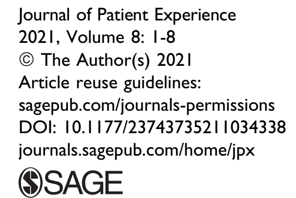
Journal of Patient Experience
2021, Volume 8: 1-8
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/23743735211034338
journals.sagepub.com/home/jpx

Medication Adherence in Type 2 Diabetes Mellitus: A Qualitative Exploration of Barriers and Facilitators From Socioecological Perspectives

Onwuchuluba EE, MPharm[1], Oyetunde OO, PhD[1], and Soremekun RO, PhD[1]

Abstract

Adherence to antidiabetic medications (ADMs) remains a serious challenge among type 2 diabetes mellitus (T2DM) patients. Factors affecting medication adherence are not fully understood in Nigeria. This qualitative study explored patients' views on barriers and facilitators of medication adherence. Data collection was through face-to-face, semistructured, in-depth interviews conducted on 25 purposively sampled patients attending a public tertiary hospital. The interviews were audio recorded, transcribed verbatim, and analyzed using thematic analysis based on socioecological framework. NVIVO version 10 identified more codes. Most commonly identified barriers were organizational (clinic structure), personal (perception of T2DM as a dangerous illness), interpersonal (lack of spousal support), and community (concerns about taking ADMs in social gatherings). It was observed that female patients received more spousal support than the males. The facilitators of adherence include perceiving medication-taking a routine, the need to live longer, having savings for ADMs, purchasing medications to last until the next clinic visit. This study identified barriers and facilitators unique to Nigerian T2DM patients. Interventions anchored on these factors would improve medication adherence.

Keywords

adherence, antidiabetic medications, barriers and facilitators, socioecological framework

Introduction

Diabetes is among the noncommunicable diseases with far-reaching social, health, and economic consequences. It is a major health concern affecting an increasing number of individuals and nations around the globe, with over 425 million of the world population currently having diabetes (1). In Nigeria, the diabetes is on the increase, and type 2 diabetes mellitus (T2DM) is the most prevalent, accounting for about 90% to 95% of the whole diabetes population (2,3). Contributing to T2DM burden are the complications arising from prolonged hyperglycemia due to nonadherence to antidiabetic medications (ADMs) (4).

Adherence to medications has historically and significantly remained the subject of discussion globally. Despite its role in diabetes management, available streams of evidence show that adherence to ADMs is low (5–7). Nonadherence contributes to the worsening of the disease, increased hospital admissions, and high medical cost (8). Based on this evidence, improving adherence among T2DM patients is of utmost importance and may require patients' views, yet studies exploring barriers to adherence from patients' perspective in Nigeria are few. Qualitative studies assist in understanding patients' lived experiences and the meaning they attached to them. They often uncover new facts that could serve as potential targets for interventions. Unfortunately, much of the adherence studies done until this point have been largely quantitative (9,10). Some qualitative studies have identified cultural, religious, health providers factors, system-related factors, perceived safety, and necessity of the medication as factors contributing to nonadherence (11–13). However, there is paucity of research

[1] Department of Clinical Pharmacy & Biopharmacy, Faculty of Pharmacy, University of Lagos, Idi-araba, Lagos, Nigeria

Corresponding Author:
Onwuchuluba EE, Department of Clinical Pharmacy & Biopharmacy, Faculty of Pharmacy, University of Lagos, Idi-araba, Lagos, Nigeria.
Emails: eonwuchuluba@unilag.edu.ng; ebyee_iyke@yahoo.com

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (https://creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Table 1. Interview Guide.

1. What are your experiences with living type 2 diabetes?
2. How are your antidiabetic medications (ADMs) helping in control of your diabetes?
3. How are your diabetes medications affecting you/your life/family?
4. What are the things you do not like about your ADMs?
5. How do you decide whether or not to take your ADMs? or What are the things that make it difficult for you to take your ADMs as prescribed?
6. What situations make it easy for you to take your medications?
7. What organizational/hospital factors do you think affect the way you purchase and use your ADMs.
8. What are the things you think can help/assist people with type 2 diabetes in taking their ADMs as prescribed?

exploring the interplay/interrelationship of the determinants of adherence among type 2 diabetes patients using socioecological models. The use of socioecological models has been advocated in adherence studies (14). They not only assist in identifying multiple underlying causes of nonadherence but also provide the reasons behind the behavior that could serve as potential targets for intervention (15). The model assumes that interventions targeted at contextual factors such as social and environmental barriers will support behavioral changes in an individual. Therefore, given the complexity and dynamic nature of adherence, tackling the problem of nonadherence requires socioecological perspectives. The aim of the study was to explore patients' experience of living with diabetes and taking their prescribed medication.

Methods

Study Design

An exploratory design was employed to gain adequate insight into factors influencing medication adherence.

Sampling and Recruitment of Patients

This study recruited T2DM patients attending the diabetic clinic of a public tertiary hospital in Lagos, Nigeria. It is a referral clinic that runs once a week for follow-up cases with an average of 60 patients per day. Patients' vitals are checked by the nurses before they are lined up to see the clinicians. Medication adherence was assessed using a pretested adherence measuring scale. Both adherent and nonadherent patients aged 18 years and older and using at least 1 ADM were purposively selected and invited for an in-depth interview. The sample selected varied in terms of age, sex, educational levels, ethnic groups, and disease duration in order to get a diverse opinion on factors affecting medication adherence. Theme saturation was achieved with 25 patients.

Data Collection

Face-to-face interviews were used for data collection. A semistructured interview protocol developed from a review of literature guided the interview (Table 1). The guide was reviewed by 2 experts in qualitative research and piloted on 2 patients. The pilot interviews were removed from the final interviews used for analysis. The interviews began with questions on patients' experience with diabetes and included probes to further explore other contextual factors that impact medication adherence. The aim of this study was explained, and patients signed an informed consent form. Patients' demographic information was collected using a data collection form. The interviews were conducted by the researcher, who is a pharmacist in academia, and have undergone some trainings on qualitative methods. The interviews took place at different locations of their choice away from the clinic to allow free discussions. The interviews were conducted from October 2017 to September 2018 and lasted between 35 and 60 minutes.

Data Analysis

The audio-recorded interviews were transcribed verbatim. The transcripts were analyzed using thematic analysis—the framework approach (16). The transcripts were read repeatedly for familiarization and understanding of the content. Two independent researchers coded 2 transcripts independently using in vivo codes. The coders met, discussed, and resolved discrepancies. The coding matrix was developed and applied subsequently to the remaining 23 transcripts. NVIVO version 10 was used for more identification of codes and data storage. The intercoder reliability of the 2 coders was computed. The Cohen's κ ranged from .78 to 1. The average level of consistency of the questions was 0.89. Codes were collated into subthemes and themes, subsequently refined, defined, and charted onto a table following the structure developed a priori to the socioecological framework (15).

Results

Fourteen female (56%) and 11 male (44%) patients participated in the study, with age ranging from 32 to 70 years. The demographic characteristics of the patients are presented in Table 2. The barriers to medication adherence composed of 4 level factors (personal, interpersonal, organizational, and community; Table 3; Figure 1).

Table 2. Overview of Demographic Characteristics of the Study Patients.

Study participants' ID	Number of ADMs	Age	Duration of diabetes	Gender	Employment status	Educational status
IDI_1	2	65	21	Male	Govt. contractor	Postsecondary
IDI_2	3	50	21	Female	Educationist	Postsecondary
IDI_3	1	70	19	Female	Retired	Postsecondary
IDI_4	1	58	2	Female	Teacher	Postsecondary
IDI_5	3	62	12	Female	Trader	Secondary
IDI_6	2	45	12	Female	Hair stylist	Secondary
IDI_7	3	47	20	Male	Self-employed	Postsecondary
IDI_8	2	67	21	Male	Retired	Postsecondary
IDI_9	2	59	7	Female	Teacher	Primary
IDI_10	2	54	11	Male	Business	Postsecondary
IDI_11	2	47	21	Male	business	Postsecondary
IDI_12	1	59	1	Female	Trader	Primary
IDI_13	2	41	11	Female	Teacher	Postsecondary
IDI_14	2	50	15	Female	Business	Postsecondary
IDI_15	2	52	21	Male	Business	Secondary
IDI_16	2	35	5	Female	Business	Postsecondary
IDI_17	2	58	19	Male	Government worker	Secondary
IDI_18	2	35	15	Female	Government worker	Secondary
IDI_19	2	52	2	Male	Lab scientist	Postsecondary
IDI_20	1	41	6	Male	Government worker	Secondary
IDI_21	2	32	9	Male	Oil company	Postsecondary
IDI_22	2	58	5	Male	LGA worker	Primary
IDI_23	2	65	6	Female	Teacher	Secondary
IDI_24	1	49	4	Female	Government worker	Postsecondary
IDI_25	1	48	3	Female	Trader	Secondary

Abbreviation: LGA, local government area.

Personal-Level Barriers

Patients' Perception of Diabetes and ADMs

Patients described their traumatized experiences before and during the diagnosis of diabetes. They perceived type 2 diabetes as a severe and dangerous illness that had no cure. This led to some patients relying on God for intervention, while they had reduced urge for their ADMs: A female patient noted: "Diabetes is a disease that can kill someone if not managed very well. Once diabetes is in your body, it is only God's intervention that can treat it" (IDI_4, female 58 years). For some patients, the perception of diabetes as a dangerous illness and poor awareness of the symptoms made them initiate the prescribed medications immediately. The manner of disclosure of the patients' diabetes status by the health care providers (HCPs) played a role on how patients received the news and their subsequent perception of the illness: "I was sent for blood test to know why I am sick . . . from the test, the Doctor said you're in difficulty o, blah blah! Your sugar is high" (IDI_3, female, 70 years). Hence, breaking the news to them in this manner suggests that they may not likely survive the illness, contributing to the severity of the patient's experience. Most patients seem to be burdened emotionally; they were sad and tired of taking the ADMs: "The fact that the illness is there forever makes me feel very sad, at times I don't feel like taking your medications, I am just tired, and down in spirit" (IDI_10, male 54 years). Some had the fear of hypoglycemia and weight gain, which made them reduce the doses of their ADMs: "The need to control my weight makes me not to eat and not to take medications" (IDI_6, female 45 years). The patients generally expressed divergent opinions regarding the efficacy of their ADMs; some were cognizant of the efficacy of the ADMs, while others doubted whether their ADMs work: "I don't know if my medication is helping, I did test three times last year, they said my sugar is not controlled" (IDI_7, male, 47 years). Lack of finance was a major factor that hindered adherence. Most patients lamented on how lack of money has prevented them from purchasing their ADMs: "There are times the drug will finish and there is no money, I may miss a day or 2 without taking the drugs" (IDI_23, female, 65 years).

Interpersonal Barriers

Lack of Family/HCPs Support

This study revealed that a lack of spousal and HCPs support hindered adherence to ADMs and added a variable "gender difference" in the perception of spousal support. While men perceived spousal support mainly as emotional support, having a wife conscious of their illness and prepares healthy meals. The males complained more of lack of support, and those who lacked assistance in meal preparation lamented how eating unhealthy meals caused a spike in their glucose level. Having delayed meals contributed to delay in

Table 3. Description of the Themes, Subthemes, and Codes Based on the Socioecological Framework.

Themes	Subthemes	Description	Direct patients quotes
Personal	**Awareness of symptoms of T2D**	Patients' description of their low awareness of T2D symptoms, reliance on god for cure	"I initially thought that I had Malaria. So I was sent for blood test. . . . I never knew about diabetes in my life until 2002." IDI_3, female 70 years
	Perceptions of T2D Perceptions and psychological burden of T2D	Patients thoughts regarding the causes, and severity of T2D, and the description of their feelings and stress of living with diabetes	"It is bad, it kills so many people. I think a lot about this my condition, will it ever come to end." IDI_1, male 65 years
	Perceptions of the medications Concerns about the efficacy of the medications, and the side effects of the medications	Statements referring to whether or not the ADMs are reducing glucose levels, and patients description of how the medications are making them loss or add weight	"I complained that I'm putting on too much weight, they said that's one of the side effects of my drugs. That gives me a lot of concern." IDI_6, female, 45 years
	Poor attitude Forgetfulness, carelessness, and lack of discipline	Patients describes their personal characters that impact on adherence	"I forget to take my medication" "I am careless." IDI_4, female 58 years
	Financial constraints Lack of finance and use of herbal concoction	Statements regarding lack of money prevented them from buying the medication, and promoted herbal use	"I find it difficult to buy drugs due to no money" "the drugs are so costly, so I had to go on my herbs." IDI_10, male 54 years
Interpersonal	**Lack of family/HCPs' support** Lack of spousal support **Poor HCPs attitude (**inadequate patient–HCP communication, distractions from drug detailers, poor follow-ups)	Statements referring to whether or not the patients received support from family members, friends, and HCPs	"Having a wife that is careless is a problem"' "The attitude of the nurses is poor, they do not pay adequate attention." IDI_7, male 47 years
Organizational	**Clinic structure** (overcrowded clinic, time-wasting at pharmacy) **Limited HCPs** (multiple prescriber, long appointments, missing case files) **Lack of subsidy** (Cost of medications)	Patients description of the clinic and the obstacle they encounter while accessing the clinic	"Clinics are overcrowded . . . I often feel discouraged" IDI_8, male 67 years "My main file is missing." IDI_9, female 59 years "I was given three months appointment" "doctors are distracted by drug detailers" IDI_11, male 47 years
Community	**Fear of embarrassment** Fear of taking medications in public Concern about people knowing their diabetes status	Statements referring to how they prevent people from knowing they are diabetes status	"One looks like a social outcast" "I don't take my drugs to office" "Nobody knows I have diabetes" "I may not eat in parties . . . some people will be wondering what's is going on, some will ask you why." IDI_ 13 female 41 years

Abbreviations: ADMs, antidiabetic medications; HCP, health care provider.

Figure 1. Barriers to medication adherence based on socioecological framework. Adapted from Berben et al (17).

medication-taking: "Failing to eat my meal at the right time will delay the time I am to take my drugs" (IDI_10, male, 54 years). On the contrary, women viewed support more of monetary support and received more support from their husbands. While most patients reported displeasure regarding HCPs poor attitude and poor communication, some complained that the clinicians gave instructions without caring whether patients understood or not: "The truth is that nobody cares for you, they are only just giving medicine, if you understand, if you don't understand, that's your business" (IDI_13, female. 41 years). Patients expected support from HCPs but did not receive such: "Buying the medication is not a problem but one needs support from your doctor, pharmacist, the nurse but it's not so" (IDI_3, female, 70 years).

Organizational Barriers

The Clinic Structure

Having overcrowded clinics, delays in purchasing ADMs from the pharmacy, having long clinic appointments, multiple prescribers, and high cost of medications were some organizational barriers that directly/indirectly affected adherence. Most patients expressed concern about seeing different doctors at different times who gave conflicting medication instructions: "Seeing different doctors that are saying different things is not right. Not reading your case file and not asking questions from it is affecting me" (IDI_4, female, 58 years). The distractions from drug company detailers marketing their ADMs during clinic hours were remarkably echoed by some patients. While female patients seem to be more disturbed about this distraction, and the lack of HCPs' attention, the males had more challenges with HCPs' poor attitude. The high cost of the ADMs resulted in delayed access, complementary use of herbal remedies, and poor adherence: "I do take my drugs, but now since you know how the country is, the drugs are so costly, so I had to go on my herbs" (IDI_15, male 52 years). Of note is that the use of herbals was common during the rains compared to the dry season when patients resorted back to their ADMs: "I am currently on herbal concoction but during the dry season, I will still go back to that of my tablets" (IDI_25, female 48 years).

Community Influence

Social Embarrassment and Stigma

Type 2 diabetes patients reported their inability to fit into the community for concerns of taking medication in the public. So, they kept their diabetes status a secret: "People do not even know I have diabetes, and I don't give them the impression that I have it" (IDI_7, male, 47 years). A female participant noted: "I will not like people in the office to know . . . . Ah, Mrs X, you like to be take drug! Which type of drug? No, no, no, it's only my husband that is aware" (IDI_13, female 41 years). Patients also felt devalued by some HCPs who on few occasions talk to them in a derogatory manner: "The way some nurses will shout at you and the way they behave, if you are looking at all those things, you will just go home and die" (IDI_10, male 54 years).

Facilitators of Medication Adherence

Three major themes were identified: positive perceptions, decision-making, and family support (Table 4; Figure 2).

Positive Perception

A unique factor that motivated patients to adhere to their medications was the perceived need to live longer and having a positive mindset toward diabetes: "You have to make up your mind that you want to live, I don't have money but when I realize that I must live I have to make out time to buy the drugs as at when due" (IDI_2, female, 50 years).

Decision to Have Reminders, Save, and Purchase Sufficient ADMs

Patients who perceived medication-taking as a routine used meals and alarms as reminders, had savings for their medications, and bought their medications to last till the next clinic appointment had tendencies to adhere: "I have to take

Table 4. Themes and Subthemes of Facilitators of Medication Adherence.

Themes (barriers)	Subthemes	Description of themes	Codes
Personal	**Decision-making regarding ADMs** *Decision to make medication-taking a routine *Taking ADMs during meals and set alarms as reminders; *having savings for medication, *buying ADMs to last till next clinic appointment **Positive perceptions** *Perceived need to stay alive *Need to have positive mindset about diabetes	Statements referring to the personal decision/measure patients took that served as reminder to medication-taking	"It has become a normal life routine' taking my drugs is like a ritual" "I take all my medication in the morning after my breakfast, it makes me not to forget my medications" "I set my alarm to remind me to take my drug" "I save a lot to be able to buy my glucose drugs" "I convinced my children to sell one of our property and keep the money in fixed deposit to have enough money to buying my medications" "I prefer if my drug is half, I will buy" "I buy my medications in bulk to last for three months" "Making up one's mind that you want to live helps one"
Interpersonal	**Family support** *Monetary support *Practical support *Meal preparation *Informational *Emotional support	Description of support patients received from family members	"My husband is very supportive . . . he makes sure there is money for my drug" "My husband helps and assist me in buying my drugs" "My wife is trying, she prepares my food" "My children have been supportive, they help me in buying the drugs" "My son guides me on how to use the drugs" "In fact at times I don t just feel like taking my drugs but the advice and encouragement from my wife and my children helps me, their words keep me going."

Abbreviation: ADMs, antidiabetic medications.

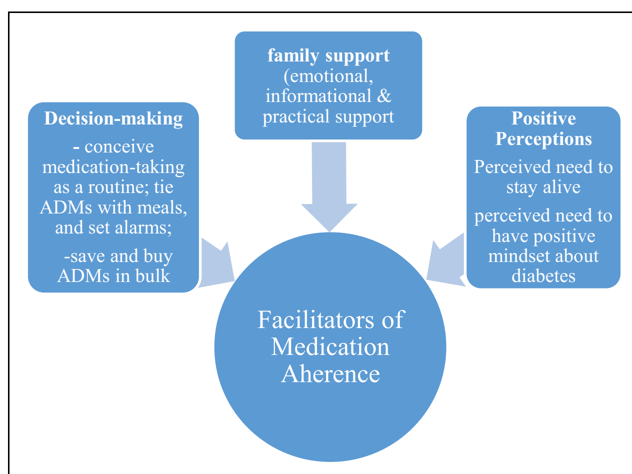

Figure 2. Facilitators of antidiabetic medications adherence among type 2 diabetes mellitus patients.

it in the morning, I am just used to it, It has become a normal life routine" (IDI_3, female, 70 years); "I save a lot to be able to buy my glucose drugs" (IDI_24, female, 49 years). Female patients who have had diabetes for more than 10 years expressed mastery of skills than males. Interestingly, glucose levels serve both as a barrier and a facilitator; while high glucose prompts medication-taking, a low or normal glucose delays medication-taking: "Sometimes, when I check my blood sugar and its ok, I won't take the drugs till the following day" (IDI_4, female, 58 years).

Family Support

Patients who received emotional, practical, and financial support from family members and spouses had better adherence: A man reported: "The advice and encouragement from my wife and my children help me, their words keep me going" (IDI_10, male, 54 years). A woman noted: "My children help me in the kitchen at times to cook; when I am tired; my husband helps me to buy the drugs" (IDI_14, female, 50 years).

Discussion

This study is among the few Nigerian studies that explored both barriers and facilitators of medication adherence using the socioecological model. From the socioecological perspective, the identification of barriers to medication adherence that go beyond the personal barriers to other environmental factors such as the family, community, HCPs, and organizational barriers is crucial for intervention. Medication adherence is often viewed as being affected by and affecting the social environment (15,17,18). Therefore

studies that focused mostly on patient-related factors provide an incomplete picture of factors influencing adherence.

In this study, organizational level barriers were frequently reported, with most patients complaining about the clinic structure (overcrowded clinic, long clinic appointments, missing case files, having multiple prescribers), poor patients–HCPs communication, limited access, and cost of ADMs. Of note is that poor access and high cost of ADMs made patients resort to herbal remedies which are complimentary and seasonal. Therefore, it is not surprising that this study recorded numerous organizational barrier that directly or indirectly impacted adherence (19). Having multiple prescribers, long clinic appointments, and missing case files evident in this study contributes to lack of continuity in care, which is a major component of the chronic care model stipulated by Wagner et al (20). Unfortunately, in Nigeria, most tertiary hospitals depict an acute care model for chronic illnesses resulting in fragmented care.

Perceptions of T2DM as a very severe illness, doubt about the efficacy of prescribed ADMs, emotional burden, forgetfulness, and poor attitude (carelessness) were the prominent personal barriers that affected medication adherence. Illness perception is one of the psychosocial factors that is generally believed to positively influence medication adherence and refers to the image patients formed from their experience with diabetes and affects motivation to adhere (21,22).

This study identified some knowledge gaps among the patients, as many patients erroneously attributed diabetes symptoms to Malaria—a parasitic disease endemic in Nigeria. This knowledge gaps resulted in the turbulent diabetes diagnosis. The influence of knowledge and perception of diabetes on adherence documented in this study is consistent with previous studies (12,13,21). This emphasizes the need to address perceptual barriers during counseling (22).

Although there are conflicting pieces of evidence regarding the role of family on medication adherence (23–25), this study highlighted the strategic role of the family in enhancing medication adherence and identified what constituted family/spousal support in Nigeria. Family members being conscious of the patients' illness, spouses/ or children serving as reminders to take ADMs, providing money for ADMs, meal preparation, and emotional support were the prominent spousal support peculiar to these patients. A gender difference in spousal support emerged, which hitherto has not been documented previously. While men expressed more of dietary and emotional support, women considered monetary provision as support. This observation lays credence to the African traditional roles, where the women are responsible for meal preparation, and the men provided money for the family. In some other developed nations, spouses acting as a role model, engaging in grocery shopping, and reading food labels were perceived as supportive roles (23,26). Therefore, involving spouses and/or family members during clinic visits should be given a priority in diabetes management.

This study demonstrated that the community within which patients live plays a significant role in defining adherence. Patients' concern about taking medication in public for fear of been tagged diabetic or discrimination was an important community-level factor that influenced medication-taking behavior. Previous studies have reported that patients with diabetes experience feelings of fear, embarrassment, blame, and guilt (27), which often leads to depression (28). Addressing this concern can be achieved through public enlightenment on the roles of the public in diabetes management and the demands of diabetes. Therefore, multilevel interventions targeted at the patients, community, and health care systems would improve adherence.

This study further provided unique insights into the facilitators of adherence. Patients perceiving medication-taking as routine, using breakfast/other meals as reminders, the realization of the need to live longer, having a positive mindset, and making efforts to avoid complications motivated them to adhere to medications. Some studies reported family support, having medication pill boxes, having insight of their illness, low medication burden, and having enabling environment as facilitators of medication adherence (29,30). Intervention focused on reminders have the potential to improve adherence.

This study has some limitations. Although in-depth interviews provided deeper understanding of the barriers and facilitators of medication adherence, the interviews may be prone to recall bias and social desirability.

Conclusion

Our findings revealed personal, interpersonal, organizational, and community barriers unique to Nigerian population. The consideration of the barriers and the facilitators of medication adherence should underpin clinical interventions to improve adherence.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Onwuchuluba EE, MPharm https://orcid.org/0000-0003-3040-8122

References

1. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF diabetes atlas: global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. 2018;138:271-81. Assessed March 12, 2020.
2. Kibirige D, Lumu W, Jones AG, Smeeth L, Hattersley AT, Nyirenda MJ. Understanding the manifestation of diabetes in

sub Saharan Africa to inform therapeutic approaches and preventive strategies: a narrative review. Clin Diabetes Endocrinol. 2019;5:1-8.
3. Fasanmade OA, Dagogo-Jack S. Diabetes care in Nigeria. Ann Glob Heal. 2015;81:821-9.
4. Bosun-Arije FS, Ling J, Graham Y, Hayes C. A systematic review of factors influencing type 2 diabetes mellitus management in Nigerian public hospitals. Int J Africa Nurs Sci. 2019; 11:1-7.
5. García-Pérez LE, Álvarez M, Dilla T, Gil-Guillén V, Orozco-Beltrán D. Adherence to therapies in patients with type 2 diabetes. Diabetes Ther. 2013;4:175-94.
6. Ahmad NS, Ramli A, Islahudin F, Paraidathathu T. Medication adherence in patients with type 2 diabetes mellitus treated at primary health clinics in Malaysia. Patient Prefer Adherence. 2013;7:525-30.
7. Onwuchuluba E, Soremekun R, Oyetunde O. Medication adherence and influencing factors in patients with type 2 diabetes attending a tertiary hospital in South-West Nigeria. J Clin Sci. 2019;16:138-43.
8. Hugtenburg JG, Timmers L, Elders PJ, Vervloet M, van Dijk L. Definitions, variants, and causes of nonadherence with medication: a challenge for tailored interventions. Patient Prefer Adherence. 2013;7:675-82.
9. Jackson IL, Adibe MO, Okonta MJ, Ukwe CV. Medication adherence in type 2 diabetes. Diabetes Technol Ther. 2015; 17:398-404.
10. Adisa R, Fakeye TO. Treatment non-adherence among patients with poorly controlled type 2 diabetes in ambulatory care settings in southwestern Nigeria. Afr Health Sci. 2014;14:1-10.
11. Aziz H, Hatah E, Makmor-Bakry M, Islahudin F, Ahmad Hamdi N, Mok Pok Wan I. Qualitative exploration of the modifiable factors for medication adherence among subsidised and self-paying patients in Malaysia. BMC Health Serv Res. 2018; 18:1-8.
12. Jeragh-Alhaddad FB, Waheedi M, Barber ND, Brock TP. Barriers to medication taking among Kuwaiti patients with type 2 diabetes: a qualitative study. Patient Prefer Adherence. 2015;9: 1491-503.
13. Habte BM, Kebede T, Fenta TG, Boon H.Barriers and facilitators to adherence to anti-diabetic medications: Ethiopian patients' perspectives. African J Prim Heal Care Fam Med. 2017;9:1-9.
14. Amico KR, Mugavero M, Krousel-Wood MA, Bosworth HB, Merlin JS. Advantages to using social-behavioral models of medication adherence in research and practice. J Gen Intern Med. 2018;33:207-15.
15. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Educ Q. 1988;15(4):351-77.
16. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Med Res Methodol. 2013;13:1-8.
17. Berben L, , Dobbels F, Engberg S, Hill MN, de Geest S. An ecological perspective on medication adherence. WJNR. 2012; 34:635-53.
18. Chimphamba Gombachika B, Fjeld H, Chirwa E, Sundby J, Malata A, Maluwa A. A social ecological approach to exploring barriers to accessing sexual and reproductive health services among couples living with HIV in Southern Malawi. Int Sch Res Notices. 2012;2012:1-13.
19. Devine F, Edwards T, Feldman SR. Barriers to treatment: describing them from a different perspective. Patient Prefer Adherence. 2018;12:129-33.
20. Wagner EH, Glasgow R, Davis C, Bonomi A, Provost L, McCulloch D, et al. Quality improvement in chronic illness care: a collaborative approach. Jt Comm J Qual Improv. 2001; 27:63-80.
21. Islam SMS, Biswas T, Bhuiyan FA, Mustafa K, Islamn A. Patients' perspective of disease and medication adherence for type 2 diabetes in an urban area in Bangladesh: a qualitative study. BMC Res. Notes. 2017;10:1-8.
22. Urata K, Hashimoto K, Horiuchi R, Fukui K, Arai K. Impact of diabetes perceptions on medication adherence in Japan. Pharmacy (Basel). 2019;7:1-14.
23. Mayberry LS, Osborn CY. Family support, medication adherence, and glycemic control among adults with type 2 diabetes. Diabetes Care. 2012;35:1239-45.
24. Iloh GP, Collins P, Amadi A. Family functionality, medication adherence, and blood glucose control among ambulatory type 2 diabetic patients in a primary care clinic in Nigeria. Int J Health Allied Sci. 2018;7:23-30.
25. Affusim C, Francis E. The influence of family/social support on adherence to diabetic therapy. IJASRE. 2018;4:71-80.
26. Aloudah NM, Scott NW, Aljadhey HS, Araujo-Soares V, Alrubeaan KA, Watson MC. Medication adherence among patients with type 2 diabetes: a mixed methods study. PLoS One. 2018; 13:1-18.
27. Browne JL, Ventura A, Mosely K, Speight J. I call it the blame and shame disease: a qualitative study about perceptions of social stigma surrounding type 2 diabetes. BMJ Open. 2013;3: 1-10.
28. Mezuk B, Eaton WW, Albrecht S, Golden SH. Depression and type 2 diabetes over the lifespan: a meta-analysis. Diabetes Care. 2008;31:2383-90.
29. McElfish PA, Balli ML, Hudson JS, Long CR, Hudson T, Wilmoth R, et al. Identifying and understanding barriers and facilitators to medication adherence among Marshallese adults in Arkansas. J Pharm Technol. 2018;34:204-15.
30. Chong CC, Redzuan AM, Sathar J, Makmor-Bakry M. Patient perspective on iron chelation therapy: barriers and facilitators of medication adherence. JPE. 2021;8:1-11.