

Risk Factors of Type 1 Diabetes Mellitus

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Abstract

The presence of antibodies directed against beta cell antigens or molecules is a significant risk factor for the development of type 1 diabetes mellitus. In type 1 diabetes, the immune system attacks the beta cells that produce insulin in the pancreas. The attack causes permanent damage and leaves the pancreas unable to produce insulin. If the pancreas isn't working they it should, or the body can't use the insulin it makes, the blood sugar levels get too high, and diabetes occurred. Type 1 diabetes mellitus is usually diagnosed before the age of 40, although occasionally people have been diagnosed later after an illness causes an immune response that triggers it. Ethnic minorities have a higher prevalence of type 1 diabetes than non-minority individuals. Environmental factors playing a role in the pathogenesis of type 1 diabetes mellitus may differ substantially from population to population. More specifically, disease incidence in one geographical area may differ from another because of different exposures to a given risk factor or because of difference between population genetic susceptibilities to that risk factor.

Keywords: Age, Ethnicity, Physical Stress, Risk Factors, Type 1 Diabetes Mellitus

Introduction

The common risk factors of type 1 diabetes mellitus are having family history and genetics, presence of autoantibodies, physical stress, and exposure to illnesses such as viral infections, disease of the pancreas, age, race, geography, and early diet [1, 2]. The risk factors of type 2 diabetes mellitus discussed in turn below.

Family History and Genetics

The risk for type 1 diabetes in siblings of patients is fifteen-fold higher than the risk for type 1 diabetes in the general population, which suggests that genetic factors play an important role in disease susceptibility. The genetic marker is located on chromosome 6, and it's an HLA (human leukocyte) complex. Several HLA complexes have been connected to type 1 diabetes mellitus [3]. Familial clustering of type 1 diabetes mellitus is a conspicuous feature; the risk of developing type 1 diabetes mellitus is 8-15 folds higher in first degree relatives and twofold in second degree relatives [4]. Genetic predisposition is thought to be a major risk factor in the development of type 1 diabetes mellitus [5]. Most white people with type 1 diabetes have genes called HLA-DR3 or HLA-DR4, which are linked to autoimmune disease [6]. The risk developing type 1 diabetes is increased by certain variants of the HLA-DQA1, HLA-DRB1 genes [7]. The risk to siblings of type 1 diabetes individuals ranges from 1 in 12 to 1 in 35 (18,19). The risk is significantly higher in siblings of individuals diagnosed at age [8].

Presence of Autoantibodies

The presence of antibodies directed against beta cell antigens or molecules is a significant risk factor for the development of type 1 diabetes mellitus [9]. Islet cell autoantibodies are strongly associated with the development of type 1 diabetes [10]. The appearance of autoantibodies to one or several of the auto antigens GAD65, IA-2, or insulin-signals an autoimmune pathogenesis of beta cell killing [11]. Type 1 diabetes mellitus is an autoimmune disease encompassing the T-cell mediated destruction of pancreatic beta cells and the production of autoantibodies against islet proteins [12]. Four primary types of islet autoantibodies are detected as markers of beta cell autoimmunity: those against glutamic acid decarboxylase (GAD65), insulin, insulinoma antigen-2 and zinc transporter 4 autoantibodies are markers of beta cell autoimmunity in type 1 diabetes: Islet cell antibodies (ICA, against cytoplasmic proteins in the beta cell), antibodies to GAD65, insulin autoantibodies (IAA), and IA-2A, to protein tyrosine phosphate [13]. The first antibodies described in association with the development of type 1 diabetes were ICA [14].

Physical Stress

Stress cause type 1 diabetes mellitus is no longer plausible. Physical stress can trigger the release of adrenaline and cortisol in the blood [15]. These hormones cause can cause blood glucose levels to rise. Stress is a potential contributor to chronic hyperglycemia in diabetes. Stress has long been shown to have major effects on metabolic activity [16]. Energy mobilization is

a primary result of the fight and flight response. When stressed, the body prepares itself by ensuring that enough sugar or energy is readily available [17]. Insulin levels fall, glucagon and epinephrine (adrenaline) levels rise and more glucose is released from the liver [18].

Exposure to Illnesses Such as Viral Infections

Certain viruses may trigger the development of type 1 development of type 1 diabetes mellitus by causing the immune system to turn against the body instead of helping it fight infection and sickness [19]. A significant number of viruses have been associated with type 1 diabetes, including enteroviruses such as Coxsackievirus B (CVB), but also rotavirus, mumps virus and cytomegalovirus [20]. Viral infection is associated with much greater variability in blood glucose levels. Virus triggers and promotes islet cell destruction and cause type 1 diabetes mellitus [21].

Disease of the Pancreas

In type 1 diabetes, the immune system attacks the beta cells that produce insulin in the pancreas [22]. The attack causes permanent damage and leaves the pancreas unable to produce insulin [23]. If the pancreas isn't working the way it should, or the body can't use the insulin it makes, the blood sugar levels get too high, and diabetes occurs. This form of diabetes results from the body's immune system attacking the insulin-producing beta cells in the pancreas. The beta cells become damaged and over time, the pancreas stops producing enough insulin to meet the body's needs [24]. Pancreatitis causes diabetes by affecting the amount of insulin the body produces [25].

Age

Type 1 diabetes is usually diagnosed before the age of 40, although occasionally people have been diagnosed later after an illness causes an immune response that triggers it [26]. In the United States, most type 1 diabetes diagnoses occur in children between the ages of 4 and 14 years old [27].

Race

Ethnic minorities have a higher prevalence of type 1 diabetes than non-minority individuals [28]. There are multiple factors that contribute to these disparities, including biological and clinical factors, as well as health system and social factors [29]. Type 1 diabetes is most common among non-Hispanic Caucasians, followed by African-Americans and Hispanic Americans [30].

Geography and Environmental Factors

Urban populations reveal more risk factors of type 1 diabetes than rural population because of the differences in lifestyles and nutritional patterns [31]. For instance, the prevalence of hypertension is higher in urban than rural areas. The urban population is more obese than the rural population [32]. Geography's impact on type 1 diabetes is less clear than its impact on type 2 diabetes mellitus [33]. The incidence of type 1 diabetes is high in the Nordic countries with geographic differences between as well as within countries [34]. Environmental factors associated with type 1 diabetes include diet, vitamin D exposure, obesity, early life exposure to virus associated with islet inflammation (such as enteroviruses), and decreased gut-microbiome diversity

[35]. Some of the candidate environmental factors for type 1 diabetes (eg, caesarean delivery, early childhood diet, and use of antibiotics) are intertwined with the development and function of the human microbiome [36]. Environmental factors playing a role in the pathogenesis of T1DM may differ substantially from population to population. More specifically, disease incidence in one geographical area may differ from another because of different exposures to a given risk factor or because of differences between population genetic susceptibilities to that risk factor [37].

Early Diet

Short-term breastfeeding and early exposure to complex dietary proteins, such as cow milk proteins and cereals, or to fruit, berries, and vegetable roots have been implicated as risk factors for advanced beta cell autoimmunity or clinical type 1 diabetes [38]. Australian children with type 1 diabetes consume high sodium and high saturated fat diets [39, 40]. Changes in early childhood diet have also been implicated, as type 1 diabetes has increased the most in the youngest children [41].

Conclusion

The common risk factors of type 1 diabetes mellitus are having family history and genetics, presence of autoantibodies, physical stress, and exposure to illnesses such as viral infections, disease of the pancreas, age, race, geography, and early diet. When stressed, the body prepares itself by ensuring that enough sugar or energy is readily available. Insulin levels fall, glucagon and epinephrine (adrenaline) levels rise and more glucose is released from the liver. Environmental factors associated with type 1 diabetes include diet, vitamin D exposure, obesity, early life exposure to virus associated with islet inflammation (such as enteroviruses), and decreased gut-microbiome diversity.

Competing Interests

The author has no financial or proprietary interest in any of the material discussed in this article.

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