



HYPOTHESIS

A diabetes-free India by 2030

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DOI: 10.21040/eom/2018.4.2.1

Received: March 21st 2017

Accepted: May 15th 2018

Published: June 29th 2018

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Funding: None.

Conflict of interest statement: The authors declare that they have no conflicts of interest.

Data Availability Statement: All relevant data are within the paper.

Abstract

In Indian scenario, the onset of diabetes pathogenesis begins at the fetal stage. The average newborn has a low birth weight but a high-fat percentage, the culprit being maternal malnutrition and metabolic dysfunction. The concept of the Asian Indian phenotype describes an Indian person with higher total and visceral fat compared to Caucasians. At a normal body mass index, the higher fat percentage might explain the faster beta cell function failure and early development of diabetes. To achieve the aim, we must work toward creating a salutogenic phenotype and environment. This can be done by focusing on girls at the prepubertal stage. If they grow into healthy adolescents and women, they will become healthy mothers. By 2030, they will have healthy children, who will be less likely to develop diabetes. Understanding these circumstances, the Honorable President of India, Shri Pranab Mukherjee, recently called for a diabetes-free India by 2030. While the diabetogenic environment has been discussed at length by experts, here we focus on how to improve our phenotype since we believe that the origin of diabetes begins with phenotype rather than the environment. Thus, focusing on a healthy phenotype, right from the start of life (*in utero*) might have a beneficial impact on transgenerational “transmission” of diabetes. To prevent diabetes in the future, we need to ensure that our children are born with a healthy phenotype and are provided with an adequate environment.

Key words: Asian Indian phenotype; diabetes; prevention; environment; preconception

1. Introduction

The rising number of individuals affected with prediabetes and diabetes mellitus represents a great public health concern. Recent data show that there is an increasing prevalence of this condition in younger age groups [1]. Compared to Caucasians, South Asians develop diabetes mellitus at least 15 years earlier and at a lower body mass index (BMI) [2]. A diabetogenic phenotype that comprises a greater amount of both total and visceral adipose tissue accompanied with a diabetogenic environment might be responsible for this accelerated rise in diabetes.

Considering these circumstances, the Honorable President of India, Shri Pranab Mukherjee, recently called for a diabetes-free India by 2030. To make the country free from diabetes by 2030, we should be working on changing both the phenotype and environment. While the diabetogenic environment has been discussed at length by experts [3], here we focus on how to improve our phenotype. The origin of diabetes, we feel, begins with the phenotype, rather than the environment. Focusing on a healthy phenotype, right from the start of life, i.e., *in utero*, might have a beneficial effect on the transgenerational “transmission” of diabetes [4].

2. Thin-Fat Indian (Asian Indian Phenotype)

A unique phenotype called the “Asian Indian Phenotype” is described as a higher degree of central body obesity (higher abdominal girth) and an increased amount of total body fat despite relatively low rates of generalized obesity [5]. This concept was brought into focus by the Y-Y paradox, postulated by Yajnik et al. [6], suggesting that an Indian person has a higher rate of both total and visceral fat than a Caucasian with similar BMI. The fact that, at a normal BMI, there is a higher fat percentage, this might explain the faster deterioration of beta cell function and the early development of diabetes.

3. Fetal Origins

The unique thin-fat Indian phenotype starts from *in utero* development. This means that the pathogenesis of diabetes begins at the fetal stage of life, though it presents in adulthood. The average Indian newborn has a low birth weight but has a higher percentage of fat. This might be

caused by maternal malnutrition during pregnancy and metabolic dysfunction in women of reproductive age [7].

4. From Theory to Action

To make India Diabetes free by 2030, we must work toward creating a healthier phenotype as well as the environment. This can be done by focusing on girls at a prepubertal stage today: If we can ensure that they grow into healthy adolescents and women, they will probably become healthier mothers as well [8]. By 2030, they will give birth to phenotypically healthier children, less likely to develop diabetes [Figure 1].

Conceptually, we want to ensure adequate conditions for full-term birth, with a normal birth weight and optimal fat percentage (25%). To get all this:

- Young prepubertal girls should be encouraged to exercise regularly and eat healthy food.
- Postpubertal girls should be screened and treated for PCOS and the metabolic syndrome.
- Newly married women should be encouraged to postpone their pregnancy until an age of 25–30 years or until they are in full health, fit, and ready.
- Women should be encouraged to achieve normal pre-conception weight.
- Optimal antenatal and natal care should be provided.

5. Small Steps Make a Beginning

To implement this, diabetes care should start focusing on education in school

- Health science should be added to the curriculum of 5th–9th standard classes. The aim should be to educate the students on nutrition, exercise, healthy lifestyles, prevention of non-communicable diseases, and other aspects of health and disease.
- School-aged children should be encouraged to follow a healthy lifestyle, including the consumption of an adequate (high protein) diet and participation in sports.
- Health should be recognized and rewarded by promoting children not only on the basis of academics but also on modifiable health parameters.
- For the detection of obesity in the pediatric population, a growth chart should be designed that plots children's weight not only according to their current age but also to their gestational/birth weight. This message has to be propagated to all the teachers as well as the parents.

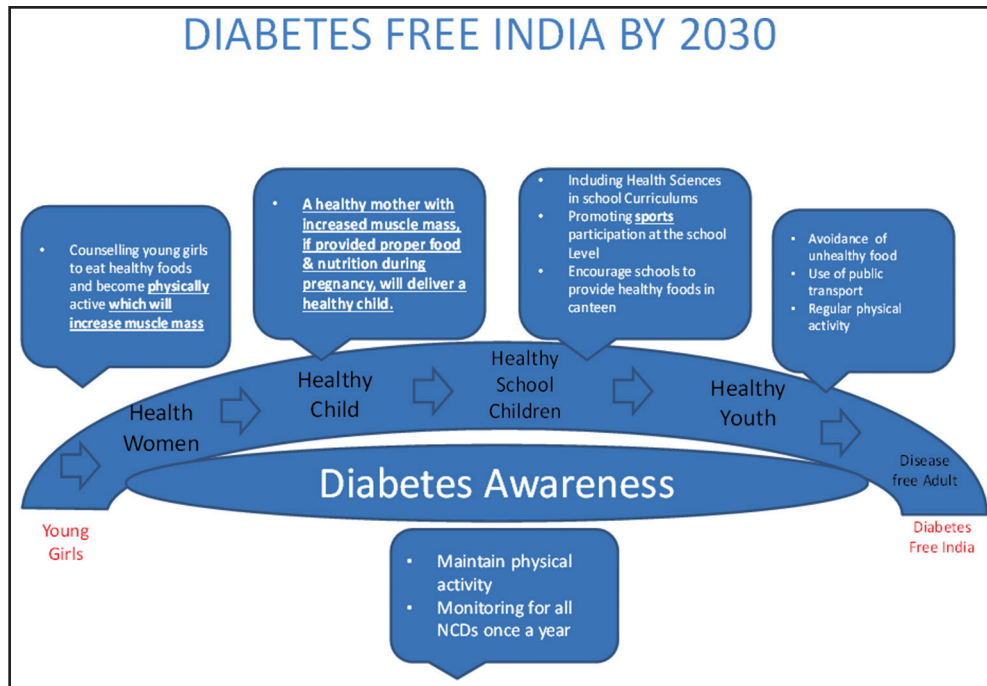


Figure 1. Proposal of an algorithm to reduce the prevalence of diabetes in India

- School health programs should be strengthened to measure body composition apart from height and weight.
- Special attention should be paid to children with low birth weight and high-fat percentage.

Intervention in youth, targeting post-pubertal and young adults, is equally important, thus:

- Healthy food choices should be promoted among young adults.
- Aerobic physical activity/exercise, cycling, and public transport should be encouraged.
- Early detection of metabolic syndrome and early intervention should be made a part of routine health care.
- Good health should be rewarded and recognized.
- Office culture should facilitate activity breaks at regular intervals during work and discourage prolonged sitting.

6. Authors' Contributions

All authors equally contributed and gave their final approval.

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