

Prediabetes: Prevalence, Screening, Definition and Management



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Prevalence

Rapid urbanization, unhealthy diets and increasingly sedentary lifestyles have resulted in previously unheard high rates of obesity and diabetes. These two diseases have reached alarming rates worldwide and according to IDF report 2017, diabetes in the MENA (Middle Eastern and North Africa) region is expected to face the highest upsurge in the next 28 years.

In 2017, approximately 38.7 (27.1-51.4) million people, or 9.6% (6.7-12.7) of adults aged 20-79 years are living with diabetes in MENA countries. About 49.1% of these are undiagnosed.

A further 33.3 million people age 20-79 years in the region, or 8.2% of the adult population, are estimated to have impaired glucose tolerance (IGT) i.e prediabetes and are at high risk of developing type 2 diabetes. From 10 to 15 percent of adults in the United States (US) have impaired glucose tolerance or impaired fasting glucose.

It is our duty as health care providers to target this population in order to avoid establishment of a devastating disease such as diabetes with its subsequent micro- and macrovascular complications. Also, patients with prediabetes are not only at risk of developing overt disease but also have two to four-fold increase in the rate of cardiovascular disease and hence increased mortality.

Screening

Criteria for testing for diabetes or prediabetes in asymptomatic adults is outlined in Table 1. Prediabetes is associated with obesity (especially abdominal or visceral obesity), dyslipidemia with high triglycerides and/or low HDL cholesterol, and hypertension.

Table 1—Criteria for testing for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in overweight or obese (BMI ≥ 25 kg/m) in adults who have one or more of the following risk factors:
 - First-degree relative with diabetes
 - History of CVD (cardiovascular disease)
 - Hypertension ($\geq 140/90$ mmHg or on therapy for hypertension)
 - HDL cholesterol level < 35 mg/dL and/or a triglyceride level > 250 mg/dL
 - Women with polycystic ovary syndrome
 - Physical inactivity
 - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
2. Patients with prediabetes (A1C $\geq 5.7\%$, IGT, or IFG) should be tested yearly.
3. Women diagnosed with GDM should have lifelong testing at least every 3 years.
4. For all other patients, testing should begin at age 45 years.
5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

GDM, gestational diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation
A1C, glycosylated hemoglobin test should be performed using a method that is certified by the NGSP (www.ngsp.org) and standardized or traceable to the Diabetes Control and Complications Trial (DCCT) reference assay.

Table 2—Risk-based screening for type 2 diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting

Testing should be considered in youth* who are overweight ($\geq 85\%$ percentile) or obese (≥ 95 percentile) and who have one or more additional risk factors:

- Maternal history of diabetes or GDM during the child's gestation
- Family history of type 2 diabetes in first- or second degree relative
- Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small-for gestational-age birth weight)

*After the onset of puberty or after 10 years of age, whichever occurs earlier. If tests are normal, repeat testing at a minimum of 3-year intervals, or more frequently if BMI is increasing, is recommended.

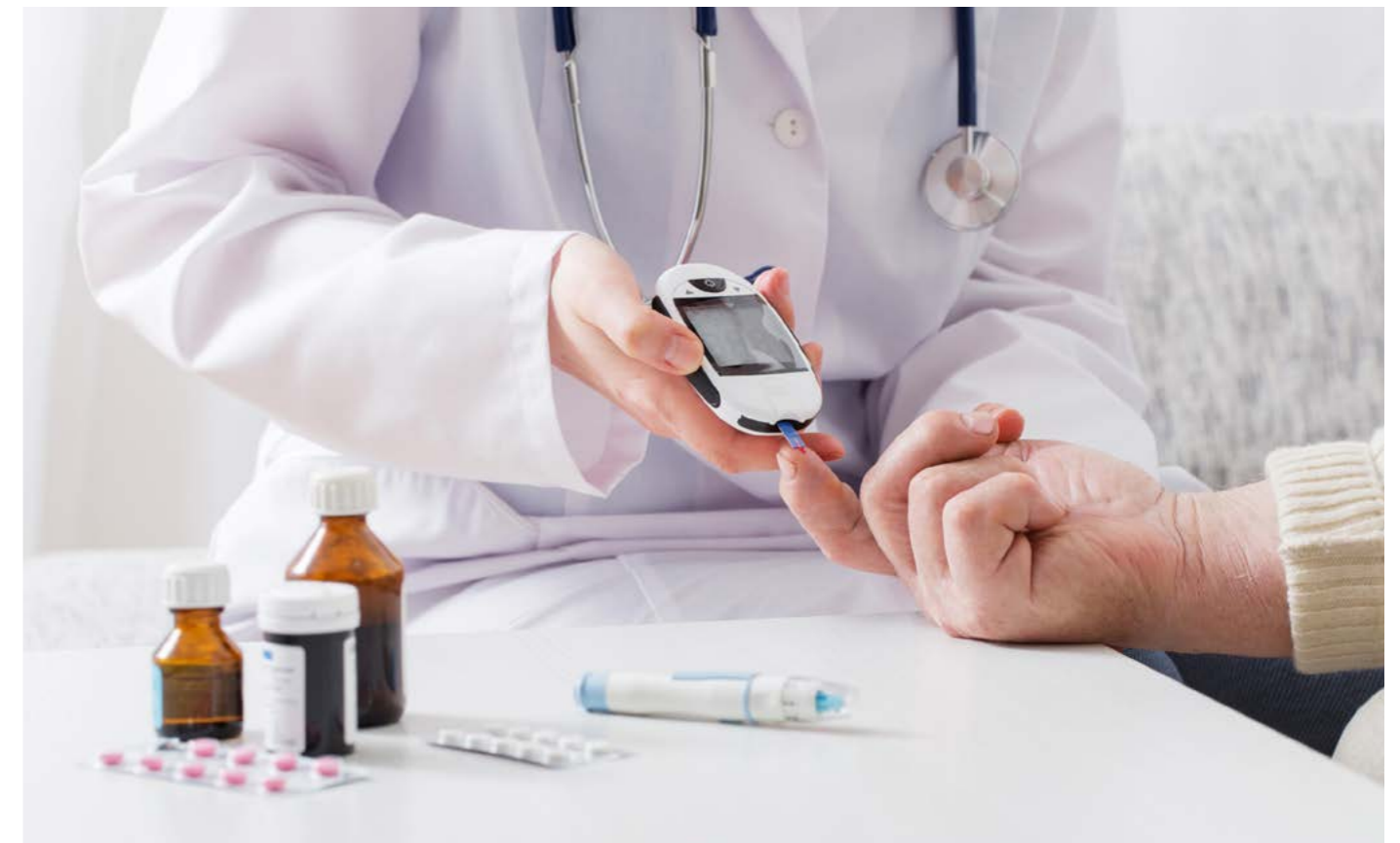
These recommendations are based on American Diabetes Association (ADA) and are applicable worldwide.

Community Screening

Ideally, testing should be carried out within a health care setting because of the need for follow-up and treatment. Community screening outside a health care setting is generally not recommended because people with positive tests may not seek, or have access to, appropriate follow-up testing and care. However, in specific situations where an adequate referral system is established beforehand for positive tests, community screening may be considered.

Community testing may also be poorly targeted; i.e., it may fail to reach the groups most at risk and inappropriately test those at very low risk or even those who have already been diagnosed.

FPG, fasting plasma glucose; IFG, impaired fasting glucose; PG, plasma glucose; OGTT, oral glucose tolerance test (after ingestion of 75 g oral glucose load); IGT, impaired glucose tolerance; A1C,



Definition

“Prediabetes” is the term used for individuals whose glucose levels do not meet the criteria for diabetes but are too high to be considered normal. Patients with prediabetes are defined by the presence of impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) and/or HbA1C 5.7–6.4% (Table 3.0).

Table 3—Criteria defining prediabetes

▪ **FPG 100 mg/dL (5.6 mmol/L) to 125 mg/dL (IFG)**

OR

▪ **2-h PG during 75-g OGTT 140 mg/dL to 199 mg/dL (IGT)**

OR

▪ **A1C 5.7–6.4%**

Diagnosis

IFG is defined as FPG levels between 100 and 125 mg/dL and IGT as 2-h PG during 75-g OGTT levels between 140 and 199 mg/dL (table3). It should be noted that the World Health Organization (WHO) and numerous other diabetes organizations define the IFG cutoff at 110 mg/dL.

As with the glucose measures, those with A1C between 5.5 and 6.0% had a substantially increased risk of diabetes (5-year incidence from 9 to 25%). Those with an A1C range of 6.0–6.5% had a 5-year risk of developing diabetes between 25 and 50% and a relative risk 20 times higher compared with A1C of 5.0%.

Similar to those with IFG and/or IGT, individuals with A1C of 5.7–6.4% should be informed of their increased risk for diabetes and CVD and counseled about effective strategies to lower their risks. Aggressive interventions and vigilant follow-up should be pursued for those considered at very high risk (e.g., those with A1C >6.0%).

At least annual monitoring for the development of type 2 diabetes in those with prediabetes is suggested.

Management

There are effective interventions that prevent progression from prediabetes to diabetes and reduce the risk of diabetes complications.

The Diabetes Prevention Program

Several major randomized controlled trials, including the

Diabetes Prevention Program (DPP) demonstrate that lifestyle/ behavioral therapy featuring an individualized reduced calorie meal plan is highly effective in preventing type 2 diabetes and improving other cardiometabolic markers (such as blood pressure, lipids, and inflammation). The strongest evidence for diabetes prevention comes from the DPP trial (1). The DPP demonstrated that an intensive lifestyle intervention could reduce the incidence of type 2 diabetes by 58% over 3 years.

Follow-up of lifestyle intervention for diabetes prevention has shown sustained reduction in the rate of conversion to type 2 diabetes. 34% reduction at 10 years and 27% reduction at 15 years in the U.S. Diabetes Prevention Program Outcomes Study (DPPOS). Notably, in the 23-year follow-up for the China study, reductions in all-cause mortality and cardiovascular disease-related mortality were observed for the lifestyle intervention groups compared with the control group (3).

The two major goals of the DPP intensive, behavioral, lifestyle intervention were to achieve and maintain a minimum of 7% weight loss and 150 min of physical activity similar in intensity to brisk walking per week. The 7% weight loss goal was selected because it was feasible to achieve and maintain and likely to lessen the risk of developing diabetes. The recommended pace of weight loss was ½ -1 Kg/week. Calorie goals were calculated by estimating the daily calories needed to maintain the participant’s initial weight and subtracting 500-1,000 calories/day (depending on initial body weight).

The goal for physical activity was selected to approximate at least 700 kcal/ week expenditure from physical activity. For ease of translation, this goal was described as at least 150 min of moderate intensity physical activity per week similar in intensity to brisk walking. Participants were encouraged to distribute their activity throughout the week with a minimum frequency of three times per week with at least 10 min per session. A maximum of 75 min of strength training could be applied toward the total 150 min/week physical activity goal.

Nutrition

Based on intervention trials, the eating patterns that may be helpful for those with prediabetes include a Mediterranean eating plan and a low-calorie, low-fat eating plan.

Additional research is needed regarding whether a low-carbohydrate eating plan is beneficial for persons with prediabetes (12). In addition, emphasis on whole grains, legumes, nuts, fruits and vegetables, and minimal refined and processed foods, is also important.



Particular dietary components impact diabetes risk in observational studies. Higher intakes of nuts, berries, yogurt, coffee, and tea are associated with reduced diabetes risk. Conversely, red meats and sugar-sweetened beverages are associated with an increased risk of type 2 diabetes.

Tobacco Use

Smoking may increase the risk of type 2 diabetes; therefore, evaluation for tobacco use and referral for tobacco cessation, if indicated, should be part of routine care for those at risk for diabetes.

PHARMACOLOGIC INTERVENTIONS

Pharmacologic agents including metformin, α -glucosidase inhibitors, glucagon-like peptide 1 receptor agonists, thiazolidinediones, and several agents approved for weight loss have been shown in research studies to decrease the incidence of diabetes to various degrees in those with prediabetes, though none are approved by the U.S. Food and Drug.

Metformin has the strongest evidence base and demonstrated long-term safety as pharmacologic therapy for diabetes prevention. For other drugs, cost, side effects, and durable efficacy require consideration. Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those with BMI ≥ 35 kg/m², those aged <60 years, and women with prior gestational diabetes mellitus.

PREVENTION OF CARDIOVASCULAR DISEASE

People with prediabetes often have other cardiovascular risk factors, including hypertension and dyslipidemia and are at increased risk for cardiovascular disease. Although treatment goals for people with prediabetes are the same as for the general population, increased vigilance is warranted to identify and treat these and other cardiovascular risk factors (e.g., smoking).

Conclusion

Modern lifestyles are characterized by physical inactivity and long sedentary periods. Community-based interventions can reach individuals and families through campaigns, education, social marketing and encourage physical activity both inside and outside school and the workplace. Diabetes self-management education and support programs may be appropriate venues for people with prediabetes to receive education and support to develop and maintain behaviors that can prevent or delay the development of type 2 diabetes.

In Lebanon, there are limited financial resources and a lack of community-based health care programs that support and educate people with prediabetes and diabetes. So, it remains our responsibility as health care providers to recognize risk factors for type 2 diabetes and screen for prediabetes every patient who enters our clinic. This can be provided by a thorough history taking achievable in just few minutes. Accordingly, emphasis on managing aggressively these risk factors should be explained to the patient targeting not only adult patients but also children and adolescents keeping in mind that this should be a lifelong approach since diabetes risk is continuous and progressive with age.