STATE-OF-THE-ART REVIEW

Synthesis: Deriving a Core Set of Recommendations to Optimize Diabetes Care on a Global Scale

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Abstract

BACKGROUND Diabetes afflicts 382 million people worldwide, with increasing prevalence rates and adverse effects on health, well-being, and society in general. There are many drivers for the complex presentation of diabetes, including environmental and genetic/epigenetic factors.

OBJECTIVE The aim was to synthesize a core set of recommendations from information from 14 countries that can be used to optimize diabetes care on a global scale.

METHODS Information from 14 papers in this special issue of *Annals of Global Health* was reviewed, analyzed, and sorted to synthesize recommendations. PubMed was searched for relevant studies on diabetes and global health.

FINDINGS Key findings are as follows: (1) Population-based transitions distinguish region-specific diabetes care; (2) biological drivers for diabetes differ among various populations and need to be clarified scientifically; (3) principal resource availability determines quality-of-care metrics; and (4) governmental involvement, independent of economic barriers, improves the contextualization of diabetes care. Core recommendations are as follows: (1) Each nation should assess region-specific epidemiology, the scientific evidence base, and population-based transitions to establish risk-stratified guidelines for diagnosis and therapeutic interventions; (2) each nation should establish a public health imperative to provide tools and funding to successfully implement these guidelines; and (3) each nation should commit to education and research to optimize recommendations for a durable effect.

CONCLUSIONS Systematic acquisition of information about diabetes care can be analyzed, extrapolated, and then used to provide a core set of actionable recommendations that may be further studied and implemented to improve diabetes care on a global scale.

KEY WORDS diabetes, recommendations, global, diabetes care, type 2 diabetes, type 1 diabetes, public policy

INTRODUCTION

The 2014 International Diabetes Federation (IDF) Global Diabetes Scoreboard[1] serves as the central resource for current epidemiology, societal drivers, and teleological strategy to combat diabetes as a serious chronic disease among the regions and nations of the world. The growing interest in diabetes, extending beyond local dimensions and onto a global scale, is reflected by a geometric surge in PubMed citations

on the topic (Table 1). In 2014, Dr. Michael Bergman edited a compilation of papers on diabetes care from 13 different global regions from a preventive care and public health perspective, further advancing our understanding of this field.[2] When considering one of the prime drivers—economics—there is an organic nature to the rise in diabetes prevalence, particularly in low-income and lower middle income countries, with insufficient funding impairing diabetes care and an unhealthy population impairing economic growth. But it is the complex interplay of all the drivers (Table 2), exerting effects with varying degrees from one region to another, that creates an entangled state of diabetes that needs to be dissected, interrogated, and reimagined. This level of complexity transcends the identification of 70 loci associated with type 2 diabetes (T2D), identified by genome-wide association studies and reviewed by Hara et al,[3] by including transgenerational effects on the neonate (including epigenetic changes on beta-cell function),[4-6] specific nutrient-gene interactions,[7] differential associations of polymorphisms (eg, KCNJ11) with South Indian versus East Asian populations,[8] adaptive mitochondrial DNA mutations/polymorphisms,[9] stress-hormonal-metabolic interactions, effects of social context and culture on disease expression, and obesity and simple dietary issues, to name just a few. In addition, population ancestry-related differences in disease expression, giving rise to intermediate phenotypes, are due to a distribution spectrum of risk alleles and further represent the complex interactions of the environment

and genome.[10] Thus, contrary to contemporary linear approaches that use generalized decision algorithms, behavioral economics, and governmental policy making, the goal here is to discern emergent properties that can generate a few key recommendations, perhaps as part of a future network of innovative solutions that optimizes patient care across diverse settings.

Although it is important to provide context for region-specific diabetes care, this context extends beyond simple comparisons to the American health care system. In the United States, overt shortcomings in diabetes care are in a population-based domain (eg, disparities accessing health care, poor distribution and implementation of evidence-based guidelines, and a fragmented health care system with inadequate community engagement) and an individual patient–based domain (eg, health care professional [HCP]–patient communication issues, an individual's insurance coverage, and inertia implementing precision or personalized preventive care, consisting of structured lifestyle recommendations, optimal pharmacotherapy, and complication management). However, a global context involves a greater number of variables and combinatorial interactions, many of which still need to be learned. In other words, it is as important for one region to provide context for another region with shared cultures as it is for many different individual regions to cumulatively inform the world as a whole.

METHODS

The purpose of this paper is to create a core set of actionable recommendations that can improve patient outcomes on a global scale. Leading researchers in diabetes care from around the world, with a focus on developing nations, were invited to contribute articles for this special issue of *Annals of Global Health* and include summary statements of key findings. Each author was asked to focus on specific drivers contributing to the unique expression of diabetes and current care plans in their respective nations. Authors were also encouraged to incorporate information not only from PubMed and the English language literature but also from other databases, the gray literature, and local academic sources in their native languages. This information was then compiled, classified, analyzed, and subjected to a synthetic cognitive process to arrive at relevant conclusions and recommendations believed to have positive impact, if successfully implemented, on diabetes—a complex, chronic disease. This process is presented in a logical and tractable format.

Table 1. Surge in PubMed Citations Using Search Terms "Diabetes" and "Global"[*]

Year range	No. total citations	No. review articles	No. clinical trials	No. Guidelines
2011-2015 (%)	4785	1086 (22.7)	221 (4.6)	6 (0.1)
2006-2010 (%)	2067	626 (30.3)	116 (5.6)	14 (0.7)
2001-2005 (%)	982	346 (35.2)	79 (8.0)	5 (0.5)
1996-2000 (%)	341	86 (25.2)	32 (9.4)	3 (0.9)
1991-1995 (%)	141	29 (20.6)	18 (12.8)	0
1986-1990 (%)	57	8 (14.0)	4 (7.0)	0
1981-1985 (%)	40	2 (5.0)	0	0
1976-1980 (%)	7	1 (14.3)	0	0
1971-1975 (%)	1	0	0	0
Before 1971 (%)	0	0	0	0

* Percentages use total citations as the denominator. PubMed search conducted on January 1, 2016. The interval growth in total citations has been consistently 2- to 3-fold every 5 years for last 2 decades. The growth in citation type is geometric with only 1 exception (a spike in guidelines from 2006 to 2010). There is a relative expansion of review articles compared with clinical trials and guidelines from 1-fold in 1986-1990 to about 5-fold in 2011-2015, suggesting a rising interest in analyses and opinions.