ORIGINAL ARTICLE

NATIONAL TYPE 2 DIABETES PREVENTION PROGRAMME IN FINLAND: FIN-D2D

Timo Saaristo 1, Markku Peltonen 2, Sirkka Keinänen-Kiukaanniemi 3, Mauno Vanhala 4, Juha Saltevo 5, Leo Niskanen 6, Heikki Oksa 7, Eeva Korpi-Hyövälti 8, Jaakko Tuomilehto 9 for the FIN-D2D Study Group

1 Finnish Diabetes Association, Tampere, Finland
2 Diabetes and Genetic Epidemiology Unit, National Public Health Institute, Helsinki, Finland
3 University of Oulu, Department of Public Health Science and General Practice, Oulu Health Centre, Oulu University Hospital District, Unit of General Practice, Oulu, Finland
4 Laukaa Health Centre, Laukaa, Finland
5 Central Finland Hospital District, Jyväskylä, Finland
6 Northern Savo Hospital District, Kuopio Finland
7 Pirkanmaa Hospital District, Tampere, Finland
8 South Ostrobothnia Hospital District, Seinäjoki, Finland
9 Department of Public Health, University of Helsinki, Helsinki, Finland

ABSTRACT

Objectives. Current evidence shows that type 2 diabetes (T2D) can be prevented by life-style changes and medication. To meet the menacing diabetes epidemic, there is an urgent need to translate the scientific evidence regarding prevention of T2D into daily clinical practice and public health. In Finland, a national programme for the prevention of T2D has been launched. The programme comprises 3 concurrent strategies for prevention: the population strategy, the high-risk strategy and the strategy of early diagnosis and management. The article describes the implementation strategy for the prevention programme for T2D.

Methods. The implementation project, FIN-D2D, is being conducted in 5 hospital districts, covering a population of 1.5 million, during the years 2003-2007. The main actors in the FIN-D2D are primary and occupational health care providers.

Results. The goals of the project are (1) to reduce the incidence and prevalence of T2D and prevalence of cardiovascular risk factor levels; (2) to identify individuals who are unaware of their T2D; (3) to generate regional and local models and programmes for the prevention of T2D; (4) to evaluate the effectiveness, feasibility and costs of the programme; and (5) to increase the awareness of T2D and its risk factors in the population and to support the population strategy of
the diabetes prevention programme. The feasibility, effectiveness and costs of the programme will be evaluated according to a specific evaluation plan.

Conclusions. Current research evidence shows that the type 2 diabetes can be effectively prevented in high-risk subjects by life-style changes, which include increased physical activity and weight reduction. FIN-D2D explores ways to implement these methods on a national level.

(Int J Circumpolar Health 2007; 66(2) 101-112)

Keywords: type 2 diabetes, prevention, screening, intervention, life-style guidance

INTRODUCTION

Type 2 diabetes (T2D) is one of the most prevalent chronic diseases in the world, and its prevalence is increasing alongside the increasing prevalence of obesity and aging of the population. T2D is associated with a range of devastating complications which result in a reduced quality of life and a premature mortality. The disease has a long asymptomatic prediabetic state (1) which includes impaired glucose tolerance (IGT) and impaired fasting glucose (IFG). The ratio of previously undiagnosed diabetes ranges from 1:2 in the U.S.A. (2) to 1:1 in Europe (3). It is estimated that in Europe, 12% of people aged 60 years or above are treated for diabetes, another 15% have undiagnosed diabetes and, in addition, about 30% have IGT (3).

The marked increase in the prevalence of T2D presents a real and serious challenge to public health. The costs of diabetes account for 5-11% of total health care spending in many European countries (4,5). In the United States, the direct and in-direct costs of diabetes were estimated to be $132 billion in 2002 (6).

Recent studies have shown that T2D can be prevented or at least delayed in high-risk subjects by life-style modification (7-10) or by combining life-style intervention and drug treatment (10-13). In the Finnish Diabetes Prevention Study (DPS), an intensive life-style modification strategy was implemented and the subjects who achieved all the 5 life-style targets through diet and exercise did not develop diabetes. However, it is not clear to what extent the life-style intervention strategy that prevented T2D in a clinical trial setting could be implemented at the population level and what the cost-effectiveness of such a strategy would be.

Twelve of 25 European Union member states have established national diabetes plans and/or guidelines on prevention and treatment of diabetes. Existing national plans and guidelines differ significantly between the member states, creating varying levels of prevention, diagnosis and control across Europe. In Finland, the national Development Programme for the Prevention and Care of Diabetes (DEHKO 2000-2010) (14) aims to improve the quality of diabetes care, the support for self-care and the prevention of T2D and its complications. One of the 3 main goals of DEHKO is the Programme for the Prevention of T2D in Finland 2003-2010, which was recently launched (15). The programme comprises 3 concurrent strategies for prevention: the population strategy covering the general population; the high-risk strategy based on individual-oriented measures targeted at those individuals with a particularly high risk of developing T2D; and the strategy...
of early diagnosis and management of T2D directed at individuals with newly diagnosed T2D. The aim of this article is to describe the implementation strategy for the prevention programme for T2D in Finland, called FIN-D2D.

IMPLEMENTATION OF THE NATIONAL T2D PREVENTION PROGRAMME IN FINLAND: FIN-D2D

The FIN-D2D is a project of the Finnish community-based T2D prevention programme. The general goal of the FIN-D2D is to support the implementation of a preventive approach to T2D in primary and occupational health care and to measure the feasibility and effectiveness of these activities. The project is being carried out during 2003-2007.

Finland, with a population of 5.2 million, is divided into 416 municipalities. Each municipality is responsible for arranging health

| Hospital District   | Population | Women % | 0–14 yrs % | 15–64 yrs % | ≥64 yrs % | Prevalence |
|---------------------|------------|---------|------------|-------------|-----------|------------|
| Pirkanmaa           | 462,766    | 51.2    | 16.9       | 66.8        | 16.2      | 3.1        |
| Central Finland     | 267,182    | 50.8    | 17.3       | 66.2        | 16.5      | 3.4        |
| South Ostrobothnia  | 194,589    | 50.4    | 18.1       | 63.4        | 18.5      | 3.9        |
| North Ostrobothnia  | 378,679    | 49.7    | 20.8       | 65.7        | 13.4      | 3.1        |
| Northern Savo       | 249,501    | 50.8    | 16.7       | 65.4        | 17.8      | 3.6        |
| Whole country       | 5,236,611  | 51.1    | 17.5       | 66.7        | 15.9      | 3.1        |

Table I. Demographics and the prevalence of drug-treated type 2 diabetes in the hospital districts participating in the FIN-D2D project in year 2004. Data on population are from Statistics Finland, and data on reimbursement are from the Social Insurance Institution of Finland.
care for its inhabitants. Primary health care is provided by health centres, established by a single municipality or jointly by neighboring municipalities. Outpatient care is also provided by occupational and private health care units. Within Finland, there are 20 hospital districts, each providing specialist consultation and care for its population. Local municipal authorities are responsible for funding specialist treatment provided to inhabitants of their areas. Each hospital district has a central hospital. There are 5 university hospitals throughout the country, which are mainly responsible for the clinical training of medical students and for medical research. Finland spends 7.3% of its gross national product on health care.

All Finnish hospital districts were asked about their willingness to join the FIN-D2D. Four hospital districts responded positively and were appointed as pilot districts. These were South Ostrobothnia, Central Finland, Pirkanmaa (university hospital) and North Ostrobothnia (university hospital) (Fig. 1 and Table I). Northern Savo (university hospital) joined the project in 2005. The total population in these 5 geographical areas is 1.5 million.

FIN-D2D is carried out by 7 partners: the 5 hospital districts, the Finnish Diabetes Association and the National Public Health Institute. The hospital districts’ role is to organize the practical prevention work in the local health centres and in the occupational health centres in their area. The Finnish Diabetes Association is co-ordinating the programme, and the National Public Health Institute is evaluating it.

FIN-D2D has a Steering Committee and an Advisory Board. Every hospital district has its own Regional Expert Committee. FIN-D2D is co-ordinated by the Finnish Diabetes Association with help from the national co-ordinator, the National Advisory Board and the 5 regional co-ordinators.

The practical diabetes prevention work is done in the health centres and in the occupational health centres with existing resources. Close co-operation between the partners of the FIN-D2D, the Finnish Heart Association, the Association of Finnish Pharmacies and other non-governmental organizations will provide support for the practical intervention work in the primary and occupational health care sectors. Different preventive activities can also be done in the third sector, where a network of services has to be built.

Every participating hospital district will invest 100,000 euros per year during the project to cover local expenses of the programme. The Ministry of Social Affairs and Health has provided the hospital districts a grant of the same sum of money. The Finnish Diabetes Association covers the expenses of the co-ordinators, and the National Public Health Institute covers the expenses related to the evaluation of the programme. The total funding for the programme during the course of the project will be 6 million euros.

FIN-D2D supports all 3 strategies of the prevention programme (the population strategy, the high-risk strategy and the strategy of early diagnosis and management), but the main emphasis of the implementation programme is on the high-risk strategy. The goals of the FIN-D2D are (1) to reduce the incidence and prevalence of T2D and prevalence of cardiovascular risk factor levels; (2) to identify those individuals who are unaware that they have T2D; (3) to generate regional and local models and programs for the prevention of T2D; (4) to evaluate the effectiveness, feasibility and costs of the project; and (5) to increase the awareness
of T2D and its risk factors in the population and to support the population strategy of the diabetes prevention programme.

**High-risk strategy**

The aim of the high-risk strategy is to identify subjects in the population who have a high risk of developing T2D and to provide them with support for lifestyle changes required to reduce their future risk. Subjects at high risk are identified using the Finnish Diabetes Risk Score, FINDRISC (16,17). The FINDRISC comprises 8 scored questions, with the total test score providing a measure of the probability of developing T2D. The risk score can be completed on the Internet, in pharmacies and at various public campaign events. The risk score is also used for systematic opportunistic screening in conjunction with health examinations within the primary and occupational health care sector. The risk score form contains brief advice on what the respondent himself/herself can do to lower his/her risk of developing T2D.

Individuals who score 7 to 14 points on the FINDRISC are considered to have an elevated risk and are given written information about health-enhancing life-styles and diets (Fig. 2). They are also offered local physical exercise possibilities and nutrition education services. Those who score 15 points or more are considered to be at a high risk for T2D, and they are referred to lifestyle intervention programmes for preventing T2D in the primary and occupational health care services. In addition, subjects who have a history of elevated blood glucose (IFG, IGT), a history of coronary heart disease or a history of gestational diabetes are considered to have a high risk for T2D and are also referred to lifestyle intervention programmes.

Involving a high-risk individual in prevention activities starts with a detailed health examination during an appointment with a public health nurse or occupational health nurse. These include determination of weight, height, body-mass index, waist circumference and blood pressure. All high-risk subjects have laboratory tests done for lipid metabolism (serum total cholesterol, HDL cholesterol, triglycerides) and undergo an oral glucose tolerance test (OGTT) in order to detect previously undiagnosed
diabetes. The diagnostic criteria by the WHO in 1999 are used (18). In addition, subjects fill in a medical history form and answer questionnaires about their exercise and dietary habits. Thus, a subject’s global risk assessment is done before the start of the intervention programme, which takes into account all risk factors and life-style habits that might contribute to T2D.

The intervention methods and guidelines are based on the experiences drawn directly from the experiences in the DPS (9). Weight management and physical activity are the basis for the prevention. The types of interventions supported in FIN-D2D are individual, self-acting and group interventions. At the beginning of the intervention, the subject’s willingness to start life-style changes and his/her readiness for the change are estimated and together the subject and professional agree on the level of intervention required. The dietary and exercise goals are tailored for each individual subject, and then the subject’s education concerning her/his knowledge, beliefs and motivation begins. As resources in primary health care are scarce, the advisable form to use is group intervention. Various health professionals are involved in group work. However, most often groups are managed by public health nurses. It is recommended that doctors be involved in the group work as this probably increases the motivation of group members. Interventions can be carried out in a primary health care setting, but they can also be implemented outside the health care system by other organizations or by third sector groups (for instance, Weight Watchers, private nutrition counselors, private anti-smoking groups, self-activity groups and various exercise groups).

The default model for life-style interventions in FIN-D2D is group intervention. A group meets 4 to 8 times during the course of the programme, either once a week or every other week, and a follow-up session takes place one month after the final intervention session. The program, its content and the methods used are planned together with the members and the manager of the group according to patient empowerment principles (9, 20). The methods used in the group can vary, depending on the experience of the manager, the group members’ needs and the skills and tools available in the group. In each group meeting, different themes are discussed, and in between the sessions, different homework is given. The power of the groups is based on motivation, support from other members, peer support and positive feedback. Depending on the resources, open health forums with different central themes can be arranged for those found to be at risk in the opportunistic screening.

Individual intervention efforts outside of weight-control and other intervention groups are also supported in the programme. Some people manage to make their life-style changes possible without the help of health care providers. However, they still might need advice on where to find more information or additional support. Some people have the opportunity of joining different self-active groups outside primary health care, and there will be some people who do not want to receive any kind of intervention. For those individuals, their psychosocial situation will be evaluated and the possibility of depression has to be excluded (21,22). Support and encouragement might be needed and follow-up will have to be arranged.

Screening and prevention of T2D in primary health care and occupational health care settings require new knowledge for and changing attitudes of health care personnel. In Finland, the university hospital districts are responsible for
the supplementary education of health care personnel. FIN-D2D supports their activities by participating in educational events and by producing necessary educational material for project workers. The purpose of providing education and training for the health care providers in FIN-D2D is to:

- inform health care personnel of T2D prevention and the FIN-D2D
- improve actions for the prevention, screening, diagnosis and early treatment of T2D in primary health care and occupational health care; evaluate associated working methods
- promote the establishment of weight-control groups in primary health care
- augment the readiness of doctors and nurses to support life-style changes in high-risk groups and increase their ability to act as group managers
- understand the importance of group intervention in order to enhance readiness for interventions
- understand the meaning of life-style changes and understand how to support high-risk subjects in changing their life-styles
- assist in creating an operating network that connects different players and health care providers

The strategy of early diagnosis and management
This strategy is directed at individuals with newly diagnosed T2D. It has been estimated that in Finland there are at least 100,000 undiagnosed T2D patients (23). In FIN-D2D, the large-scale OGTT testing of high-risk subjects will lead to an increased detection of subjects with undiagnosed diabetes and other glucose abnormalities. The aim of this strategy is to bring these subjects into systematic treatment immediately in order to prevent the development of diabetic complications. Active treatment, including required medication besides life-style guidance in the weight-control groups, will be offered to these subjects. Treatment will not only include glycemic control but multifaceted management of major CVD risk factors. While glycemic control in subjects with diagnosed T2D has improved in Finland (24,25), there is still a long way to go to achieve the desired goals.

Population strategy
FIN-D2D supports the population strategy that aims to improve the health of the entire population through a healthy diet and regular physical activity. These activities are mainly directed at preventing obesity, metabolic syndrome and other risk factors for T2D. Media communication, training, life-style counseling and an extensive network to support these activities will be used. One of the aims of the population strategy is to increase the proportion of the population who are aware of their possibilities of enhancing their health and who will know the causes of T2D and ways of preventing the development of the disease.

The population strategy is linked to and co-operates with the recommendations of the national action programmes for the enhancement of health and the prevention of major public health problems. These include the Action Plan for Promoting Finnish Heart Health (26), the Government Resolution on the Development of Health-Enhancing Physical Activity (27), the Action Programme for Implementing National Nutrition Recommendations (28) and the National Recommendations for the Local Promotion of Health-Enhancing Physical Activity (29).
Evaluation
The Finnish National Public Health Institute is responsible for the evaluation of the FIN-D2D. The main aim of the evaluation is to assess the feasibility, effects and cost-effectiveness of the programme. To assess the effectiveness of the programme, changes in the prevalence and incidence of T2D and other disturbances in glucose metabolism in geographical areas that are participating in the FIN-D2D will be compared with those in other parts of the country. In addition, changes in obesity and metabolic syndrome will be monitored in the country during the programme. Changes in the prevalence of T2D and undiagnosed T2D will be determined by independent cross-sectional population samples, utilizing the existing national FINRISK-surveys (30) (Fig. 3). The FINRISK-surveys will be complemented with additional surveys that cover the areas participating in FIN-D2D. Two surveys have already been performed during 2002-2004 in order to assess the situation at the beginning of the project. The surveys will be repeated at the end of the project in 2007.

To evaluate the effects of life-style intervention on the incidence of T2D, as implemented in primary and occupational health care settings, high-risk subjects found in the screening process will have yearly health examinations that include OGTT. Data collection for these has been organized in primary and occupational health care settings. As a control group, high-risk subjects found in the national FINRISK survey in 2002 (30) will be invited for a follow-up examination with OGTT to assess the incidence rate of T2D in areas that are not part of the prevention programme. Additionally, symptomatic cases of diabetes during the study period will be ascertained through a data linkage with the national prescription database kept by the Social Insurance Institution.

There will be an evaluation of the processes that were implemented during the FIN-D2D, as well as an evaluation of costs and cost-effectiveness of the project. These will include an investigation of the structure of different models of health counseling applied in T2D prevention, an estimation of incremental costs of the health care resources consumed due to the interven-
tion and relating them to the effectiveness of the intervention.

Monitoring changes in the awareness of the FIN-D2D project, T2D and its risk factors will be implemented into existing yearly surveys on health and health behavior among the Finnish adult population (31).

DISCUSSION

Finland has a long history of attempting to prevent cardiovascular diseases. Both the population strategy and the high-risk prevention approaches in the North Karelian Project succeeded 30 years ago in reducing the risk factor levels of coronary heart disease among middle-aged Finns (32,33). While cardiovascular mortality has declined in response to effective health and nutritional education in recent decades, hypertension, hypercholesterolemia and obesity still remain common in Finland (30). Today, the favorable trend at the population level in cardiovascular risk factors, such as serum total cholesterol has ceased (30). The prevalence of obesity has increased (34) and being overweight is closely connected to T2D and associated cardiovascular diseases. Finland, like most other countries, is expected to face an ominous T2D problem.

It is now known that T2D can be prevented or delayed in high-risk subjects across all ethnic groups and in different cultural settings, at least in clinical controlled trials. It is possible to identify high-risk subjects for T2D, to use diagnostic testing for case-detection in the early stages of the disease and to start appropriate treatment and preventive measures. It is still unclear how such preventive strategies could be implemented at the population level and what the effectiveness of such strategies would be. The implementation project of the national Finnish T2D prevention programme, FIN-D2D, is planned to address these questions. The programme is one of the largest community-based programmes for health promotion ever launched in Finland.

In FIN-D2D, the diabetes risk score FINDRISC is used both as a tool to detect asymptomatic high-risk subjects and, in combination with OGGT, as a screening tool for early case-detection of T2D. Subjects who are identified as being at high risk for future T2D by the FINDRISC will be referred to T2D prevention intervention programmes. Still, an OGGT is needed to identify undetected diabetes or the presence of any other glucose abnormality. FIN-D2D will promote OGGT testing in the whole country, although the test is invasive and costly since both patients and laboratory personnel loose time at work. This has another important implication besides the ascertainment of T2D, since it has been convincingly shown that high post-challenge plasma glucose is an independent risk factor for CVD and premature mortality (35-37).

The use of the FINDRISC in the FIN-D2D is linked to all 3 prevention strategies that are promoted in the programme: (1) in the population strategy, the score serves self-testers and can be used as motivator and increase knowledge of T2D and its risk factors; (2) in the high-risk strategy, the score is used as a screening tool for subjects at high risk for future T2D; and (3) in the strategy for early diagnosis and treatment, the score can be used together with an OGGT to identify undetected T2D and other glucose abnormalities.

Identification of high-risk subjects and early case-detection through glucose testing is rela-
tively easy, but it is only the first step in the programme. The real challenge is to successfully implement primary prevention with lifestyle intervention into routine clinical practice, where the resources are already scarce. It is recommended that intervention be done primarily in the weight-control groups, which have to be organized and supervised. Education of the personnel and patients in the risk groups is very important and doing this will require resources.

The key question is whether high-risk subjects really change their life-style in response to intervention efforts. There is evidence that patient-centred approaches to health care may be associated with better outcomes than traditional advice, especially when life-style change is involved (38-40). A subject does not necessarily want advice if it is given in a way that is perceived as a command (41,42). In FIN-D2D, motivational interviewing is used because it is seen as a better way of working with clients who may not seem ready to make the behavioral changes that are considered necessary by health care providers.

Several potential problems need to be considered in the FIN-D2D programme. First, there is a risk that health care providers will not commit themselves to the project sufficiently. Close collaboration and partnership from the beginning are important, and all players should have the opportunity of modifying their local goals and working methods. Second, health care professionals should have adequate resources to carry out screening, interventions among high-risk subjects and management of newly diagnosed T2D patients. Not all health care personnel have acquired the knowledge and skills needed for T2D prevention. During the initial phase of the project, education has to be sufficient, and in later stages, the possibility for consultations has to be arranged. Careful planning, a printed project plan, clear working instructions and information and regular feedback from the project staff are vitally important. In addition, central project leadership and common reference criteria are needed. Further, collection of comprehensive and analyzable data for evaluation is challenging in the situation where health centres use many kinds of patient record computer systems.

FIN-D2D focuses on the implementation of life-style intervention strategies in the primary health care setting. Evaluation of these activities will clarify the feasibility, effectiveness and efficiency of T2D prevention strategies that are implemented. The findings from this evaluation will be directly applicable to the Finnish and other health care systems, since the results obtained will permit making recommendations on how to proceed with the community-wide T2D prevention programmes and how to better plan the use of resources in the health care sector. Evaluation of the programme will also provide further insight into the prevention of other chronic illnesses such as cardiovascular diseases and the metabolic syndrome as well as their risk factors.

The increasing prevalence of T2D presents a real and serious challenge for public health in Finland, as well as in most developed and developing countries. Current research evidence shows that the disease can be effectively prevented in high-risk subjects by life-style changes, which include increased physical activity and reduced intake of dietary fat. FIN-D2D explores ways to implement these methods on a national level, so that prevention of T2D will become feasible in the primary health care in the long term.
National Type 2 Diabetes Prevention Programme in Finland

Writing Group
Saaristo T, Peltonen M, Keinänen-Kiukanniemi S, Vanhala M, Oksa H, Saltevo J, Niskanen L, Korpi-Hyövälti E, Tuomilehto J.

FIN-D2D Study Group
Ahonen K, Aro E, Eriksson J, Hiltunen L, Himanen O, Huttenen J, Hytylä A, Ilanne-Parikka P, Jokelainen J, Järvi V, Kallanranta T, Kangas J, Kastarinen M, Keinänen-Kiukanniemi S, Kesäniemi A, Kiuru S, Kivekäs J, Korpela K, Korpi-Hyövälti E, Kujala U, Kukkonen-Harjula K, Kunnamo I, Laakso M, Lehmusaho M, Lindström J, Marttila J, Mäkinen O A, Niskanen L, Oksa H, Peltonen M, Pesonen K, Pihlajamäki J, Poskiparta M, Puolakka J, Puska P, Pyylämpi H, Pöloken A, Riihelä J, Rimpelä A, Saaristo T, Saltevo J, Sampo T, Saramies J, Sintonen H, Syrjäläinen J, Tuomilehto J, Uusitupa M, Vanhala M, Winell K.

Contributors
A list of participating health centres and occupational health centres can be found at www.diabetes.fi/english.

REFERENCES

1. Harris MI, Klein R, Welborn TA et al. Onset of NIDDM occurs at least 4-7 yr before clinical diagnosis. Diabetes Care 1992;15:815-819.
2. Harris MI, Flegal KM, Cowie CC et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey, 1988-1994. Diabetes Care 1998;21:518-524.
3. Decode Study Group: Age- and sex-specific prevalences of diabetes and impaired glucose regulation in 13 European cohorts. Diabetes Care 2003;26:61-69.
4. Williams D, Tuomilehto J, Björk S. The Economics of Diabetes Care: An international Perspective. London: Blackwell Science 2000.
5. Kangas T. The consumption and direct costs of health care services among persons with diabetes in Helsinki. Social Insurance Institution. Studies in Social Security and Health 67/2002.
6. Hogan P, Dall T, Nikolov P. Economic costs of diabetes in the US in 2002. Diabetes Care 2003;26:917-932.
7. Pan XR, Li GW, Hu YH et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance: the Da Qing IGT and Diabetes Study. Diabetes Care 1997;20:537-544.
8. Eriksson KF, Lindgärde F. No excess 12-year mortality in men with impaired glucose tolerance who participated in the Malmö Preventive Trial with diet and exercise. Diabetologia 1998;41:1010-1016.
9. Tuomilehto J, Lindström J, Eriksson JG et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001;344:1343-1350.
10. Knowler WC, Barrett-Connor E, Fowler SE et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002;346:393-403.
11. Chiasson JL, Josse RG, Gomis R et al. Acarbose for prevention of type 2 diabetes mellitus: the STOP-NIDDM randomised trial. Lancet 2002;359:2072-2077.
12. Buchanan TA, Xiang AH, Peters RK et al. Preservation of pancreatic beta-cell function and prevention of type 2 diabetes by pharmacological treatment of insulin resistance in high-risk Hispanic women. Diabetes 2002;51:2796-2803.
13. Torgerson JS, Hauptman J, Boldrin MN et al. XENical in the prevention of diabetes in obese subjects (XENO-DOS) study: a randomized study of orlistat as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients. Diabetes Care 2004;27:155-161.
14. Finnish Diabetes Association. Development Programme for the Prevention and Care of Diabetes in Finland 2000-2010; Tampere: FDA 2001. Available from http://www.diabetes.fi/english/programme/index.html.
15. Finnish Diabetes Association. Programme for the Prevention of Type 2 Diabetes in Finland; Tampere: FDA 2003. Available from http://www.diabetes.fi/english/prevention/programme/index.html.
16. Lindström J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. Diabetes Care 2003;26:725-731.
17. Saaristo T, Peltonen M, Lindström J et al. Cross-sectional evaluation of the Finnish Diabetes Risk Score: a tool to identify undetected type 2 diabetes, abnormal glucose tolerance and metabolic syndrome. Diabetes & Vascular Disease Research 2005;2:67-72.
18. World Health Organization. Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications. Part 1: Diagnosis and Classification of Diabetes Mellitus. Geneva: WHO 1999.
19. Funnell MM. Patient empowerment. Crit Care Nurs Q 2004;27:201-204.
20. Funnell MM, Anderson RM, Arnold MS et al. Empowerment: an idea whose time has come in diabetes education. Diabetes Educ 1991;17:37-41.
21. Timonen M, Laakso M, Jokelainen J et al. Insulin resistance and depression: cross-sectional study. BMJ 2005;330:17-18.
22. Lawlor DA, Smith GD, Ebrahim S. Association of insulin resistance with depression: cross-sectional findings from the British Women’s Heart and Health Study. BMJ 2003;327:1383-1384.
23. Reunanen A. Suomalaisten diabetes: Harvinaisuudesta kansansairudeksi (Prevalence of diabetes in Finland). Diabetes ja Lääkäri 2004;4:6-11 (in Finnish).
24. Valle T, Koivisto VA, Reunanen A et al. Glycemic control in patients with diabetes in Finland. Diabetes Care 1999;22:575-579.
25. Valle T, Tuomilehto J. DEHKO-raportti 2004:1. Diabeetikkojen hoitotasapaino Suomessa vuosina 2000-2001 (DEHKO report 2004:1. Glycemic control in patients with diabetes in Finland in 2000-2001). Tampere: Finnish Diabetes Association 2004.
26. Ministry of Social Affairs and Health. Action Plan for Promoting Finnish Heart Health. Publications 1997:27. Helsinki, Ministry of Social Affairs and Health 1997.
27. Ministry of Social Affairs and Health. Government Resolution. Development of Health-Enhancing Physical Activity. Helsinki, Ministry of Social Affairs and Health 2002.
28. Ministry of Agriculture and Forestry. Finnish Nutrition Recommendations. National Nutrition Council, Committee Report 1998:7, 1999. Helsinki, Ministry of Social Affairs and Health, 1999.
29. Ministry of Social Affairs and Health. Report of the Committee on Development of Health-Enhancing Physical Activity. Helsinki, Ministry of Social Affairs and Health, 2001.
30. Vartiainen E, Laatikainen T, Tapanainen H et al. Suomalaisten sydän- ja verisuonitautien riskitekijät FINRISKI-tutkimuksessa 1982-2002 (Changes in cardiovascular risk factors in Finland in the national FINRISKI study between 1982 and 2002). Suom Lääkäril 2003;4:4099-4106 (in Finnish).
31. Helakorpi S, Patja K, Prättälä R et al. Suomalaisen ai-kuisväestön terveyskäyttäytymisen ja terveys, kevät 2004 (Health Behaviour and Health among Finnish Adult Population, Spring 2004). Available from http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b13.pdf. Kansanterveyslaitoksen julkaisuja B13/2004.
32. Puska P, Tuomilehto J, Salonen J et al. The North Karelia Project: community control of cardiovascular diseases. Evaluation of a comprehensive community programme for control of cardiovascular diseases in North Karelia, Finland 1972-1977. Copenhagen: WHO/EURO Monograph 1981.
33. Puska P, Tuomilehto J, Nissinen A et al: The North Karelia project: 20 year results and experiences. Helsinki: National Public Health Institute (KTL) 1995.
34. Männistö S, Lahti-Koski M, Tapanainen H et al. Liha- vuus ja sen taustat Suomessa — liikakilot kasvavana haasteena (Obesity — a challenge also in Finland). Suom Lääkäril 2004;59:777-781.
35. Decode Study Group: Glucose tolerance and mortality: comparison of WHO and American Diabetes Association diagnostic criteria. The DECIDE study group. European Diabetes Epidemiology Group. Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Europe. Lancet 1999;354:617-621.
36. Decode Study Group: Glucose tolerance and cardiovascular mortality: comparison of fasting and 2-hour diagnostic criteria. Arch Intern Med 2001;161:397-405.
37. Qiao Q, Jousilahti P, Eriksson J et al. Predictive properties of impaired glucose tolerance for cardiovascular risk are not explained by the development of overt diabetes during follow-up. Diabetes Care 2003;26:2910-2914.
38. Ockene JK, Kristeller J, Goldberg R et al. Increasing the efficacy of physician-delivered smoking interventions: a randomized clinical trial. J Gen Intern Med 1991;6:1-8.
39. Kaplan SH, Greenfield S, Ware JE, Jr. Assessing the effects of physician-patient interactions on the outcomes of chronic disease. Med Care 1989;27:S110-S127.
40. Stewart M, Roter D. Communicating with Medical Patients. London: Sage 1989.
41. Britt E, Hudson SM, Blampied NM. Motivational interviewing in health settings: a review. Patient Educ Couns 2004;53:147-155.
42. Stott NC, Pill RM. “Advise yes, dictate no.” Patients’ views on health promotion in the consultation. Fam Pract 1990;7:125-131.

Timo Saaristo
Finnish Diabetes Association
Kirjoniementie 15
FIN-33680 Tampere
FINLAND
Email: timo.saaristo@diabetes.fi