

Perspective

Type 2 Diabetes Mellitus(T2DM) in Pakistan: Prevalence, Trends and Management Strategies

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Abstract:

The rising incidence of diabetes has become one of the major health problems worldwide. It is especially overburdening low-income countries like Pakistan which ranks 4th in diabetes prevalence. The purpose of this review article is to analyze the current approach to diabetes management in Pakistan and to highlight its deficiencies. It also discusses the future strategies that can help Pakistan to reduce the rising disease burden. Information was collected from the publications which were searched on 'Google scholar' and 'PubMed'.

The latest data provided by IDF has shown diabetes prevalence in Pakistan to be 17.1% in 2019; 148% higher than previous reporting. The major obstacles in the effective management of diabetes are lack of resources, societal barriers and patient related issues. In order to reduce the load of diabetes, combined efforts of government, health care professionals and patients are required. In future, diabetes education of the patients as well as HealthCare providers, use of telemedicine for the management of chronic diseases and concept of precision medicine can be applied to decrease diabetes burden in Pakistan.

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Introduction:

Diabetes mellitus (DM) is a chronic, metabolic non-communicable disorder characterized by high blood glucose caused either by an impaired ability of the body to produce insulin or an inadequate response of cells to it or both. The incidence of diabetes is on the rise worldwide and the escalating burden of disease has emerged as “one of the most challenging public health problems of the 21st century, with its epicenter being in Asia”¹. One-fifth of the global population is comprised of South Asians but the incidence of type 2 DM is disproportionately higher². Diabetes is the major cause of morbidity and early mortality in low-income countries. Pakistan currently ranks fourth in diabetes prevalence and is expected to move to third place in the next 25 years. Pakistan reported 19.4 million cases of diabetes in 2019. “The number of cases is expected to rise to 26.2 million by 2030, and to 37.1 million by

2045”³.

There has been much scientific advancement in the field of medicine and healthcare, but it has failed to cope with the challenges of diabetes and its complications. The economic burden of DM is increasing the overall health expenses in the country. The healthcare system in Pakistan is mixed public-private and not well resourced to deal with the increasing burden of non-communicable diseases⁴. Moreover, effective management of this disease lags behind due to limited resources, societal barriers, and patient-related issues⁵. National action plans for diabetes control were formulated but not followed through. Private associations are making some efforts but those are not enough.⁴ There is a lack of facilities available for the diagnosis and treatment of diabetes at the primary healthcare level⁶.

T2DM cannot be cured completely but with better management strategies, economic burden and mortality

rate can be lowered⁷. The present situation calls for a multifaceted approach to decrease the incidence of diabetes, prevent its complications, and improve the prognosis of diabetic patients through integrated efforts of government officials, health care professionals, and patients.

This review article aims to analyze the current approach to diabetes treatment in Pakistan and its shortcomings. Further, it discusses the strategies which can be adopted by Pakistan in the future to target the rising burden of disease.

Prevalence of T2DM

Worldwide:

According to the recent facts and figures provided by the IDF in 2019, an estimated 463 million people between the ages of 20-79 years (representing 9.3% of the global adult population) are suffering from diabetes. “This number is expected to increase to 578 million (10.2%) by 2030 and 700 million (10.9%) by the year 2045”³. Out of these, a whopping 232 million (i.e. one in two) were undiagnosed and 79% were residents of middle and low-income countries. One in every 5 adults above 65 years of age has diabetes. A further 374 million people are prone to develop T2DM. In 2019, 4.2 million deaths worldwide were attributed to diabetes and in health expenditure, a minimum of USD 760 billion was spent on diabetes which is equivalent to 10% of total spending on adults³.

Diabetes prevalence also varied by World Bank Income Group, with a higher prevalence observed among high-income (10.4%) and middle-income countries (9.5%) as compared to that in low-income countries (4.0%). The prevalence is estimated to reach 11.9%, 11.8% and 4.7% respectively in high, middle, and low-income countries. 67% of the people with diabetes dwell in urban areas. Although prevalence in urban areas is still higher than in rural areas (10.8% vs 7.2%), the difference is less striking than that previously reported by the IDF probably because of the urbanization of rural areas⁸.

In 2019, China, India, and the USA showed the highest prevalence of diabetics having 116,77 and 31 million patients respectively. They are expected to remain on top in 2030 but in 2045, “China, India, and Pakistan

with 147,134 and 37 million diabetic patients respectively are projected to be the top 3 countries with the highest number of people with diabetes”⁸.

Diabetes has been ranked as the 7th leading disease in terms of DALYs (Disability-Adjusted Life Years) which serves as a reflection of the burden of suffering. Despite considerable investments in public health interventions, clinical care, and research, the rising prevalence shows no sign of stabilizing⁹.

Pakistan:

The prevalence of diabetes mellitus in South Asian countries has shown an increase in the last two decades¹⁰. The latest figures released by IDF show that diabetes prevalence in Pakistan has reached 17.1% in 2019, which is 148% higher than that previously reported, thus making Pakistan among “the top 10 countries for absolute increase in diabetes prevalence.” An estimated 19 million adults are suffering from diabetes in Pakistan, out of which 8.5 million are undiagnosed³.

From the year 1995 to 2018, the country has observed a continuous rise in the prevalence of prediabetes and diabetes. The pooled prevalence of diabetes was calculated to be 14.62% based on 49,418 individuals in a systematic review and meta-analysis study which suggested a significant increase over the years. All parts of the country were affected by diabetes, with the highest number of diabetic patients in Sindh and the lowest prevalence seen in Khyber Pakhtunkhwa¹¹.

According to the Second NDSP 2016-2017, weighted diabetes prevalence in Pakistan was 26.3% (19.2% known diabetics, 7.1% newly diagnosed). “Prevalence was 28.3% and 25.3% in urban and rural areas respectively. The highest prevalence was observed in Sindh followed by that in Punjab, whereas the prevalence of newly diagnosed and pre-diabetes was higher in Balochistan as compared to other provinces. The overall prevalence of pre-diabetes was 14.4%”¹². The provincial prevalence is as follows: 32.3% in Sindh, 30.2% in Punjab 29.5% in Balochistan, and 13.2% in Khyber Pakhtunkhwa⁶. These figures show an alarming increase in diabetes compared to the 1st NDSP survey done in 1994-1998¹³.

Risk factors associated with T2DM:

T2DM is a multifactorial disorder. Modifiable risk fac-

tors include obesity, high caloric Western diet, smoking, hypertension, abnormal lipid profile, sedentary mode of living including TV and internet usage, and non-modifiable risk factors include age and genetics^{7,10}.

Obesity is a significant risk factor.⁷ The risk of developing T2DM is raised 80 times by it¹⁴. Obesity means having BMI equal to or greater than 30kg/m². South Asians, in particular, have shown greater risk of developing diabetes as compared to other ethnic populations, even at a lower BMI¹⁵. The prevalence of obesity is increasing in Pakistan at an alarming rate. According to WHO, 58.1% of people of Pakistan are overweight and 43.9% are obese. Not only the adult population of Pakistan is becoming obese, but the prevalence is also increasing in children. Lack of physical activity, rapid urbanization and modernization, high socioeconomic status, abnormal and unhygienic eating habits, consumption of high caloric diet and increased screen time are the contributing factors in the development of obesity^{14,16}.

In Pakistan, low birth weight due to intrauterine growth retardation (IUGR) is also a risk factor for developing T2DM which can be prevented^{4,16}.

Economic burden of T2DM:

The economic burden caused by diabetes worldwide, both in terms of morbidity and mortality, is enormous.¹⁷ The estimated global expenditure on diabetes has shown more than 300% rise since 2003.¹⁸ “It is estimated that the global cost of diabetes and its consequences will increase from USD 1.3 trillion in 2015 to \$2.1 trillion in the targeted scenarios by 2030.”¹⁹ The early presentation of T2DM in younger people puts an extra financial burden on patients and the country, as therapeutic interventions would have to start at a younger age and that too for a longer period of time.⁵

Pakistan is a lower-middle-income economy. It had a GDP of \$284 billion for the year 2019 and stood 42nd in GDP ranking. Pakistan spends less than 1% of GDP on health as compared to 6% (recommended by WHO). The out-of-pocket (OOP) expenditure on diabetes management is high in Pakistan. A study conducted in Karachi in 2017 showed that T2DM patients spend PKR 2227.11 (\$21.7) per month on the management of diabetes²⁰.

Poor management of diabetes leads to microvascular and macrovascular complications including cardiovascular disease, nephropathy, retinopathy, and peripheral neuropathy^{21,22}. A frequently overlooked complication of diabetes is diabetes-related foot ulcers (DFU)²³. The prevalence of DFU in Pakistan is reported to be 13.9%²⁴. “According to a retrospective study from a tertiary care hospital of Faisalabad, the direct treatment cost on average for minor amputation was PKR 46926.00 +/- 11730.90 and for major amputation was PKR 53720.00 +/- 12401.24”²⁵. The post-amputation mortality in diabetics ranges from 68 to 90%, much greater than their non-diabetic counterparts²⁴. Although the economic cost of diabetes and its related complications is very high, the cost of human suffering must also be taken into account. This situation calls for effective strategies for the prevention of diabetes in the country.

Current approach to T2DM in Pakistan

The present approach to T2DM in Pakistan includes screening (i.e. fasting and random blood glucose level), diagnosis and subsequent management by changes in lifestyle and glucose-lowering drug metformin except where it is contraindicated. If metformin is contraindicated, other drugs like sulfonylureas or thiazolidinediones can be used²⁶. For patients showing poor glycaemic control, other anti-diabetic drugs can be given with metformin. Combination therapy has shown greater efficacy than single drug, often with less side effects²⁷.

The steps taken for control and management of diabetes until now are as follows:

- **Awareness and education:**

Different associations like the Diabetic Association of Pakistan [DAP], Baqai Institute of Diabetology and Endocrinology (BIDE), Pakistan Endocrinology Society (PES), and National Association of Diabetes Educator Pakistan (NADEP) are playing their role in raising public awareness to deal with diabetes epidemic. NADEP initiated a large-scale community-based project 'Stop Diabetes in Pakistan' with the partnership of pharmaceutical industries, corporate sectors, and NGOs for the development of well-structured diabetes education and awareness projects particularly focusing school children and young adults.

BIDE introduced a national screening program at the primary care level; Risk Assessment of Pakistani Individuals for Diabetes (RAPID) tool for risk prediction of T2DM in Pakistan. This cost-effective tool uses variables that are already available to people, thus eliminating the need for laboratory tests and physician interpretations for risk assessment. This screening project is planned to be expanded nationwide.¹³ “Advisory Board for the Care of Diabetes (ABCD) endorsed the first set of guidelines for self-monitoring of blood glucose level (SMBG) by the name 'Better Recommendations, Implementation and Guideline development for Healthcare providers and their Training' (BRIGHT)”¹³.

- **Capacity building:**

Capacity building is an ongoing process of strengthening skills and enhancing abilities to identify and meet developmental challenges in a fast-changing world. PES is the forerunner in recognizing endocrinology and diabetology as a specialty in Pakistan¹⁵. Many institutes are now offering diploma degrees and postgraduate programs in this specialty.

In alliance with World Diabetes Foundation (WDF), BIDE initiated Footwear for Every Diabetic (FED) program for the period of 2015 to 2018. The goal was to provide cost-effective footwear to diabetic patients and a reduction in the prevalence of diabetic ulcers. It resulted in the establishment of 11 diabetic foot clinics and footwear manufacturing facilities, provision of 20000 pairs of low-cost shoes to patients, identification of 102950 people having feet at risk, treatment of 15743 people with foot ulcers, and 0 amputations conducted²⁸.

Mobile Health Clinic, initiated in collaboration with Sakina Institute of Diabetes and Endocrine Research (SIDER), is an advancement for improving the status of diabetes in Pakistan. It works for screening diabetics in Lahore and adjacent regions. The aim is to identify undiagnosed patients and to counsel them free-of-charge.

- **Research Avenues:**

→ BIDE has started Ramadan Hajj and Study Group for research and awareness purposes since 2008, so that diabetic patients can fast safely during Ramadan.

→ ABCD was developed in 2012 consisting of 10 leading diabetologists of the country in different cities. It collaborated with the pharmaceutical industry to provide an unrestricted grant for exchanging academic, clinical, and research programs⁴.

→ In 2012, a think tank by the name of the Health Research Advisory Board (HRAB) was created. It aims to develop the research ecosystem of Pakistan. Diabetes is one of the top priority agendas¹³.

→ “The electronic database of diabetic patients is being maintained on specialized Healthcare Management Software (HMS) by BIDE”²⁹.

→ Bringing Research in Diabetes to Global Environments and Systems (BRIDGES) is IDF program for translational research projects. BRIDGES funded the Pakistan Diabetes Prevention Program (PDPP) for preventing T2DM, done by a collaboration of AKU and the University of Helsinki⁴.

- **Policies Made at National Level:**

Pakistan is one of the first developing countries to formulate national action plans (NAPs) for NCDs. So far, 5 NAPs have been formulated aimed at better management and primary prevention of diabetes in the country. Unfortunately, none of these have been implemented to curb the rising prevalence of disease.

BIDE in collaboration with DAP developed the revised National Clinical Practice Guidelines by the name 'Pakistan's Recommendations for Optimal Management from Primary to Tertiary care level' (PROMPT) in 2017 keeping in view the limited resources in the country²⁶.

Pakistan Diabetes Leadership Forum (PDLF) was formed in 2014 for developing a network of leaders to improve diabetes care in Pakistan¹⁵. Due to the combined efforts of BIDE, HRAB, and ABCD, a web-based diabetes registry (Diabetes Registry of Pakistan, DROP) has been formed with collaborators of four provinces. DROP-1 (type 1 registry) is established now²⁹.

- **Strategic Measures for Diabetes Control:**

Even though 80% of the population of Pakistan is dependent on primary healthcare, only 15% of the health budget is spent on it¹⁷. Taking into consideration

the magnitude of diabetes burden, there is a need for a broad-based approach focusing on chronic disease management.

- **Primary Prevention:**

Primary prevention strategies have to be an essential part of every health program to reduce the disease burden at all levels.¹ These include public education and awareness, and lifestyle modifications (i.e. healthy dietary patterns, physical activity, smoking cessation). Successful implementation of primary prevention strategies including awareness and lifestyle modifications (LSMs) for T2DM can delay or prevent the onset of disease and its complications. Lifestyle changes to control diabetes were shown to be far more efficacious than medication.

The fifth national action plan 2014-2018 has proposed various strategies for primary prevention of type 2 DM. It includes keeping track of the nutritional status and level of physical activity of the population so that we can prevent obesity and its associated complications³⁰.

Low birth weight children are more likely to develop T2DM later in life. In order to reduce the likelihood of in utero malnutrition, the mothers should be screened for diabetes and sufficient nutrient supply during pregnancy should be ensured³¹.

- **Diabetes Education:**

It is the cornerstone of diabetes management. The educational material should be in a simple, easy to understand regional language. This education can be provided by the healthcare system, through educational institutions, community groups, NGOs, pharmacies and electronic and print media.

- **At the level of patient:**

Self-care for diabetes includes adopting healthy eating habits, physical activity, blood glucose monitoring and compliance to medication. Barriers to recommended self-care are related to life situation, disease knowledge, psychological and cultural factors. These include financial restrictions, physical limitations, hectic job, social gatherings, food loving nature, needle phobia, forgetfulness and extreme weather conditions.³²

Educating and counselling patients on these aspects is of paramount importance. Al-Shukri found out that those type 2 diabetics who adhered to the nutritional guidelines given by their dietitians, notably improved

their blood glucose and HbA1C levels together with weight reduction¹⁰.

For better treatment adherence in South Asians, basic misunderstandings regarding diabetes medication must be addressed through the educational programs and the dangers of diabetic complications must be highlighted.²

Better glycemic control requires an appropriate monitoring technique. SMBG, as explained by the BRIGHT guidelines, should be included in diabetes education program so that the patients can have a sound understanding of their disease and can actively participate in its control and treatment together with their health care teams³³.

- **At the level of community:**

Community education can also be used as a prophylactic tool, as educational activities focusing on prevention have more of an impact on students and knowledge spreads easily to their family. Teaching nutrition as a subject at school and college level should be considered to raise awareness.

- **At the level of health care providers:**

In Pakistan, the family physicians (FP) are the first line of defense for the treatment and counselling of diabetics due to a lack of diabetes care teams. There is no training at the undergraduate level and no proper education programs afterwards, thus the FPs are not well-equipped to deal with the initial treatment and guidance of diabetics. A study assessed the knowledge, attitude and practices (KAP) of FPs regarding diabetes through questionnaires. "The questions regarding the diagnosis of impaired glucose tolerance, insulin use in pregnancy, the significance of diabetes education, management, and screening were correctly answered by more than 50% of FPs"³⁴. Deficiency lies in the understanding of genetic basis of diabetes, the significance of insulin administration during pregnancy and the correct technique of insulin injection. It is suggested that continuing medical education (CME) programs will help the health care workers to manage diabetes in a proficient way³⁴.

- **Use of Telemedicine for Chronic Disease Management:**

The use of this modern technology can help to bridge the communication gap between doctors and patients

and elevate the health status of the rural population where medical facilities are already scarce.⁷ Telemedicine is being successfully used in the developed world, however high cost, absence of technical expertise and poor infrastructure pose a hurdle in its effective implementation in the developing world. In 1998, telemedicine was introduced in Pakistan and has been developing since then.

Mobile phone interventions can be easily merged in day-to-day life of people as mobile phones are portable, extensively used, and have web access. Studies have shown that giving reminders to the patients in the form of SMS can reinforce their compliance with lifestyle modifications⁷.

Mobile health(M-health) care is also included in the sphere of telemedicine. It fills the gaps in primary healthcare services in underprivileged areas. The Mobile Health unit provides free counselling by a Diabetes Educator, BMI calculation, plasma glucose testing, and BP checking³⁵.

• Role of Stakeholders in Prevention of Diabetes:

We need to realize that even the first world countries are struggling to deal with the challenge of diabetes and other NCDs at secondary and tertiary healthcare level¹³. In this regard, the development of primary health care is the major time-effective and low-cost intervention for managing the diabetic load in the country. Diabetes should be declared as a priority disease in all health policies of the government. Ideally, there should be one Basic Health Unit (BHU) for 25,000 people but in Khyber Pakhtunkhwa, one BHU on an average serves 43,715 citizens³⁶. PROMPT guidelines for the management and referral of diabetes patients should be implemented at the grass root level. Every government institution including the primary health care centers (BHU) should be well equipped for diabetes diagnosis and management. There should be an adequate supply of drugs including insulin for proper management³⁰. Training of doctors and paramedical staff should be ensured through postgraduate training sessions, online sessions¹³.

Taxes on diabetes care products such as insulin, syringes, glucometers, etc. should be removed³⁰. At the same time, heavy taxes should be imposed on tobacco products & sugar-containing drinks in order to

discourage their consumption. State should ensure that industries do not meddle with the policymaking by the government¹³.

Pakistan can follow as an example a project of Sri Lanka Medical Association, National Initiative to Reinforce and Organize General Diabetes Care in Sri Lanka (NIROGI Lanka) which involves allied health staff, community leaders and general public through existing healthcare system for diabetes prevention and control³⁷.

A peek into the future:

In the future, the concept of precision medicine can be applied to improve the diagnosis and treatment of diabetes. It involves incorporating the information about the genetic makeup of the patient in diagnosing the type of diabetes, choosing glucose-lowering therapy, and managing the complications.

Further, personalized or individualized medicine includes psychosocial and dietary components of management in addition to precision medicine³⁸. With the advancement in biotechnology, gene therapy might contribute to the treatment of diabetes in the years to come³⁹.

Quite a few potential new approaches for the treatment of diabetes are undergoing preclinical studies e.g. glucokinase (GK) activators, agonists of fatty acid stimulated G-Protein-Coupled Receptors(GPCR), and small non-peptide molecules that either mimic or potentiate insulin action. Many novel drugs, glucagon receptor antagonists, leptin analogs, sirtuins, adiponectin receptor agonists to name a few, have been considered to improve glycemic control in T2DM but these haven't been through full phase 3 trials, and not much is known about their side effects²⁷.

Novel therapeutic approaches like nanoparticle targeted drug delivery, statin therapy for older patients, stem cell technology and bioactive substances having anti diabetic properties derived from plants undergoing research present a new perspective⁴⁰.

Conclusion:

In order to control the giant of diabetes, Pakistan needs to focus on primary and secondary prevention which remains the best available option. Diabetic awareness programs including healthy lifestyle encouragement, community-based screening campaigns, nationwide

diabetic care networks, and prioritization of mother and child healthcare to prevent transgenerational diabetes should be encouraged. Developing policies for diabetes treatment and its complications, provision of adequate funding and medications, the involvement of relevant stakeholders, and easy access to available services can lead to a sustainable productive national action plan. In the future, telemedicine and mobile health care may be better suited for T2DM management. Over time, these measures will help to reduce the prevalence of diabetes in the country.

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