

Management of diabetes mellitus through teleconsultation during COVID-19 and similar scenarios - Guidelines from Indian Council of Medical Research (ICMR) expert group.

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Authors: ICMR - National Centre for Disease Informatics and Research (NCDIR), Bengaluru, Karnataka, 562 110, India. Electronic address: gokuls.ncdir@icmr.gov.in.

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Precise indications for teleconsultation, clinical care services which can be provided, and good clinical practices to be followed during teleconsultation are explained. Guidance on risk assessment and health education for diabetes risk factors, counselling for blood glucose monitoring, treatment compliance, and prevention of complications are described.

The guidelines will help physicians in adopting teleconsultation for management of diabetes mellitus, facilitate access to diabetes care and improve health outcomes.

Telemedicine has gained importance in providing health care services, especially in the aftermath of the COVID-19 pandemic. World Health Organization (WHO) defines telemedicine as the use of electronic information and communication technologies to provide and support health care (exchange of valid information) where distance is a critical factor that separates the participants from the health care providers [1]. These are cost-effective tools that would increase health care access and improve patient health outcomes [2].

Just at the onset the COVID-19 pandemic in India, the Ministry of Health and Family Welfare (MoHFW), Government of India released “Telemedicine Practice Guidelines” in March 2020 that provides general guidelines and practical inputs for the treating physician to use telemedicine. This has provided a boost in adopting telemedicine for a range of services – tele-diagnostics, tele-monitoring, tele-consultation and tele-referral; highlighting the need for specific guidelines contextualised to the disease and level of health care service delivery [3].

Among Non-Communicable Diseases (NCDs), diabetes has distinct characteristics like delayed diagnosis due to a long asymptomatic phase, need for regular screening of complications, frequent follow-up visits for disease monitoring that requires long term clinical care and support [4]. The use of telemedicine in delivering clinical care to individuals with diabetes mellitus in other countries has shown reduction in glycated haemoglobin (HbA1c) levels by 0.37% as compared to 0.31% in control arm. ($p < 0.001$) [5]. It has also resulted in improved consultation with physicians, treatment compliance, reduction in blood glucose and blood pressure levels and increased screening for diabetes complications [5 , 6]. In India, practical guidance for physicians to use telemedicine in diabetes management was published from the early experience of Telemedicine adoption in 2020 [7] following the COVID-19 pandemic restrictions. This also highlighted the need for more comprehensive guidelines to cater to all levels of private and public health systems across the country.

Indian Council of Medical Research-National Centre of Disease Informatics and Research (ICMR-NCDIR), Bengaluru steered the development of a Framework for telemedicine use in Management of Cancer, Diabetes, Cardiovascular Disease (CVD) and Stroke in India [8] which explains practices to be followed by primary health care providers in adopting and using telemedicine effectively for NCD care. Working groups (chaired by a convener) of experts in respective areas and scientists of ICMR-NCDIR developed a framework of Telemedicine Guidelines for the areas of cancer, diabetes, CVD and stroke. Contents was developed by the experts through consensus in a series of meetings and discussions. The guidelines were derived from literature search of existing practice guidelines, application of knowledge and real-time experience in management of diabetes using teleconsultation. In addition, the guidelines were reviewed by a group of experts in diabetes for completeness and practicality. Further to this, the guidelines were edited and finalised by the Convener and ICMR-NCDIR. This paper summarises and discusses the practical application of telemedicine in providing clinical care to individuals with diabetes mellitus. This will be useful during the COVID-19 pandemic-induced restrictions in accessing appropriate healthcare and similar scenarios in future.

Primary goal of telemedicine practice in diabetes mellitus is to make health care accessible to all individuals who are challenged by distance, mobility, time, and situation to reach in-person to a health facility. It may be used by people living in rural and remote areas; during pandemic or other emergencies; and inability to travel due to disability, lack of transport or support systems.

The context of the tele-consultation (first time or follow-up), purpose (diagnosis, monitoring, investigations review, dietary advice, supervision of management, health education), and access to technology shall guide the mode of teleconsultation and its timing. i. Types of communication: •

Text based: short messaging services, WhatsApp, Google Hangout, Facebook Messenger, fax, email etc.

Video based: Zoom, Skype, Microsoft Teams, Facetime

Audio based: Phone, voice over internet protocol, audio applications

Time of Communication: • Synchronous/real time (as in video consultation): interaction is quick and helps in solving any queries in real-time

Asynchronous: (as in sending email with investigation reports) allows the physician to review and respond at their own convenience.

The physician shall evaluate the necessary skills and resources required and equip themselves to use the different digital platforms for telemedicine. The guidelines that can support teleconsultation are explained.

Risk assessment has to be done through careful history taking and possible physical examination using video conferencing. Risk assessment includes eliciting family history of diabetes mellitus, history of gestational diabetes mellitus, giving birth to large baby (birth weight >3.5 kg) and polycystic ovarian disease, and understanding presence of risk factors like sedentary lifestyle, tobacco use, alcohol use, hypertension, dyslipidaemia and stress [9].

Diagnosis of diabetes mellitus to be made using standard criteria as follows: 1. Random blood glucose levels ≥ 200 mg/dl with osmotic symptoms

Fasting blood glucose ≥ 126 mg/dl after an 8–10 h of overnight fasting

2-h post 75 g OGTT blood glucose ≥ 200 mg/dl

Presence of any one of the above criteria favours the diagnosis of diabetes mellitus and has to be confirmed with another test subsequently [9].

Any newly diagnosed individuals with diabetes mellitus or individuals with signs and symptoms suggestive of medical emergency (as listed below) should be deferred for telemedicine consultation. These include: 1. Breathlessness, severe cough, or low oxygen saturation in setting of COVID19.

Recent (<7 days) onset of weakness/paralysis

Chest pain suggesting typical/atypical angina

Complicated cases of fever with symptom such as breathlessness, altered sensorium, severe abdominal pain, diarrhoea especially in setting of COVID19.

Low blood pressure, low oxygen saturation as detected by point of care testing.

Complicated cases of pregnancy with diabetes.

Recently diagnosed type 1 diabetes that may present as diabetic ketoacidosis requiring hospitalization.

Clinical features of acute or acute-on-chronic diabetes complications such as i. Sudden onset of vision loss or blurring

Recent deterioration in renal function with pedal edema or reduced urine output

Complicated foot and leg infection (e.g. necrotising fasciitis, limb threatening ischaemia & infections)

Hyperglycaemic crisis: Diabetes ketoacidosis and/or hyperglycaemic hyperosmolar state

Symptoms suggestive of severe hypoglycaemia

Any other evidence of clinical or hemodynamic instability

There is ample scope for health education, monitoring, review of investigations and prevention of complications through teleconsultation. The broad interventions include: 1. Lifestyle: i. Cessation of tobacco use (both smoke and smokeless form)

Quit alcohol use: Individuals who are habituated for regular intake of alcohol should be counselled for alcohol intake of less than 60 ml per day. Referral to de-addiction centres for tobacco and alcohol use are highly recommended

Physical activity: As far as possible aerobic exercises like brisk walking, jogging, cycling etc. are highly recommended as these upregulate the glucose transporters and promote the insulin-independent utilization of glucose. Indoor physical activity including yoga, meditation etc. could be practised that promotes mental health and helps in stress management. These indoor physical exercises are especially important in setting of COVID19 and lockdown.

Maintain ideal body weight with body mass index $<23 \text{ kg/m}^2$ or appropriate body weight could be calculated by height (in cms) minus 100.

Nutrition and diet counselling: Individualised diet plan should be recommended based on routine food intake to maintain ideal body weight and avoid sudden rise of blood glucose levels. Individuals are advised to calculate the calorie requirement per day with 22 kcal per kg of ideal body weight. Food intake for the required calories are divided as 50% carbohydrates, 30% protein and 20% fats (one-third each of saturated fat, monounsaturated fatty acids and polyunsaturated fatty acids). In addition, the diet intake should also contain 12-15 g of fibre per 1000 kcal so as to reduce glycaemic variability and improve satiety. Model diet charts containing the food items and its method of preparation, having different calorie intake levels e.g. 1200 kcal/day, 1400 kcal/day etc. could be shared with the patients through electronic media [10].

Stress management: Through practice of aerobic exercises, yoga and meditation is recommended

Frequency for self-monitoring of blood glucose using glucometer at home and the targets for blood glucose level should be communicated to patients clearly during the teleconsultation. i. Individualised targets for blood glucose levels: tight control of blood glucose levels for newly diagnosed individuals with diabetes mellitus – HbA1C $< 6.5\%$; individuals having comorbidities along with diabetes mellitus – $7-7.5\%$; newly diagnosed young individuals fasting blood glucose levels: 100–120 mg/dl and post prandial blood glucose levels – 140–160 mg/dl; elderly individuals/long standing diabetes mellitus fasting blood glucose levels: 100–140 mg/dl and post prandial blood glucose levels of 140–180 mg/dl is recommended [10 , 11].

Ideal frequency for blood glucose monitoring: ✓ Testing of fasting plasma glucose and 2-hr postprandial plasma glucose have to be performed least once a month and more frequently when the plasma glucose levels are not in ideal target range

Titration of doses for insulin would require 3 to 4 times per day or at any time when there are symptoms of hypoglycaemia

Monitoring of blood pressure weekly using electronic blood pressure apparatus is recommended for individuals having hypertension/cardiac diseases to achieve target blood pressure of 130/80 mmHg [12 , 13].

Physicians should encourage the patients to maintain a log of blood glucose levels with date and time. These values are to be reviewed and assessed for any requirement of change in treatment during the next follow-up consultation. 3. Counselling for individuals on Insulin:

Individuals who are on insulin for diabetes management, should be taught regarding the preferred site of injection and techniques of insulin injection. Preferred site of insulin injection would be 3 cms away from the navel in the abdomen or antero-lateral aspect of thigh. It should also be advised to rotate the site every time, 2 cms away from the previous site to avoid lipodystrophy. Health education posters containing the information on insulin dose adjustments/titrations, sites and techniques of insulin injection should be shared with the patients. 4. Symptoms of hypoglycaemia and methods to identify hypoglycaemic symptoms should be advised during follow-up

Prevention and review of diabetes complications:

Major goal for treatment of diabetes mellitus is to prevent micro/macrovascular complications and improve quality of life. Health education to prevent onset of complications and need for screening should be explained to the patients. It is ideal to measure annually serum lipid profile, renal function test (blood urea, serum creatinine and estimated glomerular filtration rate), liver function test, electrocardiogram, hemogram, eye examination (visual acuity, fundus and glaucoma evaluation) and annual foot examination for neuropathy using a 10-g monofilament test. Glycated haemoglobin (HbA1C) is recommended once in three-months for monitoring the blood glucose control status. The schedule or extent of above could be altered/reduced in setting of COVID19. Review of any complications detected and management of such conditions can also be done. Self-examination of foot using a mirror daily should be advised to identify minor cracks and injuries so as to prevent the foot complications [9].

Uses of telemedicine in management of diabetes mellitus is provided in Fig. 1 . Fig. 1 Uses of telemedicine in management of diabetes mellitus.

1. Any individual seeking consultation through telemedicine should be assessed for the need of face to face consultation or emergency referral based on signs and symptoms mentioned earlier.

Teleconsultation is ideal for providing follow-up consultation/clinical care advice to individuals with diabetes mellitus.

Preliminary arrangements regarding the date, time and mode of teleconsultation should be decided on discussion with the patient. Mode of consultation should be comfortable to both the patient and doctor.

Any investigations necessary may be advised a prior, completed and reports should be made available to physician during the consultation

In the beginning of consultation, establish rapport with patient/caregiver and obtain consent from the patients to use teleconsultation, maintenance of medical records and patient related information

Careful history taking regarding the lifestyle risk factors (tobacco, alcohol, physical activity, diet, sleep and stress/depression levels), family history of diabetes mellitus, medical history related to diabetes (date and year of diagnosis, latest HbA1C/blood glucose levels, compliance to diet and

exercise, treatment adherence, hypoglycaemic attacks and home monitoring of blood glucose levels), history related to diabetes complications (chest pain, dyspnoea, loss of vision, visual floaters, tingling/burning sensation in feet, ulcers in foot, weakness of hands and legs) and drug allergies are to be recorded without fail.

Physical examination like weight, blood pressure, pulse, foot examination and simple neurological examinations may be performed depending on the presence of caregivers, availability of equipment, and the mode of consultation.

Blood investigation reports/blood glucose or blood pressure log book maintained by the patients as part of self-monitoring should be reviewed.

The current status of the patient regarding glycaemic control, presence or absence of complications, lifestyle advice on physical activity and dietary intake, treatment compliance and need for change in treatment, have to be assessed.

Accordingly, any change in treatment has to be informed to patients and the treatment advice has to be sent in a format that can be printed or available as a digital copy for the patients. Drug names have to be written in both generic and trade names with proper dosage and frequency of intake per day.

Advice regarding the biochemical investigations for next consultation, and adverse effects of drugs has to be explained during the consultation and also written in the prescription.

The mode, time, date of consult and time for next follow-up has to be informed and mentioned in the prescription.

In case of identification of emergency symptoms (or severe COVID-19 symptoms), patient has to be referred immediately to the nearest health facility. Treatment decision regarding the home management or management through teleconsultation or referral depends on physician assessment and clinical experience. Individuals having mild to moderate hypoglycaemia could be managed through re-assurance and modification of dosages of anti-hyperglycaemic agents/insulin. Records related to consultation, treatment provided and referrals need to be maintained clearly by the treating physician.

The existing guidelines of diabetes management in the National Programme for prevention & Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) can be further strengthened by integrating the procedures for first and follow-up consultation using telemedicine, and the medical officers should be trained for adopting telemedicine. National Teleconsultation service, e-Sanjeevani OPD online outpatient services encompasses patient registration, consultation with doctor, treatment and prescribing the drugs through online technology [14]. Medical officers using the e-Sanjeevani OPD service will benefit by using the Telemedicine guidelines to provide standard care for diabetes. As a beginning, indications for face to face consultation, diabetes situations that can be managed through teleconsultation, and responsibilities of physician using telemedicine may be adopted, and shall help standardize and provide continuum of care for diabetes individuals under the current programme.

Considerable proportion of diabetes individuals may require specialist consultation at clinic or hospital for management of their co-morbid conditions and screening of diabetes complications. There are issues related to use of technology for patients and family and patient satisfaction. The doctor has to take extra efforts for medical record maintenance, arriving at clinical judgment for treatment decisions, and management of complicated cases. These are some of the considerations to be kept in mind while using teleconsultation for diabetes management.

Though there are limitations and challenges in using telemedicine, it could be used as an effective tool in management of diabetes mellitus by following the guidelines as explained in this paper. It improves access to the doctor, and the teleconsultation process allows more time for communication on education, treatment, prevention and early referral, and invariably strengthening diabetes management in a holistic manner.

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1. Gokul Sarveswaran – Development of skeleton for diabetes telemedicine guidelines, co-ordination and conduct of working group meetings for diabetes, reviewing and editing the contents, literature search, preparation of manuscript and editing

Sukanya Rangamani – Overall co-ordination for working group meetings, collation of contents for telemedicine guidelines, literature search, preparation of manuscript, review and editing

Amerta Ghosh – Literature search, working group member, manuscript review

Anil Bhansali – Literature search, working group member, manuscript review and editing

Mala Dharmalingam – Literature search, working group member, manuscript review

Ambika Gopalakrishnan Unnikrishnan – Literature search, working group member, manuscript review

Naval Kishore Vikram – Literature search, working group member, manuscript review

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Gray A. Nutritional recommendations for individuals with diabetes De Groot L.J. Chrousos G. Dungan K. Endotext. South Dartmouth (MA) 2000 MDTText.com, Inc NBK279012 11 Krishnaswamy K. Sesikeran B. Laxmaiah A. Vajreswari A. Ramalaxmi B.A. Dube A.K. Dietary guidelines for Indians—A manual. Hyderabad 2011 National Institute of Nutrition, ICMR 12 American Diabetes Association Standards of medical care in diabetes 2020 Diabetes Care 43 suppl. 1 2020 S1 S211 13 The Task Force for diabetes Pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and the European Association for the Study of diabetes (EASD) ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD Revista Española de Cardiología (English Edition) vol. 73 2019 404 5 14 Centre for Development of Advanced Computing (C-DAC) eSanjeevani OPD National teleconsultation service 2020 Available from <https://esanjeevaniopd.in/About> Acknowledgements This paper has been developed from the guidance on telemedicine use in NCDs released as e-book, Framework for Telemedicine use in management of Cancer, Diabetes, Cardiovascular disease and Stroke in India' and available at https://ncdirindia.org/All_Reports/Telemedicine/Default.aspx . We would like to acknowledge the reviewers of the guidelines for their comments and suggestions during the preparation of this guideline.