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Barriers to Antidiabetic Medication Adherence among Patients with Diabetes Mellitus in Saudi Arabia: A Systematic Review

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Systematic Review

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ABSTRACT

This systematic review was conducted with aim of determining different types of barriers that interfere with the adherence to antidiabetic medications among diabetes mellitus patients in Saudi Arabia. A comprehensive systematic literature exploration was performed via databases and search engines as Science Direct, PubMed, Medline, Google Scholar, Scopus, Cochrane Library, and EBSCO. The review includes 20 original research studies on adherence to antidiabetic medications and their associated factors. The review of the studies reveals that the most prominent barriers to antidiabetic medication adherence were forgetfulness, polypharmacy and complexity of regimen, side effects, low perceived self-efficacy of the medications, and feeling better. Likewise, frequent dosing, long history of diabetes, comorbidities, cost of medication or financial issue, disruption of normal routine, carelessness, busy schedule, God centered locus of control, and food habits were among the others. The identified multifaceted barriers can serve as a potential target for interventions to improve adherence to antidiabetic medications and health related quality of life.

Keywords: Antidiabetic; barriers; diabetes mellitus; medication adherence; review; Saudi Arabia.

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1. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder affecting the entire world. According to the International Diabetes Federation (IDF), nearly 463 million people presented with diabetes in 2019, and the figure is projected to 700 million by 2045 globally. Similarly in the Middle East and North Africa (MENA) region, current figure of 55 million people with diabetes will increase twice by 2045 [1]. Saudi Arabia is among the top five countries in the MENA region with 4.3 million cases of diabetes among the people aged between 20 and 79 years in 2019 [1]. Furthermore, diabetes is among the top 10 causes of deaths in Saudi Arabia [2].

Although management approaches for diabetes is multifaceted, lifestyle related strategies and pharmacotherapy are the cornerstone [3]. Poor medication adherence, which varies widely from 38% to 93% and is still rising, is one of the most prominent reasons for inadequate glycemic control among diabetic patients [4-6]. Poor glycemic control can have many implications, leading to increased morbidity, mortality, hospitalization, cost of therapy, and decreased quality of life (QoL). It may also cause various microvascular (retinopathy, nephropathy and neuropathy) and macrovascular (cardiovascular) complications on long-term [1,7]. This demands a more thorough analysis of various barriers affecting adherence to antidiabetic medications among the people of Saudi Arabia, so that the policymakers could focus on these factors to promote medication adherence and improve health related QoL.

Barriers to medication adherence may be attributed to several factors which are not the same for every population, probably due to cultural, environmental and socioeconomic disparities [8]. Hence, this systematic review was devised with the objective to determine different types of barriers that interfere with adherence to medicines for antidiabetic use among diabetes mellitus patients in Saudi Arabia. The compilation of these factors may help policymakers develop suitable intervention plan to address the issue of non-adherence or poor adherence to antidiabetic medications.

2. MATERIALS AND METHODS

2.1 Data and Search Approach Sources

A comprehensive systematic literature exploration was performed through such databases and search engines as Science Direct, PubMed, Medline, Google Scholar, Scopus, Cochrane Library, and EBSCO. The search of literature was executed for the original research articles published up to April 2020. The retrieved articles were evaluated manually for their appropriateness with the objectives of the study. Various search phrases were used such as ‘‘diabetes, diabetic”; ‘‘adherence, compliance”; ‘‘barriers, factors”; and “Saudi Arabia, KSA, Kingdom of Saudi Arabia”. To facilitate the search for the relevant articles, Booleans operators such as “AND/OR” were also used without any filter with respect to date and language.

2.2 Study Selection

This systematic review includes original research studies based on adherence to antidiabetic medications and their related factors in Saudi Arabia. The review, however, excludes studies related to patients’ special situation that affect medication adherence such as mentally disturbed patients, patients with cancer or serious complications and abusers of narcotic drugs. The selection of the articles was performed through PRISMA guidelines (Fig.1).

2.3 Data Extraction and Analysis

The data was extracted using self-designed data extraction tool. The information included in the tool includes authors, year of publication, study settings and design, number of participants, type of diabetes (i.e., T1DM or T2DM), average duration of diabetes, medications prescribed to manage diabetes, average value of glycosylated hemoglobin, average age of the participants and their level of education, measure of non-adherence or adherence, and percentage of low or poor adherence. Two independent reviewers conducted the process and consensus was found by debate where there was disagreement.

3. RESULTS

A total of 4754 articles were discovered from the databases and search engines, and out of which only 34 studies met the criteria to be screened for full text (Fig. 1). However, 14 such full-text articles were excluded with the justification that they did not identify the barriers (n=9), not related to medication adherence (n= 3) and concerned with non-diabetic (n= 2).

Out of 20 studies, three were published in the year 2020, four in 2019, three in 2018, four in 2017, two in 2016, and one in each of 2015, 2013, 2012 and 1999. Nearly one half (45%, n=9) of the studies were conducted in Primary Healthcare Centers (PHC) and University Hospital settings followed by diabetic-care unit or chronic disease centers (20%, n=4). Moreover, Riyadh city was the highly favored place of study (25%, n=5). Most of the studies followed cross-sectional study design, but there were few examples of experimental, mixed model and web based studies as well.

The entire studies included a sum of 12862 patients, and most of the participants included in the studies had T2D (70%, n=14), followed by T1 & 2D both (30%, n=6). In 60% (n=12) of the investigations, the information about average duration of diabetes was nonexistent. The information about the medications prescribed was not mentioned in 35% of the diabetic patients, even though adherence was investigated. Conversely, oral antidiabetic mediation (OADM) along with insulin were prescribed in 35% of the patients. The average age of the patients included in the study was 40 years and above.

Two studies were published with no information about literacy, however, the average literacy rate was 25.35% (n=18). A variety of tools were used to measure adherence to antidiabetic medications including self-administered questionnaire (n=9), the Morisky Medication Adherence Scale (MMAS) (n=5), and others (n=6). The data about percentage of low or poor adherence was not illustrated in four studies, but the average value of low or poor adherence was 31.45% (n=16).

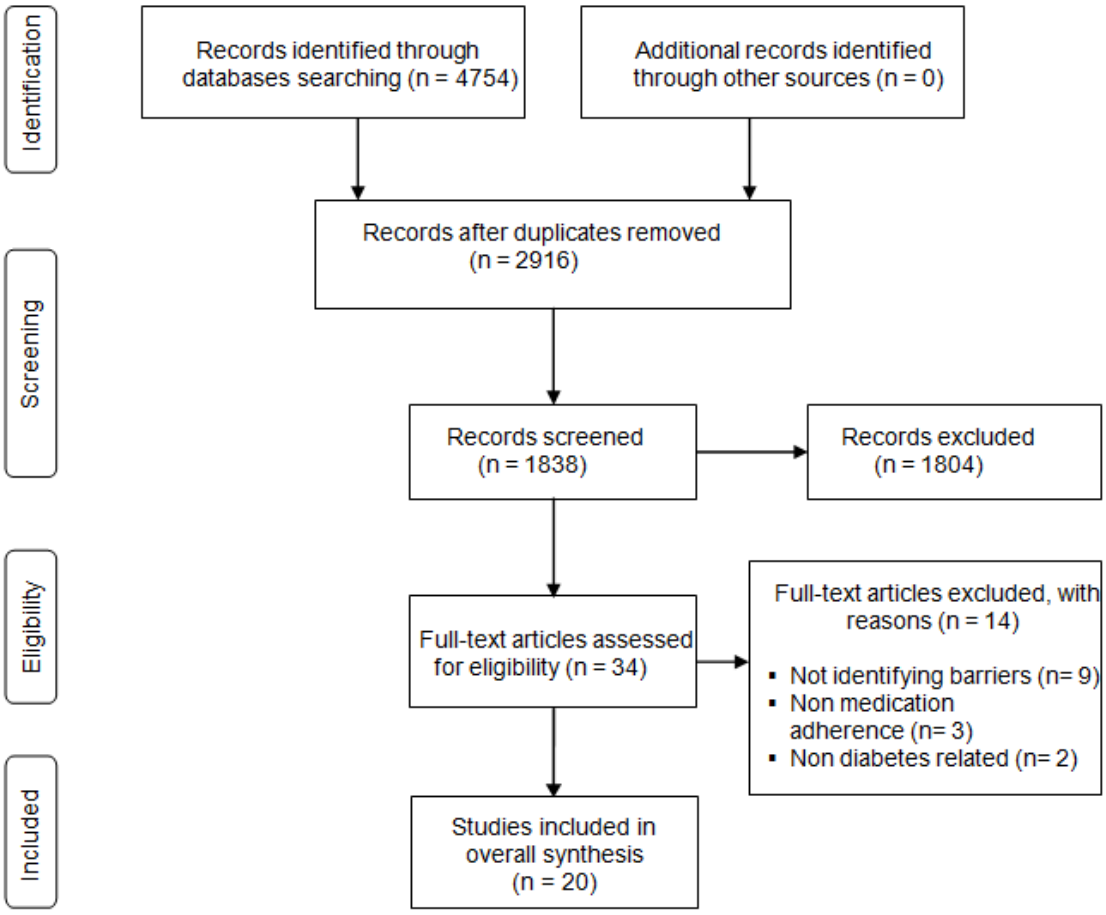

Fig. 1. Flow chart showing selection of articles based on PRISMA guidelines

Table 1. Characteristics of research

S. N	Author/Year	Setting	Design of study	No. of pts	Type of DM	Avg. duration of diabetes (Yrs)	Diabetes medications	Avg. HbA1c	Avg. age in yrs	Educational attainment	Measure of adherence	% of Low/poor Adherence
1.	Ahmed SM, et al./2020	Primary health care centers, Majmaah	Cross-sectional	161	T2D	Nil	Nil	Nil	Nil	42.2% illiterate	Self-administered questionnaire	Nil
2.	AlShayban DM, et al./2020	Community pharmacies, Khobar	Cross-sectional	318	T2D	Nil	Insulin	8.1	44 ± 15.5	None illiterate; 18.9% primary education	General Medication Adherence Scale (GMAS)	1.9%
3.	Alshehri KA, et al./2020	Primary health care centers, Jeddah	Cross-sectional	387	T2D	Nil	OADM	Nil	54±11	10.1% illiterate	Self-completed questionnaire	31.5%.
4.	Alsayed KA, et al./2019	Diabetic care unit, Riyadh	Cross-sectional	399	T1&2D	Nil	OADM & Insulin	Nil	Nil	37.3% illiterate	Self-administered questionnaire	38.1%
5.	Alqarni AM, et al./2019	Primary health care centers, Bisha	Cross-sectional	375	T1&2D	≥5	OADM & Insulin	Nil	Nil	36.3% illiterate	Morisky Green Levine Medication Adherence Scale (MGLS)	21.4%
6.	Balkhi B, et al./2019	King Saud University Medical City (KSUMC), Riyadh	Cross-sectional; retrospective study	5457	T2D	Nil	OADM	8.2±1.67	58.2± 10.8	Nil	The modified medication possession ratio (mMPR)	42.8%
7.	AlQarni K, et al./2019	Out-patient endocrine and diabetic clinics at University Hospital, Khobar	Cross-sectional	212	T2D	Nil	Nil	8.57 ± 2.3	44.17 ± 15.6	None illiterate; 46.2% graduate.	General Medication Adherence Scale (GMAS)	41.5%
8.	Alramadan MJ, et al./2018	Diabetes centers; multi-center; Riyadh, Hofuf, Jeddah	Cross-sectional	1111	T2D	13.9 ±8.4	Nil	8.5 ± 1.9	57.6 ±11.1	Nil	The 4-item Morisky Medication Adherence questionnaire	57.8%

S. N	Author/Year	Setting	Design of study	No. of pts	Type of DM	Avg. duration of diabetes (Yrs)	Diabetes medications	Avg. HbA1c	Avg. age in yrs	Educational attainment	Measure of adherence	% of Low/poor Adherence
9.	Almaghaslah D, et al./2018	Diabetic centers, Asser	Cross-sectional	200	T1&2D	Nil	Insulin	Nil	Nil	28.9% illiterate	MMAS-8 score	38%
10.	Aloudah NM, et al./2018	University diabetes center (UDC), Riyadh	Cross-sectional; mixed method	395	T2D	12.9 ± 8.0	OADM	7.9± 1.4	57.8 ±8.7	18% illiterate	MMAS-8 score	23%
11.	AlShareef SM, et al./2017	King Saud Medical City, Riyadh	Cross-sectional	512	T1&2D	11.68±9.57	OADM & Insulin	8.71± 2.43	52.45±13.22	21.1% illiterate	MMAS-8	Nil
12.	Rabba AK, et al./2017	Outpatient clinics in Alkharj	Cross-sectional	68	T2D	38.2%>10	OADM	Nil	Nil	25% illiterate	Six-item questionnaire	17.6%
13.	Mokabel FM, et al./2017	Diabetic outpatient clinic at University hospital, Al Khobar	Longitudinal experimental research	150	T2D	Nil	Nil	9.46±3.25	53.6 ± 10.9	12% illiterate	Structured questionnaire	54%
14.	Ahmed NO, et al./2017	Saudi Arabia	Cross-sectional; web-based	290	T2D	Nil	Nil	Nil	Nil	None illiterate; 50% with graduate and above.	MMAS-8 score	54.8%
15.	Albargawi M, et al./2016	King Abdulaziz Medical City, Riyadh	Descriptive correlation	30	T2D	>1	Nil	Nil	Nil	13% illiterate	Self-report scales and questionnaire	Nil
16.	Alatawi YM, et al./2016	Outpatient pharmacy, Tabuk	Cross-sectional	220	T2D	Nil	Nil	Nil	52 ± 11.2	59% had less than high school education	New multi-dimensional adherence measure (MDAM), and medication-taking recall-7days (MTR-7)	40%
17.	Louise de Villiers et	Ambulatory care clinics,	Descriptive-correlational	1409	T2D	Nil	OADM & Insulin	8.64±1.93	55 ±11.06	50% illiterate	Structured arabic questionnaire	18.7%

S. N	Author/Year	Setting	Design of study	No. of pts	Type of DM	Avg. duration of diabetes (Yrs)	Diabetes medications	Avg. HbA1c	Avg. age in yrs	Educational attainment	Measure of adherence	% of Low/poor Adherence
	al./2015	Western Region										
18.	Salam MA, et al./2013	Primary health care centers, Abha	Cross-sectional	406	T2D	Nil	OADM & Insulin	Nil	Nil	42.1% illiterate	Self-administered questionnaire	20.8%
19.	Khan AR, et al./2012	Chronic disease centers, Al-Ahsa	Cross-sectional	468	T1&2D	10	OADM & Insulin	Nil	Nil	64.7% Illiterate	Questionnaires and file records	Nil
20.	Khattab MS, et al./1999	Primary health care centers, Al-Manhal	Cross-sectional	294	T1&2D	6.4± 5.0	OADM & Insulin	Nil	54±12.8	55.6% illiterate	Questionnaires	1.4%

Table 2. Barriers to antidiabetic medications adherence

Barriers	Conclusion/Remarks [Studies]
A. Patient-related factors	
i. Demographic characteristics	
Gender	Males were poorly adherent than females.[9,10] Females were poorly adherent than males. [11,12]
Age	Patients aged 30 to <40 were poorly adherent. [13,14]
Marital status	Married were poorly adherent than others. [12,15] Single (unmarried) were poorly adherent than married. [13,16]
Educational status	Higher the education, poorer the adherence. [10,15,17] Illiterates were poorly adherent.[11,14,17]
ii. Physiological status	
Comorbidities	More the number of comorbidities, lower the level of adherence. [10,18]
Forgetfulness	Forget to take medication or follow up visit. [11,17,19-22]
iii. Perception, attitude and emotions related	
Carelessness	Do not want to restrict anything due to diabetes. [20,22]
Fasting in Ramadan	Poor adherence during month of Ramadan.[23]
Fear of hypoglycemia	[17]
Felling better	[14,20,21]
God centered locus of control	Poor adherence due to strong belief on God centered locus of control [9,20]
Low perceived self-efficacy of medication	[14,19,20,24]
Low perceived need of medication	No difference with and without medication, so quit medication. [24]
B. Disease-related factors	
Lower HbA1c	HbA1c is controlled, so discontinued the medication.[22] Low adherence with HbA1c ≥7. [25]
Long history or duration of diabetes	Poor adherence with longer history of DM. [17,18]
Lack of knowledge about diabetes related complications	[24]
C. Medication-related factors	
Frequent dosing of medications	Poor adherence with too frequent dosing or change in frequency of dosing. [21,24]
Polypharmacy and complexity of medication regimen	More the number of medications, lower the adherence level, particularly with injectable. [11,14,16,18,19,22]
Side effects	Poor or non-adherent due to side effects such as fatigue, dizziness etc. [14,19-22]
Change of medication or treatment	[20]
Shortage of medications	[21]
Cost of medications or financial issue	[17,19]
Concurrent practice of alternative medicine	[20]
D. Provider-related factors	
Lack of counseling/communication/ support from healthcare providers	[22]
E. Societal-related factors	
Too busy schedule	[20,21]
Social stigma	[22]
Lack of social or family support	[19]
Disruption of routine	Frustrated with disruption in routine induced missing of doses. [19,22]
Food habits	Cannot adhere to advised dietary regimen.[14,26]
Cultural or religious beliefs	[20]

Numerous barriers were identified from the studies reviewed and they have been categorized as: patient-related, disease-related, medication-related, provider-related, and societal-related factors (Table 2). However, the most prominent barriers identified were forgetfulness, polypharmacy and complexity of regimen, side effects; low perceived self-efficacy of the medications, feeling better. Likewise, frequent dosing, long history of diabetes, comorbidities, cost of medications or financial issue, disruption of normal routine, carelessness, busy schedule, god centered locus of control, and food habits were among the others.

4. DISCUSSION

Diabetes is a rising public health issue in Saudi Arabia and other parts of the world. Diabetes as an ailment, lasts for several years and even lifelong, and its management requires persistent rigorous approaches including life-style changes, appropriate medications and most importantly optimal antidiabetic medication adherence. However, the review of the studies above shows up various barriers that hinder adherence to antidiabetic medications. Thus, this review focuses on summarizing those barriers and to suggest the policymakers to address them to the maximal extent possible.

Most of the studies were conducted at PHCs and University Hospital settings preferably for convenience of data collection. Many patients obviously choose to visit these facilities to avail public services or less cost effective therapy as the studies point to the exorbitant cost of diabetes treatment 10 times higher than nondiabetic patients [27]. Although most of the studies were quantitative, only one survey was mixed model which necessitates more qualitative or mixed model researches to explore more barriers to antidiabetic medication adherence.

Most (70%) of the studies were found to include type 2 diabetes patients. This is attributed to a greater prevalence of type 2 diabetes compared with type 1 diabetes. The studies also report that the incidence of type 1 diabetes is rising every year in Saudi Arabia and this needs attention in the Kingdom as well [28]. Sixty percent (n=12) of the studies explained the poor medication adherence among the patients with longer duration of diabetes, but they lacked the information about the average duration of diabetes. Interestingly, a Brazilian study found the reverse trend [29]. The contrast associations may be a result of diversity in attitude among the people of different locations [23,30]**.** The average age of the patients included in the study was 40 years and above. This is often due to the reason that higher fraction of studies included in this review focused on type 2 diabetes which typically occurs in older patients [31,32]. The studies would have informed more understanding if they had included detailed information about medications prescribed. The studies highlight the importance of education and awareness in almost one-fourth of the patients who could benefit from counseling customized to their level of understanding. Also, images, photographs and local language can be utilized amid counselling to have optimal grasp of the information [33]. The studies indicate low or poor adherence to medications in 31.45% of the cases which is less than that reported in the gulf region [34].

The studies have described mixed responses as barriers to antidiabetic medication adherence in terms of gender, marital status and educational status. While there are varied gender findings, it is more persuasive that, relative to males, females are more adherent to antidiabetic medications. This is because females spend most of their time at home and can take advantage of taking their medications as prescribed [35]. Similarly, some researches have shown that married couples are more compliant than single or unmarried couples, although the reverse has been found in other studies. It is more logical to find that married patients particularly the older adhere more to medications because a partner and family can love, care for, and sustain patients [15]. Some investigators have found education as a stronger determinant of medication adherence, whereas others are of the opposite opinion. It is more convincing, however, that literacy facilitates comprehension, enable more complex thinking abilities and enhance patient compliance [36]. Furthermore, educated individuals are more conscious about health benefits of physical activity, and are more compliant with therapy and guidance on physical activity [37].

The studies have identified forgetfulness, polypharmacy and complexity of regimen, side effects (mainly fatigue, dizziness), low perceived self-efficacy of the medications as the common barriers to medication adherence and identification of most of these barriers concurs with other studies [38-41]. The issue of forgetfulness can be addressed through use of cell phone reminders, involving the children and

the family individuals to remind about the medications [42-45]. Complexity of medication regimen also play significant role in adherence. Higher the complexity of medication regimen, lower or poorer the adherence [46]. Similarly, medications induced side effects and low perceived efficacy also impede the adherence [47,48]. Injectable preparations such as insulin itself is a barrier to medication adherence owing to fear of injection, size of the needle, and even pain associated with it [49]. Therefore, this study recommends critical role of educating the patients and providing counseling ideally in local language and dialect to minimize side effects and to advance secure and viable use of drugs and devices. Similarly, feeling better, frequent dosing, long history of diabetes, comorbidities, cost of medications or financial issue, disruption of normal routine, carelessness, busy schedule, God centered locus of control, and food habits were among the other barriers to medication adherence. These factors highlight the need of coordinated counseling interventions to amplify adherence and therapeutic outcomes.

This review is not free from limitations. In most of the studies, the tools used to measure medication adherence were developed by the researchers with insufficient evidence of reliability and validity. Methodological consistency of the studies included could not be evaluated. Furthermore, the term 'medication adherence' was not clearly defined.

The following recommendations are suggested to incorporate qualitative or mixed model approaches in future researches so as to explore a range of beliefs and barriers towards medication adherence. There is also a need to include type 1 diabetes in future research activities.

5. CONCLUSION

Barriers to antidiabetic medication adherence are multifactorial. The common barriers ascertained in this review were forgetfulness, complexity of medication regimen, side effects, and low perceived self-efficacy of the medications. Similarly, feeling better, frequent dosing, long history of diabetes, comorbidities, cost of medications or financial issue, disruption of normal routine, carelessness, busy schedule, God centered locus of control, and food habits were among the other barriers to adherence. Religious and social factors as barriers are underreported and require more attention in further studies. The barriers identified and discussed in this review can serve as a potential target for intervention to augment medication adherence and health related quality of life.

CONSENT

It's not applicable.

ETHICAL APPROVAL

It's not applicable.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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