

Malta: Mediterranean Diabetes hub – a journey through the years

Sarah Cuschieri, Julian Mamo

Abstract

Introduction: Diabetes mellitus in Malta has been an established major health problem for years. It has been linked with cultural, geographical, historical, genetic as well and a change from a Mediterranean diet to a Westernized diet. This diabetes burden has led to establishment of diabetes clinics both in the central general hospital, as well as in the community. Over the past 50 years, there have been two major epidemiological diabetes studies conducted to evaluate diabetes in the Maltese population.

Diabetes in Malta: To date, there is no established national diabetes plan or diabetes register in Malta, although there has been the formation of a governmental diabetes focus group. The time is right for an updated prevalence study to look at the current Maltese generation and their changing determinants including diabetes risk factors and genetics, followed by the development of preventative strategies and policies.

Conclusion: Over the years, diabetes burden has increased and become a public health and national financial concern. It is of utmost importance to address this national disease. An updated prevalence study would provide the evidence-based backbone for the development of diabetes preventive strategies and policies. The combination of which will enable the Maltese health services to be improved and better equipped to come to grips with this epidemic.

Keywords

Diabetes Mellitus; Policy; Malta; Diet, Mediterranean

Introduction

Diabetes mellitus type 2 (T2DM) is a growing epidemic globally. By 2013 it was affecting 382 million people worldwide with an estimated 135 million currently unaware of their disease status.¹ Those suffering from T2DM are known to have a significant reduction in life quality as well as life expectancy, directly caused by this disease.² Moreover, in 2013 diabetes was estimated to be responsible for 5.1 million deaths worldwide.¹

As in other European countries, diabetes mellitus is a major health problem in the Mediterranean island of Malta. T2DM is not a recent occurrence in Malta and it is known that by the eighteenth century, diabetes was already documented in medical literature.³ Diabetes has been documented to have a negative impact on the lives of many Maltese since 1886, where diabetes was noted to be responsible for 2.1 per 10,000 deaths of the population. Diabetes related mortality rate continued to increase to 4.5 per 10,000 of population in 1900 and 8.7 per 10,000 in 1942. By 1955, Malta had the leading recorded diabetes mortality rate in the world with 26.1 deaths per 100,000 population followed by Belgium with 23.9, the USA with 15.5 and Italy with 11.1.⁴

The scope of the present paper is to review diabetes mellitus type 2 in Malta over the years along with the various local factors contributing to the high prevalence of diabetes in Malta and the current diabetic epidemiological situation.

Predisposing factors for Diabetes Mellitus in Malta

Malta is a small island in the center of the Mediterranean Sea, positioned at the crossroads between Europe and North Africa. Over the years, Malta sustained different cultural changes as one dominating empire took over from another, leaving an ethnic mixture, substantial socio-diversity and varied genetic imprints on the Maltese population.⁵ In 2008, as part of his PhD studies Al-Ashtar A. reports that both the Maltese and the Libyan populations had similar genetic

Sarah Cuschieri MD PG Dip. Diabetes (Cardiff)*
Department of Anatomy
University of Malta
Msida, Malta
sarah.cuschieri@um.edu.mt

Julian Mamo MD. MSc. PhD.
Department of Public Health
University of Malta
Msida, Malta

*Corresponding Author

diabetic and metabolic profiles. ⁶ In a recent PhD study, Pace N. found as many as ten candidate genes significantly associated with type 2 diabetes mellitus and the metabolic syndrome among adult Maltese newly diagnosed diabetic persons. ⁷ In Malta, a strong family history of diabetes among Diabetics was already established with a statistical significant relationship between Diabetes and both maternal and paternal diabetes history. ⁸⁻⁹

Having a restricted irrigated agricultural land has meant that Malta had to import most of its food supplies from overseas. The dependence on imports and their inconsistent supply had led to a tendency for chronic food deprivation in years gone by, especially during the period of world war II (1937 – 1949) affecting all of the population including pregnant women and their unborn children. ¹⁰ This most probably led to the development of the *Thrifty Diet Phenotype*. This phenotype is a protective mechanism developed to adapt for periods of starvation and food deprivation. ¹¹

It was suggested that a strong link between Malta and Diabetes contributed to a change from a Mediterranean diet to a more British type of diet in the late 19th to early 20th century, which may have led to this increase in T2DM prevalence. The theory suggests that an increased intake of fat and refined carbohydrates led to an overload of the *Thrifty Diet Physiology* which is in turn responsible for the increase in peripheral insulin resistance as well as to an increase in the prevalence of obesity. ³ This forms the *Baker's hypothesis* whereby those children originally adapted to surviving in a starved situation, now faced rich foods predisposing towards childhood and adulthood obesity and adult T2DM. ¹² This link was found to be present in the Maltese population when the 2001-02 Health Behaviour in School children Study (HSBC) showed that 33.3% of the Maltese population was either overweight or obese. ¹³

In more recent times, pregnant women in Malta have been found to be overfeeding their unborn child while in utero. This predisposes the child to foetal obesity or macrosomia. This is the basis of the *Pedersen's hypothesis*, which suggests that such a situation leads to the foetal pancreas and hypothalamus being adapted to this nutritional state with a predisposition to obesity and T2DM later on in their lives. ¹⁴

Past epidemiological studies in Malta

A high diabetes occurrence in the Maltese population was first documented in 1927, and in his book, Debono JE. describes the prevalence estimated to be 4.5% of the population and the disease firmly linked with obesity. ¹⁵

The increasing disease burden over the years led to the establishment of a special Diabetes Clinic in 1939 at the only general hospital in the island. By the 1950s,

T2DM was considered to be of major public health concern, during which time there was an extension of diabetic clinics in the community. ^{3, 16} This heightened the keen interest of local academia and by 1964, the first epidemiological diabetes 'pilot study' was conducted by Prof. J. Zammit Maempel. Table 1. Summaries the study design, results and outcomes of this study. ¹⁷

Table 1: Summaries the first epidemiological study (1964) design and outcome

JV Zammit Maempel - 1964		
Population Sample		5757 subjects
Population demographics		All ages
Study Design		All households in Urban area of Floriana & Rurar area of Gharghur, Madliena and Bahar ic-Caghaq
Screening methods		
	Phase I	Urine dipstick for glucose, reducing substance, ketone bodies & albumin
	Phase II	Glycosurics (from phase I) undergone a 50g OGTT, questionnaire and physical examination, along with an equal number of age-matched non-glycosuria individuals
	Phase III	Statistical Study of the findings
Results	Phase I	Glycosuria - 8.9% (9% males; 8.8% females); Albuminuria - 23%
	Phase II	Of the glycosuric - 70.1% had DM; 7.4% lag storage curve; 7.4% had renal glycosuria; remaining had normal OGTT.
		Of the non-glycosurics - 15% had DM, 15.7% lag storage curve; 1.5% had renal glycosuria; 67.8% had normal OGTT
Risk factors		Obesity (60 out of 100 diabetics)
Complications		Peripheral Vascular disease, Coronary disease, Cerebrovascular disease, Hypertension
T2DM prevalence		19.9%
Newly Diagnosed T2DM		1 out of every 10 inhabitants

T2DM – Type 2 Diabetes Mellitus; DM – Diabetes Mellitus; OGTT – Oral Glucose Tolerance Test

In 1981, the World Health Organization (WHO) performed the second prevalence study on Diabetes in Malta. During the same year, the Maltese Diabetes Association was set up and a year later (1982) became part of the International Diabetes Federation (IDF). Table 2. Summaries the study design, results and outcomes of this study.¹⁸

Table 2: Summaries the 1981 WHO epidemiological study design and outcomes

		World Health Organization Study - 1981
Population Sample		2945 subjects
Population demographics		> 15 years
Study Design		Randomized from electoral list, stratified according to age, gender, occupation & education
Screening methods		If not previously diagnosed with DM:
	Phase I	Fasting blood capillary sample from ear lobe, Fasting urine sample (glucose, proteins, blood & ketones), 75g OGTT, questionnaire, blood pressure, weight, height, and skinfold thickness.
	Phase II	Repeat of OGTT in those with abnormal or indeterminate result in phase I. Blood for Insulin, C-peptide, HLA-type, blood groups, Renal profile, Uric acid, lipid profile,
	Phase III	Clinical follow up of complications
Risk factors		Obesity linked with high calorie intake. Hypertension
Complications		DM patients showed: Higher mortality rate; Blindness more common; Acute MI more common; Left Ventricular failure more common; Neuropathy in lower limbs more
T2DM prevalence		7.7% (5.9% previously know, 1.8% newly diagnosed)
Newly Diagnosed T2DM		1.8%
IGT		5.6%

T2DM – Type 2 Diabetes Mellitus; DM – Diabetes Mellitus; OGTT – Oral Glucose Tolerance Test; IGT- Impaired Glucose Tolerance; MI- Myocardial Infarction.

The *pilot study* conducted by Prof. Zammit Maempel in 1964 could today be critically appraised for its design, whereby the sample population studied was non-randomized and not a representative sample of the Maltese population. There was no stratification for the different social factors and age, making it more difficult to differentiate the different types of diabetes. One can appreciate however, that as a first attempt to establish diabetes prevalence, it gave a clear idea of the relatively high diabetes burden among the Maltese population and of the poor control of the disease among sufferers at the time as well as of the strong local link of the disease with obesity.

The measurement tools used comprising seeking out glycosuria and subsequently confirming with an oral glucose tolerance test (OGTT) was also quite unique.

When considering the study conducted by WHO in 1981, one appreciates the improved epidemiological approach and the use of a randomized stratified sample of the population selected from the electoral list.

The screening method used by the WHO was the 75g OGTT - the gold standard screening tool, unlike the 50g OGTT used in the Zammit Maempel study earlier. The WHO study gave a more reliable and comparable diabetes profile, with appropriate distribution by age and gender.

No further population based studies have since elaborated on the changing Diabetes picture and burden in Malta until 2010, when the local centre of the European Health Examination Survey pilot study examined 400 randomized adult participants (18+ years) and, on the basis this time of a fasting glucose level, obtained a diabetes prevalence of 9.8% for this population. Females (10.7%) had a higher blood glucose average as compared to males (9%). This study, in common with the previous 2 studies, reported that those already diagnosed with diabetes had a generally poor diabetic management; with 38.5% of the known diabetics having an elevated blood glucose level.¹⁹ This study utilised a relatively small population sample size and consequently, results exhibited wide confidence intervals. The results must therefore be considered with caution.

During the same year, the Department of Health Promotion and Disease Prevention issued “A Strategy for the Prevention and Control of Non-communicable Disease in Malta”, which recommended local diabetes targets for 2020.²⁰

Diabetes burden in Malta - Nowadays

To date, there is no national diabetes plan or diabetes register in Malta. Similarly, there is a lack of established preventative or screening protocols for diabetes. The lack of any updated diabetes prevalence data for the Maltese population is a clear hindrance to the formulation of any such plans and protocols.

A recent survey conducted on the attitudes and habits of Malta's general practitioners (GPs) reported that there is a lack of consistency in their diabetic preventative and management practices. The screening methods used by GPs studied were varied, with a large percentage using capillary blood glucose as the screening test for diabetes. A correlation was found between the different generations of GPs and the screening tests used. Thus, older GPs (21years+ since graduation) tended to use the HbA1C test more as a screening method when compared to younger GPs.²¹

Diabetes action plan

With the recent establishment of a governmental diabetes focus group and the first national diabetes plan being in the pipeline, the time is right to update the situation on the prevalence of diabetes type 2 and stop basing pharmacological and therapeutic plans on estimates of prevalence that are now no longer viable due to the time and changes in the population in terms of aging and changing risk factor profiles.²²

A prevalence study at this point in time would be an opportunity to look at current generation of Maltese and their changing determinants and diabetes risk factors. Among these are the growing problems of obesity, the earlier onset of insulin resistance as seen globally.² It is also an opportunity to engage hitherto unavailable technology to study the underlying genetic predisposition among the Maltese population.

It is also a critical point in which to study the Maltese pre-diabetic population by linking prevalence to predisposition and risk factors - which may ultimately lead to eventual type 2 diabetes. Acquiring knowledge on the local precursor situation of diabetes (pre-diabetes) among a representative sample of adult Maltese today would be of great public health importance. Such a cross-sectional prevalence study has been proposed and is set to start at the end of 2014.²³ This epidemiological study aims to study a representative 1% of the adult Maltese population. The aim is to come up with valid and reliable updated diabetes type 2 prevalence figures as well as to have the first obesity, hypertension, smoking and alcohol consumption prevalence study with the power to give reliable figures. It is also set to understand the current Maltese dietary lifestyle and identify the risk factors predisposing the Maltese population to pre-diabetes and diabetes. This data can in turn be used to establish a diabetes risk score by age, gender and other factors for persons living in Malta.

With reliable updated diabetes prevalence figures as well as the establishment of the frequency of Diabetes risk factors in the Maltese Islands, a prevention strategy, a Diabetes policy and achievable population targets can then be accurately established to enable an evidence basis for Diabetes control plans.

Of the two broad strategies for the prevention of

any disease –high risk and population strategies, none can yet be said to be underway in the Maltese Islands, historical hub of Diabetes in the Mediterranean. Both can, however, be employed side by side.

Employing the high-risk strategy for which screening is essential would enable the identification of high-risk individuals so that early action can be taken for them and ensure effective therapy. On the positive side, this tends to be an acceptable way forward for patients and health professionals while efficiently reducing disease and risk. The negative side is that this is not really a radically effective prevention strategy and is more geared at secondary prevention. The 1968 Wilson and Jungner criteria, universally accepted for any screening programme, are all satisfied in the case of Diabetes and its impact on the Maltese population: Diabetes is an important disease; there is an acceptable and an effective screening tool which can be performed regularly - one which is acceptable to patients and health professionals alike; there is a recognizable early detectable stage and the natural history of the disease is well known; there exist facilities to bring about effective investigation and control of the disease and the costs should be balanced relative to other health costs.²⁵

The other option - the population strategy, involves the broad action needed to prevent the primary causes of the disease (lack of exercise, poor diet, obesity) for all individuals in the Maltese population, irrespective of their current risk status. This would involve a multi-sectoral approach including targeted taxation, aimed this time at high fat, high calorie foods and coupled with initiatives in the environment. It would also involve influencing the access to a healthier lifestyle - restrictions on importation and on the food manufacturing industry, an educational drive and action in other related areas for a concerted action.²⁴

Given the sustained negative impact of Diabetes on health and the prospect of an ever greater impact of the disease on the lives of adults in Malta with each passing year, there is no reason why both strategies should not be initiated and combined for the prevention and control of Diabetes in the coming years

Conclusion

Diabetes Mellitus type 2 has been a sustained health burden among the Maltese population probably for a long time, but certainly, over the past century with more accurate measures gauging the problem in the 1960s and 1980s. Over the last 33 years estimates were used to gauge the diabetes burden in Malta. Today, we do not really know how many diabetics and pre-diabetics reside in the Maltese islands and whether their needs are being largely met. A national plan and an accurate age-gender disease profile are essential for the planning of control measures for Diabetes among adults in Malta, especially given the high impact of this disease locally.

A proposed diabetes prevalence study now getting underway aims to provide the evidence basis for updated health policies and to furnish health care workers with validated information about this disease.

Establishing profiles of the different risk groups (for pre-diabetes and diabetes) and their associated anthropometric, biochemical markers and genetic factors is another achievable key goal.

Preventive strategies can combine the benefits of screening high-risk controls with pan-population initiatives; bring healthy food and regular exercise within easier access of every Maltese.²⁶

The development of a predictive tool such as an “app” for mobile phones and computers could help individuals measure their risk of developing or having a disease such as diabetes. This could be incorporated into primary care practice by patients, health insurers and health professionals. Identifying those in the population with highest predisposing pre-diabetes risk factors and formulating a pre-diabetic risk score would help pick up susceptible subjects at an early stage. Such risk scores reduce the cost and inconvenience of unnecessary screening.²⁷

This information, placed within a national diabetes plan, would enable the Maltese health services to be better equipped to come to grips with this ever growing epidemic while aiding to improve the quality of life of those affected by the disease.

References

1. International Federation Diabetes. IDF Diabetes Atlas, 6th Edn. Brussels, Belgium: International Diabetes Federation, 2013.
2. Schwarz PE, Reimann M, Schutte AE, Bergmann A, Hanefeld M, Bornstein SR, Schulze J et al. The Finnish Diabetes Risk Score is associated with insulin resistance and progression towards Type 2 Diabetes. *Journal of Clinical Endocrinology Metabolism*. 2009;94(3):920 - 6.
3. Savona-Ventura C. Mortality tends from Diabetes Mellitus in a high prevalence island population. *International Journal of risk and Safety in Medicine*. 2001;14:87 - 93.
4. Cassar P. History Development of the Concepts of Diabetes in Malta. Governmental Printing Press, Malta 1982. p. 20.
5. Formosa C, Savona-Ventura C, Mandy A. Cultural Contributors to the Development of Diabetes Mellitus in Malta. *International Journal of Diabetes and Metabolism* 2012; 20: 25 - 29.
6. Al-Ashtar A. Molecular SNPlotypes™ with Common Alleles Reflects Expression Profile in Diabetes Mellitus Type 1. PhD Thesis, Malta: University of Malta Medical School, 2008.
7. Pace, N.P. Does summation of alleles account for genetic risk and genotype-phenotype association in Type 2 Diabetes Mellitus? PhD Thesis, Malta: University of Malta Medical School, 2013.
8. Savona-Ventura C, Schranz AG, Chircop M. Family History in the Aetiology of Gestational Diabetes Mellitus and Type 2 Diabetes. *Malta Medical Journal* 2003; 15: 25 - 27.
9. Schranz AG. Abnormal glucose tolerance in the Maltese: A population-based longitudinal study of the natural history of NIDDM and IGT in Malta. *Diabetes Research and Clinical Practice* 1989; 7: 7-16.
10. Savona-Ventura C, Scerri C. Child anthropomorphy in the mid-20th century. *Malta Medical Journal* 2012; 24 (03): 39 - 42.
11. Poston L. Developmental programming and diabetes- The human experience and insight from animal models. *Best practice and Research. Clinical Endocrinology and Metabolism* 2010; 24 (5): 541 - 542
12. deBoo HA, Hardling JE. The developmental origins of adult disease (Baker) hypothesis. *Australian and New Zealand Journal of Obstetrics and Gynaecology* 2006; 46: 4 - 14
13. Scerri C, Savona-Ventura C. Early metabolic imprint as a determinant of childhood obesity. *International Journal of Diabetes Mellitus* 2010; 2: 175 - 178.
14. Catalano PM, Hauguel-De Mouzon S. Is it time to revisit the Pedersen hypothesis in the face of the obesity epidemic? *American Journal of Obstetrics and Gynecology* 2011; 204: 479 - 487.
15. Debono JE. What every diabetic should know 1927; p8-21.
16. Galea J. Annual Report on the Health Conditions of the Maltese Islands and on the work of the Departmental of Health for the years 1952-63. Malta: Government printing office, 1954-1963.
17. Zammit Maempel JV. Diabetes in Malta *The Lancet*. 1965;II:1197 - 200.
18. Katona G, Aganovic I, Vuskan V, Skrabalo Z. National Diabetes Programme in Malta: Phase 1 and II Final Report. World Health Organisation 1983 Contract No.: (WHO NCD/OND/DIAB/83.2).
19. Research Department of Health Information and. European Health Examination Survey 2010 - Pilot Study. Ministry of Health, the Elderly and Community Care 2010.
20. Ministry for Health the Elderly and Community Care. A Strategy for the Prevention and Control of Noncommunicable Disease in Malta. In: Prevention DoHPaD, editor. 1 ed. Malta Progress Press Company Ltd; 2010.
21. Grech M, Chaney D. Screening for type 2 diabetes and pre-diabetes in general practice: A descriptive study of Maltese practices. *Primary Care Diabetes*. 2014.
22. Working group of MPs to focus on diabetes. *Times of Malta*. 2014 Wednesday May 7.
23. Cuschieri S. Prevalence and Determinants of the type 2 diabetes and impaired glucose tolerance in Malta. Proposal for PhD with University of Malta. Accepted May 2014.
24. Baker DJP Cooper C, Rose GA. *Epidemiology in Medical Practice*: Churchill Livingstone; 1998.
25. Wilson JMG, Jungner G. Principles and practice of screening for disease. *Public Health Papers No. 34* ed. Geneva: World Health Organization; 1968. 163 p.
26. Development Organisation for Economic Co-operation and. Session 2: Healthy Choices. In: Meeting HM, editor. 2010.
27. Costa B, Barnio F, Pinol JL, Cabre JJ, Mundet X, Sagarra R et al. Shifting from glucose diagnosis to the new HbA1C diagnosis reduces the capability of the Finnish Diabetes Risk Score (FINDRISC) to screen for glucose abnormalities within a real-life primary healthcare preventive strategy. *BMC Medicine*. 2013;11(45):1 to 12.