

A review study of researches conducted on diabetes mellitus type 2 patients in Iraq

Enas Hussein Ali¹ Khamaal Hussein Abod Al-Khafaji² Ali Hassan Abood³

^{1,3}Iraq, Ministry of Higher Education and Scientific Research, University of Kufa, Faculty of Science
²Iraq, Ministry of Higher Education and Scientific Research, University of Kirkuk, College of Pharmacy
Corresponding author: <u>inas.aldaffaie@uokufa.edu.iq</u>

corresponding aution. <u>mas.aldanaic@uok</u>

Abstract

Type 2 diabetes mellitus (DM) is a persistent metabolic condition illness with a rapidly rising prevalence in the entire world. The management of T2DM varies greatly across the government and industry sectors in Iraq; Using this variant brought on by unequal access to treatment. The goal of this agreement is to present uniform advice about the process of treat patients with T2DM for the initial time. while taking into account regional challenges in Iraq. A group of Iraqi internists and diabetologists from throughout the nation gave their approval to these consensus statements. The recommendation was based entirely on the most recent and current level of evidence. T2DM makes up about 90% of all diabetes cases. As a result of the reduced insulin response in T2DM, This condition is referred to as insulin resistance. In this condition, To keep glycemic control, insulin is ineffectual, which is first countered by an elevation in the synthesis of insulin; however, over time, the secretion of insulin falls, which results in T2DM.

Keywords: Type 2 diabetes mellitus, management, Guidelines, screening and diagnosis, prediabetes, Iraq.

Introduction

Diabetes develops gradually as a result of a persistent rise in blood glucose levels caused by insulin shortage related to a gradual decline in beta cell activity or insulin resistance (or both) (1). The most common kind of diabetes in the world is type 2 diabetes mellitus (T2DM). It is brought on by the body's natural poor use of insulin and the steady loss of pancreatic beta cells (2,3). Chronic hyperglycemia is a prevalent metabolic condition associated with type 2 diabetes. Due to a higher risk of heart disease, stroke, peripheral neuropathy, kidney failure, blindness, and amputation, is linked to a decreased life expectancy (4). Diabetes type 2 is also categorized in a "negative" way (hyperglycemia happening in the lack of proof of autoimmune islet cell damage). That has two results .: The condition is firstly heterogeneous.; second, it is primarily identified in terms of hyperglycemia, to some extent neglecting the underlying mechanisms that cause the disease (4). To maintain normoglycemia, a combination of several antidiabetic medications will be necessary because T2DM is characterized by a variety of pathogenetic problems. The technique must improve life quality in addition to being effective and safe. The greatest unmet requirement is for medications that increase insulin sensitivity, reduce the progressive pancreatic cell death that is a defining feature of T2DM, and prevent or reverse the microvascular effects (5).

> URL: http://www.uokufa.edu.id/journals/index.php/ajb/index http://iasj.net/iasj?func=issues&jld=129&uiLanguage=en Email: biomgzn.sci@uokufa.edu.iq

Iraq's Type 2 Diabetes Management: Challenges and Inadequate Access to health

Iraq has set aims to prevent and to reduce non-communicable diseases, among which are some chronic, non-transmissible diseases like hyperglycemia. However, these objectives have proven difficult to achieve due to security issues and political unrest (6). T2DM rates among younger people are on the rise as a result of changing lifestyles. In 2016, there were 12.1% of obese and 15.2% overweight school-age children in Iraq, compared to 6% in research performed roughly 10 years prior and 1.3% in the most recent one (7). In Iraq, there are few fitness centers and few opportunities for exercise, and women, in particular, are shamed for engaging in physical activity (8). A more sedentary lifestyle is promoted by the recent strong economic growth, which has enhanced access to inexpensive labor, mechanized farming tools, and electronic gadgets use (such as TV, smartphones, and tablet devices) (9). Furthermore, it is asserted that ineffective urban planning, as well as urban growth, are the main contributors to increasing levels of sedentary behavior and that cases are discouraged from being physically healthy by the absence of required infrastructure, such as cycling or walking routes and hot weather for several months throughout the year (10). On the other hand, Westernizing the dining experience, and a strong affinity for greasy snacks, especially among kids and teenagers, had a significant impact on Iraqi daily life and raised the popularity of unhealthy food (11). Iraq's healthcare system mainly relies on secondary and tertiary care because it lacks the infrastructure and skills for primary healthcare (12). Programs were developed for the early detection of breast cancer, diabetes, and high blood pressure in primary care. Nevertheless, their application was unsuccessful. Many Iraqis who attended the health research assembly stated their willingness to support primary healthcare services, nonetheless, as it is a lengthy and challenging process, financing and regulatory changes are required, and there aren't many T2DM medicines available in Iraq's public sector clinics. Due to this, there is now an as double arrangement whereby patients' access to current therapies depends on their ability to pay (13).

Consensus Guidelines for Adults Diagnosing Type 2 Diabetes

There are no exact statistics on the locations in Iraq where people who have diabetes receive their diagnoses; these that other according to geography. The majority of people with T2DM are frequently diagnosed by primary healthcare physicians as opposed to secondary and tertiary care providers; but even so, the result differs throughout the region. As a result, the advisory group proposed that a program that could be run by a primary care doctor be introduced in a primary care setting. The expert group decided that additional testing of hyperglycemia and also before diabetes should be conducted throughout Iraq's various areas. The expert panel stated that the "Finnish Diabetes Risk Score" (FINDRISC) is a suitable tool for detecting Type 2 diabetes and strongly suggested that it be rewritten into Arabic and made available to all asymptomatic people in Iraq (14). The panel sought to provide clear and straightforward practice guidelines on T2DM diagnosis methodologies to support future physicians, household doctors, as well as other health researchers in the treatment of diabetes. also emphasized the significance of carrying out all the processes in a thorough medical evaluation during the first appointment. They also agreed on glycemic control monitoring, glycemic objectives in both outpatient and inpatient settings, and major components of diagnostic tests and criteria (14).

> URL: http://www.uokufa.edu.iq/journals/index.php/ajb/index http://iasj.net/iasj?func=issues&jld=129&uiLanguage=en Email: biomgzn.sci@uokufa.edu.iq



Screening and Diagnosis

The following are listed as the Type 2 diabetes diagnosis criteria by the American Diabetes Association (ADA) (15). 1- Fasting Plasma Glucose (FPG) \geq 6.99 mmol/L, or 126 mg/dL. No calorie intake for eight hours or longer is referred to as fasting. 2- "Two-hour plasma glucose when in an oral glucose tolerance test (OGTT) 200 mg/dL (11.1 mmol/L)." This test must be carried out following a 75 g anhydrous glucose in water glucose load. 3- The "glycated hemoglobin (HbA1c) $\geq 6.5\%$ (48) mmol/mol)." Fructosamine is still useful for tracking levels of blood sugar across time, and the lab doing the test should be National Glycohemoglobin Standardization Program (NGSP) approved and standardized to the Diabetes Control and Complications Trial (DCCT) assay. 4- less than 200 mg/dL (11.1 mmol/L) of random plasma glucose was reported in a patient with symptoms. Similar to testing based on glucose, there is no clear HbA1c cutoff point at which normalcy ends and diabetes begins (16). In Iraq, glycated hemoglobin (HbA1c) is frequently used to diagnose type 2 diabetes; however, this test should be performed using a standard procedure. The HbA1c measurement is not standardized in labs in Iraq, hence the results may differ. As a result, For the diagnosis of type 2 diabetes, the advisory group preferred the use of postprandial glucose and fasting plasma glucose (FPG). They suggested performing two procedures again on two separate days and assessing glucose concentration using veins a plasma (14). Alternately, A blood glucose test could be performed utilizing serum; however, it should be noted that when compared to plasma, the glucose serum value may be as much as 5 mg/dL (0.2 mmol/L) lower (17). The expert group demanded that fluoride-containing tubes be made available in all settings and recommended their usage to slow down glycolysis (18). When utilizing HbA1c to diagnose T2DM, it should be kept in mind that blood glucose levels may not always be closely connected with HbA1c levels in all patients (19). The blood's HbA1c level can be impacted by specific conditions (20).

Therapy

If an oral medicine was unable to control their T2DM, patients may require insulin injections (21). However, pharmacological therapy should always be coupled with a change in lifestyle (22). In Iraq, 30% of individuals with T2DM receive injectable medication, and 70% receive oral therapy, under the specialists' estimates and personal experience. Note that oral or intravenous dual or combination drugs are generally more effective than monotherapy. The following elements must be taken into account when choosing a pharmacological therapy option for T2DM patients (23): The medication's effectiveness, its anti-hyperglycemic effect's durability, its risk of causing hypoglycemia, its potential cardiovascular benefits, The person's body weight, the medication's price and ease of handling, as well as any comorbid conditions, should all be taken into account (eg, a renal illness that is ongoing). According to the expert group, The following elements are considered for determining the best Type 2 diabetes therapy in Iraq: glycemic regulation, patient values, and available medicines. It should be mentioned that the above elements are not the only ones to consider while choosing a treatment.

Monotherapy. If HbA1c is less than 9.0% (75 mmol/mol), monotherapy should be started, according to ADA guidelines (19). Iraqi patients have access to metformin, SUs, TZD, DPP-4i, and GLP-1RA as monotherapy treatments. Due to its complete effectiveness of the majority of oral drugs seldom exceeding 1%, initial combination

URL: http://www.uokufa.edu.iq/journals/index.php/ajb/index http://iasj.net/iasj?func=issues&jld=129&uiLanguage=en Email: biomgzn.sci@uokufa.edu.iq



therapy may occasionally be considered. . Metformin is the medicine of choice in monotherapy due to its excellent success (up to 2 percent of the total HbA1c drop), low risk of hypoglycemia, and decreased cardiac toxicity (24). However, metformin is not recommended for those with glomerular filtration rates (GFR) less than 30 mL/min (25).

Two-way therapy. When HbA1c is less than 9.0% (75 mmol/mol), or if monotherapy at its maximal dosage for three months has failed to control blood sugar levels, dual therapy should be initiated. In Iraq, During monotherapy, the drug of preference is metformin and is typically supplemented with SUs or DPP-4i; in the opinion of the expert, the following combination therapy choices can be thought of as an addition to metformin: Sustinex, Meglitinides, DPP-4i, TZD, GLP-1RA, SGLT2i, and Insulin, Fixed-dose combinations (FDC), particularly those containing metformin and SUs, are typically advised in dual therapy because they have better pharmacodynamic/pharmacokinetic properties than other free combinations. More current FDC appears to be effective and safe, which is encouraging and add to the therapeutic options, and The expanding use of FDC in the treatment of Patients with type 2 diabetes is supported by existing data (26, 27).

Triple treatment After three months, individuals who are not adequately managed on dual therapy should be evaluated for triple therapy. Consideration should be given to patient variables and drug-specific effects. Because this regimen typically carries an elevated risk of diabetes complications and the dearth of data on the long-term efficacy and safety of combined medicines, caution should be taken when selecting a triple therapy combination (28).

In insulin therapy, numerous studies demonstrate that the majority of type 2 diabetic patients may safely maintain their blood glucose levels with insulin. A conviction in the significance of insulin treatment in diabetics with type 2 patients who are uncontrolled is necessary for effective diabetes management at the main care or specialist level, as well as, insulin treatment Intensive lifestyle changes and insulin therapy with metformin should be taken into consideration in newly diagnosed (29), and presently being treated patients when: Random blood glucose levels of 300 mg/dL or higher (16 mmol/L), HbA1c more than 10.0% (86 mmol/mol), and the occurrence of catabolic signs and hyperglycemia (weight loss) (30). The medication is only effective in persons with type 2 diabetes who have retained endogenous insulin, in addition to the insulin dose should be divided evenly into basal and bolus (31).

Ramadan and T2DM

For many Muslims, keeping a fast throughout Ramadan is a highly essential requirement, even if they are unable to do so because of certain medical conditions. Fasting may influence blood sugar levels, which could result in severe hypoglycemia or hyperglycemia (32). Due to a variety of factors, including the type of diabetes, medicines, concomitant conditions and problems, job conditions, social standing, and prior experience, patients with diabetes face varying effects throughout Ramadan (33). Globally, there is still a dearth of literature on Ramadan fasting and diabetes. Small-scale observational studies are most common. More has to be done to raise the caliber and quantity of research on Ramadan (34). Patients should be informed about Ramadan fasting and HbA1c control should be excellent at least three months before Ramadan for those who request an exemption. Due to the extremely low danger of

URL: http://www.uokufa.edu.iq/journals/index.php/ajb/index http://iasj.net/iasj?func=issues&jld=129&uiLanguage=en Email: biomgzn.sci@uokufa.edu.iq





hypoglycemia, metformin medication is exceptional in that it permits patients to fast without changing their dose. Metformin prolonged versions should be administered to patients after their evening meal (once daily) (35). Patients receiving basal-bolus insulin medication should be advised to avoid fasting, and Patients taking basal or premixed insulin morning and night may cut the Suhoor dose by 50%. If the patients demand to fast, their blood sugar levels need to be under good control at least three months before Ramadan. The standard meal bolus amount may be consumed before Iftar, it should be noted, that before Suhoor, the supper portion should be cut in half, and the midday dose should be skipped (36). Patients' diabetes was successfully treated with minimal negative effects with dietary and pharmaceutical therapy. With a regular alteration to diet control and exercise, the majority of type 2 diabetes patients, who before Ramadan had their diabetes under control can fast during Ramadan without risk (37).

Additional barrier

The Iraqi tradition discourages men from helping with food preparation or even from being visible in the kitchen, which is another barrier. That implies that a man with diabetes must consume whatever is prepared for the household. Other obstacles to dietary self-management methods include the high expense of eating well options for diabetics who yearn for ethnic or traditional foods (Fatty food). Similar results were observed by additional researchers in Ethiopia and Sub-Saharan Africa (38,39). The primary hindrance to engaging in physical activity includes both internal (a hectic schedule and physical discomfort) and external (hot weather, unclean roads, and a lack of malls) factors. This may be explained by a lack of knowledge regarding the types and duration of beneficial exercises other than walking (40). such as stationary cycling and resistance training, which are better suited for indoor activities in warm or wet conditions (41, 42). besides swimming, which is better suited for people with rheumatologic pain (34). Although the majority of patient-related factors, such as forgetfulness, contribute to hurdles to adherence to anti-diabetic medication (44). the absence of symptoms of hyperglycemia, adverse drug effects (45), and the price of the drug was also taken into account. Numerous more research has been out in both rich and underdeveloped nations and shown similar conclusions. (44, 45). However, patient-related reasons such as the lack of hyperglycemic symptoms, anxiety brought on by test results, discomfort from the skin puncture, the expense of testing, and neglect were also mentioned as deterrents to routine blood glucose monitoring. Asian Canadian diabetic patients reported facing similar obstacles. In contrast, Asian patients performed glucose monitoring better than Iraqi patients, which may be explained by the fact that fewer Iraqi patients than most Canadian people with the disease had professional instruction in diabetes management (46). Additionally, the biggest obstacles to routine doctor visits were patient-related, including lack of awareness, the expense of appointments, and time restraints; a survey among patients in the United States revealed similar results(47). Additionally, the difficulties with daily foot care, managing stress, controlling hypoglycemia on one's own, and managing diabetes while ill was primarily attributed to a lack of knowledge, demonstrating that only a small number of participants were aware of the seriousness of diabetes complications (48).

Conclusion

To get to where it is now, Iraq had to endure a torturous and difficult process. The healthcare system was negatively impacted by several circumstances, including



Al-Kufa University Journal for Biology / VOL.14 / NO.3 / Year: 2022 Print ISSN: 2073-8854 Online ISSN: 2311-6544



wars, sectarian strife, politics, financial issues, and security concerns. This has resulted in a shortage of knowledge, medical tools, supplies, and medications. The information required to support the formulation of clinical practice guidelines specific to a given nation may be provided through epidemiological studies. Social media channels and educational initiatives should be used to spread knowledge about hyperglycemia and low fasting glucose in those with undiagnosed diabetes (IFG). To help healthcare practitioners with nutritional counseling, ready-to-use populationspecific teaching cards should be created (for instance, nutrition for weight loss or nutrition). Short educational movies might be made and broadcast on social media or in waiting areas at clinics and hospitals. Experts advise investing more funds in appropriately managing patients with diabetes mellitus. Type 2 diabetes mellitus (Type 2 DM) is a metabolic disorder that can be prevented by changing one's behavior, managing one's nutrition, and reducing overweight and obesity. The general public's education is still crucial for containing this new disease. Despite new research into the pathophysiology of the disease, novel medications are still being produced and there is no solution in sight. A type 2 DM patient's quality of life should be improved by management. The conclusion that pre-meal glycemia and the composition and size of meals should both be taken into account when prescribing prandial dosages of insulin to individuals with diabetes seems reasonable.

References

- 1- Chen C, Cohrs CM, Stertmann J, Bozsak R, Speier S. Human beta cell mass and function in diabetes: recent advances in knowledge and technologies to understand disease pathogenesis. *Mol Metab*. 2017;6:943-957.
- 2- Gerich JE. Contributions of insulin-resistance and insulin-secretory defects to the pathogenesis of type 2 diabetes mellitus. *Mayo Clin Proc.* 2003;78:447-456.
- 3- World Health Organization. *Diabetes*. Geneva, Switzerland: World Health Organization; 2018.
- 4- Smushkin G, Vella A. What is type 2 diabetes? Medicine (Abingdon). 2010 Nov 1;38(11):597-601. doi: 10.1016/j.mpmed.2010.08.008. PMID: 21151710; PMCID: PMC3073595.
- 5- DeFronzo RA, Ferrannini E, Groop L, Henry RR, Herman WH, Holst JJ, Hu FB, Kahn CR, Raz I, Shulman GI, Simonson DC, Testa MA, Weiss R. Type 2 diabetes mellitus. Nat Rev Dis Primers. 2015 Jul 23;1:15019. doi: 10.1038/nrdp.2015.19. PMID: 27189025.
- 6- World Health Organization, Regional Office for the Eastern Mediterranean. *Non-Communicable Diseases–Iraq.* Geneva, Switzerland: WHO EMRO;
 2019. http://www.emro.who.int/pdf/irq/programmes/non-communicablediseasesncds.pdf?ua=1. Updated November 7, 2019. Accessed March, 2019.
- 7- Lafta RK, Kadhim MJ. Childhood obesity in Iraq: prevalence and possible risk factors. *Ann Saudi Med.* 2005;25:389-393.
- 8- American Bar Association. The status of women in Iraq: an assessment of Iraq's De Jure and De Facto compliance with international legal standards. http://www.peacewomen.org/sites/default/files/hr_statusofwomeniniraq_aba_j uly2005_0.pdf. Published July, 2005.
- 9- Idris I. *K4D Helpdesk Report: Inclusive and Sustained Growth in Iraq.* Brighton,UK: Institute of Development Studies; 2018. https://assets.publishing.service.

URL: http://www.uokufa.edu.iq/journals/index.php/ajb/index http://iasj.net/iasj?func=issues&ild=129&uiLanguage=en Email: biomgzn.sci@uokufa.edu.iq

Al-Kufa University Journal for Biology / VOL.14 / NO.3 / Year: 2022 Print ISSN: 2073-8854 Online ISSN: 2311-6544

gov.uk/media/5b6d747440f0b640b095e76f/Inclusive_and_sustained_growth_i n_Iraq.pd.

- 10-Faihan SM. Urban policy in Iraq for the period 1970-2012, evaluation study. J Adv Soc Res. 2014;4:58-76.
- 11- Musaiger AO, Al-Mufty BA, Al-Hazzaa HM. Eating habits, inactivity, and sedentary behaviour among adolescents in Iraq: sex differences in the hidden risks of non-communicable diseases. *Food Nutr Bull*. 2014;35:12-19.
- 12- Al-Hilfi TK, Lafta R, Burnham G. Health services in Iraq. *Lancet*.2013;381:939-948.
- 13-Mikhael EM, Hassali MA, Hussain SA, Shawky N. Self-management knowledge and practice of type 2 diabetes mellitus patients in Baghdad, Iraq: a qualitative study. *Diabetes Metab Syndr Obes*. 2018;12:1-17.
- 14- Abusaib M, Ahmed M, Nwayyir HA, Alidrisi HA, Al-Abbood M, Al-Bayati A, Al-Ibrahimi S, Al-Kharasani A, Al-Rubaye H, Mahwi T, Ashor A. Iraqi experts consensus on the management of type 2 diabetes/prediabetes in adults. Clinical Medicine Insights: Endocrinology and Diabetes. 2020 Aug;13:1179551420942232.
- 15-American Diabetes Association. 2 classification and diagnosis of diabetes: standards of medical care in diabetes-2020. *Diabetes Care*. 2020;43:S14-S31.
- 16- Cox EM, Elelman D. Test for screening and diagnosis of type 2 diabetes. Clin Diabetes 2009;4(27):132-138.
- 17- Frank EA, Shubha MC, D'Souza CJ. Blood glucose determination: plasma orserum? *J Clin Lab Anal*. 2012;26:317-320.
- 18-Peake MJ, Bruns DE, Sacks DB, Horvath AR. It's time for a better blood collection tube to improve the reliability of glucose results. *Diabetes Care*. 2013;36:e2.
- 19- American Diabetes Association. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. *Diabetes Care*. 2019;42:S13-S28.
- 20-Shepard JG, Airee A, Dake AW, McFarlands MS, Vora A. Limitations of A1c interpretation. *South Med J.* 2015;108:724-729.
- 21-Chaudhury A, Duvoor C, Reddy Dendi VS, et al. Clinical review of antidiabetic drugs: implications for type 2 diabetes mellitus management. *Front Endocrinol*. 2017;8:6.
- 22- Dalle Grave R, Calugi S, Centis E, Marzocchi R, El Ghoch M, Marchesini G. Lifestyle modification in the management of the metabolic syndrome: achievements and challenges. *Diabetes Metab Syndr Obes*. 2010;3:373-385.
- 23- Cavaiola TS, Pettus JH. Management of type 2 diabetes: selecting amongst available pharmacological agents. In: Feingold KR, Anawalt B, Boyce A, et al.,eds. *Endotext*. South Dartmouth, MA: MDText.com, Inc.; 2000.
- 24- Rhee SY, Kim HJ, Ko SH, et al. Monotherapy in patients with type 2 diabetes mellitus. *Korean J Intern Med.* 2017;32:959-966.
- 25-Heaf J. Metformin in chronic kidney disease: time for a rethink. *Perit Dial Int*. 2014;34:353-357.
- 26-Blonde L, Montanya E. Comparison of liraglutide versus other incretinrelated anti-hyperglycaemic agents. *Diabetes Obes Metab.* 2012;14:20-32.
- 27- Vijayakumar TM, Jayram J, Meghana Cheekireddy V, Himaja D, Dharma Teja Y, Narayanasamy D. Safety, efficacy, and bioavailability of fixed-dose



combination in type 2 diabetes mellitus: a systematic updated review. *Curr Ther Res Clin Exp.* 2017;84:4-9.

- 28- Downes MJ, Bettington EK, Gunton JE, Turkstra E. Triple therapy in type 2 diabetes; a systematic review and network meta-analysis. PeerJ. 2015 Dec 7;3:e1461. doi: 10.7717/peerj.1461. PMID: 26664803; PMCID: PMC4675096.
- 29-Leahy JL. Insulin therapy in type 2 diabetes mellitus. Endocrinol Metab Clin North Am. 2012 Mar;41(1):119-44. doi: 10.1016/j.ecl.2012.03.004. PMID: 22575410.
- 30- Hamdy O, Ashrafzadeh S, Mottalib A. Weight Management in Patients with Type 2 Diabetes: a Multidisciplinary Real-world Approach. Curr Diab Rep. 2018 Jul 17;18(9):66. doi: 10.1007/s11892-018-1030-4. PMID: 30019229; PMCID: PMC6061196.
- 31- Krzymien J, Ladyzynski P. Insulin in Type 1 and Type 2 Diabetes-Should the Dose of Insulin Before a Meal be Based on Glycemia or Meal Content? Nutrients. 2019 Mar 13;11(3):607. doi: 10.3390/nu11030607. PMID: 30871141; PMCID: PMC6471836.
- 32-Ahmad J, Pathan MF, Jaleel MA, et al. Diabetic emergencies including hypoglycemia during Ramadan. *Indian J Endocrinol Metab.* 2012;16:512-515.
- 33- Al-Arouj M, Assaad-Khalil S, Buse J. Recommendations for management of diabetes during Ramadan: update 2010. *Diabetes Care*. 2010;33: 1895-1902.
- 34-Beshyah SA, Ali KF, Hafidh K, Hajjaji IM. Ramadan fasting and diabetes 2019: The year in review. Diabetes Res Clin Pract. 2021 Feb;172:108593. doi: 10.1016/j.diabres.2020.108593. Epub 2020 Dec 11. PMID: 33316310.
- 35- Niazi AK, Kalra S. Patient centred care in diabetology: an Islamic perspective from South Asia. *J Diabetes Metab Disord*. 2012;11:30.
- 36- Candido R, Wyne K, Romoli E. A review of basal-bolus therapy using insulin glargine and insulin lispro in the management of diabetes mellitus. *Diabetes Ther*. 2018;9:927-949.
- 37- M'guil M, Ragala MA, El Guessabi L, Fellat S, Chraibi A, Chabraoui L, Israili ZH, Lyoussi B. Is Ramadan fasting safe in type 2 diabetic patients in view of the lack of significant effect of fasting on clinical and biochemical parameters, blood pressure, and glycemic control? Clin Exp Hypertens. 2008 Jul;30(5):339-57. doi: 10.1080/10641960802272442. Erratum in: Clin Exp Hypertens. 2008 Oct;30(7):698.
- 38- Tewahido D, Berhane Y. Self-care practices among diabetes patients in addis ababa: a qualitative study. *PLoS One*. 2017; **12**(1):e0169062.
- 39-Lekoubou A, Awah P, Fezeu L, Sobngwi E, Kengne AP. Hypertension, diabetes mellitus and task shifting in their management in sub-Saharan Africa. *Int J Environ Res Public Health*. 2010;7(2):353–363.
- 40- ewahido D, Berhane Y. Self-care practices among diabetes patients in addis ababa: a qualitative study. *PLoS One*. 2017;**12**(1):e0169062.
- 41-Diabetes Canada Clinical Practice Guidelines Expert Committee Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Can J Diabetes*. 2018;**42**(Suppl 1):S88–S103.
- 42- Jenkins DW, Jenks A. Exercise and diabetes: a narrative review. *J Foot Ankle Surg.* 2017;**56**(5):968–974.
- 43- Thent ZC, das S, Henry LJ. Role of exercise in the management of diabetes mellitus: the global scenario. *PLoS One*. 2013;**8**(11):e80436.



Al-Kufa University Journal for Biology / VOL.14 / NO.3 / Year: 2022 Print ISSN: 2073-8854 Online ISSN: 2311-6544

- 44-Peeters B, van Tongelen I, Duran Z. Understanding medication adherence among patients of Turkish descent with type 2 diabetes: a qualitative study. *Ethn Health.* 2015;**20**(1):87–105.
- 45-Habte BM, Kebede T, Fenta TG, Boon H. Barriers and facilitators to adherence to anti-diabetic medications: Ethiopian patients' perspectives. *Afr J Prim Health Care Fam Med.* 2017;9(1):e1–e9.
- 46- Gucciardi E, Fortugno M, Senchuk A, Beanlands H, Mccay E, Peel EE. Selfmonitoring of blood glucose in Black Caribbean and South Asian Canadians with non-insulin treated Type 2 diabetes mellitus: a qualitative study of patients' perspectives. *BMC Endocr Disord*. 2013;**13**:46.
- 47-Taber JM, Leyva B, Persoskie A. Why do people avoid medical care? A qualitative study using national data. *J Gen Intern Med.* 2015;**30**(3):290–297.
- 48-Lawton J, Rankin D, Cooke DD, et al. Self-treating hypoglycaemia: a longitudinal qualitative investigation of the experiences and views of people with Type 1 diabetes. *Diabet Med.* 2013;**30**(2):209–215.