REVIEW ARTICLE

The Role of Indigenous Diets in Altering Insulin Resistance and Metabolic Disorders

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Abstract

The globalization of cuisine due to human migration along with the availability of agricultural produce, dairy, poultry and meat on the e-market, has made every food, seasonal and otherwise, available ubiquitously, perennially, posing a greater risk for the development of metabolic diseases like diabetes. As the beginning points for the pathogenesis of type 2 diabetes is rooted in lifestyle, it is only natural to expect correction to happen at that end as much of these lifestyle ailments were probably nonexistent in the pre-globalization era. However, to what extent one needs to go back in time, is a question that remains with various people recommending various diets for prevention and some for remission of diabetes. In this internet era with information abundance, sifting fact from myth is no easier than finding needle in a haystack. More so, it is like finding for the right needle in a needle stack. We hypothesise that adopting "indigenous diets" which are basically foods consumed by our ancestors, before the agricultural revolution may be the key to stopping the journey along this slippery slope of metabolic diseases at the farther end of which lies diabetes. Below is a literature review of the past 5 years on this subject of indigenous diets and the benefits thereof followed by the author's comments on the subject.

Keywords: Indigenous diets, insulin, type 2 diabetes, blood sugar levels

Introduction

Insulin resistance is a condition where the body's cells don't respond adequately to insulin, a hormone produced by the pancreas. This leads to elevated levels of glucose in the blood, which can eventually result in type 2 diabetes and other health issues.

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Diet plays a crucial role in managing diabetes by helping control blood sugar levels. A well-balanced diet that focuses on controlling carbohydrate intake, incorporating whole grains, fruits, vegetables, lean proteins, and healthy fats, can help manage blood sugar levels and overall health. It's essential to monitor portion sizes, choose foods with a low glycemic index, and limit the intake of sugary and processed foods. Regular meals, consistent carbohydrate intake, and healthy eating habits are key for managing diabetes effectively.

Crops have tailed man in his sojourn of necessity and more rapidly when richer purses and exotic appetites financed their import and export[1]. Since crop biology changes with the environment in which it grows, it is natural that the availability of water, minerals, shade and light varied when man carried crops during his voyages and expeditions.

Crops and animals were the chief currency for trade in the barter system of economy. In parts of Africa, even today, cattle symbolize bountifulness[2]. Profits from trade fuelled a production boom and falling prices led to fuller stomachs round the year.

Humans adapted to this change over centuries and indigenized some foreign foods. Advances in shipping and air travel set the human gut and metabolism to spin, at a rate faster than the earth rotates, outpacing even the fastest of endocrine rhythms. What began as a simple chain reaction, cascaded into a snowball phenomenon. This problem of abundance has attained nuclear proportions bringing us to the present day diabesity pandemic.

There is evidence to say, much of the present day non-communicable diseases did not exist in the pre-globalization era. Niche indigenous communities swamped by this deluge of abundance have shown increased incidence of obesity and diabetes globally, especially in the developing world, which is making the journey from making ends meet, to meeting the end at a breakneck speed[3].

Materials and Methods

A scoping literature review of the PubMed database from 15 Oct 2018 up to 15 Oct 2023 was performed independently by two of the authors (NK and ST) to identify relevant papers. The search terms were "Indigenous diets" AND "Diabetes." The search included guidelines, reviews, clinical trials, observational studies, and case reports. Potentially relevant papers were initially evaluated by checking the title and abstract, and all eligible studies were retrieved. Additional papers were identified by a manual search of the references from the retrieved articles.

Discussion

Gathering evidence, one must be unbiased and therefore, we begin with one article which seems counterintuitive to the argument that a shift from indigenous to modern diets is unsafe, but could be rather recommended. An isolated community living in the Arctic, Greenland and parts of Alaska who had, until 1970s and 1980s and low cardiovascular disease (CVD) burden and diabetes risk[4] as a result of their indigenous rich in fatty fish, today have seen a rise in the incidence of CVD. Despite a shift from the traditional diet of sea fish and sea mammals to a nonindigenous diet, the incidence of diabetes has not risen proportionately. The rise in CVD incidence according to the study cited[5] is attributed to not only a change in dietary patterns but also lifestyle which includes physical activity. It has been observed that serum lipids are elevated individuals who had adopted a western lifestyle within Greenland compared to those who migrated to Denmark. This could be explaned due to better lifestyle and availability of healthier provisions[6].

These findings suggest that studying a change in diet in isolation and its bearing on diabetes may not be possible. As man is a sum of his habits, of which food is one aspect alone. However, let us examine the rest of the evidence there is on the subject. As there is heterogeneity in food consumption patterns across the globe, so is there a heterogeneity in the prevalence of diabetes in various populations. The observed pattern has led investigators across the world to investigate if there is an association with consumption of foreign/nonindigenous foods and diabetes.

Epidemiological studies have shown a lower prevalence of diabetes among some populations of Southeast Asia where the consumption of fermented soybean food (FSF) is a tradition[7]. Nutritional studies performed in animals and intervention studies with humans suggest that the ingestion of soy protein with isoflavones improves glucose control and reduces insulin resistance. Soybean also contains high levels of unsaturated fatty acids, dietary fiber, and minerals. Being structurally similar to endogenous estrogen, isoflavonoids (genistein, daidzein, and glycitein) act as agonists or competitive antagonists due to weak binding affinity to the estrogen receptors[8]. Estrogen is also helpful for preventing type 2 diabetes by attenuating insulin resistance, improving insulin secretion, and increasing β-cell mass[8,9]. With the shift from traditional diets to westernized diets, we have witnessed an increased prevalence of type 2 diabetes in Koreans (from < 1% in 1960s to 10% by early 2000s). This dramatic increase is related to the influence of economic development, health policy, urbanization, westernized diet, decreased physical activity, as well as an individual's health behavior changes[10].

In India, the incidence of diabetes is higher in the State Capital cities which are urbanized compared to the rural population who still largely consume indigenous diets. According to the ICMR-INDIAB study, the prevalence of diabetes varied from 4.3% in Bihar (95% CI 3.7-5.0) to 10.0% (8.7-11.2) in Punjab and was higher in urban areas (11.2%, 10.6-11.8) than in rural areas (5.2%, 4.9-5.4; p <0.0001)[11].

A variety of rice known as whole grain scented Joha rice indigenous to North Eastern India is known to contain a phytochemical called PCKJ which has shown enhanced insulin sensitivity due to facilitated glucose uptake and GLUT-4 translocation to the plasma membrane in rats, showing promise as a potential nutraceutical[12]. With changing times, people are leaving these indigenous foods and one can notice a clear rise in the incidence of diabetes in these native populations which have recently made the shift to a western diet.

The Aborigines of the Northern Territory of Australia have shown an 18% increase in the prevalence of diabetes according to a retrospective longitudinal data-linkage study for 7 years from 2012-2019 (annual increase 2.5%, 95% CI: 1.9% to 3.1%, p<0.001) with much of the change occurring parallel to modernization of the region with availability of energy dense foods[13]. Epigenetic mechanisms also have a role, with factors such as intrauterine exposure to hyperglycemia or maternal undernutrition impacting long-term phenotypic expression in the offspring. This phenomenon also called as the thrifty gene hypothesis was first hypothesized by Barker and Hales[14]. Similar increase has been noted in various parts of the world who are now paying the price of development and the price of change.

Since the time of Ancel Keys, the Mediterranean diet has been recommended as a Panacea for all metabolic diseases by people, qualified and not, alike. The traditional Mediterranean diet is characterized by a high intake of plant foods (fruits, vegetables, breads and other cereals (traditionally minimally refined), potatoes, beans, nuts and seeds); minimally processed, seasonally fresh and locally grown foods; fresh fruits as typical dessert, with sweets containing sugars or honey a few times per week; a high intake of olive oil (especially virgin and extra-virgin olive oil) used as the principal source of fat; a moderate intake of dairy products (mostly as cheese and yoghurt); zero to four eggs a week; fish and poultry consumed in low to moderate amounts; red meat consumed in low amounts; and wine in moderation, consumed with meals. This variety not only makes it healthy but quite expensive and resource heavy too as the ingredients are not ubiquitous but "indigenous" to the Mediterranean.

What is the flip side of recommending a diet rich in oils, fatty fish and multiple portions of fruits to impoverished people? But obviously, it is expensive and not practical to begin with and by virtue of the thrifty genes endowed in them, they might be more prone to diabetes and metabolic conditions. The pace of modernization has outpaced the genes. People born impoverished who experience abundance while growing up, suffer. On the flip side, people who have been living in abundance, have lower prevalence of metabolic conditions, as described particularly in the French people (The French Paradox)[15]. Diets as the French typically consume, rich in saturated fat and wine in other populations is not advisable too, just as the Mediterranean diet is not recommended for all.

Diets should not only be healthy but should be affordable for the family and society alike. Recommending fatty sea fish to a highlander or a desert dweller in the arid parts of Sub-Saharan Africa or Rajasthan would entail huge shipping costs and also would not be sustainable in the long run. This would perhaps be a valid counter argument to Ancel Benjamin Keys' theory expounding that a shift from saturated fats to polyunsaturated fats in the diet protected from cardiovascular diseases.

This may seem like a digression, but the author believes differently, as not only are the metabolic conditions all interlinked, obesity and diabetes are of concern mostly as causative factors for morbidity and mortality, most of which is from CVD.

Modern day nutrition has "synthesised" several "diets" by analysis of the various foods and their benefits seen in various people, to name a few, low carbohydrate diet, very low carbohydrate diet, ketogenic diet, paleo diet, intermittent fasting, Atkins diet, mediterranean diet, DASH diet, low energy diet, very low energy ketogenic diet, vegetarian and vegan diets. Several of these diets have shown promise in achieving objectives such as weight loss, reduction in HbA1c or improving the lipid profile in various sections of the society, but the benefits are not universally applicable.

This could be due to the genetic, racial, ethnic and geographical heterogeneity of the people, and the diverse lifestyles. Nevertheless, putting it that way, is no way forward, as it seems like an excuse to drop the quest. Those who fail to read history, often commit the same mistakes. Look Ahead trial was a landmark trial which showed the benefits of medical nutrition therapy in the remission of diabetes. We know that medical nutrition therapy and weight loss helps in diabetes remission[16]. MNT is recommended by the ADA, RSSD and Indian Council of Medical Research (ICMR) as part of routine care in diabesity[17,18].

A group of general medicine, endocrine and obesity experts from South Asian countries, that is, Bangladesh, Bhutan, India, Nepal and Sri Lanka, met on January 17, 2020 to frame the Consensus on Medical Nutrition Therapy for Diabesity (CoMeND) in Adults: A South Asian Perspective and have laid out guidelines in exquisite detail with emphasis on "root cause analysis" approach before prescribing medical nutrition therapy to each patient[19]. While the solution is a game changer for the privileged who could come to the right place for the right advise, there is huge haystack full of "wrong information" which separates them and the endocrinologist and by the time the person reaches one, he's already late and complications have would have set in.

Amongst the gamut of diets available, if there is none that may be universally applicable, would a recommendation of a "tailor made" diet, be lucrative to the underprivileged, or the uneducated, who would perhaps, fail to understand things explained in fewer words?

Hence, the advise to follow individualized tailor made medical nutrition therapy or diets may not be suitable to the people out of reach of the health care system and are afflicted by not only obesity, but malnutrition, anemia, stunting and poverty. The cheaper advise sometimes is more lucrative. One of the reasons, perhaps why a poor farmer, grows the nutritionally poorer rice compared to other grains, eats the same and perhaps other cheaper more affordable "foods". If we see the secular trends across the globe, the developed classes of society are seeing lesser incidence of diabetes and CVD due to better education, better access to healthier foods and better access to information. In order to help the poor malnourished person endowed with thrifty genes, a way out of this maze where each path or diet seems to work "for a while" and then, leads to a plateau, one may bank on simpler solutions.

We need to Look Behind[1]. Studies have shown that while millets are consumed by different indigenous communities across India, their per capita consumption has decreased considerably over time[20]. Coarse cereals like Maize, Sorghum and Millets (C4 grasses) compared to rice and wheat (C3 grasses), contain more fiber and protein, and also their mineral profile is better. Due to lack of incentivization of these crops by successive governments and the huge market available for rice and wheat products including ready to eat foods, supermarket foods, etc. today, the average farmer prefers to grow the more lucrative crop and gets disease in dividends. There is a strong case in point that though there is a strong evidence base to recommend tailor made medical nutrition therapy, as the majority of the afflicted population, reside in places deprived of information, the simplest solution that could be offered is to look behind and adopt the diet of their own ancestors, instead of complicated diets which may better be left for those who may understand the nutty gritties of nutrition – macros, micros, functional foods, etc. The world we left behind, should perhaps, change slowly, stay with the "native, indigenous foods" and not get trapped into the market driven, politically sustained diabesity pandemic.

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