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"If it all goes digital, we'll have to learn": facilitators and barriers to uptake of digital health in British South Asians with cardiometabolic disease

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Abstract

Background Although availability and utilisation of digital health interventions (DHIs) for management of diabetes and cardiovascular disease ("cardiometabolic disease") have increased, they may exacerbate health inequalities. South Asians have increased cardiometabolic risk, but their experiences of DHIs are poorly investigated and characterised.

Objective To explore facilitators and barriers to DHI uptake and use in South Asian individuals in the UK with cardiometabolic disease.

Methods Mixed-methods approach encompassing online/face-to-face/individual interviews ($n = 45$) and survey ($n = 100$). After informed consent, transcription and coding, we conducted a thematic analysis informed by a guide for understanding inequalities in DHIs to examine perceptions at the individual, healthcare professional, societal and intervention level.

Results Participants described an intersection of factors resulting in varied digital skills and confidence within the community, including individual characteristics, awareness, and support. COVID-19 restrictions acted as both a positive (use of online shopping and social media increasing digital confidence) and negative (lack of access to health services) drivers to DHI uptake. Participants made recommendations for improving DHI uptake in the health service and policy area, such as promotion and upskilling through culturally and language-appropriate avenues such as community organisations and outlets. Participants suggested DHI design improvements should focus on literacy, numeracy, accessibility, and cultural appropriateness.

Conclusions DHIs have the potential to support South Asian populations in the UK to prevent and manage cardiometabolic disease. To improve their uptake, approaches to their implementation should consider community diversity to provide appropriate promotion, education, and support.

Keywords Digital health, Cardiometabolic disease, Minority ethnic, Inequalities

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Introduction

Digital health interventions (DHIs) such as apps, wearables, and websites for cardiovascular disease and diabetes (together termed cardiometabolic disease), have the potential to improve patient experience [1] and outcomes in [2–4], as well as reducing costs and increasing efficiency [5]. Digital approaches to prevention and management of cardiometabolic disease currently in use in England include lifestyle changes around diet and increased activity; remote monitoring; and support with rehabilitation [6–8].

However, digital approaches risk excluding some populations who experience barriers to access and use, exacerbating existing health inequalities [9]. There is some evidence of ethnic inequalities in uptake of DHIs [10]. People of a South Asian background in the UK have increased cardiometabolic risk [11], and some South Asian groups are more likely to experience barriers to digital inclusion [12].

There is a limited evidence base about DHI acceptability and use in the South Asian population in the UK [13, 14], and existing studies draw on data collected prior to the pandemic, when digital approaches were less embedded in the health service. There is a need to understand different populations' experiences and perspectives on digital health to ensure equity in future services, and how, if it all, it has been impacted by the pandemic. This study aimed to understand facilitators and barriers to uptake of digital health for cardiometabolic disease, focussing on in South Asians in the UK as the largest minority ethnic group [15].

Methods

Study design

A mixed-methods approach encompassing a cross-sectional survey and focus groups. Studies received ethical approval from UCL REC (20,413/001) and NHS London – Brent Research Ethics Committee (IRAS 261047).

Online survey

An online survey was developed (MR, AB, LP) to understand the types of DHIs used by South Asian individuals in the UK, digital literacy, and experiences of digital health (see Supplementary 1). Any adult of a South Asian background in the UK was eligible to part take; outlined in the survey as "...anyone who considers themselves to be from a South Asian background (including Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Pakistan, Nepal and Sri Lanka)." The survey was promoted online via professional networks and social media, and online or hard-copy versions were also made available through local community and religious organisations between July 2021 and October 2022. The survey was

provided in English, but was available to be translated to a South Asian language on request. We also offered the opportunity to complete the survey with a member of the research team. Descriptive analysis was conducted using SPSS v29 and was used to inform the development of focus group questions, such as the choice of DHIs.

Focus groups

Recruitment of adults of a South Asian background at risk, or with, cardiometabolic disease took place via primary care, community organisations, and using snowball methods, to ensure participants represented a range of demographic characteristics. Recruitment was independent of recruitment for the online survey. Online and in-person focus groups were offered, as well as individual interviews with the support of informal or formal interpreters, for those who did not feel comfortable sharing their experiences in a group setting. In-person focus groups were facilitated by a representative of the community organisation to build rapport and encourage participants to express themselves in their preferred language. Additional community organisation staff were able to provide support for other languages.

Before each focus group or interview, participants provided written informed consent, with any queries addressed by the research team. The discussions explored individuals' use of technology in relation to their health, barriers and facilitators to use, the impact of the COVID-19 pandemic on their use of DHIs, and ideas for changes and support for future use of digital health (Supplementary 2). Participants were compensated with a £50 retail voucher.

Recordings were professionally translated (if required), and transcribed. After familiarisation, transcripts were inductively and deductively coded (MR, DS). An iterative process of coding, review and revision of codes was completed (MR, DS, NK). Codes were organised thematically and mapped onto our published guide for understanding inequalities in DHIs at individual, healthcare professional, society and intervention levels [16], using the contributing factors at each level of action (the 'constructs') as a guide. Codes that did not fit these constructs were organised into separate themes; these are not considered here as they related to other health matters [16].

Results

Survey

A total of 100 South Asian individuals from the UK completed the online survey, of which 45% had at least one of diabetes or heart disease. Most participants were female ($n=61$, 61%), of an Indian background ($n=58$, 57%), and had tertiary education ($n=82$, 82%) (see Table 1 for further demographic information). Thirty four percent

Table 1 Participant demographics

	Online survey	Focus groups and interviews
Ethnicity	N = 100 (%)	N = 45 (%)
Bangladeshi	11 (11)	13 (29)
Indian	58 (58)	16 (36)
Pakistani	23 (23)	14 (31)
Other Asian ethnicity/not provided	8 (8)	2 (4)
Gender		
Female	61 (61)	24 (53)
Male	38 (38)	21 (47)
Other/not provided	1 (1)	0 (0)
Age		
18–24	9 (9)	1 (2)
25–34	17 (17)	0 (0)
35–44	29 (29)	5 (11)
45–54	19 (19)	9 (20)
55–64	15 (15)	15 (33)
65–74	8 (8)	10 (22)
75–84	3 (3)	4 (9)
84+	0 (0)	1 (2)
Education		
None/primary	0 (0)	13 (29)
Secondary	18 (18)	16 (36)
Tertiary	82 (82)	14 (31)
Other/not provided	0 (0)	2 (4)
First language (self-described)		
English	77 (77)	*please see table footnote
Bengali	2 (2)	
Gujarati	4 (4)	
Hindi	5 (5)	
Panjabi	4 (4)	
Tamil	2 (2)	
Urdu	4 (4)	
Other/not provided	1 (1)	
Religion		
No religious beliefs/none provided	14 (14)	3 (7)
Christianity	6 (6)	0 (0)
Hinduism	28 (28)	11 (24)
Islam	44 (44)	26 (58)
Jainism	2 (2)	1 (2)
Sikhism	5 (5)	4 (9)
Zoroastrianism	1 (1)	0 (0)
Location		
South West	8 (8)	0 (0)
South East	14 (14)	1 (2)
Greater London	31 (31)	23 (51)
East of England	1 (1)	0 (0)
Midlands East	11 (11)	15 (33)
West Midlands	11 (11)	0 (0)
Yorkshire and Humber	10 (10)	6 (13)
North West	12 (12)	0 (0)

Table 1 (continued)

	Online survey	Focus groups and interviews
North East	2 (2)	0 (0)
Health conditions		
Prediabetes, Type 1 or Type 2 diabetes	36 (36%)	31 (67%)
Coronary heart disease, hypertension	26 (26%)	22 (49%)
Occupation (or previous occupation if retired)		
Modern professional occupation	31 (31%)	8 (18%)
Clerical and intermediate occupation	11 (11%)	5 (11%)
Senior manager or administrator	17 (17%)	0 (0%)
Technical and craft occupation	1 (1%)	3 (7%)
Semi-routine manual and service occupation	4 (4%)	0 (0%)
Routine manual and service occupation	1 (1%)	5 (11%)
Middle or junior manager	4 (4%)	2 (4%)
Traditional professional occupation	14 (14%)	2 (4%)
None of the above (never formally employed)	6 (6%)	2 (4%)
Other/not provided	11 (11%)	18 (40%)

Demographic information on participants in online survey and focus groups/interviews

*Participants in the focus groups and interviews were not asked about their first language. 26(58%) reported speaking English, with 2 others describing themselves as speaking some or a little English. Participants who completed this information, reported speaking: Gujarati ($n=12$, 28%), Urdu ($n=10$, 25%), Punjabi ($n=13$, 30%), Hindi ($n=9$, 21%), Bengali ($n=11$, 26%), and 2 people reported speaking other languages

($n=34$) of respondents to the survey had used a DHI. Of those that had used a DHI, 18 (75%) cited healthy lifestyle apps such as exercise and weight loss apps, as their most used, and 8 (33%) cited diabetes-specific apps such as those for advice or continuous glucose monitoring (CGM). This group described helpful features of their most used apps as: advice on healthy eating ($n=16$, 46%) and physical activity ($n=17$, 49%), and tracking aspects of lifestyle ($n=14$, 40%) and health ($n=13$, 37%) for one's own interest. Out of those who had not used a DHI, frequently cited reasons for lack of engagement included: not being recommended by an HCP ($n=44$, 67%), not having heard of a DHI ($n=26$, 39%), preference for in person ($n=15$, 23%) and DHIs not being relevant to them ($n=14$, 21%).

Focus group and interview study population

Forty-five South Asian participants at risk, or with, cardiometabolic disease were recruited. This included 31 individuals (67%) with prediabetes, Type 1 or Type 2 diabetes, and 22 individuals (49%) with coronary heart disease or hypertension. The sample included diversity of participants in terms of gender (female $n=24$, 53%, male $n=21$, 47%), South Asian ethnicity (Bangladeshi $n=13$, 29%, Indian $n=16$, 36%, Pakistani $n=14$, 31% and other $n=2$, 4%) and education (no or primary level $n=13$, 29%, secondary $n=16$, 36%, and tertiary $n=14$, 31%). Twenty six participants (58%) reported speaking English; further details related to languages spoken, religion and geography are provided in Table 1. Data was collected through

in-person (3 groups, $n=7-8$) or online (7, $n=2-6$) focus groups, and individual interviews supported by an interpreter ($n=3$), which were conducted between May and September 2022. Data saturation was achieved across all major themes (facilitators and barriers at the levels of: individual, provider or healthcare system, population or society, and intervention).

Focus group and Interview findings

Figure 1 is derived from our previously published guide for understanding DHI inequalities. The top row shows the levels of action for digital health inequalities, which form our themes (numbered 1–4), and the second row, key constructs within each level (labelled A–O). Within each level, we have listed the sub-themes identified through our analysis of the focus group and interview findings. As the results presented here focus on patient experiences, most themes and sub-themes relate to participant perceptions of digital health and how these are used, barriers and facilitators to uptake and use, acting at the individual level. However, these are closely linked to constructs within the provider, population and intervention levels.

Level 1: individual

Participant understanding and use of digital health

Participants had varied understanding of what constituted digital health, and what options were available, from electronic monitoring tools (such as home blood pressure machines) to more connected devices or mobile

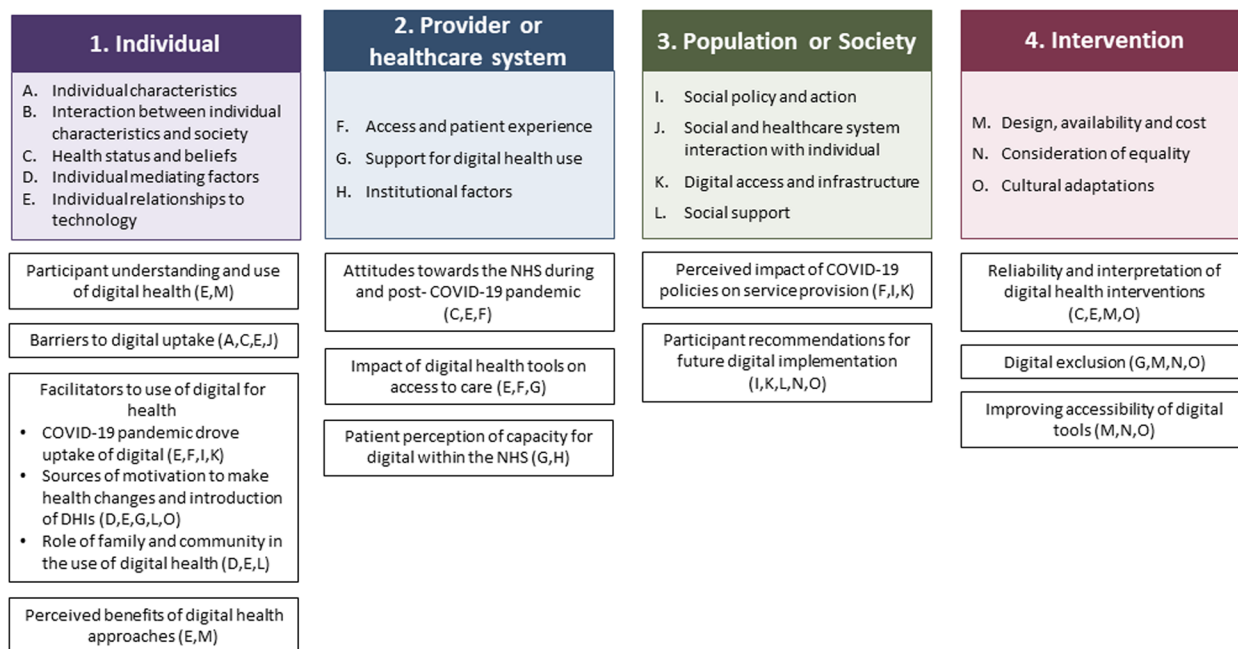


Fig. 1 Mapping of themes and sub-themes (white boxes) to levels of impact (1–4) and contributing constructs(A–O). Letters in brackets indicate the relationship between themes and constructs across all four levels of action. Derived from Ramasawmy et al., 2022 [16]

apps for remote management with their health care teams. Participants varied in the extent to which they engaged with DHIs, with some reporting no experience while others were actively engaged. Many participants used WhatsApp, social media and YouTube to access and share information, even if they did not otherwise use mobile phones.

Use of digital tools used for the management of cardio-metabolic disease were split across four categories: active or passive information networks, administrative health tasks, (self-directed) health behaviours, and prevention and management with healthcare team (summarised in Fig. 2).

Barriers to digital uptake

Age, English language skills, literacy and numeracy, physical barriers such as eyesight and arthritis, and cost of up-to-date digital devices and data, were highlighted as potential barriers to digital interest, use and skills. Participants described an interaction of these factors and varied level of digital skills within the community:

“... I’ve got ...neighbours who struggled and it wasn’t just the older generations, it was, I mean people in their forties, you know. They didn’t know how to get the NHS app. And the other thing is obviously with technology, you need to have a smartphone and then you need the Internet access as well... people

in in our area mostly they are on pay as you go.” [M, Age 45-54].

Older participants spoke about how they had used technology while within the workforce, but that technological advancements over time have left them out of practice or out of date. However, participants of all ages talked about a fear of technology, with specific concerns including privacy of information, being tracked, and experience of scams:

“But I think if you’ve got technology fear or something like I have, that again I had to learn a new thing and some big fear stays in my head at that time.” [F, Age 45-54]

“... the first fee I paid £10 for online doctor. And then he’s asking like - he’s not calling me, just texting... after that he is asking like, ‘I understand the medication, I give it to you, give me another £10’. And it was a bit scary.” [F, Age 35-44]

Facilitators to use of digital for health

The COVID-19 pandemic drove uptake of digital The COVID-19 pandemic was a driver of uptake of digital more broadly for many participants. Maintaining social bonds via WhatsApp and other platforms moderated feelings of isolation. Participants noted that they had

How do patients use digital tools to manage CMD and other health needs?



Fig. 2 Participant use of digital technologies to prevent or manage cardiometabolic disease

increased their use of digital services, such as online shopping, and other digital tools, such as for banking or travel. As a result of increased time and confidence online, some sought out health information, highlighting medical professional videos on social media:

“.. During Covid I am stuck up in my home, totally, cut off from everything. So I depend on YouTube and I learned so many things” [M, Age 65-74]

“I think that [videos from India are] really good in a way, because then you’ve got you’ve got a doctor or dietician who is, you know from speaking from in India, they speak in the native language and they are dealing with food that’s that more oriented towards our community.” [M, Age 45-54]

Participants noted both positive (convenience, safety) or negative (‘forced’) change to digital, for example, changes in the ways to contact primary care. As COVID-19 restrictions lifted, the need to ‘check-in’ to venues via the NHS COVID app for a period of time, led to temporary use of the app, which was later deleted when no longer required. However, several people had since engaged with the NHS App for access to their vaccination record to facilitate travel abroad.

Sources of motivation to make health changes and introduction to DHIs Participants spoke about several

motivations to make changes to their lifestyle to improve health, including recommendations from their doctor, family, friends, the media, and as a result of concerns about risk during the COVID-19 pandemic. Participants generally expressed positive sentiments around their own capacity to manage their health, while highlighting common challenges, for example with making the right dietary choices.

Family and the wider community acted as both positive and negative drivers of behaviour change, for example, through opportunities to share and adapt healthy versions of cultural food, including with virtual networks ‘back home’, balanced by rejection of these changes by family members. This linked to a perception that there were problems with motivation to make healthy changes among the wider community, illustrated by the following quotes

“I find that you cook [the healthier version] once, and then you sort of go back... into your own diet because... the rest of your family doesn’t want [the food], you know they think ‘We can’t suffer because of you...’” [F, Age 45-54]

“...not all, all persons are so motivated to control their habits, their dieting habits, eating habits, it’s

very difficult. It's not easy to follow all these advices. Maybe I found that 20% or 30% listeners, they follow my advices [shared in an online community group] and the other 70% they listen, participate but not following the advices..." [M, Age 65-74]

These networks recommended and facilitated use of DHIs to make these changes, in particular around exercise tracking, with some describing some competitiveness with friends and family as being an effective motivator. Participants had also heard about condition-specific digital health tools from their networks, such as for continuous glucose monitoring (CGM). There was an awareness that specific DHIs such as these were not currently available for everyone on the NHS, and described cost, technology anxiety or difficulty in setting them up, and the risk for increasing health anxiety, as barriers to uptake.

Participants also highlighted that the wider community could be a source of potentially harmful advice and information around DHIs:

"... I had to explain to her how it works, it sends a signal either to your mobile phone and then it goes to the GP etc, and this was when Covid was starting. She said, "No, no, no, they'll be tracking me everywhere, I don't want this." Because she was listening to her own friends and family who were using WhatsApp and feeding negative information..." [M, Age 45-54]

The role of family and community in supporting use of digital health Participants described varied levels of need for support with learning or ongoing use of DHIs. Participants with little English or low literacy often described their children handling all their health-related administration such as prescriptions and making appointments, whether via traditional or digital routes. Some current DHI users described initial help from family members (usually their children) which motivated them to engage further.

However, family members were not universally considered a source of potential support. For those who lacked the confidence to use digital tools independently, the need to constantly ask family members, or to be reliant on them, could be a cause of conflict or sense of burden, and did not represent a sustainable solution:

"...my husband was using [the same app] and he goes, 'Oh, it's so easy, why can't you use it?' You know, 'Why are you having problems?'" [E, Age 45-54]

Perceived benefits of digital health approaches

For those who were able to use them, DHIs, particularly those related to administrative health tasks, were described as providing ease, convenience and time saving. Not having to travel within work hours, or the availability of services at a range of times, removed barriers to engaging with services.

DHIs were seen to have the potential to promote patient self-management of health and well-being, such as around motivation for exercise and dietary change, and improve interactions with the health system. In particular, the ease of sharing information or remote monitoring, allowed patients to visit services less regularly, but get help when required. Participants also highlighted the potential for DHIs to enhance patient experience of care in other health conditions.

Level 2: provider or healthcare system

Attitudes towards the NHS during and post-COVID-19 pandemic

The NHS and their healthcare providers were seen as trusted sources of information regarding health and were used by some to check information shared with them by friends and family, or that they had found online:

"...when I go to the GP I ask the doctor sometime, and they, when they say like, "Yes, what dieting do you follow? Yeah, it's good." Or sometimes - they said, like, yeah, "Do something like this." Then I match it with Google, what I'm watching, then I feel, yeah, this is the right information I'm seeing from Google. That way I check my information is - because everything is online, I don't trust it." [E, Age 35-44]

Patient discussion of healthcare most frequently focused on the limited accessibility of GPs, during and post-pandemic. While many were sympathetic to the burdens on healthcare professionals, particularly in the last few years, some felt that there had been a reduction in the quality of care received in the NHS, and that more important people got better service.

Impact of digital health tools on access to care

The use of digital tools in health services was described as a way to overcome barriers or lack of service: for example, for those able to use portals to access services (e.g. GP apps), they provided a way to book appointments, handle prescriptions and view test results. Other perspectives were that they provided new benefits, such as rapid communication of symptom or status change via remote monitoring. Follow-up by text message and other digital communication had multiple positives, including: providing useful reminders or reassurance of appointments

and timescales; reducing pressure of scheduling appointments for negative results; and were seen as a more convenient way to access further resources. Digital records were also seen as a way to improve communication between primary and secondary care:

“..as a result of the pandemic all of my appointments have been remotely, electronically, sending information, receiving information, apart from [hospital] which I attended... I was very confident because a text message is sent saying, your consultant will be calling you at such and such time. So it's all very reassuring and I feel that the GP definitely, even the hospital, everyone's sort of adapted to the new way of having appointments and assessment, and I'm happy with that.” [M, Age 55-64]

For those unable to attend services in regular hours, digital tools also enabled accessibility and convenience. Some participants recognised the potential benefits of digital services but did not feel that they needed them for the moment: for example, they found SMS communication sufficient, or were happy to self-manage with their current tools. Face-to-face services were perceived to be better than remote for some types of care (for example, with new concerns), or where there was a language barrier or other communication need.

Many participants described the difficulty of registering or signing onto online health platforms as a barrier to use, as illustrated in the following quote:

“...you have to contact several different people in terms of, with GP, you ring, then the receptionist will tell you something, then you have to go and collect, they won't give it you in your text message or anything, so you have to go and collect that letter. When you collect that letter, then you try and put a couple of passwords and information. If it doesn't go through then it's more frustrating and then you end up giving up.” [E, Age 45-54]

Others reported having to repeat this process if they lost their password. Suggestions on how this process could be improved included providing patients with videos on how to set up their account and use the app or offering opportunities to support them to do it in person.

On the topic of digital tools specific to cardiometabolic disease, participants reported that health care professionals could act as both facilitators and barriers to use. For example, one participant described their doctor making a case for NHS access to CMG technology to support them with their diabetes. A few participants expressed frustration that CGM and other diabetes technology is not available to all patients with Type 2 diabetes, highlighting its impact on lower income households.

“I don't think [CGM discussed by group] is offered everywhere. Somebody very close to me who's been a type 2 diabetic for many years [has] not been offered the app... she'd have to pay it for herself, she can't afford it... so sometimes she struggles to know what insulin... to take.” [F, Age 55-64]

Most had not been suggested or offered any specific DHIs to prevent or manage cardiometabolic disease, and suggested reasons for this included lack of time, or a perception that health care professionals believed they would not “know how to use it.”

Patient perception of capacity for digital within the NHS

Patient perception of the capacity for digital within the NHS as a whole was mixed. Some participants highlighted a perceived unpreparedness, understaffing and under-resourcing for an environment ready for digital approaches; and that the potential benefits of digital for the patient or provider were not realised. One participant gave an example of slow updates or lack of access to test results on a patient portal. However, others felt that the NHS was adapting well to integrating digital, and that this approach was no longer novel.

Level 3: population or society

Perceived impact of COVID-19 policies on service provision

Participants spoke about the impact of COVID-19 policies on service provision. Some highlighted that their local practice had already made digital services available prior to the pandemic, such as options for online prescriptions and patient portals, and they did not have to make any changes to how they accessed care.

Telephone and video consultations were accepted as a reasonable step during COVID-19 restrictions, and were preferred in some cases due to a fear of becoming ill if attending a practice or hospital environment in person. In addition, some specialists were able to provide new digital services, such as remote monitoring. However, COVID-19 was perceived to have a negative impact on the quality of care, such as rushed appointments, lack of proper communication, and difference between sharing photographs of an issue versus being examined. This led some people to seek care elsewhere, or to try to self-manage as they did not feel adequately supported:

“When it was like the pandemic they don't answer the call, or sometimes they like don't provide the medication properly, and that communication is cut off totally... When I talked to them, the [traditional medicine] shops, they're asking everything, and they sent the medication in my address, and I paid online. Which is how a long time I'm using herbal medication, because the doctors, they do not serve.

They answer but they're not face-to-face. So I didn't like feel comfortable to take medication like this." [F, Age 35-44]

"Even if we fell sick, we did not go to the doctor. Because there was no one in the Surgery, we somehow used to manage." [M, Age 55-64]

The impact on care was considered in some cases to be lasting, as participants raised concerns that their practices had not returned to in-person appointments. In general, participants stated that their preferred service provision would use the best of both approaches, such as having digital options for routine or administrative tasks such as prescription ordering, but that they would prefer being able to see someone in person for any new health concerns.

Participant recommendations for future digital implementation

Participants were asked about their recommendations for future implementation of digital. They highlighted the need for data to support policy and funding for digital health, and opportunities for promoting digital skills and tools in the community: for example, using existing infrastructure such as screens at GPs, posters in pharmacies, advertising via UK-based Asian radio and TV, and workplace practice to improve digital skills. The specific needs related to digital upskilling identified were: awareness of what digital tools were available, how to use devices and specific digital tools, and management of disinformation and technology fears. Digital upskilling should be held in locally accessible venues, and be culturally and language-appropriate, e.g. to be run by community organisations.

However, a few participants identified that either they or their relatives were relatively isolated, relying on a few family members, and did not engage with the wider community, particularly in those interviews which were undertaken with the support of an interpreter. For wider benefit, it was suggested that a programme of support should be put in place to support the introduction of DHIs within health: for example, to explain benefits, set it up and initial instruction, and follow-up alongside clinical follow-up.

"...funding needs to be given.. so if somebody whose first language is not English, is not confident in using the apps, that they can get into a group and have maybe a week of lessons in a friendly setting. It could be in a community centre, it could be in a Gurdwara, in a temple, in a Mosque, and that's the way. Because that's where some people go to have meetings." [M, Age 55-64]

Level 4: intervention

Reliability and interpretation of digital health interventions

Looking at the design and implementation of DHIs for physiological monitoring, participants were unsure about whether they were aimed at the public or health care professionals: for example, having to read and interpret measurements without professional support was perceived as difficult or anxiety provoking, particularly when they did not appear to reflect patient experiences. However, they could also prompt access to healthcare, as explained by one participant:

"My [relative's] oxygen levels were like 48, 40, and I thought, oh my God, [she]'s going to die, you know, like it was so scary. But then my brother said that you're not even supposed to have that gadget, that's a doctor's gadget, what you doing with it?... But it gave me an indication to call the ambulance... So it has a plus point and it has a panic point, so I think the gadgets are really good to be honest. They saved [her] life at that time." [F, Age 45-54]

Other specific areas of concern were raised around reliability and trustworthiness of DHIs. DHIs and online information sources recommended or provided by the NHS were perceived to have a greater trustworthiness. Participants generally also described having high level of trust in the knowledge of their health care team and would check information found elsewhere online with them or the NHS website. However, even among trusted tools, patients had concerns about whether advice received would be reliable, based on the quality of information (such as photos) that are sharable online compared to face-to-face. For example one participant highlighted a concern about burns, but this would also have relevance for foot injuries in patients with diabetes, or for concerns about ankle swelling.

"...there were incidents where they asked us to send photos and send it through to them. But in real life - I mean you look at a photo, it's completely different... there's like one photo that she took, they thought it was something different, but in reality she actually burnt it, it was a burn mark and not shingles." [F, from mixed-age focus group]

Digital exclusion and improving accessibility and relevance of digital tools

Participants raised concerns about digital exclusion or inequalities in who benefited from DHIs, through lack of awareness, suitability or access, as highlighted in Theme 2 around the process of using GP patient portals. The high cost and variable accessibility of CGM

for those with Type 2 diabetes was also mentioned as a specific example.

Recommendations about improving the accessibility of digital tools focused on literacy, numeracy, and cultural appropriateness. Specific examples included: simple background and easy to read font, providing information in different languages, use of clear symbols, use of audio and video, integration of voice-interactive navigation or input, inclusion of more culturally relevant dietary information; and improved syncing of devices. For example, one participant described why they ceased using a dietary app: “...it’s not really telling me anything because I can’t track the food properly—like I’m having to put my rotis or chapatis as something else.” [F, Age 35–44].

Desktop interfaces for GP or other NHS portals were also described as being easier to use by some people, for example because it was difficult to view all prescription medicines on the screen on a mobile phone. Reflecting the diversity of participant digital familiarity, some described a preference for basic or single feature apps, with single click navigation, while others enjoyed more advanced features such as visualisation of results (for example to promote self-management), and integration with other systems (such as across GP and NHS apps, or from monitoring systems to their care providers). Having some form of support either within the app or via healthcare providers was also seen as useful.

Some participants did not feel that digital tools currently added anything that could not be achieved manually (e.g. by tracking measurements on paper or a spreadsheet). However, specific areas of interest included: greater personalisation of information (culturally or to the individual), apps that could be used by carers or other family members, and apps that enabled patients to understand how different food types affect their blood sugar.

Discussion

This study presents the attitudes and acceptability of digital health across a diverse group of individuals from a South Asian background across the UK. While many participants had some access to mobile devices, confidence and utilisation of DHIs were impacted by individual characteristics, awareness of DHIs, and available support, including to take up digital services during COVID-19 restrictions. Participants made recommendations for improving DHI design and implementation, such as promotion and upskilling through culturally and language-appropriate avenues such as community organisations and outlets.

Findings in context

Many of the barriers and facilitators to DHI uptake and continued use described here (such as affordability and digital skills) are well understood [17]. While the COVID-19 pandemic accelerated uptake of digital by individuals [18] other pressures such as the cost of living crisis, and widening inequalities, will continue to digitally exclude some groups [19].

Existing categorisations of digital health focus on health-specific tools, such as the WHO categorisation of DHIs based on target user and functionalities [20] and NICE classification based on purpose and risk [21]. Our work adds to this by focussing on South Asian patient experiences of how individuals use technology to manage their health and wellbeing, including technology types where health is not the primary function, such as peer to peer messaging apps and YouTube (Fig. 2). Information exchange within the community in the UK and abroad was a key way in which digital platforms were used by our participants to manage their health. Previous studies have found that South Asian community networks are a source of incorrect information around herbal remedies and food choices [22]. This effect may be exacerbated with the increase in digitally inexperienced individuals accessing and sharing online resources post-pandemic [23]. A review of YouTube resources found that, among those tailored to the South Asian community, about one third contained misleading or unproven information [24]. Exposure and susceptibility to misinformation around health can be associated with other factors affecting health disparities [25]. While system-level actions are underway [26], community-level approaches may support individuals with decision-making around health information found or received online, as well as broader digital awareness, skills and safety.

Recommendations about improving intervention accessibility via design have been reflected in other studies with diverse populations, for example highlighting the use of small screens and text [27]. Our findings challenge suggestions that due to access to family or friends who can translate, it is not always necessary to provide translated information [28]. Even for those not facing language or accessibility barriers, a lack of culturally diverse information, led to disengagement with prevention or management DHIs which included dietary management. A study of apps available in India for diabetes prevention also noted a lack of culturally relevant food data [29]. Existing resources on South Asian or global diets such as those produced by health charities and the NHS [30–33] present an opportunity to improve these offerings, although this is subject to health care professional awareness. This is particularly important as previous studies have highlighted cultural pressures around traditional

food preparation, preferences and consumption practices as being a key barrier around healthy lifestyle change in South Asians in the UK [34], and suggested that this may be particularly difficult to navigate for the sub-group of patients who do not speak English [35].

Given the diverse nature of this group, a nuanced approach to digital health implementation can better identify and address needs. In Fig. 3 we have mapped user types, the barriers they face, and opportunities to support acceptability and use of DHIs at the individual level. It also draws on the diversity of user preferences to suggest where single-faceted or multi-faceted DHIs may be best directed. We suggest, this can help us and other researchers working in this field identify where recommendations from participants may have the most benefit.

Limitations

Given the diversity within those that identify as South Asian in the UK (such as that demonstrated by occupation [36] and income [37]), this study cannot represent all experiences of digital access. We made efforts to address this through offering translations or assistance with completing the survey, and the use of snowball and community routes for recruitment to focus groups, and by offering individual interviews, which were either

facilitated or interpreted by individuals with appropriate languages. Forty percent of attendees to the interviews or focus groups did not provide occupational data; however where details were provided this included a wide range including manual and service occupations, and women who described themselves as ‘housewives.’ Unfortunately, due to the small sample recruited to the online survey, we were unable to conduct an analysis of the impact of sociodemographic factors on digital health utilisation, however a descriptive approach provided a useful basis for understanding which DHIs participants may be familiar with. We recruited a range of ages, the average of the focus group sample was around 60 years old, reflecting the increased risk of cardiometabolic conditions in older age groups [38].

As well as there being significant diversity within South Asian populations in the UK, South Asian populations worldwide, both in South Asian countries, and in the significant diaspora in the USA and Canada, are diverse, and may have experiences of access and engagement with healthcare that is unique to the social, political, economic environment and history. Reviews looking at the experiences of digital health for South Asian people have found limited studies in the UK [13, 14]; as such, this paper is an important contribution

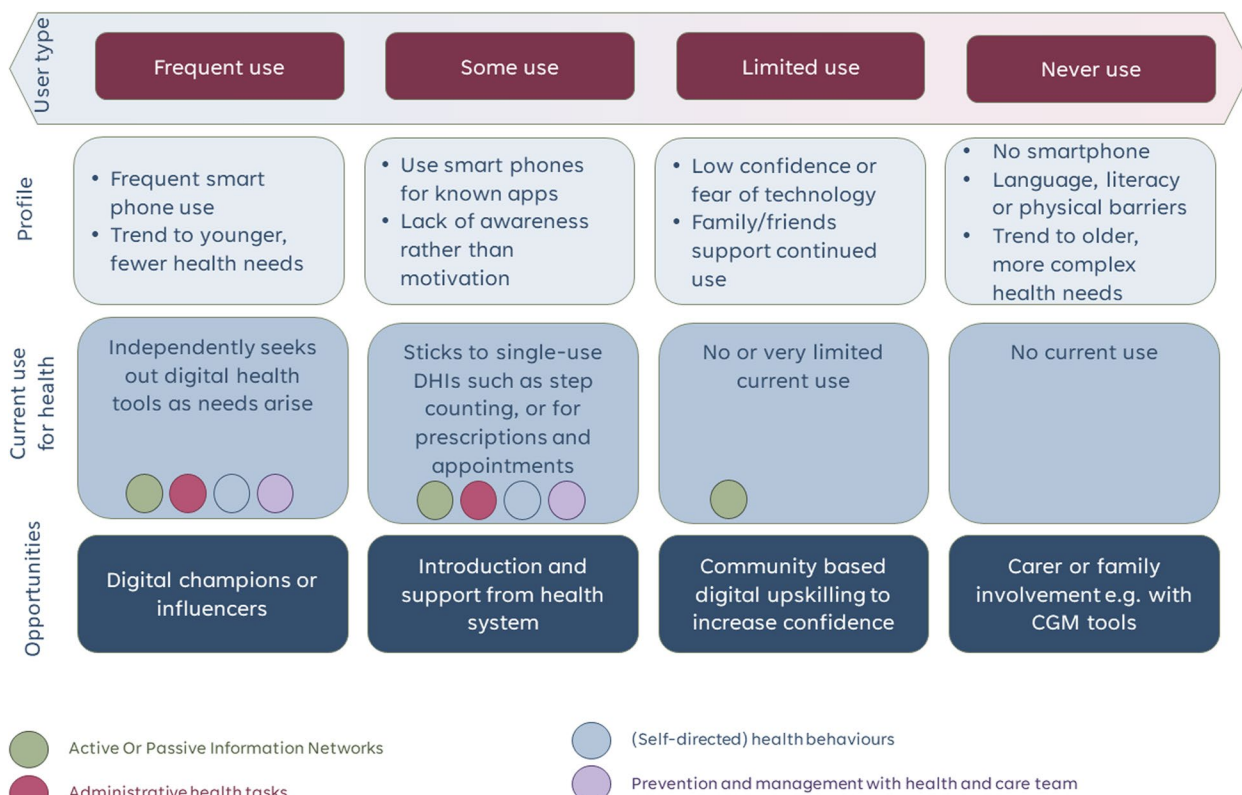


Fig. 3 Understanding user types and opportunities for engagement with digital

towards understanding how services in the UK can take into account the needs of a significant population.

While this study focussed on South Asians, as the largest minority ethnic group in the UK [15], further research should consider the needs of specific populations, given disparities in T2DM prevalence within the group [Indian (16.51%), Pakistani (24.38%) and Bangladeshi (31.65%); compared to White (5.51%) [39]. Additionally, attention should be given to other groups who may experience barriers to digital uptake and use, to understand their specific needs. However, many recommendations around improving the implementation process as well as design are likely to have benefit in other health conditions and across the population.

Conclusion

This study describes the complex and interdependent barriers to DHI use for cardiometabolic disease in South Asian individuals in the UK. Patients demonstrated an interest in the potential for DHIs to support self-management of health, while expressing concern about its broader impact on accessibility and quality of care in health services, particularly for those who may already face language or cultural barriers to engagement. Participant recommendations at the individual, healthcare provider, policy and intervention-level, such as providing training, utilising local expertise, and designing for all, are potentially applicable across user groups and can benefit all.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s44247-024-00083-y>.

Supplementary Materials 1.

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Authors' contributions

The study concept was designed by AB, MR and LP. Interviews were carried out by MR and NK. Analysis was conducted by MR and DS, with support from NK and DRP. MR wrote the original draft with review and edits by AB, DS, NK and DRP. The figures were designed by MR. Additional review was carried out by all LP, KP, SM, MS, PG and FS for the Digital Interventions for South Asians with Cardiometabolic Disease Study consortium.

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Availability of data and materials

The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

Declarations

Ethics approval and consent to participate

The study was performed in line with the principles of the Declaration of Helsinki. Studies received ethical approval from UCL REC (20413/001) and NHS London—Brent Research Ethics Committee (IRAS 261047). Informed consent was obtained from all the participants.

Consent for publication

Not applicable.

Competing interests

AB is supported by research funding from NIHR, European Union, British Medical Association, AstraZeneca and UK Research and Innovation. We declare no other competing interests.

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