Cultural Contributors to the Development of Diabetes Mellitus in Malta

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Abstract
Diabetes Mellitus is a condition of particular importance to the Maltese population. Currently 16.7% of the Maltese population is living with diabetes or impaired glucose tolerance. A cultural and historical evaluation of this area-restricted archipelago population has suggested that the associated high prevalence of diabetes may be the result of the Baker-Pederson hypothesis cycles following an original adaptation to a thrifty near starvation diet.

Keywords*: Diabetes Mellitus, culture, Malta, thrifty diet phenotype.*

Introduction

Small island communities have particular geographical and cultural stressors that can influence the risk for developing a spectrum of metabolic diseases including diabetes and obesity. The Maltese archipelago, composed of three main inhabited islands - Malta, Gozo and Comino, is located in the Central Mediterranean. The archipelago's strategic position at the crossroads of the Mediterranean shipping lanes has played a crucial role in the islands' history and has ensured a varied genetic intermix involving the circum-Mediterranean and European populations. The Maltese saw a population influx from Sicily during the Stone age period about 5000 BCE with a cultural change occurring during the Bronze age when there appeared to be links with the Aegean [circa 2500 BCE], and with the Eastern Mediterranean cultures circa 900 BCE. After the Phoenician colonization [800 - 218 BCE], the archipelago has fallen under the domain of all the powers that have ruled the Mediterranean region - Rome and Byzantium [218 BCE - 810], Arab [810 - 1090], Sicilian [1090 -1530], Order of St. John [1530 -1798], French [1798 -1800], and British [1800 - 1964]. Malta became an independent nation in 1964 and a republic in 1974, but remained within the British Commonwealth. It joined the European Union in 2004. The scope of the present paper is to review the possible interplay between the particular geographical and cultural characters of the Maltese population and the risk for developing type 2 diabetes mellitus.

Diabetes Mellitus Prevalence

Diabetes Mellitus is highly prevalent in the Maltese population contributing significantly towards population morbidity and mortality.[1] Currently about 16.7% of the Maltese population is living with diabetes [9.2%] or impaired glucose tolerance [7.5%]. This compares closely to the estimated prevalence from other circum-Mediterranean countries that ranges from reported figures of 9.9% in Lebanon to 26.8% in Slovenia [Figure 1].[2] This high prevalence in the Maltese population is responsible for one in four deaths of the Maltese people before the age of 65 years.[3] In the Mediterranean region, the prevalence of Type 2 DM [T2DM] and impaired glucose tolerance [IGT] varies, but there appears to be a T2DM prevalence relationship with population density of the country and degree of urbanization.[4] The Mediterranean area represents a unique regional example of the interplay of varying ethnic variations and socio-economic differences. The region can be regarded as a single unit with a large number of common ethnic and cultural features. The region is heterogeneous in terms of socio-economic and demographical factors. Thus, most of the Northern Mediterranean countries (European coast) share the features of other industrialized countries, while most of the Southern Mediterranean (African coast) belongs to the developing world or recently developed world. The Mediterranean islands and Eastern countries (Asian coast) share a mixture of these features.[5]

The problems associated with diabetes mellitus in Malta seem to have come to the fore in the latter part of the twentieth century, even though Maltese medical practitioners were familiar with the disease since earlier centuries. Early evidence of an interest in diabetic disorders by Maltese medical practitioners dates to the 17th Century.[6] However, awareness of diabetes as a major public health problem in Malta was not recognized or felt until the 1950's when the Chief Government Officer voiced his concerns about the disease.[7] The problems of T2DM and the associated obesity have progressively increased in the last decades so that whereas the prevalence of known diabetics in 1981 was 5.9%, the estimated rate in 2003 was reported as 7.5%.[2, 8]

Geographical Contributors

The small geographical area of the Maltese archipelago has

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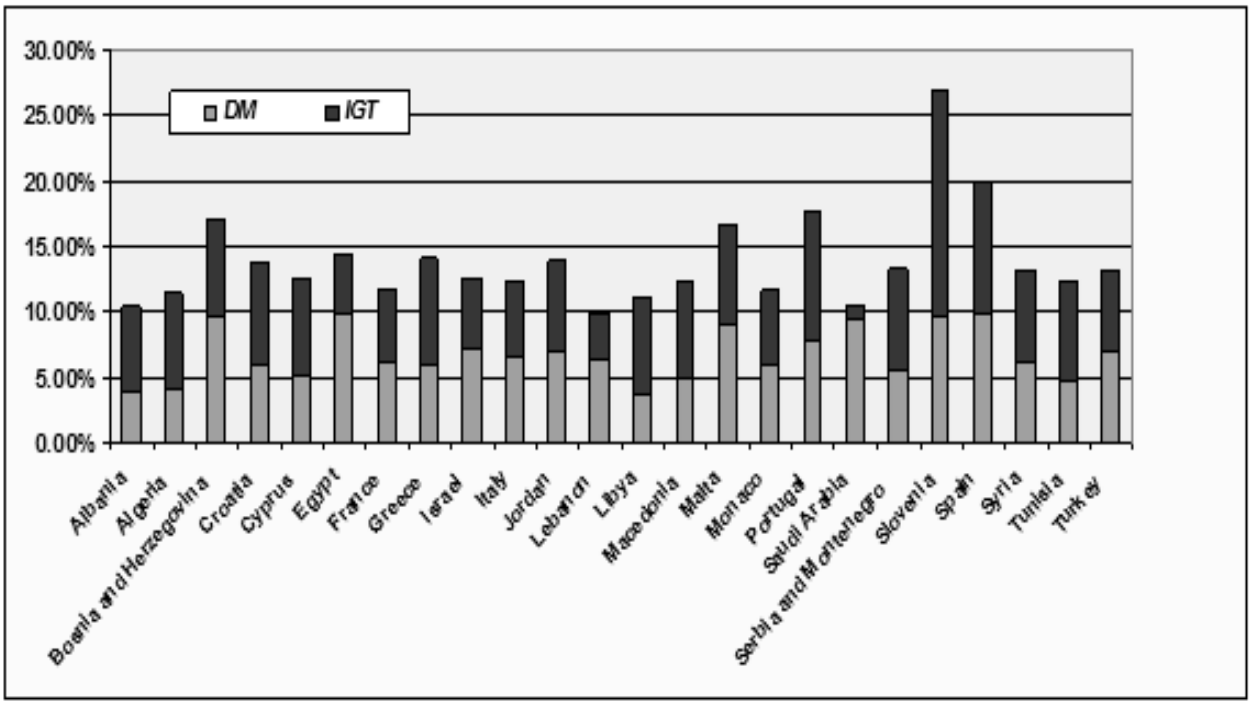

Figure 1: Estimated prevalence of DM in the Mediterranean Region Population aged 20-79 years – year 2003

resulted in a significant restriction in availability of agricultural land area. The archipelago covers a total area of only 316 km^2 with a reported population of 404,039.[9] Its current population density stands at 1282 person/km^2. Agricultural land accounts for about 34% of the total land area.[10] This agricultural land restriction has required regular importation of food supplies from overseas since antiquity; with archaeological and documentary evidence dating to the Roman and particularly the medieval period. This dependence on imports, compounded by a relatively low socio-economic status of the general population, led to a tendency towards chronic food deprivation. This chronic food deprivation affecting all age strata of the population, including pregnant women and their unborn foetus, probably led towards the development of a Thrifty Diet Phenotype.[11] The development of a Thrifty Diet Phenotype is a protective mechanism possibly mediated through epigenetic influences whereby the individual is better adapted to deal with periods of starvation and food deprivation.[12]

The central position in the Mediterranean and the historical background of the archipelago has led to a genetic melting point with regular influx from all around the Mediterranean and thus it is not surprising to note the generally high prevalence of the disorder throughout the Mediterranean region [Figure 1]. The molecular SNPlotypes representing inflammatory response, metabolic syndrome and MODY genes have shown no significant differences in Maltese compared to Libyan populations[13]suggesting a similar genetic profile in relation to these disorders in these two populations. The importance of a familial rather than a purely genetic inheritance of diabetes in Malta has been confirmed by the results of the later phases of the National Diabetes Survey, where a strong family history of diabetes was found in female subjects living with diabetes more likely to furnish a statistically significant relationship to a maternal but not paternal family history.[14] In contrast, a statistical relationship to a paternal history was described in male diabetics.[15]

Dietary contributors

Until the early twentieth century, the diet was the same for the general population, especially for the lower socio-economic classes. During the nineteenth century, the majority of the population consumed large quantities of barley bread and wine together with olives, oil, onions, garlic, cheese and very little fish or meat, since meat was rarely affordable. The Maltese also consumed seasonal fruit and vegetables in abundance.[6] The diet was therefore typical of the Mediterranean one that consist of daily consumption of fruits, vegetables, wholegrain breads, non-refined cereals, olive oil and dairy products; moderate weekly consumption of fish, poultry, nuts, potatoes and eggs; low monthly consumption of red meat; and daily moderate wine consumption.[16] The dietary restrictions persisted well until the mid-twentieth century as evidenced by the concerns regarding child health status stated in the Department of Health annual reports of the time.[11]

After the end of the Second World War, the financial status and social conditions for the Maltese population improved greatly. In addition, the presence of the British colony in Malta resulted in the introduction and high consumption of food high in fats and carbohydrates such as fried eggs, bacon and chips.[6] Nutritional studies carried out in 1981 confirmed that the Maltese consume large amounts of food with a large proportion of fat (43.5-47.7%), starch (25.4-

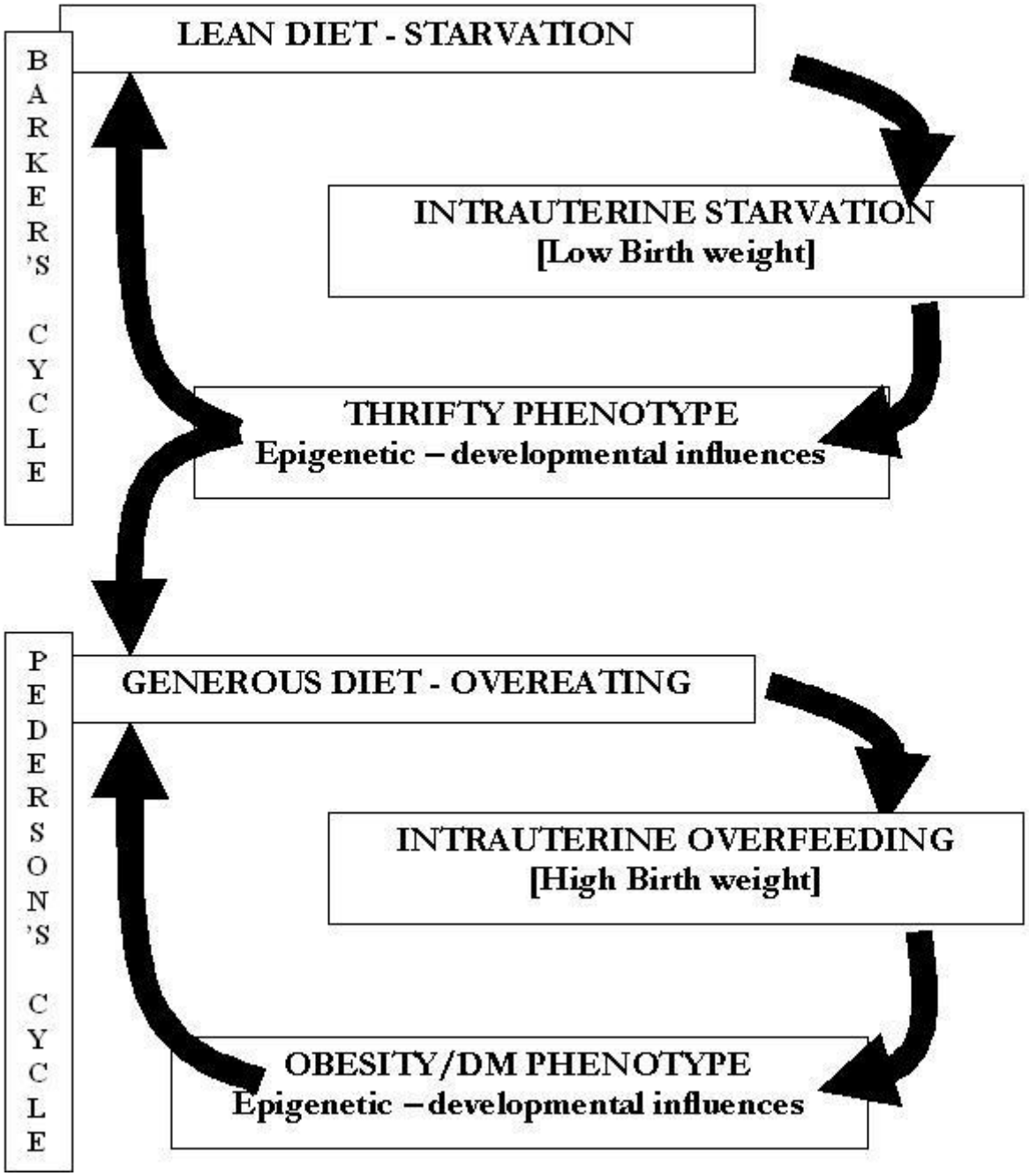

Figure 2: Barker – Pederson's cycles

20.4%), and sugar (14.9-14.8%).[8] Neel et al [17] have suggested that the sudden increase in fat and refined carbohydrate intake that occurred during the late twentieth century 'overloaded' the Thrifty Diet physiology of the previously starved population resulting in an increased incidence of obesity, increased peripheral insulin resistance and consequent higher prevalence of T2DM. This predisposition towards developing the metabolic syndrome in individuals biologically designed to survive a thrifty diet conforms to the Barker's hypothesis of the foetal origins of adult onset disease where nutritionally-starved infants during intra-uterine and early infant life were shown to have a greater predisposition towards child and adult obesity and adult T2DM.[18,19] The link between low birth weight and the subsequent development of childhood obesity and development of gestational diabetes has been demonstrated in the Maltese population.[20,21]

Maltese mothers who during their pregnancy survived on a restricted frugal-diet in the past centuries thus predisposed the population towards a 'Thrifty Phenotype'.[22] This phenotype presents no anomalies as long as the population remains lean. However, it becomes problematic when there are dietary changes that lead to obesity. A link between

intrauterine starvation and subsequent tendency to larger birth weights has been demonstrated in Maltese women born during the siege conditions of the Second World War.[23]

The problem has now gone a full circle where obese pregnant women with mild forms of gestational diabetes are over feeding their unborn infants in utero predisposing these towards foetal obesity or macrosomia [Pedersen's hypothesis]. The intrauterine overfeeding is responsible for biological adaptations in the foetal pancreas and hypothalamus; adaptations that will eventually predispose these infants to developing later obesity and T2DM.[24] Several epidemiological studies have linked an excessive intra-uterine and childhood nutritional environment to the high prevalence of T2DM and obesity in this specific population.[20, 21][Figure 2].

Cultural contributors

Maltese culture is broadly Mediterranean, but it is at the same time very distinctive: it has its own unique blend of historical and economic traditions which in turn have influenced the values, motivations, expectations and practices that characterize the Maltese people.[25] Although most Maltese people argue that their country sits within a wider European culture, certain factors remain exclusive to this country. In particular, the Maltese are very reluctant to relinquish certain traditions related to social life, family work and 'festa'.[26]

Decades of research have demonstrated that the risk of disease varies in relation to culture.[27] The Mediterranean Diet has received attention due to increasing scientific evidence demonstrating its protective benefits in reducing overall mortality and coronary heart disease.[16] Malta's history of colonization has altered its cuisine and today offers a combination of tastes of many different cultures. Over the past decades, the Maltese diet has changed from one that is high in complex carbohydrates and low in fats, especially animal fats, to one that is high in total fats, especially animal fats, and low in complex carbohydrates. These changes are due to an increase in consumption of meat, milk and dairy, eggs and vegetable oils and a reduction in the consumption of cereals. Sugar intake, especially in the form of confectionery and non-alcoholic beverages is high. Salt intake is higher than the recommended levels, as is the proportion of energy from total fats, saturated fats and sugar. The altered nutritional habits of the Maltese population in recent decades have significantly affected the increasing levels of diabetes in the Maltese population.[28]

Local and national characteristics and customs continue to live in Maltese individuals through cultural demands. Malta's historical diversity, climate, religion and culture have resulted in a people who value eating out with families especially in weekends.[29] In addition, the Maltese engage themselves all year round in religious-oriented public or family-oriented feasts and celebrations that are all traditionally celebrated by large parties and an abundance of food. The village feasts or 'festa' – whether religious or secular - remains a distinctive tradition that is central to Maltese life. These feasts have been commercialised with mobile kiosks selling all sorts of Maltese and foreign fast foods including hot-dogs, ice-creams, burgers, kebabs, chips, and Maltese treats such as "mqaret" pastry stuffed with a combination of dates fried in oil, nougat with almonds or peanuts and candy floss. The type of food available for consumption during these occasions is therefore high in fats, sugars and carbohydrates and thus significantly contrary to the successful prevention and management of diabetes. These practices are considered important cultural emblems of Maltese society and past Maltese migrants to the United Kingdom, Australia and Canada have exported these traditions and continue practice them even after several generations have gone by.[30] Migrant studies of Maltese communities in Australia and in Canada indicate a prevalence of abnormalities in T2DM not markedly different from that found in Malta.[31] These results suggest that Maltese immigrants after years of residence in to other countries still run a higher risk of becoming affected with DM implying the relative importance of a familial inheritance of diabetes possibly resulting from the exportation of a continuing Maltese way of life.

Conclusion

This article has highlighted the fundamental importance of sensitivity to the historical and cultural identity of specific populations. The culture and history of Malta has significantly contributed to the higher than average incidence and prevalence of diabetes. Hereditary features, ethnicity, cultural family traditions and lifestyle factors all contribute in the development of disease. Successful management of diabetes requires an understanding of the history, religion, culture and family and social networks of the people concerned. Diabetes care cannot be addressed only from the medical aspects of chronic disease but should encompass psychosocial and cultural factors as well. This will undoubtedly go a long way towards alleviating, to some extent, the costs and burden regarding the management of diabetes in Malta.

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