

Focus on migrants with type 2 diabetes mellitus in European Countries

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Abstract The prevalence of type 2 diabetes mellitus, one of the major causes of morbidity and mortality in Europe, is increasing in all European countries. Diabetes is not distributed equally among all population groups, as higher incidence, appearance of complications, and different mortality rates have been observed among migrants and the native population. These differences may be due to genetic profiles, lifestyle, and utilization of the health care system in different ways. Taking into account that the quantity of migrants is nowadays increasing, mainly in the southern part of Europe, the knowledge of diabetes in migrants through a better collection of data is necessary, considering that few limited epidemiological studies have evaluated the importance of this problem in EU countries. A special effort in developing a comprehensive management for native and immigrant populations in order to prevent and cure diabetes should be mandatory. This activity could be helpful to limit the incidence of future diabetes complications and to avoid the consequent burden of the health care system along with a control on its costs. It is clear that

diabetes complication prevention is essential for long-term sustainability of the health care system.

Keywords Type 2 diabetes mellitus · Non-communicable diseases · Chronic disease · Migrants · Life style · Health care disparities · Health management

Introduction

Non-communicable diseases (NCDs) are the leading causes of death worldwide. More people die from NCDs than from all other causes combined [1]. In the European Region, cardiovascular disease, cancer, respiratory diseases, and diabetes (the four major NCDs) together account for 77 % of the burden of the disease and almost 86 % of premature mortality [2].

The prevalence of type 2 diabetes mellitus (T2DM) in Italy has increased rapidly in the past 10 years; to date, approximately 3.3 million people have been diagnosed with T2DM (5.5 % of the total population), and another million people are yet undiagnosed but who are already affected by this illness. These data will increase in the near future, and it has been estimated that 9.0 % of the population will have T2DM by 2030 [3]. Similar increases are postulated in other European countries, and globally, the number of people with diabetes is predicted to reach 592 million by the year 2035, a 55 % increase since 2013 data [4]. However, these estimates could mask important differences in mortality and morbidity among different population groups within regions and countries, including migrant and ethnic minority groups. Diabetes is not distributed equally among all population groups, as higher incidence, appearance of complications, and higher mortality rate have been observed among women, ethnic

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minorities, and people with a low socioeconomic level [5, 6]. Europe was a source of emigrants in the 19th century and first half of the 20th century. It is now a net recipient of migrants [7]. It is estimated that in 2010, there were 47.3 million foreign-born residents in Europe, corresponding to 9.4 % of the total population. [8]. The member states of Europe with the highest numbers of immigrants are Germany, France, and the United Kingdom [9]. However, the migrant influx to these countries from 2001 has become relatively modest compared with Spain and Italy where the percentage of international migrants as a percentage of the population increased from 2.1 and 2.5 % in 1990 to 14.1 and 7.4 % in 2010, respectively [9]. Due to the young age of migrants, most of activities of European member states on migrant health seem to be focused on emergency care. Most of migration health activities that have been made in the past highlighted the recognition, identification, and management of communicable diseases such as tuberculosis, leprosy, or syphilis at the time and place of the migrant arrival [10]. NCDs such as diabetes and hypertension have rapidly increased during the last decades in the poor areas of the planet where culture of prevention is not yet spread at population level [11]. Lifestyle-associated health issues, including tobacco use and alcohol consumption, as well as the lack of implementation of prevention strategies among the migrant communities may also importantly affect the long-term consequences of movement between locations with different health determinants [12–14].

Epidemiological features of diabetes in EU migrants

Important changes of the ethnic composition of Europe followed substantial emigration and immigration throughout the 20th century, surely affecting the epidemiology of chronic diseases and their determinants [15, 16]. For these reasons, diabetes mellitus became, in migrant and ethnic minority populations, a major public health challenge for European countries [15]. It is now evident that only a few limited epidemiological scientific papers have studied the importance of this problem in EU countries. The few papers published have shown that migrants have greater risks of mortality or morbidity from diabetes, and these data depend on the country of origin and ethnic background, compared with the European white populations [16–21]. For example, obesity and T2DM are highly prevalent among African migrants compared with European descent populations. The prevalence of T2DM in these populations, for example, is about three to five times higher than in Europeans [22]. They also develop T2DM at a younger age and have higher morbidity and mortality from T2DM and related complications, such as cardiovascular disease (CVD), than European populations [22,

23]. Ethnicity has been used as a variable for describing differences in population characteristics and disease experiences [24]. An article published by Rafnsson et al. reports the available large-scale epidemiological data on CVD and diabetes immigrant and ethnic minority groups in Europe [25]. They affirm that routine health data are essential for informing public health policies and health care planning at both national and EU level. The authors point out that high-quality data on the health status of migrant and ethnic minority populations are generally not available in Europe at that time. Out of the 72 datasets identified, 47 come from only eight Nordic and Western European countries. As a consequence, for several EU member states, no relevant data are identified. Routine health data of migrants, disaggregated by ethnicity, should be addressed in order to meet the needs of migrant and ethnic minority populations in EU health policies.

Summarizing the literature data, diabetes mellitus incidence prevalence and mortality rates are usually much higher among migrants than among locally born residents [19–21, 26–31]. Table 1 summarizes the main bibliographic sources of the papers discussed in this paragraph.

Effect of migrants' lifestyle on diabetes characteristics

In addition to genetic predisposition, there are several other interacting causes of the increased diabetes mellitus risk of migrants, including changing environments [32]. A more general explanation suggests that migrants' excess diabetes mellitus mortality is due to a dramatic change from a poor to an affluent environment [29].

Some authors have studied the influence of migration on characteristics of diabetes. Choukem et al. compare the clinical and biochemical characteristics and microvascular complications in three groups of type 2 diabetes patients: Africans living in Africa; African immigrants living in France; and Caucasians living in France [33]. The data in this study show that Africans who emigrate to France developed diabetes earlier than those staying in their home country. However, it is impossible to exclude that these results may be a reflection of late diagnosis of diabetes. Besides, the less adequate control of diabetes and hypertension would explain their higher rates of nephropathy.

Pollard et al. find that there are healthier levels of several cardiovascular and type 2 diabetes risk factors in British-born British Pakistani women than in migrant British Pakistani women. Starting from this finding, they hypothesize that these data might be related to the effects of early environment or to other factors, such as differences in health behaviors [34]. Holmboe-Ottesen et al. report on dietary changes and health consequences among South Asian immigrants from low-income countries to Europe

Table 1 Main bibliographic sources of the papers discussed in the paragraph “*Epidemiological features of diabetes in EU migrants*”

Source (Ref.)	Country	Ethnicity	Topic	Results
Carballo et al. [16]	Switzerland	Various	Epidemiology	The paper gives a brief overview of a wide spectrum of health issues and problems, ranging from communicable disease to mental health and family formation, which affect migrants and host countries
Bhopal et al. [17]	Great Britain	Indian, Pakistani, Bangladeshi, and European	Epidemiology	Risk of coronary heart disease is not uniform among South Asians, and there are important differences between Indians, Pakistanis, and Bangladeshis for many coronary risk factors
Cappuccio et al. [18]	Great Britain	White, African descent, and of South Asian origin	Epidemiology	Hypertension and diabetes are raised two- to threefold in South Asians, Caribbeans, and West Africans in Britain
Wändell et al. [19]	Sweden	Swedish-born, immigrants from Europe, and immigrants from non-European countries	Epidemiology	The prevalence of diabetes was found to be considerably higher among immigrants from non-European countries in Sweden. The excess risk was associated with above all to a higher BMI
Weijers et al. [20]	The Netherlands	Surinam (mainly Creole), Turkish, Moroccan, and Dutch adults	Epidemiology	The study highlights a high prevalence of known type 2 diabetes and GDM in the immigrant inhabitants
Zaninotto et al. [21]	Great Britain	Black Caribbean, Indian, Pakistanis, Bangladeshi, Chinese, Irish, and adults from the general population	Epidemiology	CVD prevention through control of risk factors, especially diabetes and hypertension, should not only address the general population, but also target people from these groups
Oldroyd et al. [22]	Great Britain	South Asians and African-Caribbeans in the UK but also using non-UK data	Review	It is concluded that although the origin of the ethnic differences in incidence need further clarification, many factors should be amenable to prevention and treatment in all ethnic groups worldwide
Rafnsson et al. [25]	Great Britain	Network of European public health researchers and searches of bibliographic databases and internet sites	Epidemiology	See text
Mather et al. [26]	Great Britain	Cohort of South Asian and European people with diabetes	Epidemiology	Both mortality and morbidity from ischaemic heart disease are markedly increased in middle aged South Asian people with diabetes, with a two to three-fold excess over their European counterparts
Ujčić-Voortman et al. [27]	The Netherlands	The study included Turkish, Moroccan and Dutch individuals aged 18–70 years	Epidemiology	Diabetes is more prevalent among Turkish and Moroccan migrants as compared to the indigenous population. Only part of this difference can be explained by differences in demographic and lifestyle risk factors
Carlsson et al. [28]	Sweden	The Apolipoprotein MORTality RISK (AMORIS) cohort was used, aged between 20 and 80 years	Epidemiology	Female immigrants to Sweden from Iraq, North Africa, South Asia, Syria, and Turkey have an increased prevalence of diabetes of substantial public health concern
Vandenheede H et al. [30]	Belgium	Mortality data from seven European countries	Epidemiology	The inverse association between gross domestic product of country of birth and diabetes mortality suggests that socio-economic change may be one of the key aetiological factors

(India, Pakistan, Bangladesh, Sri Lanka). The main dietary trend after migration is a substantial increase in energy and fat intake, a reduction in carbohydrates, and a switch from whole grains and pulses to more refined sources of carbohydrates, resulting in a low intake of fiber. The data also indicate an increase in intake of meat and dairy foods. Some groups also reduce their vegetable intake. The

findings suggest that these dietary changes may all have contributed to a higher risk of obesity, T2DM, and CVD [35].

Ethnic background may also affect lifestyle, dietary, and health practices, reflecting complex influences of diverse cultural, social, and religious characteristics. [36–38] Social inequalities are reported to influence diabetes health

care [39]. The low socioeconomic level subjects suffer from a greater delay in diagnosis and are worse at controlling their condition. Moreover, recently, it is reported that education and diabetes mortality are inversely related in Europe in the 2000s [40]. This association differs by gender, indicating the need to take the socioeconomic and gender dimension into account when developing public health policies. In order to have a clear idea in understanding variations due to ethnicity in health behaviors and beliefs, it is necessary to know these migrants' characteristics. These data regarding ethnic differences in diabetes might be useful to identify clinical outcomes to promote health and wellbeing and help direct public health interventions and health care resources [41]. Table 2 summarizes the main bibliographic sources of the papers discussed in this paragraph.

Migrants and health care system

Another important point is the integration of the migrant population into the receiving health care system. This is a key issue in countries that receive a large number of migrants each year. Independent of the health care system, there is evidence that migrants remain undertreated compared with the native population [39]. For instance, a relevant finding in a study of Peeters et al. [42] is that among

Turkish migrants in Belgium, only slightly more than half have been informed by a health care provider about Ramadan fasting and diabetes. This percentage is similar to that observed in previous studies [43, 44]. In addition, only 60 % of those who actually fasted received recommendations about intake of diabetes medication during the fasting period. Most fasters continued their medication dose unchanged (87 % of OHA users and 80 % of the insulin users). These findings suggest that health workers should pay more attention to informing their Muslim diabetes patients about medication used during the Ramadan. Metabolic control is poor among migrant groups with diabetes, and HbA1c in migrants is generally higher than that in the locally born population, increasing the risk of diabetic complications [45]. A number of studies reveal important barriers in health care access [46, 47]. According to a recent retrospective analysis of administrative health care records in Italy, all quality management indicators for diabetes, heart failure, and ischemic heart disease are lower for citizens from high-pressure migration countries than those for citizens from highly developed countries and Italy [48]. Furthermore, people from high-pressure migration countries are also more likely to contact emergency services and less likely to visit specialist doctors or use preventive care [48]. These differences may be due to limited access of migrants to health resources, due to job and time

Table 2 Main bibliographic source of the papers discussed in the paragraph “Effect of migrants’ lifestyle on diabetes characteristics”

Source (Ref.)	Country	Ethnicity	Topic	Results
Cruickshank et al. [32]	Great Britain	African	Epidemiology	Energy imbalance and intergenerational socioeconomic influences are much more likely causes of diabetes than ethnic/genetic variation
Choukem et al. [33]	France	T2D Africans living in Cameroon and African migrants diagnosed with T2D after having moved to France, and a group of 199 T2D Caucasian patients living in France	Epidemiology	Africans who emigrate to France may develop diabetes earlier than those staying in their home country
Pollard et al. [34]	Great Britain	Migrants from Pakistan to the UK, British-born British Pakistani women, and British-born women of European origin	Epidemiology	There may be differences in body composition and levels of cardiovascular and Type 2 diabetes risk factors between migrant and British-born British Pakistani women
Holmboe-Ottesen et al. [35]	Norway	Systematic searches in PubMed to major immigrant groups in Europe, including those from South Asia (India, Pakistan, Bangladesh, Sri Lanka)	Prevention, epidemiology	South Asians living in Europe tend to have changed their diet after migration toward a unhealthier pattern leading to a higher risk of obesity, T2D, and cardiovascular disease
Ricci-Cabello et al. [39]	Spain	MEDLINE, EMBASE and the cochrane database of systematic reviews	Review, prevention, epidemiology	Even in countries with a significant level of economic development and which have universal healthcare systems in place and are endeavouring to provide medical care to the entire population, socioeconomic and ethnic inequalities can be identified in the provision of health-care to DM sufferers
Vandenheede et al. [40]	Belgium	Data obtained from mortality registries covering 14 European countries	Epidemiology	Education and diabetes mortality are inversely related in Europe in the 2000s

Table 3 Main bibliographic source of the papers discussed in the paragraph “Migrants and health care system”

Source (Ref.)	Country	Ethnicity	Topic	Results
Peeters et al. [42]	Belgium	Turkish migrants with diabetes	Epidemiology, management	This pilot study found a low prevalence of Ramadan fasting among Turkish migrants with diabetes in Belgium. It was also found that provision of advice by healthcare providers could be improved
Salti et al. [43]	Lebanon	Transversal survey conducted in 13 countries	Epidemiology	The large proportion of both type 1 and type 2 diabetic patients who fast during Ramadan represents a challenge to physicians to provide more intensive education before fasting and emphasizes the need for closer monitoring of blood glucose during fasting
Gaborit et al. [44]	France	Muslim diabetic patients were selected from among patients hospitalized	Epidemiology, prevention	This study confirms the importance of Ramadan fasting for Muslim patients, and reveals a wide cross-cultural gap between general practitioners and their patients. Systematic advice on treatment adjustment needs to be given
Lanting et al. [45]	The Netherlands	A review of the literature on ethnic differences in the prevalence of complications and mortality among diabetic patients and in the quality of diabetes care was performed	Review	It seems the case that ethnic differences in diabetes care contribute to the more adverse disease outcomes of diabetic patients from some ethnic minority groups
Lien et al. [46]	Norway	Two population-based surveys, the Oslo Health Study and the Oslo Immigrant Health Study, were performed on selected groups of Oslo citizens in 2000 and 2002	Survey	The non-western immigrants in this study were less satisfied than ethnic Norwegians with their last visit to a general practitioner
Buja et al. [48]	Italy	A population-based retrospective cohort study on people aged 16 years or more residing in Italy	Epidemiology	This study revealed a different prevalence of chronic diseases by citizenship, implying a different burden of primary care by citizenship
Marchesini et al. [51]	Italy	Drug-treated diabetic individuals were identified in the population-based multiregional ARNO observatory	Epidemiology	Compared to subjects of Italian ancestry, migrants to Italy show a higher risk of diabetes but less intense treatment
Kofahl et al. [58]	Germany	Patients with type 2 diabetes were interviewed in Istanbul (Turkey) and Turkish patients in Hamburg (Germany)	Epidemiology	There are no significant differences between Turkish diabetics in Germany and Turkey in the physical and the psychological dimensions of the WHOQOL-Bref. However, in the WHOQOL-domains ‘social QoL’ and ‘environmental QoL’ Turkish diabetics living in Hamburg have a significantly better quality of life than their counterparts in Istanbul

constraints and sociocultural conditions, and to lack of specific skills of physicians in intercultural communication [49]. Far from being money saving, the underutilization of drugs, primary care services, and diabetes clinics may lead to rapid disease progression, translating into higher costs [50]. A recent study published by Marchesini et al. provides a comprehensive analysis of the prevalence of drug-treated diabetes and the amount of care provided to migrants in Italy, under the universal coverage of the NHS [51]. The results have shown that the risk of having diabetes is 55 % higher in migrants than in Italians of similar age, gender, and place of residence, whereas direct costs are 27 % lower. The pattern of treatment is also different;

migrants with diabetes have a 40 % higher likelihood of being treated with oral drugs and 15–20 % lower likelihood of being treated with lipid-lowering and antithrombotic agents. The data suggest lower quality of diabetes care in migrants compared to age, gender, and place of residence matched Italians as well as within a universal health care system in the presence of high migratory fluxes from low-income countries towards the European Community [52]. The authors conclude that differences exist in the prevalence and treatment of diabetes in migrants to Italy compared to subjects of Italian ancestry, also in a universal health care system. Inequalities may derive from socioeconomic and cultural status of migrants and may also

arise on the physicians' side, pointing out the need to favor visits to general practitioners/diabetologists and attendance in screening and treatment programs, to adapt education programs to specific cultures [53]. Recently, a consensus statement was developed by approaching relevant Italian national scientific societies involved in cardiovascular prevention to review information on cardiovascular health and migration [54]. The authors emphasize that in Italy, given the rate of immigrants in the total number of residents increased from 2.5 % in 1990 to 7.4 % in 2010 and currently exceeds 10 % in several regions, the aging of ethnic minority populations can lead to a future burden of cardiovascular (myocardial infarction and stroke) and renal diseases (dialysis) in the next few decades, which will increase local need for health services significantly. Therefore, in Italy, much needs to be done especially in the collection of sound data, which is the first step to allow central governments to identify this issue as an important public health concern. Specific measures to control diabetes, hypertension, and secondary complications in susceptible populations will contribute both to safeguarding health and to economies in care spending.

Political, economic, and social inequalities in the migrant population may cause the different health-related opportunities and resources, with the result that the most disadvantaged groups suffer worse health than the rest [55, 56]. The relevance of inequalities in terms of health care is especially evident among patients suffering from chronic or long-term illnesses such as diabetes, as these people have a relationship with the health care system for a greater length of time [57].

Besides the public investment in social security, infrastructure in addition to health care positively influences the quality of life in the foreign-born and local-born population. Turkish diabetics living in Hamburg have a significantly better quality of life than their counterparts in Istanbul; nonetheless, strong similarities exist between the two samples in sociodemographics, physical and mental health [58]. Table 3 summarizes the main bibliographic sources of the papers discussed in this paragraph.

Conclusions

The prevalence of diabetes is found to be higher among immigrants than in the native population in a great part of western European countries. Even if we consider that migrants might initially be healthier with respect to non-migrant populations in their host countries, genetic factors, and changing environments with lifestyle changes, social exclusion together with an insufficient medical control may expose them to a higher risk of non-communicable diseases

such as T2DM. In Europe, cultural barriers and poor communication between health systems and migrants may limit migrants from receiving appropriate prevention, diagnosis, and treatment. Scientific working groups have elaborated proposals to review current strategies for cardiovascular risk assessment in population studies in low-income and middle-income countries [59]. Cultural reasons may also hamper both the dissemination of prevention strategies and migrant communication with health care providers. Ethnic minority groups are also excluded from most epidemiological studies in high-income countries in Europe. If they are included, the number of respondents from ethnic minority groups is generally too small to draw conclusions about specific ethnic groups. Consequently, the current evidence on the epidemiological profile of ethnic minorities is limited. We should also consider that great diversity exists across and within different groups of migrants, thus making it very difficult to find reliable results. Many countries do not collect registry or survey data for migrants' health. A permanent central observatory that coordinates data collection from all European countries on migrants' health could be very useful in order to have an extensive picture of their situation and to monitor variations in the course of time. This information could help each European country to improve its health policies. Nonetheless, the European Union is searching to improve data collection for migrant health and to support specific prevention policies in the attempt to limit the future burden of NCDs such as T2DM.

Despite all the progress made, efforts are still required in scaling up activities and interventions against the NCDs threats.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Statement of human and animal rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study formal consent is not required.

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