Diabetes & Metabolic Syndrome: Clinical Research & Reviews xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

Challenges in diabetology research in India

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Diabetes
Diabetology research
S&T policy
Health policy
Research evaluation

ABSTRACT

Background: Diabetes emerges out to be a major epidemic in recent years that engulfs both developed and developing countries across the globe. India, a country witnessing rapid socioeconomic progress and urbanization carries a considerable share of the global diabetes burden. There has been an incongruity between disease burden and the technical capacity to make use of existing knowledge or to generate new knowledge to combat diabetes in India.
Aim: This paper examines the role of different actors, organizations & institutions in shaping diabetology research in India using arrays of scientific indicators such as research output (publications and patents), research finance and role of policy-making bodies. This paper also identifies research gaps and challenges pertinent to this sector.
Methodology: A combination of three methods patent data analysis, publication data analysis and primary survey corroborated with secondary data to obtain desire objectives. We made an in-depth study of the patent and publication data (2000–2016) to know the research output and direction of Indian actors, institutions and organizations in the area of diabetes research.
Results: This paper identifies some key structural barriers and institutional challenges pertinent to diabetology research in India that will help in canvassing and formulating science, technology and policy guidelines for diabetology research in India
Conclusion: Multilevel intervention requires bridging the gap between knowledge and action hence policy-making should align to balance resources with innovation capabilities.

1. Introduction

The current trends in global health burden appear shifting gear gradually. On one hand, diseases like cholera, plague, polio, leprosy, malaria, HIV and tuberculosis are declining [1,2] due to timely interventions and effective management, specific target oriented interventions by government & international agencies, massive immunization, improved sanitation and lifestyle of individuals; on other hand chronic diseases like cancer, diabetes, cardiovascular diseases (heart diseases) are increasing exponentially [2]. Over the last decade due to focused action to attain Millennium Development Goals, India had made steady progress in improving and strengthening her health care system. The National Health Policy of 1983 and the National Health Policy of 2002 have served well, in guiding the health sector through Five-Year Plans and different schemes (Central, states sponsor & Public Private Partnership) [3]. However, in the contemporary scenario, India's health priorities are changing. More than sixty percent of all global deaths are reported due to chronic diseases [4,5]. The rising problems of these diseases have widespread social and economic impacts, affecting all levels of society, including households, healthcare systems and national and global economies [1,6,7].

In the contemporary world, diabetes is recognized as a major lifestyle disease. Globally, 415 million adults have diabetes and 318 million adults have impaired glucose tolerance (IGT), which puts them at high risk of developing the disease in the future. Every one in 15 adults is estimated to have IGT and one in seven births is affected by gestational diabetes [4]. The scenario of diabetes in a country like India is also not different from the larger picture. It's genetic profile of the population, sedentary lifestyles, high-stress levels, insomnia and deteriorating eating habits are some of the major factors contributing to its galloping figure of the diabetic population. India is currently undergoing a demographic transition which reflects both quantitative as well as qualitative changes in the population profile. She has world's second-largest pool of diabetic patients with 69.2 million people were affected till 2015

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https://doi.org/10.1016/j.dsx.2017.12.018
1871-4021/

[4] and high blood glucose attributed to more than 0.67 million death in the country [8].

The issue of diabetes, as an emerging problem of India's health scenario, poses an important question that goes well beyond the specific problem of diabetes and includes in its reach the whole of health schema. There has been an incongruity between disease burden and the technical capacity to make use of existing knowledge or to generate new knowledge to combat diabetes in India. In addition, social determinants such as disparity among rich and poor, inequalities, poverty, accessibility, affordability, political instability, policy uncertainty & inefficient policies implementation are hindering the effective management of diseases in India. Is the increasing rate of diabetes in contemporary Indian situation imply an inadequate intervention on the part of the Government? Or are there other factors? On the preceding context, the present study is an attempt to find out the research and innovation gaps while assessing diabetes research in India.

Various attempts were made to study and evaluate research output of a scientific organizations' nationally [9,10] and internationally in the past [11,12]. Most popular methods were scientometrics analysis, bibliometrics analysis, patent analysis, evaluating R&D expenditure [13,14] and human resources capitals etc. Scientometrics analysis also focused on research evaluation of a specific field. Some of the important contributions of scientific evaluation in the specific areas are medicine [9,11], endocrinology research [12,15], diabetes research [16–19] etc. In contrast to bibliometrics analysis, the patent analysis was more focused on determining the efficacy of individual compounds New Chemical Entities (NCE), New Biological Entities (NBE), drugs families, combination drugs etc. except some attempt to determine the patent portfolio of the organization [20]. A few patent studies specific to individual diabetes molecules are oral combined drug formulations [21], SGLT inhibitors [22], alpha1- antitrypsin (AAT) [23], Thiazolidinediones (TZDs) [24] and herbal compound in India [25]. Most of these studies were focused on analysing publication trends, patenting activities, R&D expenditure, human resources etc., however, linking research output to identifying gaps & challenges in a specific sector and its linkage with policy formulation is missing.

2. Methodology

The foundation of this study was built keeping in view some of the key concepts that have prime importance in understanding the problems, issues and challenges related to diabetes research and the whole healthcare innovation system. For a system where actors, organizations and institutions play a diverse role in different conditions, the measurement problems are more significant. A single indicator is not sufficient to capture all actors and their innovation activities. However, while focusing on research evaluation method, it is important to notices that the research output is different as per the mandate of the different organization. While hospital, research organization focuses more on publication, protocols, standards, On contrary firms' motivation are to obtain patents, abbreviated new drug applications (ANDAs), in-licensing and out-licensing due to their commercial importance. Therefore, several measures have been combined to address this problem.

A mixed methodology is used in this study. It has the flexibility of being fixed or emergent, as per requirement [26] and quite popular in health research [27,28]. This study involves three major methods: analysis of patent data, publication data and follow-up with a survey. While combining various methods this study drew inspiration from various other similar studies [29,30]. Snowball method for identifying actors complimenting with a patent-based method or citation based method reduces the risk of alienation of a population with a single method. The qualitative & quantitative data were used for preliminary & follow-up purposes simultaneously. The motives behind taking a wide range of indicators are to link and analysis both the quantitative and qualitative data. The following data sources were used to retrieve relevant information.

2.1. Study design & data sources

Patent data were retrieved from *WIPO-PatentScopus databases*, *Derwent Innovation Index* and *InPASS* (Indian Patent Advanced Search System), IP-India. The search terms used were diabet*, OR Type 1 Diab * OR Type 2 Diab * OR Type 1.5 Diab*, Double Diab* OR NIDDM OR IDDM OR MODY OR FCPD OR Hypoglycem* OR Hyperglycem* OR "Islet transplant*" OR "Islet encapsulation" OR "Insulin resist*" OR Retinopath* etc. [16]. The final analysis was made from IP-India database. These data include all patent application registered in Indian patent office including foreign applicants in the area of diabetes research from the period of 2000–2016. Publication data were retrieved from *SCOPUS database- Elsevier*. Except for a broad analysis of global trend (Fig. 1), all other data and detail analysis were based on the publication data of 2000–2016. Further, data were corroborated from institutional web sources, annual reports, financial data, product and institutional portfolio of institutions and organizations.

In addition to the above processes, set of the questionnaire were sent to actors including scientist, doctors, clinician, researcher, policy maker in the field of diabetology. The main purpose of the survey is to identify and gather knowledge from experts about different sectoral experience, perception, priorities, barriers and facilitators etc. at different stages of research. The response rates were poor only 47 actors responded positively. However, primary survey corroborated with other methods for attending research objectives.

3. Diabetology research & innovation in India

This section is a systematic, holistic analysis of various actors and organizations involves in diabetes research in India. Although our primary focus is to study various aspects of diabetes research confines to the national geographical boundary; however, sometimes, it is inevitable to take the international scenario for a comparative analysis and to draw attention towards policy direction.

3.1. Results from citation analysis

3.1.1. The growth of literature

Diabetes, no doubt became a global epidemic in the recent past engulfed equally both developed and developing countries. However, research in diabetes shows tremendous growth in last two decades due to global attention. Globally the number of peer-reviewed research articles in diabetes has increased from below 15

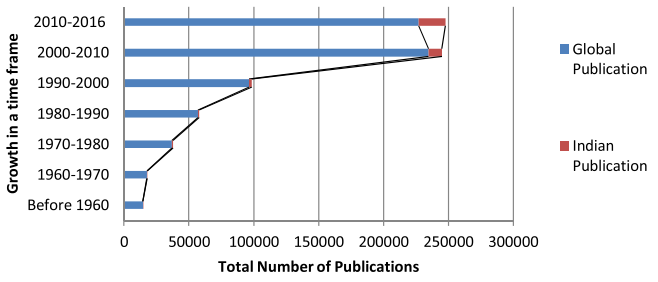

Fig. 1. India's contribution to global literature in the area of diabetology. Source: citation analysis through Scopus database, Elsevier.