highlighting low levels of physical activity among women (Rosselli et al., 2020; Sharara et al., 2018); studies suggest that the economic status of the family is the main factor that determines involvement of women in physical activity, while culture is listed as a secondary factor (Kara & Demirci, 2010; Laar et al., 2019; Tekin, 2010; Walseth & Strandbu, 2014). Nonetheless the findings of the current study showed that cultural values may be a major barrier for women. Although religion, particularly in Muslim countries, is often considered a barrier to physical activity promotion in women, participants in the current study reported that it is not religion, rather it is the cultural codes which restrict women's participation. The finding that culture is supportive of physical activity for men but not for women is consistent with previous studies (Aljayyousi et al., 2019; Raskind et al., 2020; Shuval et al., 2008).

Limited resources may not preclude promotion of physical activity. Participants in our study highlighted that physical activity may be carried out even in resource limited settings, as it does not always require specific resources and can be performed without supervision. Moreover, they reported that physical activity can be easily incorporated into everyday routine activities including domestic, occupational, and recreational activities. Previous studies have also reported that routine

daily activities can provide the opportunity to perform physical activity (Arshad et al., 2016; Pasquarella et al., 2022). Similarly, studies have reported that household chores are the main source of physical activity among women (Banavali et al., 2021; Hoodbhoy et al., 2018; Raskind et al., 2020). A study conducted in India reported that adolescent girls and boys had almost the same levels of physical activity, but girls spent most of their active time in completing household chores and work, while boys spent most of their active time playing (Raskind et al., 2020). A study conducted in Pakistan also reported that household chores were the predominant source of physical activity among pregnant women (Hoodbhoy et al., 2018). Likewise, a qualitative study conducted in rural parts of India emphasized that there is a scarcity of opportunities for performing recreational physical activity in rural areas, and that household chores and walking long distances are the major sources of physical activity (Banavali et al., 2021).

There is evidence that low intensity physical activity is effective in managing depressive symptoms (Arsh et al., 2023; de Groot et al., 2019; Kim, 2018). Reports also suggest that low intensity leisure and work-related physical activity confer mental health benefits (Teychenne et al., 2020); however we were unable to locate any high-quality evidence which supports the effectiveness of household chores and daily routine activities either in the management of depression or T2DM. Nevertheless, these activities appear promising for promoting physical activity in this population by incorporating it into peoples daily routine.

The findings of this current study suggest that healthcare workers and the healthcare system can play an important role in promoting physical activity. Nonetheless, it appeared that currently, physical activity promotion is not prioritised in the healthcare system and despite the evidence supporting its widespread clinical use, physical activity is still underutilized as an established treatment modality. We found that healthcare professionals do not routinely discuss physical activity with their patients and the few who discuss it, provide very brief, non-specific advice using verbal counselling. This barrier is not specific to Pakistan, because studies from other LMICs, and even from some high-income countries, report that unlike medication, which is prescribed in written form, clinicians do not regularly assess or prescribe physical activity in routine care (Brannan et al., 2019; Hagströmer et al., 2022; Nauta et al., 2022). Thus, the challenge remains to translate knowledge of the health benefits of physical activity to practical use in the healthcare system (Brannan et al., 2019). Healthcare professionals can play an important role in the dissemination of physical activity recommendations to a broad segment of the population; however, this can only be possible if clinicians provide written prescriptions for physical activity (Linke et al., 2021; Nauta et al., 2022). The relatively new concept of 'Exercise is medicine' implies that just as for prescriptions of medication, guidance about physical activity should be provided by a health care professional in a structured way, resulting in an individualized prescription for activity in written form, tailored to the person's needs (Li et al., 2023; Thompson et al., 2020). Prescription of physical activity by the treating physician or other healthcare professional could be one approach to promoting physical activity, in addition to the other evidence-based approaches and initiatives which can assist in the promotion of physical activity, such as social support interventions, behavioural and educational interventions and enabling environment initiatives (Alessy et al., 2023; Gelius et al., 2020; Taylor et al., 2021). For example, evidence supports the use of motivational interviewing, a counselling approach, for the promotion of physical activity (O'Halloran et al., 2014).

The findings of this study can be used as an initial step in the development of a comprehensive, sustainable, and culturally tailored intervention to promote physical activity in this population. Our findings suggest that due to cultural values women face significant barriers to physical activity compared to their male counterparts. It is imperative therefore to develop an intervention to promote physical activity tailored to women, which will help in reducing gender disparities. Our findings suggest that religious and cultural activities such as praying five times a day, visit to religious schools, attachments with religious groups, participation in cultural events, and cultural dance can be used to promote physical activity in people with depression and T2DM. Similarly, the findings emphasized that patients generally follow instructions of healthcare workers and therefore if these patients are properly guided about physical activity in healthcare settings, it may improve uptake of physical activity. Nonetheless, the lack of proper training for healthcare workers about physical activity appeared to be a barrier to advising on, and/or prescribing, physical activity in clinical settings. Therefore, healthcare workers need to be appropriately trained. There is also a need to explore emerging technologies for the promotion of physical activity in this country, despite some barriers to their use in some sections of the population.

Our study has some limitations. We did not explore the perspectives of policy makers; thus, we were unable to report on facilitators and barriers at a policy level. Although healthcare workers discussed the important role of policy in the promotion of physical activity, they were uncertain about policy-relevant facilitators and barriers or any government initiatives to promote physical activity in the country. In addition, it is difficult to determine how broadly transferable the findings of the current study are because the study was restricted to a single district and participants were all of Pashtun ethnicity. Nevertheless, we think that the study has provided insights that could be largely applicable to people residing in other regions of Pakistan. Moreover, Pashtun ethnicity is the predominant ethnic group in Afghanistan where they have the same religious practices and cultural norms, so the findings may be applicable there as well. Furthermore, our findings may be transferable to other LMICs, particularly those in South Asia because LMICs often face similar challenges to the promotion of physical activity.

5. Conclusion

Individual, cultural, and healthcare system level barriers and facilitators can affect participation of people with depression and T2DM in physical activity. These barriers and facilitators should be considered in designing interventions to promote physical activity in this population. It appears that physical activity could be promoted in this population by focusing on available resources while keeping in mind economic, individual, cultural, and social barriers, and by incorporating physical activity into everyday activities (including religious, social, cultural, domestic, occupational, and recreational activities), tailoring them to individual characteristics, using technology and harnessing routinely available healthcare resources.

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CRediT author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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