Modifying diet and exercise in the prevention of coronary heart disease in diabetes mellitus type 2

George Fodor

Model United Nations Association, Ottawa, ON, Canada

The increased risk of coronary heart disease (CHD) in patients with impaired blood sugar concentration and diabetes mellitus (DM) is well documented. In the Whitehall Study of 18 403 male civil servants aged 40–64 years, 71/2-year coronary-heart-disease (CHD) mortality was examined in relation to blood-sugar concentration 2 hours after a 50 g oral glucose load. CHD mortality was approximately doubled for subjects with impaired glucose tolerance (IGT), defined as a blood-sugar above the 95th centile (≥ 96 mg/dl) [1]. In a meta-analysis of 37 prospective cohort studies of fatal CHD among a total of 447 064 people, the rate of fatal CHD was about 3.5-fold higher in patients with diabetes than in those without [2]. In people with no history of diabetes, every 1 mmol/L of higher fasting glucose above 5.6 mmol/L increased the risk of CHD by about 12%; impaired fasting glucose (5.6 to 7.0 mmol/L) independently increased the risk of CHD by 15% in women and 7% in men [3]. The issue, therefore, is not whether IGT and DM represent a significant risk factor for CHD but what are the available, evidence-based strategies for intervening with life style changes in primary and secondary prevention of CHD in DM?

Changing life style is a universal recommendation of guidelines dealing with the prevention of CHD. Multiple risk factor interventions aim to alter modifiable risk factors such as smoking, hypertension, hyperlipidemia, high intake of dietary salt, lack of exercise, obesity and high glucose levels in people with diabetes. As to the life style changes, the considered interventions are focusing on diet and exercise. Attempt to control smoking is a universal manoeuvre not limited specifically on DM. The crux of life style intervention is behavioral change. How efficacious are these manoeuvres?

A Cochrane Review by Ebrahim and colleagues which focused on counselling and educational interventions, and included 55 trials aimed at modifying one or more cardiovascular risk factors in the adult general population, concluded that counselling and education for changing behaviour do not reduce total or CHD mortality or clinical events in general populations [4,5].

The largest clinical trial to date to study lifestyle interventions for the prevention of diabetes was the Diabetes Prevention Program (DPP) [6]. The DPP randomized 3,234 overweight participants with IGT and elevated fasting glucose from 22 sites in the United States to one of three interventions: intensive lifestyle intervention (ILS), metformin, or placebo. The participants were mostly middle aged and had an average BMI of 34 kg/m^2. After an average follow-up of 2.8 years, the ILS group achieved a mean weight loss of 7%, and three-fourths of the participants met the exercise targets during the first 6 months of the study. The ILS group had a 58% reduction in the development of diabetes compared to the placebo group. Weight loss was the predominant predictor of reduced diabetes incidence, with a 16% reduction of developing diabetes for each kilogram of weight lost. However, a Cochrane systematic review six years later by Nield et al [7] concluded that "...there are no high quality data on the efficacy of dietary interventions for the prevention of type 2 diabetes…" [7].

The notion about the beneficial effects of physical exercise on the incidence of diabetes is based entirely on observational studies of mid-level strength of evidence. Thus, a prospective cohort study by Wannamethee et al [8] concluded that, after adjustment for potential confounders, physical activity was inversely related to CHD rates, with the lowest rates in the men undertaking moderate physical activity. For type 2 diabetes, risk decreased progressively with increasing levels of physical activity. Physical activity was associated with serum insulin level and with factors associated with insulin, i.e. heart rate, hyperuricemia, diastolic blood pressure, and high-density lipoprotein cholesterol level, and with gamma-glutamyltransferase level, a possible marker of hepatic insulin resistance.

Seron P et al [9] carried out a systematic review of randomized clinical trials regarding the effect of exercise on cardiovascular event in high cardiovascular risk individuals. Their conclusion is as follows: "Evidence to date is entirely limited to small studies with regard to sample size, short-term follow-up, and high risk of methodological bias, which makes it difficult to derive any conclusions on the efficacy or safety of aerobic or resistance exercise on groups with increased cardiovascular risk or in individuals with two or more coexisting risk factors. Further randomized clinical trials assessing controlled exercise programs on total cardiovascular risk in individuals are warranted."

The trials dealing with physical activity for primary prevention are beset with methodological problems. A Danish systematic review by Karmisholt K et al [10] deduced that the reviewed trials on this topic were of poor quality and there is a need for large trials that live up to accepted standards and include measurement of harms, in particular for trials that compare exercise with drugs.

Summary

Recent systematic reviews concerning the efficacy of dietary modifications and increasing physical activity as manoeuvres to prevent CHD in diabetic patients have ended up with ambiguous results. Some well-designed studies, like the DPP [6], used methodology which can be hardly translated into everyday practice. Future research should explore better methods of behavioral modification and apart from efficacy evaluate also the effectiveness of the interventions.

Štúdie zaoberajúce sa fyzickou aktivitou v primárnej prevencii sú poznačené metodologickými chybami. Dánsky systematický prehľad vypracovaný Karmisholt K et al [10] došiel k záveru, že skúmané štúdie na túto tému boli nekvalitné a je potrebné zrealizovať veľké štúdie, ktoré by brali do úvahy všeobecne akceptované normy vrátane hodnotenia poškodenia, najmä pri štúdiách, ktoré by porovnávali cvičenie s liekmi.

Záver

Najnovšie prehľadové práce, ktoré sa zaoberajú účinnosťou diétnych zmien a zvýšenej fyzickej aktivity v prevencii KCHS u diabetického pacienta sa skončili s nejednoznačnými výsledkami. Niektoré dobre dizajnované štúdie, ako napr. DPP [6], použili metodológiu, ktorá je ťažko uskutočniteľná v bežnej praxi. Budúce štúdie by mali lepšími metódami preskúmať zmeny správania a na rozdiel od účinnosti by mali vyhodnotiť aj efektívnosť intervencie v bežnej praxi.

References | Literatúra

1. Fuller JH, Shipley MJ, Rose G et al. Coronary-heart-disease risk and impaired glucose tolerance. The Whitehall Study. Lancet 1980; 1(8183): 1373–1376.

2. Huxley R, Barzi F, Woodward M. Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. BMJ 2006; 332(7533): 73–78.

3. Sarwar N, Gao P, Seshasai SR et al. Emerging Risk Factors Collaboration. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet 2010; 375(9733): 2215–2222.

4. Ebrahim S, Taylor F, Ward K et al. Multiple risk factor interventions for primary prevention of coronary heart disease. Cochrane Database Syst Rev 2011; (1): CD001561. Dostupné z DOI: <http://doi: 10.1002/14651858.CD001561.pub3>.

5. Heneghan C. Considerable uncertainty remains in the evidence for primary prevention of cardiovascular disease. Cochrane Database Syst Rev 2011; (8): ED000017. Dostupné z DOI: <http://doi: 10.1002/14651858.ED000017>.

6. Knowler WC, Barrett-Connor E, Fowler SE et al. Diabetes Prevention Program Research Group.. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002; 346(6):393–403.

7. Nield L, Summerbell CD, Hooper L et al. Dietary advice for the prevention of type 2 diabetes mellitus in adults. Cochrane Database Syst Rev 2008; (3): CD005102. Dostupné z DOI: <http://doi: 10.1002/14651858.CD005102.pub2>.

8. Wannamethee SG, Shaper AG, Alberti KG. Physical activity, metabolic factors, and the incidence of coronary heart disease and type 2 diabetes. Arch Intern Med 2000; 160(14): 2108–2116.

9. Seron P, Lanas F, Pardo Hernandez H et al. Exercise for people with high cardiovascular risk. Cochrane Database Syst Rev 2014; (8): CD009387. Dostupné z DOI: <http://doi: 10.1002/14651858.CD009387.pub2>

10. Karmisholt K, Gyntelberg F, Gotzche PC. Physical activity for primary prevention of disease. Systematic reviews of randomised clinical trials. Dan Med Bull 2005; 52(2): 86–89.

George Fodor, MD, PhD, FRCPC, FAHA
Profesor Emeritus of Medicine and Epidemiology, MUN, Ottawa, ON, Canada
✉ **gfodor@ottawaheart.ca**
Model United Nations Association, Ottawa, ON, Canada
www.muna.ca

Doručené do redakcie 11. 1. 2015
Prijaté do tlače po recenzii 18. 1. 2015

Profesor G. J. Fodor je rodákom z východného Slovenska. Pracoval v Prahe a spolu s profesorom Brodom v r. 1969 odchádzajú do emigrácie po okupácii Československa.

Po roku pôsobenia vo Švédsku odchádza do Kanady, kde sa významným spôsobom zaslúžil o rozvoj Lekárskej fakulty na Univerzite v New Foundlande a 20 rokov ju viedol ako dekan.

Po tomto období odchádza do Ottawy, kde dlhé roky viedol renomované pracovisko Ottawa Heart Institute. Významným spôsobom rozvinul vedu a výskum v tejto inštitúcii a stal sa špičkovým predstaviteľom kardiológie nielen v Kanade, ale celosvetovo. Spolu s profesorom Yusufom bol iniciátorom a vedúcim riešiteľom vôbec najdôležitejších randomizovaných klinických štúdií v kardiológii. Bol aj viceprezidentom Svetovej ligy proti hypertenzii.

Svojou autoritou neustále pomáhal českej a slovenskej kardiológii, pravidelne prednášal na českých i slovenských kardiologických i hypertenziologických národných kongresoch. Mnohí lekári i študenti medicíny z ČR i SR veľmi profitovali zo študijných pobytov na pracovisku, ktoré viedol. Profesor Fodor sa v dobrom zdraví dožil 80 rokov, t.č je už na dôchodku a teší sa zo svojej rodiny a predovšetkým z dvoch vnukov.