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To Dispel Darkness of Diabetes

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ESSENTIALS OF SETTING UP AN IDEAL DIABETES CLINIC

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Diabetes is a common and ubiquitous disease considered as an escalating global pandemic. India happens to be the world diabetes capital, as it accounts for 14% of the total world diabetes population. Currently, in India there are near about 75 million people with diabetes and this number is substantially increasing with the projection of near about 125 million by 2045. Current rise in number of diabetes is mainly due to rapid Westernization of lifestyle. Adoption of rapid changes in dietary patterns, desk-bound, sedentary lifestyle and increased weight are accounted for the primary reason of increase in diabetes cases. Also, in low-income countries like India high economic burden on households or individuals is a culprit for an increase in diabetes burden. Today the mean expenditure on diabetes per person is 92 US dollars (~7571.6 INR). A meta-analysis of 32 studies showed that in India the median direct cost of diabetes was estimated to be approx. INR 18,900/- p.a. for the North zone, INR 10,590/- p.a., for the South zone, INR 45,800/- p.a. for the North-East zone, and INR 8800/- for the West zone. This study highlighted the high economic burden among diabetes individuals in the country. India, being a differently resourced country, another factor for the high incidence of diabetes is the low number of efficient diabetes clinics and lack of awareness among patients, care providers (nurses) and general practitioners. Diabetes specific clinics could help people to manage and prevent most complications. An ideal diabetes clinic setup should comprise of all the basic needs for diabetes management i.e. knowledgeable clinic staff and testing equipment for diabetes. Also, the physicians must have proper follow-up systems. In public health care systems, there must be presence of specialists (diabetologist and endocrinologist) along with well-trained physicians to manage the patient overload. But the major bottleneck in the management of diabetes in India is a weak public health system. A study has reported the wide gap between effective management practices and its implementation for diabetes. Although, access to blood glucose measurements and antidiabetic drugs are available in most facilities of the country, there is still inadequate HbA1c estimation, lipid examination and foot care, mainly in primary health setups. Also, availability of insulin is limited to secondary and tertiary care. Thus, an ideal diabetes specific setup along with an adequate referral mechanism is a need of the country for controlling the current numbers.

The provision of affordable, high quality essential medicines and its availability is a necessary factor for a well-functioning health system. In modern India, essential medications are widely available throughout the country. Also, more than 5000 Jan Aushadhi stores which are government supported are operative in country which provides generic high-quality medicines at affordable price. At these stores, medicines are cheaper by at least 50% with more than 300 medicines having their prices reduced by at least 80%. In urban areas the e-pharmacy sector has also seen remarkable growth because of its convenience and the price discounts offered by start-ups in this sector. Also access to healthcare is easy with public health care

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services available at low cost throughout the country.

Not withstanding above facts, certain challenges remain regarding health care. In India, people believe public health care is of low quality and generic medications are not effective. Also, In India, culture and religion play a significant role in the health care of the patient. Blind adherence to religious or conventional cultural ways of treatment may cause delays in getting professional help and can affect overall health. Other problems include the lack of effective cold-chain management for insulin and unavailability of equipment for insulin storage in many parts of the country.

Basic requirements for setting up an ideal clinic:

An ideal diabetes clinic should offer besides consultations, diabetes testing and help diabetics receive necessary drugs and supplies. Since diabetes requires an extensive set up, opening a clinic is a viable commercial opportunity and also a chance to fulfil a genuine community need. Establishing a one-stop diabetes care centre or 'medical home' for persons with diabetes begins with space, the quantity of which is determined by the scope of services required. This includes reception area, a triage room, private consulting rooms, toilets and hand washing room and several more rooms to house other services: diabetes education, diet and examination. Once the foundation is in place, the growth of the centres can be modular, depending on the starting resources and available space. At the minimum, at a diabetes care centre, a diabetes-trained general practitioner or endocrinologist, a specialised nurse and/or a diabetes educator and a pharmacist should all be available.

Establishment of medical records system to manage patient data, insurance and check-in forms are required. This results in easy and efficient hand over and thereby any delays in initiating treatment. Patient appointment-reminders through a telephone call a week before appointments have reduced the 'no show' rates. With telemedicine, it may take just a phone call to connect with an expert to start appropriate fluids and insulin in emergency/ complications. So, implementation of teleconsultation for remote patients or in case of emergency, can facilitate more seamless patient management. Also, more time-efficient appointment scheduling between care providers for same day appointments is also possible.

Workforce Training:

A lot of change is occurring in the medical field, which is enabling medical professionals to manage diseases more efficiently and effectively. It is important for medical professionals to participate in scientific and evidence-based capacity-building programmes to improve their skills and knowledge. The diabetes education programme should not be only for patients but also for the workforce of the clinic. For setting up an ideal diabetes clinic it is essential that workforce including healthcare assistants, diabetes educators, receptionists and dieticians should be trained with knowledge of diabetes to identify and handle critical emergencies of hypoglycemia or hyperglycemia. Planning regular training programmes through various certification and accreditation programmes for workforce based on some practical challenges and ability to handle plays an important role. In addition, the study demonstrated the effectiveness of continuing medical education in improving the knowledge of healthcare workers in the management of Type 2 diabetes mellitus. In India, a number of programmes have been established to educate and train diabetes educators. These programme ensure a standardized level of skills and knowledge imparted through diabetes education.

Basic equipment needed in clinic:

General assessment of health and the screening

for complications are main components of diabetes care, hence equipment for these are important for ideal diabetes clinic. A complete diabetes clinic setup comprises of medical equipment for screening of diabetic retinopathy, diabetic nephropathy, peripheral neuropathy, other macrovascular complications (cardio-vascular and foot related) and diet counselling. Diabetes is a metabolic disorder that is characterized by high blood sugar. Fundamental in diabetes screening is testing the level of glucose in blood. The HbA1c test is an important blood test that gives accurate indication of diabetes control. Several additional blood tests are performed for early detection and status of control. Hence, basic laboratory services for testing are crucial for an ideal diabetes clinic. Minimum medical equipment needed includes devices to measure the blood glucose (glucometers, lancets, strips and glycated haemoglobin device) and anthropomorphic values (weight, height and waist circumference). Urgent required items include needles, alcohol swabs, sterilizer, urine sample cup and laboratory equipment for blood and urine testing. Need for filing equipment, computers, phones, chairs, medication storage and perhaps some books, leaflets and toys for the waiting room set up. Other equipment includes stethoscope, weighing scales and blood pressure instrument, urinalysis equipment; including urine pots for the patients, to test for glucose, ketones and urinary tract infections as well as microalbuminuria. Sharp boxes for the safe disposal of sharp equipment should also be made available. Insulin fridges for the safe storage of insulin and other medications is also required.

At the secondary or tertiary care level, certain specialized equipment may not necessarily be required, but can be introduced to improve the quality of services. This includes a biothesiometer and foot pressure distribution measurement equipment to manage diabetic foot problems. Similarly, a tonometer, fundus camera and an auto refractor for visual care is required. Along with BP monitoring, an ECG could be introduced for advanced cardiac care. Apart from these, a pharmacy would add to the overall clinic experience.

Special instruments:

Diabetes clinic can have some special instruments which results in better patient care.

Biothesiometer - All diabetes clinics should have a Biothesiometer, a device which helps to detect diabetic peripheral neuropathy and gives an idea of its progress. This device works on the principle of an electrical tuning fork and has a vibrating probe which when applied to the plantar aspect of feet helps detect neuropathy. These devices are now available at affordable cost in India.

TENS Machine - Also, if a physiotherapist is associated with diabetes clinic then a clinic can have a TENS (transcutaneous electrical nerve stimulation) machine. These devices are available at low cost within the country. TENS is a method for relieving pain by using mild electrical current. This would provide immediate pain relief to the patient which makes treatment of diabetic neuropathy possible within the clinic. It might also reduce the tablet burden for neuropathy.

Direct fundoscope – Another ideal instrument a diabetes clinic can have, is a fundoscope (ophthalmoscope). It is an instrument about the size of a small flashlight (torch) with many lenses that can magnify up to about 15 times. In this method, dilation of the pupil is generally not required. This device is also available at an affordable cost in India.

There are several types of blood tests that can be done for early detection and status of the control of diabetes. The laboratory services in an ideal diabetes clinic must include biochemistry, hematology, pathology and serology. If the laboratory facility is available, some routine tests like HbA1c, lipid profile, urine analysis, RFT and

LFT tests can be done easily. There should be sufficient equipment or machine in the diabetes clinic to carry out these tests.

Management of diabetes related emergency:

In the clinic, patients may present with diabetes related emergency. To manage this there should be emergency treatment available in the clinic. If a patient goes into hypoglycaemia it should be managed with the 15-15 rule. The term 'clinical hypoglycemia' refers to a plasma glucose concentration that is sufficiently low to cause signs and/or symptoms. The 15-15 rule is to raise patient's blood glucose by taking 15 grams of carbohydrate and check it after 15 minutes. If the blood glucose level is still below 70 mg/dL, one has to have another serving of glucose. Repeat these steps until patient's blood glucose is at least 70 mg/dL. Once his/her blood glucose is normal, he/she should consume food or snack to prevent another hypoglycemic episode. This may be: 3 or 4 Glucose tablets or Gel tube or 4 ounces (½ cup) of juice or regular soda (not diet) or 1 tablespoon of sugar or honey or corn syrup or 6-8 hard candy pieces. If a person is unable to swallow or is unresponsive, alternate methods such as subcutaneous, intramuscular or intranasal glucagon or IV glucose should be administered by trained medical personnel. Intranasal glucagon, dasiglucagon and non-aqueous soluble glucagon are novel and stable forms of glucagon which recently have become available for clinical use. These new FDA-approved formulations have demonstrated glycemic responses like standard glucagon formulations for the treatment of hypoglycemia, without reconstitution.

Patient may present with signs and symptoms of diabetic ketoacidosis or hyperosmolar hyperglycemic state in the diabetes clinic. Emergency treatment can lower patient's blood sugar to a normal range. Treatment usually includes fluid replacement, electrolyte replacement and insulin therapy. Insulin remains the best way to control hyperglycemia in this situation. Intravenous infusion of insulin is preferred method to achieve the recommended glycemic target. As patient's body returns to normal, health care provider should consider what may have triggered the severe hyperglycemia. Depending on the circumstances, patient may need additional tests and treatment.

Education materials:

Educating the patient about diabetes is of paramount importance. It results in better health outcomes for the patient. An ideal diabetes clinic should provide handouts to the patients about information on Type 1 and 2 diabetes, signs and symptoms of the disease, diet education, complications of the disease, do's and don't in diabetes, what to do in case of emergency (hypoglycemia or symptomatic hyperglycemia). The leaflets should also be available in local language. Along with that, clinic should also provide education in electronic format such as on television while the patients are waiting in the OPD. Apart from the leaflets and digital platform, verbal education is also very important as patients tend to trust the words of health care staff. It is responsibility of every health care staff that whenever they are dealing with the patient in diabetes clinic, they should provide education verbally to the patient in layman language and correct any misinformation or myths. The clinic staff can review the handouts with patients to ensure that patient have understood the instructions and answer any questions patients may have. Patients can share their experiences regarding diabetes and ask doubts which will eventually help to improve the knowledge in a group discussion.

Referral services:

Diabetes care also requires addressing other issues as diabetes mellitus is associated with macro and microvascular complications. Complications such as retinopathy, neuropathy, nephropathy and coronary artery disease can be managed efficiently if diagnosed early. Screening

for complications should be performed at regular intervals as recommended by guidelines. Patients should be referred to a specialist if symptoms or screening test indicates the presence of any complication. A diabetes clinic should have reference to health care professionals such as the dietician, podiatrists, ophthalmologist, psychologist, dentist or diabetes educator to manage diabetic patients more efficiently.

Soft skills: CARES

Diabetes creates a distress in patients and family members. Approaching patients and family members through a soft skill approach will help creating an ideal environment for patients to have an open discussion in the clinic. Patients with diabetes would require physician to provide CARES. CARES comprises of **Confident competence, Authentic accessibility, Reciprocal relationship, Expressive Empathy and Straightforward simplicity.** Patients would want the physician to exude confident competence. The physician should be confident but not arrogant at any stage of communication with patient. Also, the patient would want easy accessibility to their physicians or availability of care in emergencies. Relationship between the patient and the physician should be based on the system of reciprocal respect. However these systems are currently missing in our community. The reciprocal respect can be achieved by expressing empathy. An expression of gratitude with the creation of some humour with patients in a simple manner will develop a connect with the patient.

Conclusion:

In India, an ideal clinic setup is need of the hour for optimum diabetes management. Availability of well-knowledge staff, testing equipment, medication, education materials, proper referral services, equipment for managing diabetes emergency are some of the essentials for an ideal diabetes clinic. A soft skill approach for communication with patients will be value addition for staff and physicians to manage diabetes with ease.

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SGLT2 INHIBITORS AND GENITAL HYGIENE

Vaibhavi Rajesh Gala*

Introduction

Sodium-glucose cotransporter-2 (SGLT2) inhibitors are the novel class of oral anti-diabetic drug that work on reducing plasma glucose concentrations, independent of insulin release and action. The US Food and Drug Administration (FDA) and European Medicines Agency (EMA) have approved Dapagliflozin, Canagliflozin and Empagliflozin for clinical use in patients with Type 2 diabetes.

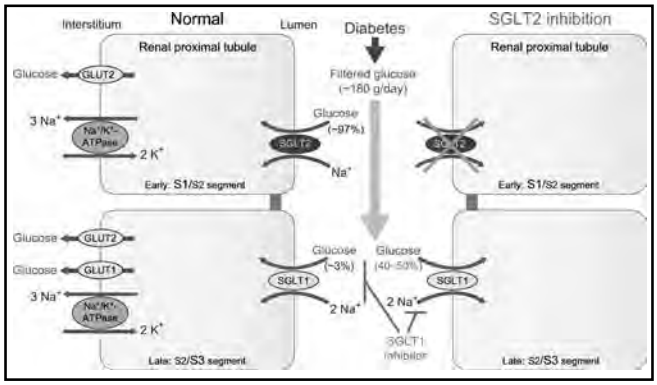
SGLT2 inhibitors increase urinary glucose excretion by preventing glucose reabsorption in the renal proximal tubules, thereby increasing the potential risk of Urinary Tract Infections (UTI) and non-sexual genital infections. This makes genital hygiene an important precautionary measure for Type 2 diabetics on SGLT2 Inhibitor therapy.

Mechanism of action of SGLT2 Inhibitors

Sodium-glucose cotransporter-2 (SGLT2) proteins are transporters expressed in the renal proximal convoluted tubule, which is responsible for the re-absorption of approximately 90% of filtered glucose. As per Figure 1, SGLT2 and SGLT1 proteins are expressed in the luminal membrane of the Proximal Convoluted Tubule (PCT) (specifically S1 and S2 segment) and late PCT (specifically S2 and S3 segment), respectively; Most of the filtered glucose is reabsorbed by stimulation of SGLT2 action. SGLT2 inhibitors work to reduce the normal renal threshold for glucose reabsorption from 180 mg/dL to as low as from 40 to 120 mg/dL thereby glucose levels above this range is excreted. Thus, they inhibit resorption of glucose in proximal tubules and thereby reduce blood glucose.

Figure 1:

Mechanism of action of SGLT2 inhibitors



Source: Rieg, T., & Vallon, V., Diabetologia; 2018.

Side-Effect of SGLT2 Inhibitors on Genital Health

Type 2 diabetes itself escalates UTI risk by one and a half to four-fold in patients by reducing mucosal immune defense because of chronic hyperglycemia.

The risk additionally gets aggravated in Type 2 diabetes patients treated with SGLT2 inhibitors as a pharmacologically-induced urinary glucose excretion causes additional growth of commensal genital microorganisms especially bacteria and yeast. This results in enhanced risk of genital infections and UTI's in these patients.

SGLT2 inhibitors cause mild to moderately severe genital infection in Type 2 diabetes patients. The symptoms manifested are dysuria, frequent urination, urinary urgency, and/or suprapubic discomfort. Symptoms of genital yeast infections include redness, itchiness, rash, pain or soreness, swelling and thick white discharge.

SGLT2 inhibitors can also cause UTI related conditions such as Pyelonephritis, Urosepsis

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and Cystitis which are more severe form of infections. It manifests symptoms such as frequent urination, burning micturition, dark or cloudy urine, strong odor in urine, pelvic pain, fever or chills, nausea, vomiting and fatigue.

Gender based differential risk for Genital infections

The prevalence of genital infections is similar in both the genders of patients with Type 2 diabetes. However, most studies reveal that females are at higher risk, especially those who already have history of genitourinary tract infections. Vulvovaginal infections in females and balanitis in males are the most common mycotic genital infections in Type 2 diabetes patients.

In Indian women, fungal species isolated causing genital infections *are candida glabrata, candida albicans and candida tropicalis* in descending prevalence rate. There is strong homology of structure of glucose-inducible proteins produced by the fungus *C. glabrata* to functionally and structurally similar complement receptor CD11b or CD18 found on the female mammalian phagocytes. This protein enables the fungi to adhere strongly to the vaginal epithelium and multiply, thereby making *C. glabrata* the most common fungus causing vaginal candidiasis. The risk of genital infections is higher in menopausal women due to hormonal changes resulting in compromised immune response in the female reproductive tract.

In males, circumcision is found to be associated with easier maintenance of genital hygiene which reduces incidence of genital infection. The moist and warm space below the foreskin in uncircumcised males stimulates the growth of the microorganisms.

Drug based differential risk for Genital infections

Canagliflozin causes a slightly higher risk of genital infections, followed by Dapagliflozin and Empagliflozin.

Research studies in females with Type 2 diabetes on Canagliflozin revealed that as the drug dosage increases from 50 mg, 100 mg, 200 mg, to 300 mg daily for 12 weeks, the incidence of vaginal Candida colonization and symptomatic vulvovaginal adverse events escalate.

Similar findings were found in research studies with Dapagliflozin and Empagliflozin administration, increased dosage of the drug increased the incidence of UTI in comparison to Placebo. Females were at a risk to vulvovaginal mycotic infections and vulvovaginal pruritus whereas males had the prevalence of balanitis. Although these infections were lower in males, they affected males on SGLT2 inhibitors as compared to placebo.

For all three drugs, findings indicated that the risk of genital infections can be minimized by maintaining perineal hygiene and standard antifungal or antibacterial therapy without any discontinuation of SGLT2 inhibitor treatment.

Other risk factors for Genital infections

Type 2 diabetes patients on SGLT2 inhibitors with previous history of genitourinary infections are more prone to risk of recurrent genital infections; greater risk is associated if the previous infection encounter has been more recent.

Interestingly, a high HbA1c does not produce added risk of genital infections in patients with SGLT2 inhibitors. The reason being, SGLT2 induced glycosuria occurs in all patients irrespective of the HbA1c levels being high, low or normal, So the association between glycosuria and genital infection reaches a saturation point above which increased glycosuria does not increase infection risk.

The usage of SGLT2 inhibitors for long duration increases the risk of genital infections. Relatively, higher the BMI, higher is the risk associated for genital infections. However, there is proven research data that SGLT2 inhibitors cause weight loss. So, obese patients should be educated on

both the benefits and side effects of this drug and counseled on treatment and prevention of genital infections and UTI.

Treatment

Since the SGLT2 inhibitor induced genital infections are mostly mild to moderately severe, patients respond well to the standard conventional antifungal or anti-bacterial therapy, and do not need discontinuation of SGLT2 inhibitor therapy.

As per the Infectious Diseases Society of America, the clinical practice guidelines, recommends treatment of uncomplicated Candida Vulvovaginitis with topical antifungal agents. Whereas oral Fluconazole 150 mg dosage weekly for 6 months is recommended only for patients with recurrent infections. Even for *Candida balanitis,* topical therapy is usually sufficient in most cases.

Prevention

All people with diabetes should be advised on preventive measures regarding perineal hygiene, irrespective of their anti-diabetic treatment therapy.

This should include the following routine care –

- To wash genitals from front-to-back.
- To properly wash genitals, post urination or defecation.
- To urinate regularly and do not hold urine.
- To use clean water for washing or mild soap if required.
- To use hygienic wipes or sprays.
- To avoid alcohol-based disinfectant for washing.
- To prefer loose-fitting cotton based bottoms and undergarments over synthetic fabrics, as latter traps moisture and creates breeding ground for infection.

Table 1:

Gender specific Perineal Hygiene Guidelines

FEMALE	MALE
To clean the inner legs, labia, and groin area	To clean the tip and shaft of the penis, along with the scrotum
Menstruating females to maintain hygiene and sanitization. Tampons to be preferred over pads as tampons keep perineal area drier.	Uncircumcised males to retract the prepuce fore-skin before washing.
Void urine to empty bladder post sexual intercourse and drink two glasses of water to increase urine flow.	To maintain perineal hygiene, post sexual intercourse.

Dietary Guidelines

A healthy balanced therapeutic diabetic diet is essential for both prevention and treatment of genital infections and UTI in Type 2 diabetes patients.

It is advisable for Type 2 diabetes patients to increase dietary water intake so as to lower urine osmolarity by dilution.

Vitamin C prevents UTI as it creates less tolerable environment for bacteria to grow, lowers the pH, maintaining urine acidity. Vitamin C rich sources like amla, orange, sweet lime, guava, pumello, kale, kiwi, berries can be recommended to Type 2 diabetes patients.

Proanthocyanidins compounds naturally found in cranberries have been proven to prevent UTI by preventing adhesion of the bacteria to urinary tract wall.

Conclusion

The risk of increased genital infections in Type 2 diabetes patients with SGLT2 inhibitors is a known fact. Research indicates that the side effect is reversible in most patients with the use of conventional anti-fungal treatment. Since prevention is always better than cure, patient

education on perineal hygiene becomes one of the important advices for Type 2 diabetes patients on SGLT2 inhibitors and it has been proven to lower the risk of genital mycotic infections and UTI.

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Risk and care of vitamin B_{12} deficiency in people with diabetes

Munira Husain* & Zainab Nadeem **

Vitamin B_{12} is a water-soluble vitamin; it plays a very vital role in maintaining neurological functions, DNA synthesis and optimal hemopoesis. The deficiency of vitamin B_{12} is common in India because malnutrition exists across socio-economic boundaries. Vitamin B_{12} cannot be synthesized by the body so this should be provided through diet. There are many diet related reasons for these which include lifestyle, social and cultural issues. The core cause of vitamin B_{12} deficiency are multi-factorial which mainly includes insufficient dietary intake. Strict vegetarianism poses greater risk of developing vitamin B_{12} deficiency versus non-vegetarians and lacto-ovo vegetarians, because foods providing B_{12} are of animal origin. Furthermore, malabsorption of B_{12} is common in people who have diseases or situations that hinder the absorption of the vitamin like infection, chronic alcoholism, gastrointestinal diseases or surgery and interaction with drugs. Vitamin B_{12} absorption and utilization is compromised with the persistent use of medications including potassium supplements, metformin, oral contraceptives, antivirals, proton pump inhibitors (PPIs) and nicotine which interfere with the absorption of B_{12} obtained from food but not from supplements. Fortified foods contain B_{12} in its free form, so they may be more easily absorbed.

Varied manifestations of B_{12} deficiency prevails in isolation and co-occurs with other co-morbidities. Vitamin B_{12} deficiency among patients with Type 2 diabetes mellitus (T2DM) is one of the commonest co-morbid conditions. In view of the growing incidence of diabetes mellitus and as per recent guidelines metformin is a prime glucose lowering agent with life-style modification. Metformin is also recommended for patients with impaired fasting glucose and to those who had impaired glucose tolerance along with other risk factors like elderly people (> 60 year age) with a Body Mass Index ≥ 35 kg/m^2, diabetes existing in first degree of relatives, elevated triglycerides and/or reduced HDL cholesterol, high blood pressure and HbA1c > 6.0%.

Increasing age, metformin dose and duration of use greatly influences the risk of developing metformin-associated vitamin B_{12} deficiency. Clinically vitamin B_{12} deficiency manifests in 5–10 years owing to the large body stores in the liver mainly that are not quickly depleted. Vitamin B_{12} deficiency also results in hyper homocysteinemia (HHcy) which is associated with an increased risk of several diabetes co-morbidities. The proposed mechanisms to explain metformin-induced vitamin B_{12} deficiency among patients with T2DM include alterations in small bowel motility which stimulates certain bacterial overgrowth with further vitamin B_{12} deficiency as well as competitive inhibition or inactivation of vitamin B_{12} absorption and causes alterations in intrinsic factor (IF) levels. It has also been shown that metformin inhibits the calcium-dependent absorption of the vitamin B_{12}-intrinsic factor complex at the terminal ileum. This inhibitory effect can be reversed with calcium supplementation. It has also been advised that diabetic patients with gastrointestinal diseases

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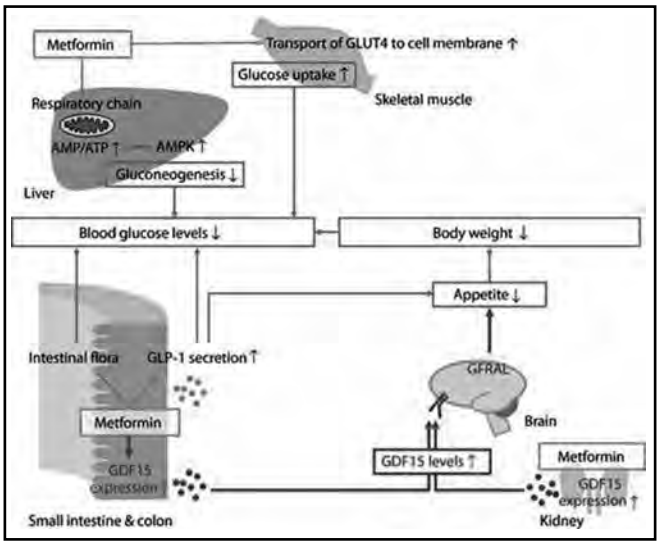
should be screened and treated for vitamin B_{12} deficiency eventually.

Type 1 DM (T1DM) is an autoimmune condition that results from autoimmune destruction of insulin-secreting beta cells of the pancreas. Type 1 DM can also result into vitamin B_{12} deficiency by blocking the binding of vitamin B_{12} to IF, thus preventing its absorption. Primary autoimmune hypothyroidism and celiac disease are also frequent co-morbidities among patients with T1DM which directly affect vitamin B_{12} metabolism.

Metformin reduces blood glucose levels by inhibiting gluconeogenesis in the liver. Metformin also works on the intestine and lowers blood glucose levels and body weight by diverse mechanisms. Figure 1 shows the mechanisms by which it reduces body weight and blood glucose levels.

Figure 1:

Mechanisms by which metformin reduces body weight and blood glucose levels

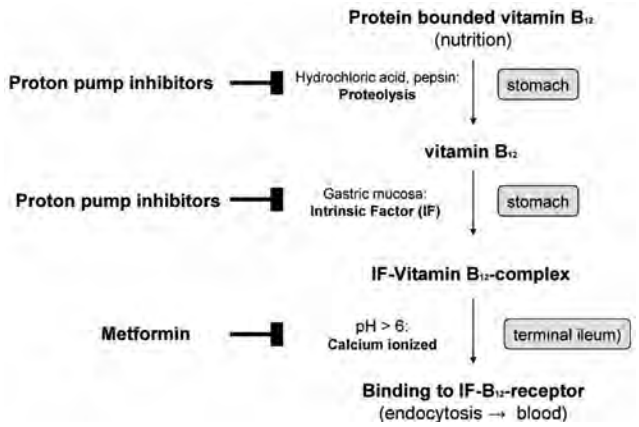


Source: Harada et al, Journal of Diabetes Education; 2020

Thus, based on available evidence of the association between metformin use and depletion of B_{12} levels, there is a recommendation to periodically check vitamin B_{12} status when clinically indicated. Also guidelines recommend vitamin B_{12} supplementation among diabetes patients receiving metformin. However, among Type 2 diabetic patients, it is clinically reasonable to screen for vitamin B_{12} deficiency prior to commencement of metformin use and later conduct an annual checkup especially among elderly patients with a history of long-term use of metformin (≥3-4 years), use of high doses of metformin (≥2 g/day) and/or with clinically diagnosed diabetic neuropathy. The screening approach for vitamin B_{12} deficiency among diabetic patients and the general population is similar. Measurement of the serum vitamin B_{12} concentrations ought to be the preliminary screening step. Concentrations <200 pg/ml are generally diagnostic of vitamin B_{12} deficiency while concentrations >400 pg/ml verify absence of vitamin B_{12} deficiency and while concentration ranging from 200-400 pg/ml indicates subclinical deficiency. Measurement of serum homocysteine or methylmelonicac acid (MMA) concentrations is a more specific and sensitive approach for screening especially among Type 2 diabetic patients with borderline serum vitamin B_{12} concentrations and slight haematological manifestations. Serum B_{12} along with mean corpuscular volume (MCV) seem to be used in a large amount in clinical settings. Unfortunately, diagnosis of vitamin B_{12} status by these two assessment methods are not considered always precise. Considering that hyperhomocysteinemia is associated with a number of diabetes co-morbidities, methylmalonic acid (MMA) could be considered the most reliable diagnostic tool to assess vitamin B_{12} status. Preferably, clinicians should take homocysteine beside MMA in order to get the best picture of vitamin B_{12} status. On the other hand, basically with the exception of serum/plasma vitamin B_{12} and MCV, any combination of two of the above described assessment methods (eg. serum B_{12} and /or serum vitamin B_{12} combined with serum MMA) should give more reliable assessment of vitamin B_{12} status than any single method of appraisal.

Figure 2:

How Metformin Causes Vitamin B_{12} deficiency?



Source: Fatima et al; American Journal of Phytomedicine and Clinical Therapeutics: 2019

However, among patients with T1DM, there are no clear guidelines regarding screening for vitamin B_{12} deficiency. Though, due to the high prevalence of pernicious anaemia and subsequent vitamin B_{12} deficiency among T1DM, it would be pragmatic to screen at diagnosis and then yearly for 3 years and five yearly thereafter or in the presence of any clinical indication since vitamin B_{12} deficiency can develop at anytime.

All patients deficient of vitamin B_{12} should receive either intramuscular injections or oral B_{12} supplements. Both of these can improve haematological and neurological symptoms. There is large variation in the frequency of intramuscular injections, from daily to weekly at the onset of treatment and monthly injection on follow-up. Daily or even alternate day injections are infrequently used for further treatment. Monthly injections are used to continue to attain and maintain adequate vitamin B_{12} status. A supplemental vitamin B_{12} dose of 1000 µg/day is just as efficient therapy with intramuscular injection. Supplementary vitamin B_{12} therapy has proved to be cost effective treatment and ensures consistent supply of the vitamin. More than one form of vitamin B_{12} is available both as intramuscular and as oral supplements. They include methylcobalamin, cyanocobalamin, and hydroxocobalamin. All of these forms are effective in treating vitamin B_{12} deficiency. Folate administration prior to correcting vitamin B_{12} deficiency should be avoided because it results into worsening of the associated neurological manifestations. Patients who use medications that involve gastric acidity may require utilizing supplements with higher doses. The same may be true of elderly patients with diabetes. Therapeutic benefits of vitamin B_{12} replacement among Type 2 diabetic patients with diabetic neuropathy have been shown to cause improvement in symptoms of pain and paresthesia.

Suggestions for prevention of Vitamin B_{12} deficiency in DM

1. Maintain healthy blood sugar levels.
2. Proper diet, regular exercise and adequate sleep pattern should be followed.
3. Diet including good sources of vitamin B_{12} like fish, poultry, eggs, dairy products should be consumed.
4. Vitamin B_{12} fortified nutritional yeast, cereal, bread, tofu can be used.
5. Check nutrition labels carefully for vitamin B_{12} content.
6. Follow the doctor's advice to avoid serious complications of vitamin B_{12} deficiency.
7. Considering the effect of metformin treatment on vitamin B_{12} status and the fact that many diabetes patients are at a high risk of vitamin B_{12} deficiency, a routine check for Vitamin B_{12} status is recommended.

References for Further Reading:

1. Harada N. Effects of metformin on blood glucose levels and bodyweight mediated through intestinal effects. J Diabetes Investig. 2020; 11: 1420-1421.
2. Kim J, Ahn CW, Fang S, Lee HS, Park JS. Association between metformin dose and vitamin B_{12} deficiency in patients with type 2 diabetes. Medicine (Baltimore). 2019; 98 :e17918.
3. Mazokopakis EE, Starakis IK. Recommendations for diagnosis and management of metformin-induced vitamin B_{12} (Cbl) deficiency. Diabetes Res Clin Pract 2012; 97:359–67.
5. Fatima, S., Noor, S. 2013. A review on effects of metformin on vitamin B_{12} status. American Journal of Phytomedicine and Clinical Therapeutics, 1:652-660.
6. https://epomedicine.com/medical-students/metformin-vitamin-B_{12}-deficiency/ (accessed on March 20, 2023)

QUESTION AND ANSWERS

Q. Can diabetes affect bladder control?

Ans. Yes, this could be a possible symptom of advanced autonomic neuropathy. If this is the case in the early course of diabetes, it means your diabetes has been present and progressing for a long time, probably several years before it was diagnosed. One may have noticed reduced feelings in feet and hands, like reduced pain by a pinprick. This would often be accompanied by erectile dysfunction in males. This should be discussed with the physician, who is in the best position to advise one on the next course of action.

Q. Is the "Plate Method" good for teaching patients with Type 2 diabetes?

Ans. Use the Healthy Eating Plate as a guide for creating healthy, balanced meals—whether served at the table or packed in a lunch box.

- Make most of your meal vegetables and fruits – ½ of your plate. Aim for color and variety of fruits and vegetables.
- Go for whole grains – ¼ of your plate. Whole and intact grains—whole wheat, barley, wheat,, quinoa, oats, brown rice and foods made with them, such as whole wheat pasta as they have a milder effect on blood sugar and insulin than white bread, white rice and other refined grains.
- Protein power – ¼ of your plate. Fish, poultry, beans and nuts are all healthy and versatile protein sources as they can be mixed into salads and paired well with vegetables. Limit red meat and avoid processed meats such as bacon and sausage.
- Healthy plant oils – in moderation. Choose healthy vegetable oils like olive, canola, peanut, soy, corn sunflower and others and avoid partially hydrogenated oils which contain unhealthy trans fats.
- Drink atleast 6-8 glasses of water. Skip sugary drinks and limit high fat milk and dairy products to one to two servings per day. Limit juice to a small glass per day.

The main message of the Healthy Eating Plate is to focus on diet quality by including the appropriate type of carbohydrate is most important rather than focusing on only the amount of carbohydrate in the diet, because some sources of carbohydrate like vegetables as well as fruits, whole grains and beans are healthier than other options.

JJ

RECIPES

JOWAR AND VEGETABLE PORRIDGE RECIPE

INGREDIENTS:

30 gm Jowar Seeds , ground to a coarse mix

50 gm French Beans, finely chopped

50 gm Carrots, finely chopped

1 Green Chilli , finely chopped

1 sprig Curry leaf

2 teaspoons Coriander leaves, finely chopped for garnish

1 teaspoon Mustard seeds

1 teaspoon Oil

Salt to taste

METHOD:

1. To begin, pressure cook the coarsely ground jowar with 4 cups of water and salt to taste for 4 whistles using a pressure cooker. Keep aside.
2. Now heat oil in a wide pan, add the mustard seeds and let it crackle.
3. After the mustard seeds have crackles add the green chillies, curry leaves and let it splutter.
4. Once done add the beans, carrot and a pinch of salt and saute for 2 minutes till the vegetables are cooked yet crunchy in texture.
5. Now add the cooked jowar to the pan, add some water, season with salt and simmer the jowar and vegetable porridge for 5 minutes.
6. Once the porridge reaches the desired consistency turn off the heat and garnish it with coriander leaves.

Provides 2 servings

Nutritional information per serving:

Energy (Kcal)	Carbohydrate (gm)	Protein (gms)	Fats (gms)	Fibre (gm)	Glycemic Index
200	27	5	7	7	Low

Special features:

- A healthy recipe for main meals: breakfast, lunch and dinner
- A recipe rich in fibre

SWEET AND SOUR TOFU GRAVY

INGREDIENTS

100 gm firm Tofu

50 gm Red Bell Pepper

50 gm Cabbage (¼ of medium cabbage)

1 teaspoon Oil

FOR GRAVY

30 gm Tamarind

1 teaspoon roasted Cumin seeds powder

1 teaspoon Salt

¼ teaspoon Turmeric (haldi)

¼ teaspoon Black Pepper

¼ teaspoon red Chili Powder

1 tablespoon finely shred Ginger

Sucralose as per taste

METHOD

1. Soak tamarind in ¼ cup of warm water for 15 minutes. Squeeze the tamarind mixture well, then discard tamarind pieces leaving a thick pulp.
2. Add the remaining ingredients of the sauce to the tamarind pulp; Mix well and set aside.
3. Squeeze the tofu gently keeping between your both palm.
4. Cut tofu into ¾ inch thick slices then and pat dry between paper towels. Then cut slices into ¾ inch cubes.
5. Remove seeds from the whole bell pepper and slice ¼ inch thick lengthwise.
6. Heat oil in a wide pan over medium heat. Stir fry tofu pieces until golden brown in color for approximately 2-3 minutes. Remove from pan and place on a paper towel.
7. In the remaining oil, first stir-fry bell pepper for a minute then add cabbage and continue to stir fry it for approximately 2 more minutes over medium heat. Vegetables should still be crunchy.
8. Add tofu and tamarind sauce to the vegetables in the pan, stir well and let it simmer over low heat for 4-5 minutes.
9. Sweet and Sour Tofu gravy taste good with chapati.

Provides 2 servings

Nutritional information per serving:

Energy (Kcal)	Carbohydrate (gm)	Protein (gms)	Fats (gms)	Fibre (gm)	Glycemic Index
150	5	11	5	2	Low

Special features:

- A healthy recipe for midmorning or evening snacks
- A recipe rich in protein

JJ

HOW KNOWLEDGEABLE ARE YOU?

1. Which insulin is likely to produce lowest incidence of hypoglycemia?
   A. NPH
   B. Human Regular
   C. Humalog
   D. Glargine

2. Which sulphonylurea is the safe for use in chronic renal failure?
   A. Gliclazide, short acting
   B. Glimepiride
   C. Glipizide
   D. Glibenclamide

3. Best renal function preservation and heart failure reduction is seen with the use of?
   A. Linagliptin
   B. Liraglutide
   C. Canagliflozin
   D. Sitagliptin

4. Best method of insulin delivery in hyperglycemic crisis is?
   A. I. V. Insulin Infusion
   B. S. C. Insulin every 2 hours
   C. I. M. Insulin
   D. Sliding scale insulin

5. Earliest detection of small fiber sensory neuropathy in diabetes is possible by?
   A. Electrophysiological studies
   B. Erectile dysfunction
   C. Postural Hypotension
   D. Symptoms of tingling, numbness and burning of feet

6. Which sweetener and how much of it does one can of cola contain?
   A. 54 mg saccharin
   B. 188 mg Aspartame
   C. 75 mg Fructose
   D. 200 mg Sucralose

7. As part of the counter-regulatory responses to hypoglycemia, what happens first?
   A. Glucogon is secreted
   B. Insulin secretion is suppressed
   C. Epinephrine and norepinephrine is secreted
   D. Growth hormone and cortisol are secreted

8. The leading cause of blindness in working age population at large is?
   A. Cataract
   B. Glaucoma
   C. Diabetic Retinopathy
   D. Keratitis

9. As compared to large LDL particles, small dense LDL particles are:
   A. Less athergonic
   B. Equally atherogenic
   C. More atherogenic

10. GLP-RA therapy is not associated with side effects of:
   A. Diarrhea, vomiting
   B. Epigastric fullness
   C. Drowsiness
   D. Belching

ANSWERS:

1. D	2. C	3. C	4. A	5. A	6. D
7. B	8. A	9. C	10. C		

MYTHS AND FACTS

1. **White potatoes are unhealthy**

   Often labelled as "unhealthy", white potatoes are restricted by many people wanting to lose weight or control their diabetes and improve their overall health.

   Just as eating too much of any food, including white potatoes can lead to weight gain, these starchy tubers are highly nutritious and can be included as part of a healthy diet. White potatoes are an excellent source of many nutrients, including potassium, vitamin C and Fibre. Potatoes and other starchy foods, actually contain a special type of starch, called resistant starch which is not digested by your body. It's "resistant" because it cannot be broken down by the digestive enzymes produced by your body, so it travels all the way to your large intestine where it feeds your gut microbiome. Additionally, they are more filling than other carbohydrate sources, like rice and pasta and can help you feel more satisfied after meals. If someone wants to have potatoes than they can reduce one exchange of cereal and can include potato in their diet. Enjoy potatoes with skin preferably and baked or roasted, not fried.

2. **Following a very low calorie diet (VLCD) is the best way to lose weight**

   These diets are usually <600 kcal/ daily. While reducing calorie intake can indeed accelerate weight loss as cutting calories too low can lead to multiple metabolic adaptations and long-term health consequences.

   Though going on a very low calorie diet is likely to promote rapid weight loss in the short term, long-term adherence to such diets leads to a reduction in metabolic rate, increased feeling of hunger and alterations in satiety. This makes long-term weight maintenance difficult. This is why studies have shown that low calorie dieters rarely succeed in keeping excess weight off in the long term but a mild restriction may help maintain weight loss in the long term, thus aiding weight sustenance.

3. **Fibre supplements are a good substitute for high-fibre foods**

   Many people struggle with getting adequate dietary fibre, which is why fibre supplements are so popular. Although fibre supplements confer benefit health benefits by improving bowel movements and blood sugar control, they should not replace regular food intake or be used as meal replacements.

   High-fibre whole foods like vegetables, beans and fruits contain nutrients and plant compounds that work synergistically to promote one's health and cannot be replaced by fibre supplements. Hence fibre supplements are not be used in lieu of foods with high nutritive value in terms of macro and micronutrients.

4. **All smoothies and juices are healthy**

   Certain juices and smoothies are highly nutritious. For example, a nutrient-dense smoothie or freshly-made juice composed primarily of non-starchy vegetables can be a great way to increase one's vitamin, mineral and antioxidant intake. Yet, it is important to know that most juices and smoothies sold at stores are loaded with sugar and calories. When consumed in large portions, they can promote weight gain and other health issues like tooth decay and blood sugar dysregulation. Instead smoothies prepared at home with low fat milk/yogurt, fruit (no

sugar) and cold pressed juices with pulp are preferable.

5. Everyone can benefit from a probiotic

Probiotics are amongst the most popular dietary supplements on the market. However, practitioners generally overprescribe the products. Research has demonstrated that some people may not benefit from probiotics like others do.

Not only are some people's digestive systems resistant to probiotic colonization, but introducing probiotics through supplements may lead to negative changes in their gut bacteria. Additionally, bacterial overgrowth in the small intestine related to probiotic use can lead to bloating, gas and other adverse side effects. Additionally, some studies show that probiotic treatment following a course of antibiotics may delay the natural reconstitution of normal gut bacteria. Instead of being prescribed as a one-size-fits-all supplement, probiotics should be more personalized and only be used when a therapeutic benefit is required.

JJ

CERTIFIED DIABETES EDUCATOR COURSE

Dr Chandalia's DENMARC in association with Help Defeat Diabetes Trust (HDDT) presents to you a course to be a Certified Diabetes Educator (CDE)!

Help Defeat Diabetes Trust (HDDT) is a registered, non-profit public trust, having amongst its many objectives, the main objective of promoting education and awareness about diabetes among people from different fields.

Who can enroll?

Graduates in Nutrition, Nursing, Pharmacy, Occupational and Physiotherapy.

What is the duration of the course?

6 months, including 3 months (300 Hours) of hands-on training and experience with a recognized mentor in your own town (see this on our website).

How can I do this course from my place of residence?

The Mentor can be selected from the particular locality and under whom the training can be done.

How will I get the course material?

All course material is available online on our website.

What are the course fees?

The standard fees for the course are INR 10,000/- only.

Where can I get more information about this course?

Kindly visit our website **http://www.helpdefeatdiabetes.org** or you can get in touch with us on our email id: heldefeatdiabetesinfo@gmail.com.

CERTIFIED DIABETES EDUCATOR COURSE

HELP DEFEAT DIABETES TRUST announces

Reward of Rs. 10,000/- for securing the highest marks

Nature of Course: Virtual and Hands on

Duration: 6 months

Course Highlights:

- Get certificate of training in diabetes
- Get practical exposure under a recognized mentor in your own town
- Get access to 800 pages of study material and more than 18 audio & audiovisuals.

Criteria for award:

- To complete the course in given time frame i.e. 6 months.
- To secure highest marks in the current year.

For further details visit helpdefeatdiabetes.org

MEMBERSHIP FORM

Association of Diabetes Educators (ADE)

(For eligibility criteria: Check Website www.diabeteseducatorsindia.com)

Name …… Date of Birth: ……

Address ……

……

Telephone: Res: …… Office: …… Cell: ……

E-mail id: ……

Educational Qualifications:……

……

……

Work Experience: ……

……

……

Currently employed at: ……

……

Certificates attached*: ……

……

Please pay the membership fees through NEFT / RTGS to the following bank account.

The details are as folllows:

Account name: Association of Diabetes Educators

Account type: Savings Account

Name of the bank: Bank of India

Account number: 006610110001734

IFSC Code: BKID0000066

……

Signature

CHALLENGES IN DIABETES EDUCATION

AN AWARD FOR PROBLEM RESOLUTION IN DIABETES EDUCATION

SPONSORED BY DR. CHANDALIA'S HELP DEFEAT DIABETES TRUST

Prize money of Rs. 10,000 for reporting a problem case

Dr. Chandalia's HDDT aims to enhance the quality of Diabetes education in India by creating a world-class research and education environment and to build up a platform of networking and knowledge sharing within diabetologists and/or diabetes educators.

Challenges in Diabetes Education 2023 places special emphasis on supporting educational initiatives that have the potential to improve and significantly revolutionize diabetes care, enhance self-management and/or support patients with Type 1 or Type 2 Diabetes Mellitus. The educator should describe an individual or group case history and identify the problem in diabetes education. Furthermore, s/he should describe the plan of education to resolve the issue, partly or totally. The issue described may be related to patient perceptions, knowledge, behaviors and implementation of advice given. S/He should describe her struggle in resolving the issue including her triumphs and failures, the methodologies used and ethical, socio-economic and behavioral aspects of the case.

General Rules and Regulations regarding the eligibility Criteria for the Award

- The applicant of the Award should be a citizen of India and member of Association of Diabetes Educators.
- The case discussion should be on the subject of Diabetes Education.

The best case chosen by a group of referees will be awarded "Challenges in Diabetes Education Award- 2023" - which will carry a cash prize of Rs 10,000. The awardee will get the opportunity to present the case in the annual meeting of Association of Diabetes Educators and publish it in the journal of Diabetes Education.

The last date for the submission is 30th December, 2023 !!!!

(Instructions for authors is available on website www.diabeteseducatorsindia.com)