Preparing nurses to face the pandemic of diabetes mellitus: a literature review

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Background. Diabetes constitutes a global public health problem. Today about 135 million people are affected and it is estimated that the number in 2025 will be 300 million.

Aims. By reviewing existing literature the aim is to raise awareness among nurses, nurse educators and nursing students of the global epidemic of diabetes mellitus, its multiple underlying causes, especially social ones, and how to fight it. A further aim is to discuss the implications for future curriculum content in nurse education programmes.

Findings. The main underlying causes of the disease are genetic and environmental factors, such as urbanization and industrialization, as well as increased longevity and changes in lifestyle from a traditional healthy and active life to a modern, sedentary, stressful life and over-consumption of energy-dense foods. This process, labelled 'coca-colonization', is evident all over the world, although more so in developing countries. The prevalence of diabetes mellitus varies among populations due to differences in genetic susceptibility and social risk factors such as change in diet, obesity, physical inactivity and, possibly, factors relating to intrauterine development. Migrants are especially affected. Diabetes mellitus needs to be treated by a holistic approach through dietary adjustment, exercise, medication (if needed), education and self-care measures. Type 2 diabetes mellitus is a preventable disease. The main implication for nurses and nursing curricula is to change the focus from the individual with diabetes mellitus and management to prevent deterioration of health (secondary prevention), to population-based community-intervention pro-

grammes. These need to focus on health promoting activities to raise awareness among healthy people of the risk factors for diabetes mellitus.
Conclusion. Nurses all over the world have an important role in fighting the diabetic pandemic by health promotion aimed to keep people healthy as long as possible.

Keywords: diabetes mellitus, epidemic, nurses, students, continuing education, curriculum development, nursing, health promotion, prevention

Introduction

Diabetes mellitus (DM) constitutes a growing global public health problem, from 30 million people affected 10 years ago to about 135 million today (Amos *et al*. 1997), and an estimated 300 million by 2025 [World Health Organization (WHO) 1997]. This global epidemic involves not only the industrialized world but also less developed countries where urbanization and industrialization are proceeding rapidly (Amos *et al*. 1997, Zimmet *et al*. 1997). Populations of developing countries, minority groups and disadvantaged communities in industrialized countries now face the greatest risk (King & Rewers 1993, Zimmet 2000). This situation has been called a 'new world syndrome' (Zimmet *et al*. 1997), a symptom of globalization and its social, cultural, economic and political significance (Zimmet 2000).

The pandemic involves essentially noninsulin-dependent diabetes mellitus (Type 2 DM), which comprises about 85% of all DM cases (Zimmet *et al*. 1997). Apart from the impact on health, the economic cost of DM and its complications is enormous, both in health care and loss of productivity to society (Zimmet 2000). In the future, DM will constitute a heavy burden both for individuals affected and for the societies in which they live (Zimmet *et al*. 2001).

The term epidemic is often associated with communicable and infectious diseases rather than noncommunicable diseases such as diabetes mellitus. Why is DM increasing to epidemic proportions and how can the increase be stopped?

Nurses are in a strategic position to employ new research findings and aggressive strategies to fight this fatal disease (Capriotti & McLaughlin 1998) but how should they be taught about the epidemic? No previous studies about promotion of health and prevention of DM in groups of people or the implications for the epidemic on nurse education have been found in the literature.

The increase in Type 2 DM is an outstanding example of a disease of transition. This is a stimulus for medical and nursing curricula to prepare students for new roles in health promotion, and the issue of the content of nurse education curricula then becomes a subject for debate.

What is already known on this topic

- Diabetes mellitus is a growing public health problem, from 30 million people affected 10 years ago to over 130 million now, and an estimated 300 million by 2025.
- This pandemic involves developed and developing countries. Populations of developing countries, minority groups and disadvantaged communities in industrialized countries now face the greatest risk.
- Although nurses are in a strategic position to help reduce this serious problem, no major studies or implications for nurse education can be found in the literature on large-scale promotion of health and prevention of diabetes mellitus.

What this paper adds

- The literature review confirms that underlying causes of diabetes mellitus are genetic and environmental and increased longevity and changes in lifestyle are also key factors, indicating that type 2 diabetes mellitus is essentially a preventable disease.
- The proposal is made that nurses and nursing curricula across the world should begin to focus more on health promoting activities to raise awareness among healthy people of the risk factors for diabetes mellitus.

The study

Aims

The aims of this study were, first, to raise awareness among nurses and nurse educators of the global epidemic of DM and its underlying causes by reviewing existing literature in the area and, secondly, to discuss and give recommendations concerning the implications for the content of nursing curricula with particular reference to Great Britain, Sweden,

Uganda and Zimbabwe. These are the home countries of the four authors, each of whom is involved in nurse education at university level. All are engaged in an Afro-European exchange based on reciprocal visits and learning opportunities. One of these is described by Kemp and Tindiweegi (2001).

Methods

The CINAHL and MEDLINE databases were searched, identifying literature published in 1985–2001. Main keywords used were developing countries, diabetes mellitus, epidemiology, epidemic, health education, health promotion, nurse education, nurses, nursing students, prevalence, prevention/and control, risk factors. References in recently published studies were scrutinized, government reports were searched, and textbooks were hand searched. Discussions were held with front-line researchers regarding key references. Contemporary literature has formed the focus of this critical analysis, but more dated material has been included where it informs later research. The knowledge base relevant to development of DM was reviewed by systematic methods.

Findings

Diabetes mellitus

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycaemia. Hyperglycaemia may be due to defects of insulin secretion, insulin action or both, and DM is divided clinically into two major classes: Type 1 and Type 2 diabetes mellitus. Until 1998 these were named insulin-dependent diabetes mellitus (IDDM) and noninsulin-dependent diabetes mellitus (NIDDM) and these terms were sometimes used synonymously with Type 1 and Type 2 DM- (In the rest of the Document type 1 and Type 2 DM will be used.) Impaired glucose tolerance and gestational diabetes mellitus have been added to the list. Type 2 includes the major form of diabetes that results from defects in insulin secretion and insulin resistance. Impaired glucose regulation, impaired glucose tolerance and impaired fasting glycaemia are stages in the natural history of disordered carbohydrate metabolism. They are considered as risk categories for future diabetes and/or cardiovascular disease (Alberti & Zimmet 1998). Many individuals with impaired glucose tolerance have a constellation of abnormalities called the metabolic syndrome, 'Syndrome X', or 'the Deadly Quartet' (Zimmet 1995). The metabolic syndrome is marked by hyperinsulinaemia and/or hypertension, central (upper body) obesity, and dyslipidaemia that may develop into manifest Type 2 DM (Zimmet 1995).

People with DM have a substantially reduced life expectancy (Amos *et al.* 1997) and DM is associated with increased mortality and morbidity, due to the high risk of developing chronic complications such as microangiopathy, neuropathy and macroangiopathy.

Components of diabetes management plans include: dietary adjustment, physical activity, self-monitoring of blood glucose, diabetes medications, behavioural strategies to promote lifestyle changes, and education on how to integrate these components and related healthy habits. The main management goal is to be free of diabetic symptoms, to have normalized blood glucose levels and to be able to live as near normal a life as possible (National Diabetes Data Group 1995, Skyler 1997). Optimal glycaemic control prevents and delays the onset of microvascular (DCCT 1993) and possibly macrovascular complications related to DM (Turner 1998).

Management goals should be targeted through a co-ordinated health team effort in partnership with patients. Nursing care is critical for successful management (Capriotti & McLaughlin 1998), and key elements in this are patient knowledge and awareness of the disease and learning self-care (Clement 1995) with planned and scheduled teaching at appropriate times and aimed at patient empowerment (Socialstyrelsen 1999). Focus groups have been shown to be effective in assessment of individual beliefs about health and illness and their implications for self-care measures, as well as in educating patients and sharing the burden of the disease with others (Hjelm *et al.* 1999).

Equally important for successful treatment of DM and prevention of related complications is the need to understand how people feel about having this disease and its impact on their lifestyle (Sutton *et al.* 2000). Different authors urge a holistic approach to diabetes care where the whole patient, including all his emotions, fears and worries, is the centre of attention (Wikblad 1991, Sutton *et al.* 2000). In the empowerment process, the involvement of social support from family, friends and employers is important in reducing stress (Anderson *et al.* 2000), improving coping capability (Lazarus & Folkman 1984) and enhancing the perceived self-efficacy of patients to manage their DM (Bandura 1995).

Lifelong adaptation to diabetes mellitus and implications for health

The chronic disease experience may involve trying to gain control over disease and life, changed time perspectives, losses related to the disease (Strauss *et al.* 1984, Charmaz 1991) and fear of complications (especially loss of limbs) (Hayes 2001), loss of reconstruction of self (Strauss *et al.*

1984, Charmaz 1991) and dealing with uncertainty (Bury 1997). Management and self-care in diabetic disease demand adaptation (William-Olsson 1986, Ternulf Nyhlin 1990, Wikblad & Montin 1992) and are described as a balancing act, walking a fine line to manage oneself and master life (Ternulf Nyhlin 1990). The occurrence of complications may have social, psychological and physical consequences (William-Olsson 1986), such as loss of mobility with restriction in daily life and dependency and strained relationships to others (Brod 1998).

Prevalence of diabetes mellitus

In 1997, about 2·1% (124 million) of the world's population was estimated to be affected by DM (Amos *et al*. 1997). Regional differences have been found and are presented in Table 1. The regions with the greatest potential increase of DM in the future are Asia and Africa, where diabetes could become two to three times more common than today (Amos *et al*. 1997).

The prevalence of DM varies in different populations; figures of 2–10% have been reported in European populations and 2–20% in non-European populations (King & Rewers 1993, National Diabetes Data Group 1995). In Sweden, the figures range from 2 to 4% (Lithman 1982, Andersson 1994), with the latest reported figure at 3·3% in a large population-based study (Berger *et al*. 1998). In the United Kingdom (UK) the figures range from 1·3 to 2·5% (Nabarro 1988, Meadows 1995, Connolly *et al*. 2000).

Prevalence figures for DM in Uganda and Zimbabwe are not yet available but are under compilation (personal communication Ministry of Health Uganda and Zimbabwe). According to the National Health Policy Plan (Ministry of Health – Republic of Uganda 1999), DM is one of Uganda's main public health problems, with rising figures. In Zimbabwe, diabetes is fifth among the 10 most common diseases (Mudiayi *et al*. 1997). Prevalence figures are also available for neighbouring countries. In South Africa DM has a prevalence of 4·5% and impaired glucose tolerance 5·1% (Erasmus *et al*. 2001). In Tanzania, the prevalence of DM in 1989 was approximately 1% (McLarty *et al*. 1989), but an increase has recently been reported in groups who have changed from a traditional to an industrial way of living, with figures of 4·3% in a group of African nuns and 12·2% in a group of high-ranking male government officials (McLarty 1995).

Table 1 Likely number of people affected with diabetes in different parts of the world

Continent	Number of people affected by diabetes mellitus
Oceania	1 million
Africa	8 million
North America	13 million
Latin America	13 million
Europe	22 million
Asia	66 million

Migrants appear to have an increased risk of contracting DM, especially Type 2, compared with their host population (Zimmet 1982, King & Rewers 1993, Carter *et al*. 1996, Fujimoto 1996, Zimmet *et al*. 1997). In previous investigations of non-European migrant populations, the prevalence has been estimated at 2–22% (Odugbesan *et al*. 1989, Simmons *et al*. 1991, Hazuda *et al*. 1993, King & Rewers 1993, National Diabetes Data Group 1995, Carter *et al*. 1996, Zimmet *et al*. 1997).

Previous investigations with non-European migrant groups living predominantly in the UK and USA have focused on the influence of ethnic origin on health, whilst the migratory background and the reasons for migration were never discussed. The influence of migration on DM has been studied in investigations of migrants in Sweden (Hjelm *et al*. 1996, 1997, 2002b). No major differences were found in prevalence of DM in foreign-born persons (about 2%) in comparison to the host population. These migrants were mainly of European origin, and there was a dominance of Scandinavians with short cultural distance (similarities in cultural values), a migrant labour background and long residence in Sweden (mean 19 and 32 years; range 0·4–47 years). The results showed that migrational background and the process of acculturation, depending on time and circumstances of immigration, as well as the health care system's potential to meet individual needs, are crucial for the health of diabetic migrants (Hjelm 1998). It has previously been suggested that the influence of acculturation on health depends on the degree of adaptation (Hull 1979, Berry 1990).

Genetic and environmental factors in the aetiology of type 2 diabetes mellitus

Type 2 DM generally is a lifestyle disorder, most prevalent in populations with heightened genetic susceptibility. Environmental factors associated with lifestyle unmask the disease (Zimmet 1995). Type 2 DM arises from the collision of our old hunter-gatherer genes with our new 20th century way of living (Diamond 1992). Type 2 DM is unmasked by social, behavioural and environmental risk factors. The epidemic, particularly in developing and newly industrialized nations, appears to be the result of a change in lifestyle from traditional to 'modern', a process labelled 'coca-colonization' (Zimmet 1995, Zimmet *et al*. 1997).

Previously, the so called 'thrifty gene' promoted fat deposition and storage of calories in times of plentiful food and provided positive selective advantage during periods of food shortage and starvation (Neel 1962, Dowse & Zimmet 1993). The highest incidence of Type 2 DM is found among the Pima Indians and the Nauruans, which are the populations that previously were most subject to these adverse circumstances and where the frequency of the thrifty genotype would be the highest. Thus, the thrifty gene would contribute to increased fat storage during feast periods and would protect reproductive function during famines. When the scenario of social and cultural factors favours feasting, with a preference for energy-dense processed foods and a sedentary lifestyle, the selective advantage is lost (Zimmet 1995).

Several risk determinants are associated with Type 2 DM, such as increased age, nutritional factors, obesity (central), physical inactivity, intrauterine environment and possibly stress (Zimmet *et al*. 1997), as well as socio-economic factors (Zimmet 2000). An inverse relationship between Type 2 DM and socio-economic status has been found, in contrast to no association between the prevalence of Type 1 DM and socio-economic status (Meadows 1995, Connolly *et al*. 2000). Abdominal obesity, particularly with centralized distribution of body fat, has been implicated as a primary risk factor for the development of Type 2 DM. A two- to fourfold increase in the prevalence of Type 2 DM has been shown in the least active vs. the most active individuals, and is apparent among a range of ethnic groups. These are mainly of non-European origin, including Native Americans, Asians and Pacific Islanders. Exercise appears to have a protective effect against Type 2 DM and other chronic diseases, possibly through improved insulin sensitivity (Zimmet *et al*. 1997).

Compatible with the thrifty gene theory, common variants in genes regulating lipolysis, thermogenesis and glucose uptake in skeletal muscle account for a large part of such thrifty genes. Unknown genes may still be identified by random gene approaches (Groop & Orho-Melander 2001).

Low birth weight has been proposed as a new risk factor for Type 2 DM. Hales and Barker (1992) suggest that it is a reflection of nutritional deficiency *in utero*, which is related to the later development of glucose intolerance, either impaired glucose tolerance or Type 2 DM and the metabolic syndrome. Their interpretation of these findings is that impaired development of the endocrine pancreas and other tissues results from long-term effects of nutritional deprivation affecting foetal and infant growth. Thus, a 'thrifty phenotype' hypothesis was proposed, suggesting that Type 2 DM mainly results from environmental determinants and that genetic factors play a minimal role if any (Hales & Barker 1992). It has recently been suggested that low birth weight could be a phenotype for a thrifty gene because the risk of the dysmetabolic syndrome is increased, particularly with heredity of hypertension, irrespective of paternal or maternal inheritance (Melander *et al*. 1999, McCance *et al*. 1994).

Globally, there is a demographic transition in process. In association with urbanization and industrialization, life expectancy and longevity are increasing (WHO 1997). In all populations, the prevalence of DM has been shown to rise with age. This trend is most pronounced in populations at moderate to high risk. In the majority, peak prevalence occurs in the sixth decade of life, followed by a decline in the seventh decade, presumably because of the greater mortality of diabetic individuals (King & Rewers 1993).

Health and development – the influence of modernization

Environmental change is leading to new health risks and exposure to new forms of danger. Development, in its many facets, can have very positive but also negative effects on physical and mental health (Harpham 1994, Kloos 1994, Philips & Verhasselt 1994a,1994b), and the reports of high prevalence of DM in many populations that have undergone urbanization or migration suggests that environmental factors related to lifestyle contribute (Fujimoto 1996). In many developing countries, there has been rapid societal development and urbanization, and the numbers of people affected by DM have increased (King & Rewers 1991, 1993, Amos *et al*. 1997, Zimmet *et al*. 1997). The developing countries will eventually approach the urbanization levels of established industrialized countries (Harpham 1994).

Urbanization or modernization has historically been perceived as the process of change towards social, economic and political systems that developed in Western Europe and North America during the 17th to 19th centuries, spreading elsewhere during the last century. Modernization implies transformation of many aspects of life, but is often associated with industrialization. It involves interrelated technical, economic and ecological processes and movement from villages towards urban centres (Philips & Verhasselt 1994a,1994b). Thus, ill-health will tend to assume different forms as a country develops and urbanization progresses, and an epidemiological transition will ensue. The epidemiological transition model involves a process from epidemics of infections and famine, through an era of receding pandemics to one of pre-eminently degenerative, or sometimes 'man-made' diseases. As major killer diseases are better controlled or detected, life expectancy increases, but

health status might deteriorate as the causes of chronic but non-fatal morbidity are yet to be defeated. The inhabitants of many cities in developing countries, particularly industrializing ones, will often be exposed to traditional infectious and environmental health risks (e.g. poor housing, sanitation and water supply, poor nutritional status, etc.), as well as to chronic ailments and the spin-offs of industrialization (e.g. adoption of modern lifestyles such as smoking, alcohol consumption and refined diets, exposure to occupational hazards, toxic substances, unscrupulous workplace practice, etc.). Social factors as determinants of health status are, in many ways, gaining enormous influence in developing cities in a way that they have ceased to do, or that is much muted, in Western cities. Which part of the city one lives in and who one is become major risk factors influencing individual health and life chances (Philips & Verhasselt 1994a,1994b).

The double burden of disease for people in developing countries as a result of modernization

Disease patterns have changed over the last century. In industrialized and Western countries, such as Sweden and the UK, communicable diseases (e.g. tuberculosis, diarrhoea) have been replaced by noncommunicable diseases [(NCDs), e.g. coronary heart disease, diabetes] which are associated with modernization, increased wealth and prosperity. In developing countries, the incidence of NCDs correlates with the degree of modernization. Thus for some rapidly changing societies, these will be added to the dominating NCDs and will place a double burden of disease on people in sub-Saharan countries (WHO 1997, 1999). Uganda and Zimbabwe have entered the early phase of epidemiological transition and, besides the heavy burden of infectious disease, are experiencing a marked upsurge in noncommunicable diseases related to lifestyle (Ministry of Health and Child Welfare Zimbabwe 1999, Ministry of Health – Republic of Uganda 1999). By 2015, it is estimated that deaths due to NCDs in Africa will exceed those due to communicable diseases (Unwin *et al*. 1999). The probability of death from a noncommunicable disease is higher in low-income regions, such as sub-Saharan Africa, than in high-income regions such as established market economies (Murray & Lopez 1997). Leading possibilities of death include the possible role of communicable diseases early in life as determinants of subsequent noncommunicable diseases in adult age (Barker & Martyn 1992).

The situation is particularly critical among urban poor people in developing countries as they are at the interface of underdevelopment and industrialization, and in the mid-stage of epidemiological transition (Harpham 1994, WHO 1999). Type 2 DM is likely to continue to affect every region of the world, but its most damaging impact will be felt in newly industrialized and developing nations (Amos *et al*. 1997).

Prevention of diabetes mellitus: reality or dream?

Today, there is a lack of knowledge about how to prevent Type 1 DM and what the presence of one or more autoantibodies implies for its later incidence. There are several experimental investigations of treatment on an immunological basis, but more knowledge is still needed about the importance of different autoantibodies and their roles in the development of Type 1 DM (Atkinson & Maclaren 1994, Cantor *et al*. 1995, Groop & Orho-Melander 2001).

Type 2 DM is obviously heterogeneous and probably multigenetic, with a complex aetiology (Scherstén 1997, Zimmet *et al*. 1997, Groop & Orho-Melander 2001).

Based on knowledge from previous studies, there is consensus on the value of physical activity and exercise in Type 2 DM. Most patients with Type 2 DM are obese and have disturbances in lipid metabolism; many are also affected by hypertension (Scherstén 1997). Physical activity and dietary adjustments can favourably influence these conditions (Tuomilehto *et al*. 1992, Scherstén 1997, Tuomilehto *et al*. 2001). Previous studies also show a comparable situation in people with increased risk of developing DM: those with impaired glucose tolerance, impaired fasting glucose, obesity and hypertension (Scherstén 1997, Zimmet 2000, Eriksson *et al*. 2001). It was recently shown that the risk of DM was reduced by 58% in an intervention group of patients with impaired glucose tolerance (Tuomilehto *et al*. 2001). Reduction in the incidence of DM was directly associated with changes in lifestyle. A healthy diet and exercise resulting in reduced energy intake and increased energy expenditure provide the logical means of prevention (Zimmet 1995, 2000, Zimmet *et al*. 2001, Eriksson *et al*. 2001, Tuomilehto *et al*. 2001).

Thus, prevention of Type 2 DM is a reality and not a dream.

Health promotion

The original meaning of the concept of prevention is to stop the development of a disease before it occurs, but it has now come to include measures aimed at preventing or slowing down the progression of an established disease. Primary prevention includes both general prevention directed towards a population (health promotion) and more specific protective measures including immunization, environmental health and

control of exposure to ailments. The concept of health promotion also includes the need to change lifestyle, as well as the prerequisites of life in order to promote or favour health. Thus, health promotion should be seen as a transmitting strategy between people and their environment. It synthesizes personal choice and social responsibility for health. Basic resources for health, according to this concept, are income, housing and food (Mackintosh 1996, Scherstén 1997). The association between the individual, the environment and health is an essential part of nursing care and its development (Henderson 1969, Leininger 1991).

With regard to Type 2 DM, it is easy to accept health promotion as a priority activity in developing countries where the process of urbanization has started. It is more difficult to accept the concept in the industrialized countries, but evidence indicates that nurses should act in accordance with the concept of health promotion. Thus, primary prevention of Type 2 DM should include changes in structural social and economic factors that are important determinants of lifestyle (Scherstén 1997, Eriksson *et al.* 2001), as diabetes is not only a disease but also a symptom of wider political and social problems (Zimmet 2000). Preventive activities must be directed at the entire society and the entire population via community intervention programmes, and need to be integrated with measures directed against other diseases such as hypertension and cardiovascular disease. The projected dramatic increase in incidence and prevalence of DM requires population-based activities directed at the society as a whole (Scherstén 1997, Zimmet 2000, Eriksson *et al.* 2001), as well as international co-operation (Zimmet *et al.* 2001).

Primary preventive measures in a high-risk strategy are directed at individuals with increased risk of developing Type 2 DM, such as those with impaired glucose tolerance, obesity, insulin resistance, established coronary heart disease, dyslipidaemia, hypertension, familial DM and gestational diabetes mellitus. Intervention may be directed entirely towards behaviour and lifestyle changes, or combined with pharmacological agents (Scherstén 1997, Eriksson *et al.* 2001, Tuomilehto *et al.* 2001).

Early detection of DM and early treatment of the disease can further reduce the societal loading of Type 2 DM and its complications. Recommendations have been made (ADA 1997) for assessing blood glucose in all individuals over 45 years of age at intervals of 3 years, and earlier or more frequently in risk groups. Also, early detection and aggressive management of the metabolic syndrome should be stressed; this might have a significant impact both on the prevention of Type 2 DM and on cardiovascular disease globally (Zimmet *et al.* 1997, 2001).

Discussion

Implications for nurse education curricula and nursing

Based on the literature review, some general recommendations concerning the content of nurse education and nursing will be made. The recommendations then have to be adapted and implemented in the context of each particular country.

So far nurse education curricula in the countries studied – in Sweden, the UK, Uganda and Zimbabwe – have focused mainly on individuals and diabetic disease and its management, aiming to prevent deterioration of the condition. As seen in the literature review, the number of DM cases will rapidly increase globally and almost double during the coming 25 years, placing an enormous social and economic burden on society (Amos *et al.* 1997, WHO 1997, Zimmet *et al.* 1997, 2001, Zimmet 2000). In the future it will be impossible to manage adequately all those affected with DM, which means that measures have to be directed against the development of the disease. The main focus in nursing and in nursing curricula must be on health promotion in healthy people. A shift from a sickness service to a health service (Whitehead 2000), or from disease elimination to an approach based on the creation and production of health (Kickbush 1996), is needed. There are many underutilized opportunities for health promotion in health care, especially in hospital care. Health promotion is a key part of all health services whenever they are provided (Whitehead 1999). Through education, nurses will be able to develop the skills necessary to use every opportunity for promoting health in everyday practice (Whitehead 1999, 2001). It is important to learn about different methods for health education. Waiting times during visits to health institutions can be used for education (planned/spontaneous activities, individually/in groups), for example, by means of oral history/narratives, drawings, pamphlets, books, videos, Internet, etc. The choice of method depends on local conditions and accessibility. A prerequisite for nurses' participation in prevention of DM is that they learn how to work with community-based intervention programmes aimed at teaching people about the risk factors. The focus should be shifted from individual to population-based approaches. Basic concepts in epidemiology and epidemiological methods for assessing data should be taught. The development of nurse-based health clinics where the main aim is to educate healthy people about healthy habits individually, in groups and with population-based approaches, including the use of the mass media, could be one solution. Screening for DM could also be included. The foundations of healthy lifestyles and habits are laid in early life, so health education of mothers and children is of great

importance, and schools are important arenas for nurses' health promotion activities (Mackintosh 1996).

From this review, it is obvious that development and urbanization (Philips & Verhasselt 1994a, Zimmet 2000) do not always equate with better health. Thus, the implications of urbanization and industrialization are important to emphasize in nurse education, and awareness of their importance should be developed among qualified nurses. The role of societal development and its consequences for health and population development should also be included. The individual, society, environment and health are key concepts whose relationship is of great importance. Discussions between nurse students and qualified staff could be one way to develop this knowledge.

Previous investigations indicate differences in knowledge about DM and the body in people from different parts of the world (Hjelm *et al*. 1998, 1999). Nurses should learn about the implications for health promotion activities of differing knowledge bases in different populations. Discussions of the influence of socio-economic and cultural beliefs are important for understanding the influence of individual beliefs about health and illness. Methods for assessing data on individual beliefs by individual or group interviews should be learnt.

The impact of DM, on individual and societal level, can be reduced by appropriate treatment (DCCT 1993, Turner 1998). Nursing curricula need to include a sound knowledge base about DM and its management, as well as measures for secondary prevention aimed at promoting health and preventing the development of complications related to the disease. As DM is a complex health problem demanding physiological, social and psychological adaptation (William-Olsson 1986, Ternulf Nyhlin 1990, Wikblad & Montin 1992), nurses should learn a holistic approach to the disease in all its dimensions, so as to diminish its effects. This approach is recommended and described in Swedish national guidelines for diabetes care (Socialstyrelsen 1999). These could be used for discussions of a model for holistic diabetes care and its development and adaptation in different countries.

To summarize, the emergence of diseases of lifestyle demands a focus on and work with integrated health promotion and disease prevention, but also curative and rehabilitative services (Ministry of Health and Child Welfare Zimbabwe 1999, Ministry of Health – Republic of Uganda 1999).

Nurses should also learn how to develop a diabetes care organization that is patient-centred, high-quality and cost-effective. Examples are multidisciplinary teams, evaluations from the patient perspective and studies of cost-effectiveness (Ragnarson Tennvall & Apelqvist 1997, Apelqvist & Larsson 2000, Hjelm *et al*. 2002a). The implementation of this organization also demands support from administrative bodies and policy-makers. Knowledge and courses in nurse administration are important. Nurses will thus have pathways for rapid expert assessment and intervention aimed at teaching patients to live with the problem and to react early to signs of ill-health. Different teaching methods and strategies concerned with self-care measures should be stressed in curricula.

The main underlying causes of DM have been shown to be genetic factors and relatively rapid changes of lifestyle (Zimmet 2000). Energy-dense food rich in fat and carbohydrates, such as fast food, is often less expensive than healthy food. The global market has developed and habits have spread from industrialized countries to developing countries (Philips & Verhasselt 1994a,1994b). Thus globalization concerns not only economic change, but also changes to diet (Zimmet 2000). It is important to include nutritional habits in education. Particular problems arise in different parts of the world and in different countries due to varying degrees of urbanization and development. The epidemiological transition has brought European countries such as Sweden and the UK from communicable diseases, mainly infectious diseases related to poverty, to NCDs such as DM, cardiovascular disease and cancer related to wealth. Developing countries such as Uganda and Zimbabwe still have serious communicable diseases, but they have also started to develop NCDs in association with industrialization and urbanization and changes of lifestyle (Philips & Verhasselt 1994a,1994b, Ministry of Health and Child Welfare Zimbabwe 1999, Ministry of Health – Republic of Uganda 1999, WHO 1999). Thus, nurses in developing countries have to live with a double burden of disease and a greater challenge in the development of the curriculum, not only to teach about the impact of social measures such as good hygiene and housing on communicable diseases, but also other societal factors such as healthy lifestyle and its impact on the incidence of NCDs like DM. Very often poor people lack knowledge, understanding and money to change their lifestyle in a healthy direction (Philips & Verhasselt 1994a,1994b); thus methods for empowering people also need to be included in curricula.

Furthermore, it is important that nurses become aware of and active in international and regional agencies involved in global social, health, nutrition and welfare [e.g. WHO, United Nations Development Program (UNDP), United Nations International Children's Emergency Fund (UNICEF), and the World Bank]. More specifically nurses should be involved in the development of policies for education and intervention and legislative changes to reduce the adverse effects of nutritional transition (Zimmet 2000).

The development of programmes for continuing education is important for nurses. Refresher efforts with the focus on DM and health promotion could be made, for example, by discussions of case studies, using Internet-based courses and video-conferencing systems. Co-ordinated activities for students and qualified nurses offer advantages through encounters between experts and novices.

Conclusion

In conclusion, the development of Type 2 DM is to a great extent associated with factors related to societal development, and it is possible to prevent the disease. Different measures could be taken as regards the education of nurses at different levels. Nurses all over the world have an important role in fighting the diabetic pandemic by health promotion aimed at keeping healthy people healthy as long as possible.

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