Prediabetes: the cat is out!

Venkata Ranga Rao Kodali¹ • Iftikhar Ali^{2,3}

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Prediabetes is a state of hyperglycemia preceding diabetes. This state is mostly reversible and hence needs special attention. The benefits of arresting the progression of prediabetes to diabetes and thus the spectrum of complications such as blindness, dialysis dependence, sexual dysfunction, amputations, loss of self-esteem, unremitting neuropathy, and in addition to changing lifestyle with daily interventions in the form of injections, monitoring outweigh any other single disease prevention. Prediabetes or intermediate hyperglycaemia is defined as dysglycemia in which the spectrum ranges from normal and diabetes.

According to the American Diabetes Association, prediabetes is defined by fasting blood glucose of 100 mg to <126 mg/dl, 2-h plasma glucose of 140 to <200 mg/dl after 75-g oral glucose tolerance test or HbA1C of 5.7 to <6.5 % [1]. It is considered an at-risk state with a high probability of developing diabetes and confers a high risk of developing CVD. Prediabetes can be present for more than 10 years before the development of glycemic abnormalities characteristic of diabetes. This disorder is not benign by itself. There is an increased risk of vascular and metabolic derangements. Thus, in real terms, stopping progression to diabetes reaches the

secondary stage of prevention though prediabetes is not classified as a disease.

The prevalence of prediabetes is increasing worldwide and by 2035, projected 471 million people will have this condition [2]. It has attained clinical significance because of epidemiological association with macro-vascular disease and neuropathy. In the developing world, public health impetus is on eliminating the communicable disease. However, the non-communicable diseases are also increasing with the disease already outweighing that of communicable diseases. This is an alarming situation when considering the cost incurred by diabetes. Understanding the risk factors helps to prevent or postpone the onset of diabetes.

In this issue of the journal, two studies address prediabetes, its prevalence and risk factors [3, 4] in the developing nations Nigeria and India. These data cover age groups from childhood to elderly. The Nigerian study involved the adult population of interior rural villages of Enugu state while the Indian study involved urban children and adolescents from Nellore in the South Indian state of Andhra Pradesh. Though a prediabetes state can exist for type 1 diabetes, the current publications here pertain to type 2 diabetes mellitus.

In the Nigerian study, one in every five adults in this had prediabetes. Here, 5.8 % of the study population were classified as obese while central obesity was noted in 34 %. The authors rounded off the weight to the nearest 0.5 kg. One would like a 100-g precision. Likewise, two blood pressure readings were taken with shorter 5-min interval in contrast to the regular 15-min gap. The prevalence of diabetes of 4.8 % is much higher than (1.9 %) quoted by the International Diabetes Federation [5] for Nigeria and the semi-urban Umudike community [6] of South-East Nigeria. Almost all (96 %) subjects were hard working and 34 % had central obesity. In logistic regression, both age and hypertension and not obesity were noted to be risk factors for prediabetes. Ethnicity has been

✉ Venkata Ranga Rao Kodali
venkata.kodali@uwa.edu.au

¹ Department of Medicine, Geraldton Hospital and University of Western Australia, 167 Fitzgerald Street, Geraldton, WA 6531, Australia

² Department of Pharmacy Services, Northwest General Hospital & Research Centre, Peshawar, Khyber Pakhtunkhwa, Pakistan

³ Department of Pharmacy, University of Swabi, Swabi, Khyber Pakhtunkhwa, Pakistan

much highlighted risk factor for hypertension in these populations, and the data on prediabetic state are scant.

The Indian study was conducted on children and adolescents attending the urban endocrine clinic for obesity. Robust biochemical evaluation including glucose tolerance tests and HOMA-IR (homeostatic model assessment-insulin resistance) was carried out in 224 obese patients. The cross-sectional data showed an increase in the prevalence of IFG (8 to 10 %), IGT (10 to 15 %), and diabetes (1.3 to 1.8 %) from childhood to adolescent stage, respectively. Likewise, HOMA-IR worsened from 33 to 48 %. While it can be a progression of the innate disorder, the increase can also be attributed to the pubertal spurt of counter-regulatory hormones. Their data also showed positive association of both systolic and diastolic blood pressure readings with insulin resistance.

The good news is that there is an accumulated evidence that this intermediate disorder can be slowed down or prevented from deteriorating to diabetes with pathological consequences. The successful interventions tested were diet and exercise [7], metformin [8], tolbutamide [9], orlistat [10], and acarbose [11].

The bad news is that, in Nigeria, as demonstrated in the study albeit the small sample size, there is lack of association with obesity. This is a serious concern. One cannot plan or evaluate intervention strategies in the absence of simple parameters other than frequent biochemistry to monitor in a large population. Furthermore, it may or may not be easy to impress upon people who are not overweight or with no obesity to adopt the healthy lifestyle. High prevalence rates of diabetes were similar in both urban and rural population in the Indian subcontinent [12–16]. Studies have recorded prediabetes in >10 % of Sri Lankan and Indian and >20 % in Bangladeshi [16] adult population. These data raise questions regarding ethnicity and beta cell reserve. The authors also suggest a possible role of the number of pregnancies with weight gain. Parity has already been raised as a possible risk factor leading to obesity and diabetes [17]. The proportions of diabetic women having >5 children did not differ between various BMI grades in an Indian study [18]. In logistic regression, parity has an insignificant association with hypertension only in rural south Indian populations [13].

The other observations of concern are the high prevalence of hypertension and obesity. Studies from the Sub-Saharan countries have consistently reported a higher prevalence of hypertension with rates ranging from 19 % in rural Tanzania, 20 % in rural Kenya [19], 21 % in rural Nigeria, and 32 % in urban Namibia. The situation in the Indian subcontinent is equally worse [20, 21]. Likewise, the prevalence of obesity is high in children of Africa [22] and India [23]. If both high blood pressure and obesity are considered independent risk factors, these are double burden to the health promoters.

The two studies clearly bring out the epidemic nature of prediabetes in developing countries. The scenario is alarming not just for planners but also for clinicians and raises the question of what the next move should be when confronting an obese child or a non-obese but still high-risk adult. The associated dyslipidemias and microalbuminuria [24] in the prediabetic stage beg for swift intervention strategies from clinicians. The health care plans in the developing nations need to focus on health promotion and education for the masses and attempt to curtail the consumption of high-energy empty-calorie foods and prevent exposure to environmental disruptors of the endocrine system with unknown consequences.

Compliance with ethical standards

Conflicts of interest The authors declare that they have no competing interests.

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