Diabetes & Metabolic Syndrome: Clinical Research & Reviews 17 (2023) 102741

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Barriers and facilitators in dietary and physical activity management of type 2 diabetes: Perspective of healthcare providers and patients

Divya Tripathi [a], Naval K. Vikram [a], Swapna Chaturvedi [b], Neena Bhatia [c,*]

[a] Department of Medicine, All India Institute of Medical Sciences, New Delhi, India
[b] Department of Dietetics, All India Institute of Medical Sciences, New Delhi, India
[c] Dept of Food and Nutrition, Lady Irwin College, University of Delhi and Senior Specialist, NITI Aayog, Government of India, India

ARTICLE INFO

Article history:
Received 12 October 2021
Received in revised form
24 February 2023
Accepted 26 February 2023

Keywords:
Barriers
Facilitators
Type 2 diabetes
Qualitative study
Healthcare providers
India

ABSTRACT

Background and aims: Type 2 diabetes (T2DM) is a chronic disease that requires continuous management and daily self-care activities. The purpose of the study was to identify the barriers and facilitators in dietary and physical activity management of T2DM by patients.
Method: Two focus group discussions with patients with T2DM (n = 12) and interviews with healthcare providers (HCPs, n = 15) were done, to identify the barriers and facilitators experienced by patients towards lifestyle management in T2DM. Data were analyzed using qualitative data analysis software Atlas ti. version 8.
Result: Three major themes were identified as barriers and facilitators viz., Personal barriers and facilitators, social barriers and facilitators, and barriers and facilitators related to the healthcare provider. Major barriers were denial of illness, low level of knowledge of the disease, excess use of gadgets, poor infrastructure, gender issues, and lack of time. Major facilitators identified were patient education and motivation, continuous counseling and regular follow-up, family and peer support, and recreational and indoor activities.
Conclusion: Based on the findings of the study, a multifaceted approach is required to address these barriers and facilitators. These findings will help in developing novel intervention strategies and making policy-level changes, which are required to improve diabetes self-management practices in people with T2DM.

1. Introduction

Type 2 diabetes (T2DM) is a chronic disorder of multiple etiologies and is associated with many long-term complications which involve many organs like eyes, kidneys, nerves, heart, and blood vessels [1]. T2DM is a disease that requires continuous management and daily self-care activities [2]. Simple lifestyle measures are effective in the management of T2DM and in delaying the onset of diabetes-related co-morbidities. Much of the diabetes burden can be prevented or delayed by behavioral changes favoring a healthy diet and regular physical activity [3]. It is reported in multiple previous studies that it is managed poorly by patients and adherence to the recommendation given by healthcare providers (HCPs) is low in India as well as in other countries [4–6]. The factors which potentially inhibit effective management include lack of knowledge about diabetes, time constraint, lack of diabetes education, social stigma, etc. Patients' ability for optimum self-care depends largely on their knowledge, social support, attitude, and self-efficacy [7–9]. In addition to several other factors like available resources, social support and patient-HCPs relations also affect their self-care practices [9–11]. Strategies and activities to promote adherence should be patient-centric, collaborative, and multi-disciplinary to bring positive behavioral changes. It is essential to understand the barriers and facilitators associated with adherence to diet and physical activity to prioritize the area which requires more attention for the clinical care of the patient and developing future interventions [12,13]. The following study was conducted because of the aforementioned factors, to understand the barriers and facilitators faced by patients residing in Delhi NCR, India, from the perspective of the patient themselves and their HCP.

* Corresponding author.
E-mail addresses: divyatripathi2911@gmail.com (D. Tripathi), navalvikram@gmail.com (N.K. Vikram), swapnaaiims@gmail.com (S. Chaturvedi), neena.bhatia@lic.du.ac.in (N. Bhatia).

https://doi.org/10.1016/j.dsx.2023.102741

2. Methods

2.1. Study design

An exploratory descriptive qualitative study was carried out to investigate barriers and facilitators experienced by patients with T2DM in lifestyle management. The detailed methodology is depicted in Fig. 1. This study followed the COnsolidated criteria for REporting Qualitative research (COREQ) guidelines [14].

2.2. Ethical consideration

Ethical clearance was obtained from the Institutional Ethics Committee of Lady Irwin College, University of Delhi. Written informed consent was obtained from patients as well as HCPs before they participated in the study.

2.3. Study participant and sampling

In this study in-depth face-to-face interviews with HCPs (n = 15) and two focus group discussions (FGD) with T2DM patients (n = 12) were done. The interviews and FGDs were guided by a topic guide, consisting of 9 and 6 probes respectively (Appendix 1). The topic guide of this study was mainly focused on four broad areas: a) barriers and facilitators in the management of diet in type 2 diabetes, b) barriers and facilitators in the management of physical activity in type 2 diabetes, c) Role of patient-healthcare provider communication in the management of T2DM and d) role of family members and peers in management of T2DM. Additionally, socio-demographic data was asked in the introductory questions. A topic guide was pilot tested on 5 healthcare providers and 5 diabetes patients. Minor revisions and corrections were incorporated into the topic guides after pilot testing.

A convenience sample of HCPs was taken and experts in three areas-5 clinicians, 5 Diabetes educators, and 5 Dieticians were recruited. In-depth face-to-face interviews with 15 HCPs were conducted at their respective hospitals and clinics across Delhi NCR. A total of 27 HCPs were contacted initially by 5 big hospitals of Delhi NCR (AIIMS, New Delhi, Lady Harding Medical College, New Delhi, Sir Ganga Ram Hospital, New Delhi, Apollo Hospital, Delhi, and Medanta Hospital, Gurgaon) and 2 large Private diabetes Clinics (with a daily footfall of more than 50 diabetes patients). Twelve HCPs refused to participate in the study due to lack of time or lack of interest. Finally, 15 healthcare given their consent to participate in the study. Interviews with 15 HCPs were conducted in their respective government/private hospital and clinics.

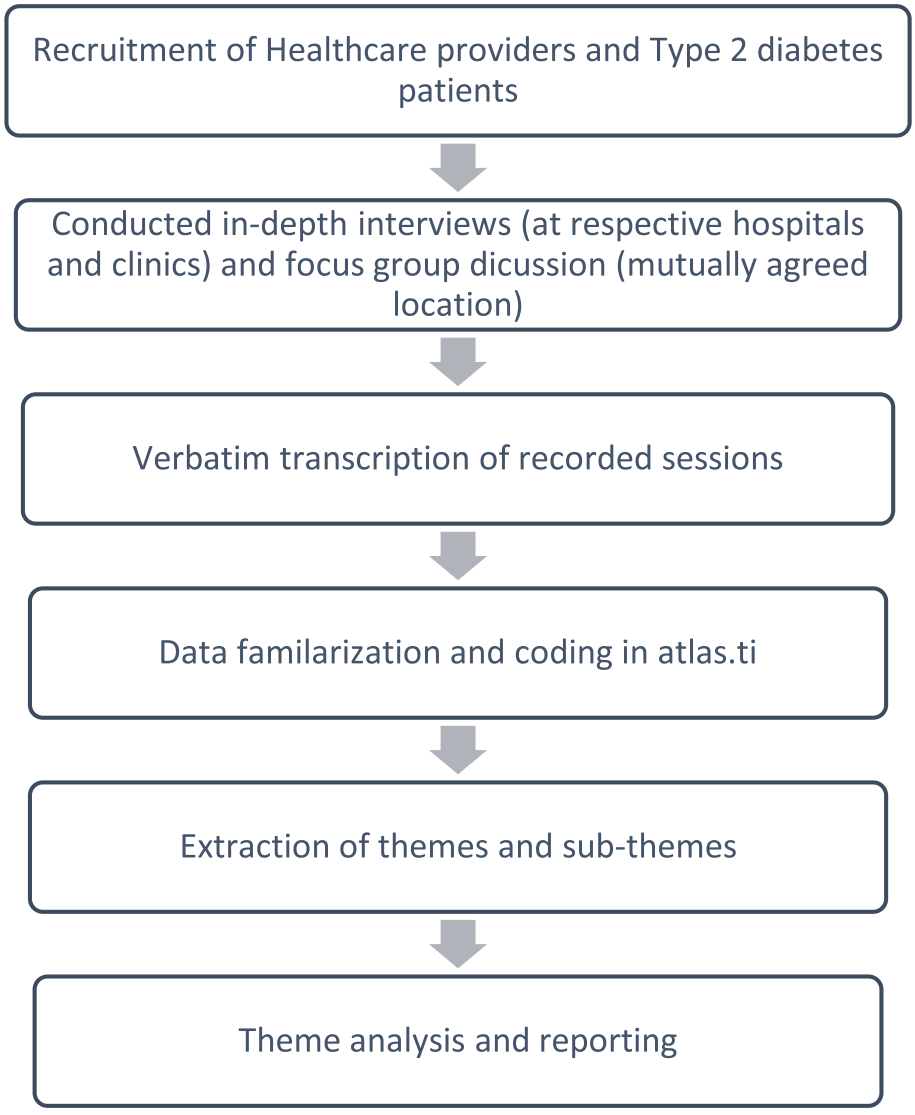

Fig. 1. Data analysis Chart.

Similarly, Convenience and snowball sampling following the principle of maximum diversity was adopted. Snowball sampling provides for limited diversity in the study population but it was tried to maintain diversity as much as possible. A total of 32 T2DM patients were contacted initially through hospital and clinic records for participation in the study. Twenty patients refused to participate in the study due to lack of time, lack of interest, and due to distance from the venue of the Focus group Discussion. Finally, 12 T2DM subjects were recruited. Two FDGs were done with 12 T2DM subjects having diabetes for more than 5 years. Sessions were conducted at a mutually agreed location.

Data saturation was discussed among the research team when repetitive data started emerging.

Data collection and analysis: Semi-structured audio-recorded interviews were conducted between January 2018–April 2018 with professionals at their workplace. DT (Ph.D. student) conducted the interviews. DT and NB (Ph.D. Professor) moderated FGDs. Both Researchers were trained and experienced in conducting interviews, FGD, and qualitative research. There was no relationship established between the interviewers and patients before the study. The interviewers introduced themselves as researchers and elaborated on the study's aim before the interviews. Before and during the interviews, the confidentiality of data was emphasized to minimize the possibility of receiving socially desirable answers. The interviews and FGDs were recorded and verbatim transcription of all sessions was done. Two data coders (DT, Ph. D student, and NB) were involved in data coding and theme identification. Disagreements between coders were discussed in the expert group until a consensus was reached. The coding process was in addition peer-reviewed by two more researchers (NKV and SC) to enhance the quality of data analysis. The analysis of data was performed using Atlas. ti 8.4.2 (Berlin, Germany) using inductive thematic analysis. Preliminary codes and quotations were obtained automatically using Atlas. ti 8.4.2 (Berlin, Germany) from the excerpts of the transcript. In addition, field notes were analyzed and manual coding was done for a deeper understanding and creation of themes and sub-themes from the data.

3. Results

3.1. Demographic characteristics of HCP and patients with T2DM

HCPs from both private and government hospitals were interviewed. Two doctors and 3 dietitians were interviewed from a government hospital and 3 doctors, 2 dietitians, and 5 diabetes educators from private hospitals and clinics were interviewed. All the HCPs were post-graduates and have more than 10 years of experience in their respective fields. Twelve people with T2DM participated in two FGDs (with n = 7 in FGD 1 and n = 5 in FGD 2). In the FGD, 5 patients were female and 7 were male. Demographic information on HCP and patients with T2DM is given in Table 1 and Table 2.

Three major themes on barriers and facilitators were experienced in diabetes management by patients and HCPs as shown in Fig. 2.

3.2. Barriers and facilitators in the management of type 2 diabetes

Major barriers were reported by HCP and patients with T2DM and are categorized into three types: Personal barriers, Social and environmental barriers, and Healthcare Provider related barriers. Some barriers were observed specifically by HCPs or patients, but many were common to both patients and HCPs (Table 3 and Table 4). Corresponding to barriers, the facilitators can also be divided into three categories: Personal facilitators, Social and environmental facilitators, and HCPs-related facilitators.

Table 1
Demographic characteristics of HCP.

Characteristics	Participants n (%)
Gender	
Female	9 (60)
Male	6 [40]
Age(years) (Mean ± SD)	52 ± 6.5
Educational Qualification	
Post-graduation	11(73.3)
Ph.D.	4 (26.7)
Mean year of practice in years (Mean ± SD)	16 ± 16.3

Table 2
Demographic characteristics of participants of FGD.

Characteristics	Participants [n = 12] n (%)
Gender	
Female	5 (41.7)
Male	7 (58.3)
Mean Age ±SD (Years)	55.7 ± 9.5
Female	56.8 ± 7.2
Male	54 ± 10.6
Educational qualification	
Graduate	8 (66.7)
Post graduate	4 (33.3)
Occupation	
Homemaker	1 (8.3)
Business:	5 (41.7)
Teacher	1 (8.3)
Private job	3 [25]
Business	2 (16.7)
Duration of Illness in years (Mean ± SD)	10.1 ± 8.5 (5–20 years)

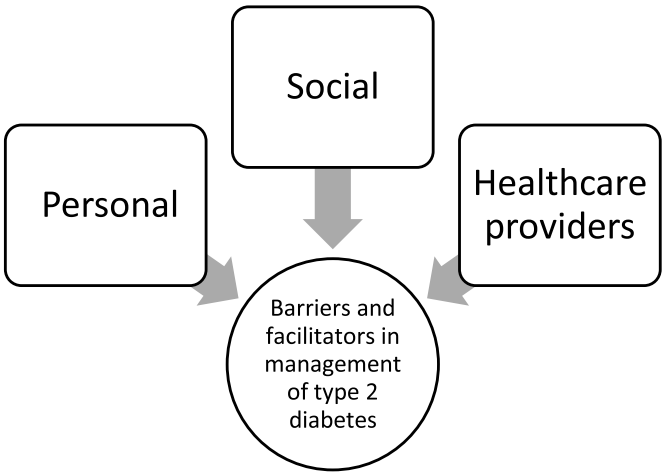

Fig. 2. Major themes of barriers and facilitators identified by patients and healthcare providers.

3.2.1. Personal barriers

Factors that emerged due to a patient's ability to take care of his/her disease included.

i) **Lack of Knowledge in patients about the disease and its management**: HCPs in the present study suggested that knowledge of T2DM, in general, is poor in patients. Patients usually do not understand dietary management.

"Diet looks easy but it is very complex because of the various kinds of foods available to us, therefore it is very difficult for a layman to understand the complexity of diet and that is one reason why they are not able to follow it very rigidly" (HCP 10)

Table 3
Barriers reported by Patients and Healthcare providers.

Patients	HCPs	Barriers reported by both Patients and HCPs
Disinhibition	Denial of disease	Lack of Knowledge
Physical restriction	Gender Issues	Lack of time
Social stigma	Gadgets and Media	Lack of infrastructure
		Weather and Pollution
		Policing and Nagging
		Lack of trust between patient and doctor
		Patient dissatisfaction over consultation

Table 4
Major themes and subthemes in barriers reported by patients and healthcare providers in adherence to diet and physical activity.

Themes	Sub-themes	Representative quotes
Personal Barriers to diet and exercise	Lack of Knowledge[b]	*"Lot of patients don't know much about diet or physical activity management; they just ask for medicines they are not aware of the complications and why it is important to control the disease*" (HCP 2)
	Lack of time[b]	*"Doctors ask for walking and suggest eating small frequent meals, when will I work if I invest all the time in eating and walking"* (Male, 49 years)
	Denial of disease[h]	*"The most important part is accepting the disease, if they find it difficult to accept their diabetes then it is very difficult for them to begin the new regime"* (HCP 1)
	Disinhibition[p]	*"I try to avoid foods having excess sugar but in winters I cannot resist jaggery, in summer I cannot resist cold-drink and ice creams. When I go out with my family, I eat ice cream"* (Female, 58 years)
	Physical restriction[p]	*"I feel so tired after exercise that I cannot exercise for more than 10 min, my legs pain so much I find it difficult to sleep. They (healthcare providers) asked me to exercise for 60 min, how to do it"* (Female, 56 years)
Social Barriers	Social stigma[p]	"*I cannot tell anyone in my office, I am just 42 and I am diabetic, I cannot stop eating everything I like, they (healthcare providers) restrict everything*" (Male, 42 years)
	Lack of infrastructure[b]	*"There are no parks in my area and fast-moving cars start passing early in the morning in my area, I am afraid of accidents"* (Male, 64 years)
	Gender Issues[h]	*"These days more and more females are working, so if a male has diabetes, he has his wife to take care but if the female, who is taking care of the house, is also working professionally then she doesn't get time to take care of herself"* (HCP 10)
	Weather and Pollution[b]	*"The kind of weather we have, extremely Hot and Cold, people stop their physical activity, that time their blood glucose goes up" (HCP1)*
	Gadgets and Media[h]	*"There are so many distractions these days, TV, computer and mobile phones. They sit with these gadgets for the whole day. Patients should be encouraged to do outdoor activities."* (HCP 3)
	Policing and Nagging[b]	*"I become very angry with my son, even if I pick a biscuit, he has to say something. What should I eat?"* (Male, 64 years)
Healthcare Provider-related Barriers	Lack of trust between patient and doctor[b]	*"Every time I go to a hospital, doctors suggest multiple tests, why do they need to do so many tests? I don't have so much money."* (Male, 57 years)
	Patient dissatisfaction over consultation[b]	*"I sit there for hours waiting for my turn and they just write a few lines in my card and send me out. I don't get a satisfactory answer, but what to do?"* (Female, 46 years)

[p] = represents barriers specifically reported by patients.
[h] = represents barriers specifically reported by HCPs.
[b] = represents barriers reported by both HCPs and Patients.

A lack of understanding about the seriousness of T2DM and its complications can lead to reduced emphasis on management and subsequently reduced incentive to involve in essential self-care behavior.

ii) **Lack of time for disease management**: Most HCPs indicated that people lack the time required to manage their diabetes effectively, especially those who were working. Time as a barrier to effective management may be more pronounced in a metropolitan city, as work and daily life require a big-time commitment. Many health professionals proposed that managing a chronic health condition is often secondary in priority in this context:

"*Following the diet is difficult because people are out of their homes in those effective hours in which they can do something for themselves, they go out at 8 am and come back around 8 or 9 pm due to work or traffic, etc.*" (HCP 8)

iii) **Denial of the disease**: Denial of the fact that they are diagnosed to be having diabetes was reported by both subjects and HCPs. This denial was commonly attributed by HCP to the non-symptomatic nature of diabetes (that effects are not instantly evident).

"I eat sweets for 1 month continuously and I got detected by Diabetes, I will stop eating sweets everything will be under control" (Male, 52 years)

Several negative perceptions towards the 'new' or recommended diet and physical activity regimen were revealed by HCPs and in FGDs. The new regimen which was given to the patients was disliked by many. Patients with T2DM voiced frustration with dietary restrictions imposed by diabetes.

"Initially I used to follow every recommendation, but it's been more than 10 years should I stop eating everything? Whenever I go there (clinic) they stop one thing or the other. Give me the medicines and I will eat everything" (female, 58 years)

iv) **Dietary disinhibition:** It was reflected as one of the major themes. They described their propensity to overeat in response to diverse stimuli, which occurs in multiple circumstances such as when they are presented with a range of palatable foods when they are under emotional distress. They continuously discussed how they enjoyed the food and felt that they had little or no self-control when it came to dietary choices. One participant stated,

"I am very fond of sweets after dinner, I can do all other things but cannot leave to take sweet after dinner" (Male, 52 years)

v) **Physical Restrictions**: Some patients with T2DM had a plethora of comorbidities that restricted them from pursuing physical activity, starting from joint problems to tiredness, and lack of stamina.

"I have gout and my weight is very high, it's difficult for me to walk even 50 steps. I somehow manage to do my routine."

II. **Social and environmental barriers:** The following factors emerged as social and environmental barriers:

i) **Social Stigma**: Many HCPs reported that there is enormous *social and cultural pressure* from within the community that makes it harder to manage diabetes. Patients choose to compromise their diet and treatment regimen to comply with their community's social etiquette and avoid the social stigma surrounding their condition. One of the HCP stated:

"In India, every festival is celebrated by everyone be it Holi, Diwali, Christmas or Eid and there are so many festivals round the year, people many a time eat under social pressure" (HCP 11)

ii) **Lack of infrastructure**: Many HCPs brought up the issue of *lack of infrastructure* as an impediment to exercise. There were only a few parks or other recreational spots where citizens can walk, jog, or exercise in a safe, healthy, and pollution-free environment.

The main roads were a threat to their safety by themselves because of vehicular traffic. In addition, the poor walkability on Indian roads due to a lack of dedicated pavements for pedestrians and potholes on the roads where pedestrians are forced to walk are barriers. One of the HCP's stated:

"Increasing urbanization led to the decrease in available open spaces where people can engage in physical activity. It is difficult to walk on the road due to traffic and dedicated pavements; secluded places for physical activity are mostly not available." (HCP 2)

iii) **Weather and Pollution**: It is a very important factor for non-adherence to physical activity in patients in India. Weather condition is extreme many times around the year. In extreme weather conditions, patients prefer to stay indoors. In addition to weather, *pollution* is also a factor that causes patients to stay indoors most of the time.

"People say there is so much pollution these days that we develop several other problems related to pollution, in such cases, it is difficult to convince patients for outdoor activities" (HCP 15)

iv) **Gender issues**: Another factor that emerged from interviews with HCPs is *gender.* The role of female members is often associated with caring for other family members as is presented in these quotes and represents a challenge for patients to take care of themselves. They discussed the kind of bias that is prevalent in our society against women. Women face problems in both conditions, when they are working outside the home and when they are not working outside the home. When a woman is not working outside, she has the burden of taking care of the whole family, and it is difficult for her to take out time for her care. This is suggested in a statement given by one HCP which states.

"A woman in their in-law's house is unable to manage her diet due to their family food choices, then you have to tell her accordingly" (HCP12)

Apart from these daily issues, women are also burdened with cultural and social responsibilities.

"Women have many issues one of which is fasting. For the women we need to give different types of diet which they can take even during fasting" (HCP 6)

v) **Gadgets and Media**: The use of gadgets like, mobile phones, TV, and laptops cause distraction. People are so busy using these gadgets that they do not get time for any kind of physical activity.

"I come back from the office and lie down; I watch my social media profile etc. without noticing when it's time for dinner. Then I skip my evening walk" (Male, 42 years)

vi) **Policing and Nagging**: Sometimes when the vigilance is more, that causes difficulty in the patient's regular management. HCPs recommend that a check is required on the patient, but that should not convert into nagging or policing. This kind of attitude causes a negative impact on patients' health.

"Policing will bring a negative impact that will cause stress to the patient. Family and friends should be aware about the modifications and management. They should not straightaway eliminate anything from the routine or from the food" (HCP 11)

3.2.2. Healthcare provider related barriers

Many barriers associated with patient-HCP relationship were reported as follows.

i) **Lack of trust between patient and doctor**: Patients don't trust doctors and think that doctors are suggesting several tests for making money. These things cause unsatisfactory doctor-patient relationship. This barrier was reported by both patient and HCP. As reported by one healthcare provider:

"A lot of people avoid checkups because they feel it is a wastage of money. People do not want to go for comorbidity checkups because they feel that doctor is making money. Patients must be made aware of the severity of Diabetes" (HCP 2)

ii) **Patient dissatisfaction over consultation duration**: Doctors sometimes do not give required time sought by the patient. It was mentioned multiple times by many HCPs that until and unless patient is convinced, he/she will not follow the treatment. Patients were dissatisfied with the kind of attention given to them in the hospital. As described by a patient:

"No information was given to me about lifestyle changes. Doctors and dietitians were not interested in telling me about the disease and 95% of my questions were not answered" (Patient, 56 years, male)

Some HCPs reported that some patients don't take dietitian and diabetes educator's advice seriously. As described by one healthcare provider:

"Medicine is easy because it is something doctor has prescribed and many times, they don't take the Counselor or Diabetes educator or dietician's advice very seriously". (HCP 11)

Some patients reported that some of the members of their healthcare team were missing. Thus, relation between patient and HCP is very important and creates barriers in self-management of T2DM.

3.3. Facilitators in management of type 2 diabetes

I. **Personal facilitators:** These facilitators are associated with patient knowledge and willful engagement in self-care activities. Personal facilitators are categorized as follows:

i. **Patient education and motivation:** Both health professionals and patients in the present study emphasized the *importance of motivation and positive attitude* in the management of diabetes. This can be achieved by educating *the patients* about the relationship between *proper management and reduction in risk of complications.* It helps in increasing the motivation of patient to self-manage their diabetes.

HCPs suggested that one of the strategies which work for the patient in dietary management is *self-monitoring of blood glucose.* When the patient monitors their blood glucose after bringing some changes in their lifestyle, they gradually learn what works for them and what creates instability in their blood glucose levels. Getting tangible results in the form of stable blood glucose reading is a big motivation for them to follow the suggested lifestyle regime.

"If they know what to do with 200 sugar whether it is insulin adjustment, diet adjustment they know the do's and don'ts and why's and how's that is what is motivating and what empowers them to control their sugar on their own". (HCP 7)

ii. **Recreational Physical Activity and promotion of indoor activities**: For *increasing the physical activity levels* of patients, HCPs suggested that the activity should be interesting to indulge the patient on regular basis, for this those activities should be promoted, which along with physical exercise are recreational in nature. This can increase the daily physical activity, and also help in maintaining the routine.

"Exercise is an individualized program that cannot be forced upon therefore the exercise should be such that the person is able to enjoy and get benefit from it" (HCP 2)

New devices are developed which make patients keep track of their physical activity on regular basis and also encourage them to maintain the activity.

"I suggest them to count their steps. There are many apps available for doing the same. I ask them to do 10000 steps for a day. It could either be in the morning, at their workplaces or climbing stairs etc." (HCP 8)

Development of indoor physical activities are answer to many problems like weather, pollution, poor infrastructure. Indoor activities are independent of time and weather and it can be developed as per the convenience and availability of resources.

One important facilitator which was emphasized by most of the HCPs was increasing the amount of physical activity in daily routine or incorporating without trying to change their routine much.

"Giving them options like at work not to take the lift, rather taking stairs, for shopping avoid taking vehicle if it is nearby or at a walking distance, and give them the best time for physical activity which suits their routine" (HCP 11)

II. Social and Environmental facilitator

These facilitators include the role of family members and peers in disease management

Support **of family members and peers**: Patients reported that their *family members* play a very important role in Diabetes management, they cook food for them, help them in adhering to the regime given by HCPs

"At my home special food is prepared for me because no one else is diabetic. So, normal food is prepared for others and special food for me. Friends help me in getting lot of information" (Male, 59 years)

When *any other member of the family is also diabetic* then it helps in management of the disease. HCPs stated that the role of family is very important when it comes to lifestyle management of a patient, family members help in keeping a vigilant eye on the patient and encourage them in following a healthy lifestyle. Diabetes management requires the effort of the whole family.

"If we simply ask a patient to come alone to counsel them, they may or may not follow, but when we counsel their family members as well, adherence will be more as the message penetrate deeper." (HCP 1)

Patients know that the *responsibility of their health is their own* and family members can only help in implementation. They believe that self-consciousness is very important factor.

Family does the work of handholding and support, thus help in curtailing stress occurred in daily life due to work or due to Diabetes.

"I try to avoid stress and my family helps me in relieving stress" (Female, 59 years)

"If family is more involved in what or patient is more interacting than problems like coping with depression and frustration is very easy" (HCP 2)

There are many cultural pressure festivals, get togethers, parties, family members help in keeping check on the patient and also reminds him/her for eating in moderation.

Patients find it difficult to go for any activity alone. HCPs suggests that *group activities should be promoted and* support *groups* should be made. Success stories of other patients should be shared. These things work and keeps the patient motivated.

"One thing is company, if somebody is accompanying, it's easy to go for exercise" (Male, 61 years)

Support group and success stories helps to motivate the patient to follow the lifestyle regime provided to them.

III. **Healthcare provider related facilitators:** The following was reported from patients on facilitators related to health care providers:

Continuous counseling of patients and tailored care: Patients specified that if they get *adequate information from credible sources*, they will follow the regime. Patients also stated that they can follow better if they get regular counseling and proper diabetes education.

"But periodically we need counselling. It should happen that we get periodic counselling" (Female,59 years)

Patients also suggested that there should be *more Health Camps,* in which experts explain them about the disease. Patients have some knowledge about dietary modification and physical activity which they try to incorporate in their daily life:

HCPs also considers *diabetes education and continuous reinforcement of the information* as a major facilitator in dietary management. They believe that one-time education is not sufficient to bring the changes and continuous reinforcement of diabetes education in different forms is necessary. For continuous counseling it is *important for both patient and HCPs to give time to each other.* It is essential that patient must trust his/her healthcare team and make their health their priority. When they do so, the follow up will increase.

"Some people do not consider their health as their priority. the patient has to make their health their priority and we need to help them to make it their priority by our counselling skills or it will not work". (HCP12)

It is important to *give individual specific counseling and to provide choices to the patient* and let them choose from what they like.

> "*It is essential to empower the patient by giving them all the information. Once the patient is convinced, he/she will start following the regime and that can be incorporated in their lifestyle gradually with continuous reinforcement*." (HCP 7)

One patient discussed the importance of counseling and how he incorporated the changes in daily life.

> *"Food which is cooked at home contains a lot of vegetables and I eat chapati instead of parathas"* (Male, 54 years)

4. Discussion

The findings that emerged from the present study included a *lack of knowledge about the management of T2DM* which is reported as the biggest barrier. Patients perceive that they do not understand the information and care plan provided by the healthcare provider, in a study conducted by Adhikari et al., 2021 in Nepal and Chethan et al., 2016 similar observations were reported. Lack of knowledge is reported by several other studies conducted in India and South Asia and some review studies also [15–20]. The lack of knowledge may be caused by the unavailability of a specialized *team of HCPs* as reported by some patients in the present study. In other words, fragmented healthcare services also affect self-care along with poor access to HCP and a lack of specialized health professionals like endocrinologists or dieticians, which was pointed out earlier also [21,22]. Additionally, in the present study, similar observations were made as reported in a study by Janes et al., 2013, by interviewing 15 patients HCP imposes unrealistic treatment goals on patients which results in further confusion and poor adherence to the recommendations [16]. The management plan should be structured and progressive [23]. In some studies, it was reported that there was a *lack of empathy and understanding* of patients' problems, which was attributed to the short time allowed for the consultation which is reported in the current study and many other studies [19–21,24,25]. Although India has achieved the WHO-recommended Doctor-patient ratio recently [26], still doctors' patient relation needs improvement. In this study gender difference was also observed as a barrier in the management of T2DM, HCPs reported that women are unable to follow all the recommendations due to their caregiver role in their families. This issue has been elaborated on in a review by Suresh and Thankappan, 2019 [27].

Patients face a range of problems while adhering to their dietary regime. Patients admitted *dietary disinhibition* and that they regularly eat foods that potentially increase their blood glucose, like sweets, because they like those foods. Disinhibition is recognized as an important barrier worldwide [10,12,25,28–31]. Kavya et al., 2019 reported that the type of food prescribed to the patients is highly restrictive and it is difficult for them to implement the given dietary regime in their daily lives, same barrier is reported in this study as well as in many other studies [12,25,28,32]. In such situations *support of society, family and friends play a very important part in diabetes self-care*. If the patient is not able to get the support it becomes difficult to manage their disease, and this lack of support mainly affects eating habits [12,33,34]. There is also a *social stigma associated with diabetes*, as indicated by some studies, which may be associated with patient concealing their disease to avoid embarrassment, such issues may also be tackled with the help of social support and acceptance [22,33].

For exercise *lack of time* was a common barrier with difficulty in finding time for exercising due to work or home responsibilities, more than lack of time, emotional barriers such as lack of motivation, laziness, and fear of exercise or inability to do any physical activity have been reported in present as well as earlier studies as barriers in physical activity [33,35,36]. If a patient has the time or overcomes emotional barriers then *lack of infrastructure* was reported as a barrier in this study which is a common barrier in Indian studies [37,38]. Chandra and Nonkyngrih, 2020, reported in a study that the availability of proper parks and similar facilities close to one's home helps in increasing physical activity [39]. Factors independent of an individual's decision-making, like weather or cultural barriers, were also reported by some other studies as a barrier [40,41]. For physical activity, there is a need for constant encouragement and monitoring. The main motivator is the sense of physical as well as mental well-being [40,42,43]. HCPs and patients suggested diversity in physical activity or recreational physical activity which are not monotonous along with accompaniment helps in engagement in regular physical activity, as also reported in some earlier studies [33,43]. Group activity is also a facilitator as that gives constant encouragement [42,43]. For some patients support of family and friends acts as a major motivating factor [29,30,43,44]. Adhikari et al., 2021, in a recent study reported that family members and peers help the study participants in following healthy lifestyle practices [18].

The key to effective self-management lies in the hands of the patient. Patient's motivation and willingness to assume charge for their care is the biggest facilitator as reported. Dietary barriers could be overcome by patients by attaining proper information and self-discipline. Healthcare provider plays a major role in gaining information. Repeated exposure to this new information in more manageable amounts may be required to build knowledge and confidence in this area as mentioned in a few other studies also [33,45]. Provision of information in stages, alongside access to resources that can be used by patients in their own time and at their own pace outside of the formal education sessions, may be helpful [12]. The HCPs and patients equally emphasized that educating family members about disease management helps a lot [24].

In a study, it was suggested that HCPs should facilitate support networks through empowerment interventions to optimize self-care practices [46]. Access to care and HCP support was identified as an important element related to Diabetes Self-Management [9,47]. The present study and several other studies recommend that Group diabetes education and support groups were also recommended [46,47]. Continuous counseling and education focusing on disease management, which is easy to access are desirable. Counseling and diabetes education as facilitators were also reported in some other studies [9,48]. The findings of this study will help HCPs to understand what are the barriers faced by the patients and will help in designing appropriate interventions for better management of type 2 diabetes.

Conclusion: Several barriers and facilitators were reported by both patients and HCPs. The main finding which emerged was that there is a need for the proper education of newly diagnosed T2DM patients and continuous reinforcement of diabetes education in old patients. Structured diabetes education modules are required to provide continuous counseling to patients. Continuous counseling and individualized care are observed to be very important in motivating patients to adhere to the recommended dietary regime.

Strength of the study: The study was conducted in both government and private settings and thus obtained observations of diverse settings. A representative sample of all HCPs was taken. Both HCPs and patients were included to provide a view of both sides and combined results are presented.

Limitations of the study: The focus group discussion is limited to diabetes patients having an education level of graduation and above thus it is not representing all populations. Another limitation is the diversity of the sample due to snowball sampling and convenience sampling. Only two Focus group discussions were

conducted because after interviews with 15 HCPs and two FGD data repetitions started although only two FGDs may become a limitation in the extrapolation of the result.

Financial support and sponsorship

None

Declaration of competing interest

The authors declare that there is no conflict of interest.

Appendix 1. COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349–357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix 2a. Topic Guides for interviews with healthcare providers:

Topic	Item No.	Guide Questions/Description	Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	4–5
Credentials	2	What were the researcher's credentials? E.g., PhD, MD	4–5
Occupation	3	What was their occupation at the time of the study?	4–5
Gender	4	Was the researcher male or female?	N/A
Experience and training	5	What experience or training did the researcher have?	4–5
Relationship with Participants			
Relationship established	6	Was a relationship established prior to study commencement?	4–5
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g., personal goals, reasons for doing the research	4–5
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g., Bias, assumptions, reasons and interests in the research topic	4
Domain 2: Study designrowhead			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	4–5
Participant selection			
Sampling	10	How were participants selected? e.g., purposive, convenience, consecutive, snowball	4–5
Method of approach	11	How were participants approached? e.g., face-to-face, telephone, mail, email	4–5
Sample size	12	How many participants were in the study?	4–5
Non-participation	13	How many people refused to participate or dropped out? Reasons?	4–5
Setting			
Setting of data collection	14	Where was the data collected? e.g., home, clinic, workplace	4–5
Presence of non-Participants	15	Was anyone else present besides the participants and researchers?	4–5
Description of sample	16	What are the important characteristics of the sample? e.g., demographic data, date etc.	6–7
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot? tested?	4
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	4
Field notes	20	Were field notes made during and/or after the interview or focus group?	4
Duration	21	What was the duration of the inter views or focus group?	4
Data saturation	22	Was data saturation discussed?	4
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: **analysis and findings**rowhead			
Data analysis			
Number of data coders	24	How many data coders coded the data?	5
Description of the coding Tree	25	Did authors provide a description of the coding tree?	7
Derivation of themes	26	Were themes identified in advance or derived from the data?	5
Software	27	What software, if applicable, was used to manage the data?	5
Participant checking	28	Did participants provide feedback on the findings?	N/A
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g., participant number	8–9
Data and findings consistent	30	Was there consistency between the data presented and the findings?	8–17
Clarity of major themes	31	Were major themes clearly presented in the findings?	8–17
Clarity of minor themes	32	Is there a description of diverse cases or a discussion of minor themes?	8–17

Introduction	Could you introduce yourself? Age, gender, occupation, (work) experience, etc
Dietary barriers and facilitators	1.a. In your view why the patients do not follow the dietary regime provided to them? 1. b How difficult it is to maintain a healthy diet when they are out of their home for some days and why?
Physical activity barrier and facilitators	2.a. Why exercising daily is a problem for patients? 2.b. What could be done for motivating them to do some moderate physical activity at least 5 days a week?
Role of healthcare providers	3.a. What does the role of beliefs and attitudes of healthcare providers play in diabetes management? 3.b. How important is team care for patients? 4. What can be the most helpful motivating factors for patients to adhere to their lifestyle modification plans? 5. Patients often feel depressed and frustrated due to poor control despite all instructions being followed, what do you suggest for those patients? 6. How can they overcome their anxiety? 7. How seriously do the patients take their disease and what is the effect of their attitude on disease management?
Role of family and friends	8. What role do family and friends' support play in the proper management of diabetes? • What role does cultural pressure play in the poor management of diabetes? • How these factors can be tackled?

Appendix 2b. Topic guides for Focus Group Discussion

Introduction	Could you introduce yourself? Age, gender, occupation, (work) experience.
Dietary barriers and facilitators	1. a. What special things do you need to do to take care of your diabetes when it comes to dietary management? 1. b How successful are you in adhering to your dietary regime? 1. c If not, then what are the barriers to adhering to your diet plan? 1.d Is it a lack of information or you don't like the foods in your meal plan or any other reasons? 2. What kind of cultural pressure do you face in sticking to your healthy diet regime? 3.a. How do you manage your diet when you are out of your home for some days or you have to share food with others? 3.b. Do you consider any factors before ordering your food in a restaurant or read food labels before buying packed foods?
Physical activity barriers and facilitators	4. a. Physical activity plays a very important role in maintaining blood glucose, then also some people do not follow it regularly. 4. b What according to you are the problems in adhering to that? 4. c. What can be done for motivating people with diabetes to go for any moderate physical activity at least 5 days a week?
Role of healthcare providers	5.a. How often do you need to see your healthcare provider and why? 5. b. Is there any problem you face when you communicate with your healthcare provider? 5. c. Are you satisfied with the information provided to you about diabetes by your healthcare providers, if not then why?
Role of family and friends	6.a. How big family or friends' support is a barrier or facilitator in your diabetes management? 6. b. What kind of support group do you think you require, like other people having diabetes for sharing your problems or your healthcare team?

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