



Factors associated with progression to pre-diabetes: a recurrent events analysis

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Abstract

Aims Pre-diabetes is a strong risk factor for type 2 diabetes (T2D). The aim of this study was to explore factors associated with normal glucose maintenance and pre-diabetes prevention or delay.

Methods Data of 1016 first-degree relatives of T2D patients were retrieved from the Isfahan Diabetes Prevention Study (IDPS). Association of various variables including nutrients, serum tests and physical activity with the risk of pre-diabetes was assessed using recurrent events approach.

Results Cumulative incidence of diabetes was 8.17, 9.44, and 4.91% for total sample and individuals with and without pre-diabetes experience in the follow-up. Risk of progression to pre-diabetes was higher in women and older people ($p < 0.01$). Additionally, BMI and blood pressure had significant association with the risk ($p < 0.01$) and individuals with higher intake of fat were at higher risk (HR = 2.26; 95% CI 1.66–3.07 for high-intake and HR = 1.52; 95% CI 1.27–1.83 for medium-intake compared to low-intake group). Carbohydrates and protein intake were positively associated with the risk of pre-diabetes with HR = 8.63 per 49 g extra carbohydrates per day and HR = 1.32 per 6 g extra protein per day ($p < 0.01$). The association was also significant for triglyceride (TG) with 7% risk increase per 1 SD = 1.14 increase in TG level.

Conclusion Despite frequent studies on lifestyle modification for pre-diabetes prevention, less information is available about the role of nutritional components. We observed direct effects for intake of macronutrients including fat, carbohydrates, and protein in first-degree relatives. Further research is warranted to assess these associations in general populations.

Level of evidence Level III: Evidence obtained from a single-center cohort study.

Keywords Pre-diabetes · Risk factor · Type 2 diabetes · Relatives

Marjan Mansourian and Akram Yazdani contributed equally to this research and share first author position.

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Introduction

Type 2 diabetes (T2D) is a heterogeneous disorder with a strong genetic component and an increasing global prevalence [1]. Diet composition is believed to influence the development of T2D through change in body weight [2]. Clinical studies in human subjects have shown that dietary factors, particularly fat and energy intake are strongly and positively associated with excess body weight and diabetes risk [2, 3]. However, inconsistent results from population-based studies on diet and obesity could be attributed, at least in part, to limitations in study design and systematic measurement errors in dietary data [4]. Elevated risk of diabetes in the first-degree relatives (FDRs) of T2D patients underscores the importance of genetic and environmental factors in the genesis and progression of the disease [5, 6].