

A brief evaluation of care at a diabetic clinic in a primary health care centre

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ABSTRACT

Introduction

Type 2 diabetes is one of the commonest chronic conditions in Malta posing a major health burden as a result of the complications that may arise. Evaluating patient management and comparing them to standard guidelines such as those set by the International Diabetes Federation (IDF) is an important step in improving care.

Objective

The study aimed to assess whether the practice at the diabetic clinic in Mosta Health Centre is in line with IDF targets for glycosylated haemoglobin (HbA1c), lipid profile and urinary albumin/creatinine ratio (ACR).

Method

All patients who attended the diabetic clinic in November and December 2016 were included. For each, data was collected for investigations done retrospectively from the Information Clinical Manager system over the year preceding their appointment. Data collected included age, gender, HbA1c values, lipid profile readings and ACR values. Adherence to guidelines was calculated and significant trends were reported.

Results

The study involved 515 patients, of which 55.5% were males and 44.5% females. The majority were of the older age group (48.3% being older than 70 years). Results for each investigation considered are as follows:

For HbA1c, 99.2% of patients had this test taken, with 89.1% having a second reading and 53.2% having a third reading over the year preceding the appointment. There was a statistical difference of HbA1c levels between males and females. Of all HbA1c values taken in this study 45.7% adhered to the IDF standards.

For ACR, 55% of the total had a measurement. Of these, 69.6% were within normal limits. Of the 30.4% abnormal results, only 5.7% had the test repeated twice over 4 months.

In this study 97.5% had at least a single lipid profile taken over the previous year. Of these, 88.4% had triglyceride levels <2.3 mmol/l, 28.3% had low-density lipoprotein (LDL) levels <2 mmol/l, and 86.7% had high-density lipoprotein (HDL) levels >1 mmol/l. Similar values were obtained for the 52.2% of patients who had two lipid profile readings and for the 17.3% of patients who had three readings over the year prior to appointment.

Conclusion

Most investigations were done as per IDF standards but there is still room for improvement. Adhering to guidelines is important and this may be improved by raising awareness of these guidelines among general practitioners. Development of local guidelines would be ideal.

Keywords

Diabetes mellitus, primary health care, guidelines

INTRODUCTION

Background

Type 2 diabetes is one of the most common chronic conditions in Malta, with one in every eight of Maltese adults suffering from the condition (Cuschieri, et al., 2016). This leads to a major public health burden as a result of the possible macrovascular and microvascular complications that may arise. These complications, which may be prevented by better diabetic control (O'Connor, et al., 2006) include heart disease, nephropathy and retinopathy. As emphasized by the International Diabetes Federation (IDF) Guidelines (IDF, 2012), cardiovascular disease is the major cause of morbidity and mortality in patients with type 2 diabetes. This further shows the importance of having a structured diabetic management clinic where the diabetic population is regularly monitored and followed up.

Mosta Health Centre is one of eight health centres which are the core of the primary health care service provided by the government in Malta (Primary Health Care Department, 2017). The health centre is open 24 hours a day, whilst the diabetes clinic within the health centre operates on weekdays between 08.00-13.00 hours, except on Wednesdays. Patients need to be referred to the clinic by a doctor, and attendance is by appointment. The clinic is led by a nurse and a doctor. On the day of the appointment, the patient's weight, blood pressure, haemoglucotest (HGT) and urinalysis are checked, and blood investigations taken prior to the appointment are reviewed. The patient's diabetic control, general well-being, treatment and any necessary changes are discussed, as well as any related health issues that patients might be concerned about. Annual referrals for diabetic retinopathy and neuropathy screening as well as assessment of the peripheral vascular system are also organised. A follow-up appointment is given and investigations are ordered, to be taken a few weeks prior to the next appointment.

A number of guidelines about monitoring and targets in type 2 diabetes have been published by different organisations. These include the International Diabetes Federation (IDF, 2012), the National Institute for Health and Clinical Excellence (NICE, 2015) and the American Diabetes Association (ADA, 2017). For the purpose of this evaluation, the IDF guidelines have been used.

Objective

Evaluating diabetes care is indeed a complex task. However, in line with the basic principles of chronic disease management, one important aspect of care is outcome assessment (Norris, et al., 2003). As stated previously, preventing complications (microvascular & macrovascular) is one important outcome of care. It can be stated that the biochemical monitoring of important parameters that have been shown to be directly related to such complications is another important indicator of quality of care.

Thus, the study aimed to assess whether the practice at the diabetic clinic in Mosta Health Centre is in line with the standards set by the International Diabetes Federation (IDF, 2012) for the following three biochemical parameters:

- glycosylated haemoglobin (HbA1c),
- lipid profile and
- urinary microalbuminuria (albumin/creatinine ratio [ACR])

METHOD

Data collection

This was a cross-sectional observational study. A data collection form was designed on Microsoft Excel to facilitate data collection. All patients who attended the diabetic clinic in November and December 2016 were included. Data was collected retrospectively by reviewing relevant investigations carried out, using the Information Clinical Manager (ICM) system, over the year preceding their appointment. Data collected included:

- Age and gender
- Values of HbA1c
- Values of ACR if available
- Values of total cholesterol, triglycerides, low-density lipoprotein (LDL) and high-density lipoprotein (HDL)

Data analysis

Data input and analysis was carried out using Microsoft Excel. Adherence to the guidelines (%), with respect to targets and frequency of estimation, was calculated. In addition, any clinically significant trends were reported. Further analyses were conducted using Statistical Package for the Social Sciences (SPSS) programme version 22.

Study approval

This evaluation was approved by the Department of Primary Health Care and by the Data Protection officer of the Department.

Standards

The standards were obtained from the IDF guideline *Global Guideline for Type 2 Diabetes* (IDF, 2012). These were chosen since, when compared with other guidelines, namely ADA (2017) and NICE (2015), they were thought to be more appropriate for an evaluation study. This guideline recommends the following:

Glycosylated haemoglobin (HbA1c):

- Measure HbA1c every 2 to 6 months depending on level, stability of blood glucose control and changes in therapy.
- Target of HbA1c less than 7%.

In this evaluation, HbA1c levels were reported as DCCT-aligned units (%) and not IFCC units (mmol/mmol) as the latter have only been recently introduced, and most GPs are more familiar with the DCCT-aligned units.

Urinary microalbuminuria

- Measure urinary albumin/creatinine ratio yearly.
- If ACR is raised (microalbuminuria ACR > 2.5 mg/mmol in men, > 3.5 mg/mmol in women), repeat ACR twice over the following 4 months. Microalbuminuria is confirmed if ACR is elevated in two out of three tests, in the absence of infection or overt proteinuria. If both repeat tests are not raised, check again annually.

Lipid profile

- Measure lipid profile yearly.
- Lipid targets are as follows:
 - LDL cholesterol < 2.0 mmol/l (should be < 1.8 mmol/l in established cardiovascular disease)
 - Triglyceride < 2.3 mmol/l
 - HDL cholesterol > 1.0 mmol/l

RESULTS

Demographic details

During the period of this study, between November and December 2016, 515 patients had a registered appointment at the Mosta Health Centre diabetic clinic. Of these, 55.5% were males and 44.5% were females. The majority of the patients attending were of an older age group, with 48.3% being older than 70 years, closely followed by those aged between 60 and 69 years who

represented 38.6% of the total number of patients. These results are summarised in Figure 1.

With respect to the individual biochemical parameters, the results were as follows.

A. HbA1c

99.2% of the total number of patients registered during the study period had at least one HbA1c reading over the previous year (mean value = 7.36% [95% CI: 7.24-7.47]), 89.1% had a second reading (mean 7.26% [95% CI: 7.15-7.38]), and 53.2% of the total 515 patients had a third HbA1c reading (mean 7.37 [95% CI: 7.21-7.53]). The least HbA1c value recorded was 3.2%, with the highest being 12.8% for all the readings. The overall mode of the total HbA1c values was 6.5%.

Comparing average HbA1c levels by gender, through the use of t-test, shows a statistically significant difference between males and females ($P = 0.016$) when the first HbA1c reading is taken into consideration, with males having better glycaemic control. There was a similar gender difference for the second and third HbA1c readings taken; however this difference was not statistically significant. Percentage values for each HbA1c reading according to gender are shown in Figure 2. 45.7% of all the HbA1c values available for the patients in this study adhered to the IDF standards which recommend HbA1c levels <7%.

Figure 1: Age and sex distribution of patient population

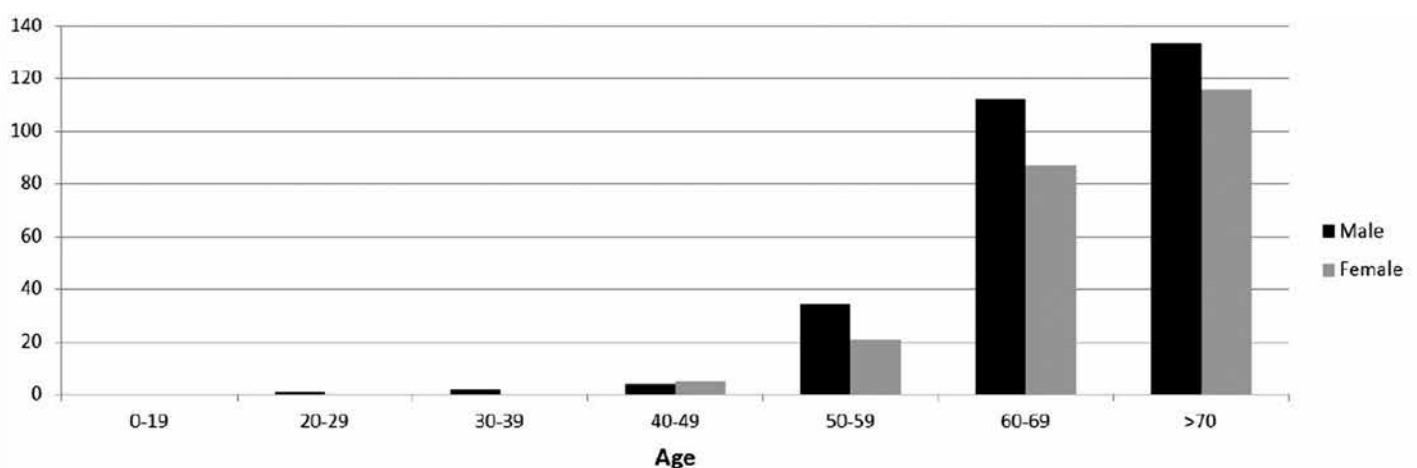
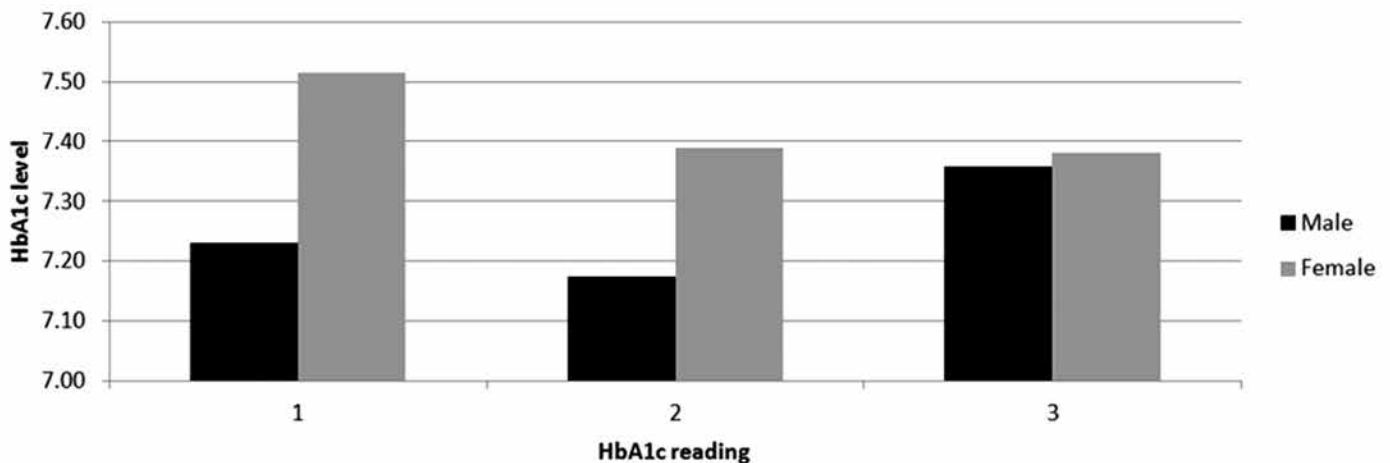


Figure 2: Average HbA1c levels by gender of patient population



B. Albumin creatinine ratio

55% of the total number of patients had at least a single ACR measurement over the previous year, with 45% having had no urine taken to detect microalbuminuria. Of the ACR readings available, 69.6% were within normal limits. Of the 30.4% abnormal ACR results, the majority had no urine taken to retest ACR (64.4%) while 26 patients (29.9%) had one ACR test repeated after the abnormal result. Only 5.7% of patients with an abnormal ACR had the test repeated twice over the following 4 months as recommended by IDF.

C. Lipid profile

97.5% of the total number of patients had at least a single lipid profile measurement over the previous year, 52.2% had two and 17.3% had three readings. Overall, when taking into consideration all the patients' lipid profile readings available, 86.7% had triglyceride levels <2.3, 30.6% had LDL levels <2 and 86.0% had HDL levels >1. On further analysis, when comparing the lipid profile results of those having at least a single, two or three readings, the percentage levels were very similar.

Of the 97.5% of patients who had at least one lipid profile reading over the previous year, 88.4% had triglyceride levels <2.3 (mean value = 1.46mmol/l [95% CI: 1.39-1.53]), 28.3% had LDL levels <2 (mean value = 3.04mmol/l [95% CI: 2.08-3.99]), and 86.7% had HDL levels >1 (mean value = 1.98mmol/l [95% CI: 1.02-2.95]).

Of those with two lipid profile readings over the year preceding the appointment, 86.2% had triglyceride levels

<2.3 (mean value = 1.55mmol/l [95% CI: 1.44-1.66]), 30.9% had LDL levels <2 (mean value = 2.41mmol/l [95% CI: 2.32-2.50]), and 87% had HDL levels >1 (mean value = 1.39mmol/l [95% CI:1.34 -1.44]).

Of the 17.3% of patients who had three lipid profile readings, 85.4% had triglyceride levels <2.3 (mean value = 1.66mmol/l [95% CI: 1.43-1.89]), 32.6% had LDL levels <2 (mean value = 5.90mmol/l [95% CI: 0.94-12.75]), and 84.3% had HDL levels >1 (mean value = 1.37mmol/l [95% CI: 1.28-1.47]).

A summary of the overall results, compared with IDF standards, can be seen in Table 1.

DISCUSSION

Evaluation

In this evaluation, 44.5% of the study population was represented by females. One explanation for this may be that the prevalence of diabetes in Malta, as stated in the Report on the Performance of the Maltese Health System (Grech, et al., 2015), has been found to be significantly higher in males aged 15 years and older. On the other hand, the fact that the population sample was taken only over a one-month period might not be an accurate representation of the total population seen over one whole year.

The majority of the patients in this evaluation had at least one HbA1c reading over the preceding year, with only 0.8% having no readings. 89.1% of the patients had at least two HbA1c readings over a one year period, and therefore it can be concluded that this percentage adhered to the IDF recommendation that HbA1c levels

Table 1: Comparison with IDF standards

IDF target		Achieved	Not Achieved
HbA1c	7%	45.7%	54.3%
	Measure every 2-6 months	89.1%	10.9%
Urinary ACR	Measure yearly	55.0%	45.0%
Lipid profile	Measure yearly	97.5%	2.5%
	LDL < 2.0 mmol/l	30.6%	69.4%
	Triglyceride < 2.3 mmol/l	86.7%	13.3%
	HDL > 1.0 mmol/l	86.0%	14.0%

should be checked every 2-6 months depending on the control. Approximately 47% of the patients had satisfactory HbA1c levels (less than 7%) according to IDF recommendations (2012). This ranks well when one compares satisfactory HbA1c percentages quoted in other audits, such as the one done at a primary health care centre in Oman (Ahmed and Qurashi, 2014) with 35% having satisfactory HbA1c levels of less than 7%, or an audit done at the primary health care facilities in Dubai (Othman, et al., 2015) where 44.1% had satisfactory HbA1c levels of less than 7%, or the percentage of 41% stated in the American National Electronic Health Record (Gill and Foy Yu Ling, 2006).

This study's percentage shows an improvement when compared to data of a local study, which had shown that approximately 33% of the patients in the study had satisfactory HbA1c control (Cutajar, 2007). It should be noted however, that IDF standards at the time recommended HbA1c levels less than 6.5%. On further evaluation, 28% of the patients in this study had HbA1c levels less than 6.5%, as per previous standards, and this shows a deterioration when compared to the same study in 2007 which had shown that 38.2% of the patients at Mosta Health Centre had HbA1c within target (Cutajar, 2007). The results also show a difference in HbA1c control between genders, with females having poorer glycaemic control when compared to males. This finding has been documented previously (Cambra, et al., 2016).

Only 55% of the total number of patients had at least a single urine sample tested for microalbuminuria over the previous year, of which 30.4% were abnormal. The

suboptimal percentage of patients being screened yearly for microalbuminuria is similar to studies carried out in other countries. Some studies, such as those done by Anabtawi and Mathew (2013), and Pilson, Snow and Varlett (2001) quote a variable compliance rate of 14-49% in the USA, while a study in the Netherlands to assess how frequent microalbuminuria screening was carried out yearly over three years (2007-2009) gave similar results to this study with percentages ranging from 45.2% to 57.4% (Hellemons, et al., 2013). This shows that there is much room for improvement in this aspect, as IDF standards (2012) recommend at least a yearly ACR measurement, in addition to serum creatinine and eGFR - estimated Glomerular Filtration Rate (which were not recorded in this evaluation).

There may be several reasons behind these low rates of compliance across different areas. The study carried out by Pilson, Snow and Vartlett (2001) aimed to find out the compliance rates with guidelines in diabetic care and also the reasons suggested by physicians behind the low compliance rates that resulted. They point out that some physicians raised questions regarding the utility of carrying out ACR testing in patients with end-stage renal disease while other physicians expressed their concern that assessing for microalbuminuria in patients who are already on ACE (angiotensin-converting-enzyme) - inhibitors would be inappropriate, given the fact that management of microalbuminuria would remain the same. However, it can be argued that despite the latter reason being very valid, optimizing blood pressure control in ACR positive patients remains a priority. This

study did not take into consideration the past history, drug history or blood pressure levels of patients and therefore we cannot give account for the above three factors. The guidelines do not only stress on yearly monitoring but also on further evaluation upon finding a high ACR result.

The result of this study that 64.4% of patients with positive ACR result had no further testing done is worrying. If one reviews audits abroad there is also a similar problem. In a study by Fifield, James and Ajmal-Ali (2005), 57% of patients were new cases of microalbuminuria and had no further monitoring. Chronic kidney disease is one of the major complications of diabetes, and is associated with an increased risk of morbidity and mortality (IDF, 2012). Early detection of developing kidney damage is useful in helping to minimize harm by appropriate interventions. These may include tighter blood pressure control, use of ACE-inhibitors or angiotensin II receptor blockers (ARBs), and referral to specialist clinics, such as the Chronic Kidney Disease Prevention Clinic (CKDPC) within the Primary Health Care Department. The latter is a nurse-led clinic, with the primary aim of education and monitoring of patients with established early kidney disease to help prevent deterioration in their condition (Primary Health Care Department, 2016).

Most of the patients in this evaluation had at least a single lipid profile measurement, with only 2.5% not adhering to the IDF recommendations of a yearly lipid profile test. The majority of readings (86.7%) showed triglyceride levels less than 2.3mmol/l, however only 30.6% had LDL levels less than 2mmol/l. Considering the results of Cutajar (2007), overall 10.9% of patients were found to have LDL values less than 2.51mmol/l. Of particular note is the change in IDF standards over the span of 10 years, with stricter control recommended for LDL levels as opposed to HbA1c levels. Lipid profile results of patients who had a single, two or three readings in the previous year were similar, and therefore this does not give much indication as to the reason why some patients had multiple readings taken. Of particular note is the fact that, of the patients with a second lipid profile reading, 37% had triglyceride levels > 2.3 when compared to 11.6% and 13% of patients with at least a single, and three readings respectively.

Strengths and limitations

The sample of 515 patients used in this study, who had been seen at the Mosta Health centre diabetic clinic over a period of two months, represent approximately one

sixth of the total number of patients seen yearly. This is therefore quite a good representation of the population of patients that are seen at the clinic. A larger evaluation including patients visiting diabetic clinics in other health centres would have yielded results that can be said to be more representative of the whole population.

The number of patients who did not turn up for their diabetic clinic appointment was not taken into consideration in this evaluation. This can be a reason for some of the missing investigations, including the small percentage of patients who did not have a single HbA1c level taken during the year preceding the appointment, and it can be considered to be a limitation in this study.

The results of the albumin/creatinine ratio recorded were not standardised, with some of them having the albumin creatinine ratio, while others having microalbumin level in the urine. Also, the units used in Malta are mg/g for ACR and mg/l for microalbumin, as opposed to mg/mmol found in the IDF guidelines. The upper limit of normal for both males and females is taken to be 20mg/g for ACR and 20mg/l for microalbumin. In view of this, it was not possible to compare the results with each other, derive the range, mode and average of the values available and evaluate the results by gender according to IDF standards. In this study, only whether results were normal or abnormal was evaluated, and in the case of abnormal results it was checked whether the ACR was repeated twice over the following 4 months.

The patients' blood pressure, body mass index, waist circumference and medications were not included in the study data, and having this information would have made a more thorough evaluation possible.

CONCLUSION

Recommendations

All general practitioners who assess patients with diabetes should be made aware and reminded (through lectures, seminars and other teaching opportunities) of the latest guidelines in the management of this very common chronic condition. A chart with the most important recommended standards can be made available in the diabetic clinic, GP rooms or else as a soft copy on every computer, for easy access. Development of local guidelines about diabetes would be ideal, considering the high prevalence of this condition.

The diabetic clinic form available for filling in patient details, examination and investigation results may be modified to make it easier for GPs to avoid missing out important investigations and referrals, and to focus more on reaching target levels. A space should also be

made available to record any particular reasons why certain investigations may be felt to be unnecessary or are difficult to perform on certain patients. This will aid evaluation of practice in the future. Re-evaluation after adequate staff training may be undertaken, and a larger sample of patients can be studied.

Conclusion

The diabetic clinic at Mosta Health Centre helps to provide diabetic patients with a structured care approach. The aim of this study has been reached in assessing whether current practices at the diabetic clinic are in line with IDF standards. Most of the investigations are being done as specified by IDF standards in a good percentage of patients, especially when these results are compared to other audits done in primary health care. However more serious consideration should be given to improving diabetes control by focusing on reaching specific targets. Therefore, one should also aim to manage patients in a holistic manner, using a multidisciplinary team and a system which empowers patients to lead a healthy lifestyle and fight obesity.

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