

Diabetes as a communicable disease

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Abstract

This article raises interesting concepts about the multifaceted nature of diabetes. This thought provoking review describes diabetes as a communicable disease. Collating well documented evidence, it suggests that diabetes may be a transmissible condition. The authors propose four routes of transmission of diabetes: spread by example, by the ear, the environment, and by "evolution".

Keywords: Communicable disease, diabetes hearsay, IAPP, MODY, monogenic diabetes, non-communicable disease, prion diabetes, Type 1 diabetes, type 2 diabetes, viral diabetes.

Introduction

Dubbed by experts as a lifestyle disorder, a disease of the family or community, and a metabolic syndrome, diabetes is one of the most prevalent diseases of humankind. With over 360 million adults living with diabetes today, the condition is now considered endemic, rather than epidemic, in many parts of the world¹. Diabetes has traditionally been thought of as a non-communicable disease (NCD). The International Epidemiological Association defines NCD (Syn: non-transmissible disease) as "a disease for which evidence is lacking that transmission from individual to individual is possible by contagion, a vector, biological heredity or inheritance."².

Advances in research have changed the way we look at the pathophysiology of diabetes, and how we screen, diagnose and manage it. Most advances in pathophysiology are "biomedical" in nature, exploring the frontiers of biochemical and physiologic abnormalities. The Ominous Octet and Dirty Dozen models of diabetes causation highlight the multifaceted nature of diabetes^{3,4}. Improvement has also occurred on the psychosocial front: the bidirectional relation between diabetes and depression, is well documented⁵.

Communicability Of Diabetes

Recent work has highlighted various types and etiologies

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of diabetes, some of which may fit the definition of communicable disease (CD). CD (Syn: transmissible disease) is defined as "a disease whose causal agent can be transmitted from successive hosts to healthy subjects, from one individual to another". CD include contagious and noncontagious diseases. The latter include diseases genetically inherited and diseases exclusively transmitted through vectors⁶.

Researchers have documented a higher risk of occurrence of diabetes among spouses⁷. This finding is distinct from the genetic linkage seen in earlier family studies. Researchers have also been able to "transmit" diabetes in mice, using a prion-like particle. Injecting blood containing islet amyloid polypeptide (IAPP) from a diabetic mouse to a non-diabetic mouse was able to produce diabetes in the latter⁸. This raises the possibility of human-human diabetes transmission, similar to that seen in mad cow disease. Clustering of diabetes has been noted in specific socioeconomic strata across the world⁹. Infectious or viral etiologies have also been proposed for tropical diabetes in the past¹⁰. Diabetologists have also been aware of the transmissibility of diabetes in families, as in the case of maturity onset diabetes of the young (MODY)¹¹.

The discovery of the intestinal microbiome, its relationship with metabolic syndrome and diabetes, and the potential of faecal transplantation in managing diabetes, are recent milestones in endocrinology and metabolism¹². Though in their infancy, these developments suggest the possibility of faeco-oral transmission of diabetes as well. These newly uncovered aspects of diabetes science lead one to raise the question: is diabetes a communicable disease (CD)?

Difficult Definitions

Dictionaries clearly differentiate between NCD and CD. However, there does exist a grey zone, consisting of diseases which are not caused by conventional infectious agents, but can be transmitted from person to person. Exposure to second hand smoke, for example, may lead to carcinoma lung. While carcinoma lung is not infectious or contagious, the transmission of tobacco smoke is by air. Yet another example is road traffic accidents: one careless index driver can 'communicate' an accident to multiple unsuspecting co-travellers on the road, in air, or on sea. Mass hysteria, well documented by psychiatry, is another

exemplar of a condition which meets the definition of both NCD and CD.

Heterogeneity Of Diabetes

With this background, suddenly, the classification of diabetes as an NCD does not seem so straightforward anymore. While diabetes is a disorder of carbohydrate metabolism, multiple factors cause, precipitate, or contribute to this abnormality. Each individual with diabetes has a specific 'glycaemic personality', characterized by a unique 'glucophenotype', which is based upon a specific mix of physiological and biochemical dysfunction¹³. The multifaceted syndrome of diabetes is linked with various lifestyle-related issues. Many of these disordered aspects of lifestyle are 'communicable' or 'transmissible' or contagious.

Modes Of Spread

A person surrounded by family, friends and colleagues who practice unhealthy living behaviours, including eating and (lack of) physical activity¹⁴, will exhibit a tendency to follow such behaviours. The same will hold true for substance abuse and coping skills. We term these aspects "diabetes spread by example" (Table 1).

Hearsay, or misinformation, is reality of life that one has to contend with. Social media and other communication

channels has made e-hearsay an important challenge to global health. This is especially true for chronic diseases such as diabetes, where d-hearsay' plays a significant role in determining health care seeking, behaviour, and health care acceptance¹⁵. D-hearsay is transmissible, communicable and contagious, and can contribute to worsening of outcome. This communicable characteristic of diabetes can be called 'diabetes spread by the ear'.

Modern science explores newer vistas every day, and our frontiers continue to expand. Researchers have reported mouse to mouse transmission of diabetes using parenteral administration of body fluid from a diabetic mouse. This adds to the substantial body of evidence which links type 1 diabetes with viral infections and immunization. It is plausible that the same viral insult, in a person with more resilient beta cells, or a more robust autoimmune defence system, may lead to type 2 diabetes instead of type 1. This viral borne etiologic mechanism may be a communicable one. Others have demonstrated the ability of intestinal microbiota (transmitted via the faeces-oral route) to modulate metabolic function. These, and other hypotheses that may be discovered in future, can be clubbed under the heading, 'diabetes spread though environment'.

"Diabetes spread through 'evolution'" is the alliterative term we choose to describe monogenic diabetes, including the various forms of MODY. These conditions are not contagious, but are certainly transmissible across generations, and hence fit the definition of CD. A similar descriptor can be used to explain trans generational karma and the communicability of metabolic dysfunction, including dysglycaemia, from mothers with gestational diabetes mellitus to their unborn offspring¹⁶.

Prevention Of Diabetes

If diabetes is communicable, it should be amenable to preventive interventions as well. Diabetes spread should be targeted using strategies of primordial and primary intervention. However, better availability of health care facilities which offer secondary and tertiary prevention is necessary to back word with action (Table 2).

Quaternary prevention is an important facet of diabetes care. Rational use of screening, diagnostic, therapeutic and monitoring tools must be ensured. This will help avoid unnecessary diagnosis, labeling and intervention in diabetes. An apt exemplar may be the use of non-validated criteria for the diagnosis of gestational diabetes, which encourage over diagnosis, and result in stigmatization of the affected individual^{17 18}.

Quinary prevention, a newly coined term, promotes the

Table-1: Diabetes as a communicable disease: modes of spread

Through lifestyle/"By example"

- **Shared culinary/dietary practices**

- o Meal quantity
- o Meal composition
- o Meal pattern
- o Cooking styles

- **Shared physical activity practices**

- o Sports and games
- o Exercise
- o Non-exercise physical activity

- **Shared stress levels**

- o Personal
- o Professional
- o Substance abuse?

Through mis-information/ "By the ear"

- Related to prevention of diabetes
- Related to management of diabetes
- Related to health care seeking behaviour

Through infective particles/"By environment"

- Prions
- Faeco-oral microbiota
- Viral infection (type 1 diabetes?)

Through "evolution"/genetics

- MODY (maturity onset diabetes of young)
- Offspring of mothers with gestational diabetes

Table-2: Prevention of communicable spread of diabetes**Primordial and primary prevention**

- Healthy lifestyle
- 0 Culinary/dietary
- 0 Physical activity
- 0 Stress management

Secondary and tertiary prevention

- Better health care facilities
- 0 Availability
- 0 Affordability
- 0 Accessibility

Quaternary prevention

- Rational use of
- 0 Screening/diagnostic tools
- 0 Treatment/interventional tools

Quinary prevention

- Spread health awareness and information

avoidance of hearsay and misinformation which may impede efforts to control diabetes. Quinary preventive strategies are of specific use in tackling diabetes spread by the ear (personal observation).

Summary

Diabetes can thus be studied as a communicable disease, which can be spread by example, by the ear, and by the environment. We hope that this communication will help facilitate the spread of such studies and enhance efforts to prevent it.

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