S Afr Optom 2012 **71**(2) 70-77

Knowledge of diabetes mellitus in privately-funded diabetic patients attending a rural optometric practice in Malmesbury, South Africa*

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Received 24 November 2011; revised version accepted 28 May 2012

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Abstract

Patient knowledge about diabetes mellitus (DM) and appropriate timely management with respect to the condition are important factors for limiting the complications of the disease. The aim of this study was to evaluate knowledge and practices regarding DM, its ocular effects and management protocols among privately-funded diabetic patients. A questionnaire containing questions on these issues and certain demographics was provided to 73 self-funding or privately-funded diabetic patients attending an optometric practice in a rural district of the Western Cape. Respondents ages ranged from 33 to 80 years (mean = 57 ± 11.2 years) and included 59% males and 41% females. Above half (56%) of the respondents knew that there were two main types of DM. Less than half (46%) of the respondents reported having Type 2 DM, 4% reported having Type 1 DM and 49% did not know what type of DM they had. Although 82% of the respondents reported owning a glucometer and 98% knew that controlling their blood sugar levels may help reduce diabetic complications, only 29% measured their blood sugar levels on a daily basis. Most respondents (97%) agreed that DM could affect their vision yet only 37% stated that they had annual eye examinations. A significant proportion of the respondents did not know that DM could cause strabismus (57%), colour vision problems (44%), cataracts (41%), retinopathy (37%) and contribute to causing glaucoma (63%). Most respondents took their medication regularly and as prescribed (89%) and underwent regular medical check-ups (82%). However, a large proportion of the respondents did not exercise regularly (61%), had no regular eye testing (63%) nor Body Mass Index (BMI) monitoring (84%) in their management of DM. This study indicates that, despite access to private health care, these subjects level of knowledge of DM and its ocular effects was suboptimal. It also indicated poor self-management practices of the diabetic patients towards diabetes care and management. Optometrists should form part of a team of health professionals to assist in the management of DM. (*S Afr Optom* 2012 **71**(2) 70-77)

Key Words: Diabetes mellitus, blood glucose, diabetes education, knowledge of diabetes, complications of diabetes, management of diabetes, practices related to DM

*This paper is based on research by KC Phillips towards a Masters degree in the Discipline of Optometry of the University of KwaZulu-Natal with the supervision of Mr KP Mashige and Dr PC Clarke-Farr

Introduction

Diabetes mellitus (DM) is a metabolic disease resulting from insulin insufficiency or ineffectiveness, primarily due to peripheral resistance to the action of insulin[1]. Diabetes mellitus can be classified into two main types: Type 1 (insulin-dependent diabetes) and Type 2 (non-insulin dependent diabetes[1, 2]. Type 1 DM is caused by defective insulin production or release and Type 2 is caused by resistance to insulin action[1, 2]. Gestational diabetes occurs only in pregnancy and is a risk factor to progress to Type 2 DM after the pregnancy[3]. The estimated global prevalence of people with DM in 2000 was 171 million or approximately 3% of the population and that of Africa is estimated to be 1.2%[4]. The South African Department of Health[5] estimates prevalence rates of 2.4% and 3.2% for South Africa and the Western Cape respectively. The prevalence of DM is on the rise globally, and current prevalence figures are expected to double[4] by the year 2030, thus creating a major public health challenge.

The clinical features of DM include excessive thirst (polydipsia), excessive urine production (polyuria), tiredness, loss of weight, increased appetite (polyphagia), genital itching and visual disturbances[6]. Impotence, amputations, strokes, kidney failure and heart attack are common systemic complications of DM. Visual and ocular complications include retinopathy, higher prevalence of cataracts, secondary glaucoma, colour vision deficiencies and neuropathy[7-10]. Clinical investigations for DM include urine and blood glucose testing, including the glycated haemoglobin test (HbA1c)[11]. The management and treatment options for DM involve medication and lifestyle modifications[12-14]. Medication used includes conventional insulin therapy, particularly for Type 1 DM; Type 2 diabetics are usually initially managed with medication such as Metformin. Lifestyle intervention strategies include dietary modifications and regular exercise. Early detection, good control of DM, and general education about DM are key features to managing the condition in order to minimize the risk of complications[15]. Knowledge of DM and its complications is an integral part of comprehensive diabetes care and management[16]. A study by Gagliardino *et al*[17] has shown that improving knowledge of people with DM is associated with better practices in prevention and control of the disease. Local studies[18-20] focused mainly on patients' levels of knowledge of DM and its potential complications and management in the Public Sector and in metropolitan Durban, while little has been done to assess the practices or behaviour regarding diabetes among diabetic subjects neither in the private sector nor in rural settings. However, knowledge is only one factor which may influence management of patients with DM. Another important factor is the practice or behaviour related to diabetes and its management. An assessment of knowledge and practices or behaviour is also necessary before beginning the process of creating awareness in any given community. It might be assumed that privately-funded DM patients would have optimal treatment available, which would include good communication and explanation of diabetes in order to better facilitate the management and treatment of the condition. The aim of this study therefore, was to assess diabetes-related knowledge and practices among privately-funded diabetic patients in a rural setting.

Methodology

Approval to conduct this study was obtained from the University of KwaZulu-Natal Research and Ethics Committee. A self-administered questionnaire was used to collect data for this study. The design of the questionnaire was based on a review of related studies[18-20] and modified following a pilot study. The questionnaire consisted of questions eliciting information regarding the subjects' demographic profile and incorporated questions on patient knowledge of DM (types of DM, risk factors and tests for DM), its specific ocular effects and management protocols. Questions regarding the practice of DM control and management assessed the practices of the respondents with regard to the way in which they demonstrate their knowledge through their actions. These questions covered intervention and diabetic management. The questionnaire was also available in either English/Afrikaans format or English/isiXhosa to overcome language barriers. To evaluate the questionnaire, the survey was preceded by a pilot study conducted among eight diabetic subjects (who did not form part of the final study). All queries concerning the questionnaire during the pilot study were addressed and the questionnaire was adjusted accordingly before the final

study was conducted. The participants were given a questionnaire to complete by the researcher. Participants were informed of the purpose of the study and that their participation in the study was voluntary. Those who agreed to partake in the study signed consent forms and were assured of the confidentiality of information provided. The responses from the questionnaires were collated and analysed descriptively using the Microsoft Excel 2007 programme. Copies of the questionnaire are available from the first author on request.

Results

Demographic characteristics

Of the seventy-three subjects (N = 73) that responded to the questionnaire, 59% were males and 41% were females. Their ages ranged from 33 to 80 years with a mean of 57 years (± 11.2 years). Many of the subjects were Coloured (59%), or were White (38%) and only 3% were Black. The majority (86%) stated that they were Afrikaans-speaking followed by English (12%) and isiXhosa (1%). Almost one-third of respondents (31.5%) had post-matriculation education, 64.4% had secondary education and 4.1% had primary education. Regarding specific health conditions, 65% of the respondents reported having hypertension, 54% had high cholesterol levels, 13% had heart disease and 4% reported having lung problems. The majority (77%) of the respondents indicated that they were diagnosed with DM by general practitioners (GP's), 18% by physicians and 5% by nurses. Many respondents (63%) reported that they had been advised on the need for regular eye examinations by the diagnosing clinician while 37% reported that they did not receive such advice. The average duration of diabetes treatment by the respondents was 6.6 years and the average body mass index (BMI) of respondents was 31.26 kg/m^2.

Participants' knowledge about diabetes mellitus

More than half (56%) knew that there are two main types, 15% knew of one type and 15% did not know how many types there were while 14% reported that there were more than two types of diabetes. Nearly half (46%) of the respondents reported that they had Type 2 DM, 4% reported having Type 1 DM and 49% did not know what type of DM they had. Many (61%) respondents thought that DM is a hereditary condition and 39% did not know. With regard to diabetic blood tests, 60% were unsure of the importance of glycated haemoglobin (HbA1c) and 40% thought the test was very important. Just above half (53%) of the respondents thought that daily blood glucose testing was very important and 47% were unsure.

Participants' knowledge about the ocular effects of diabetes mellitus

The majority (97%) of respondents agreed that DM could affect vision and 3% disagreed or were unsure whether diabetes could affect their vision. Most (95%) agreed that diabetes could affect wound healing and 62% agreed that DM could affect the back of the eye and cause bleeding within the eye. Just above half agreed that DM could cause cataracts (55%) and affect colour vision (52%) (see Figure 1).

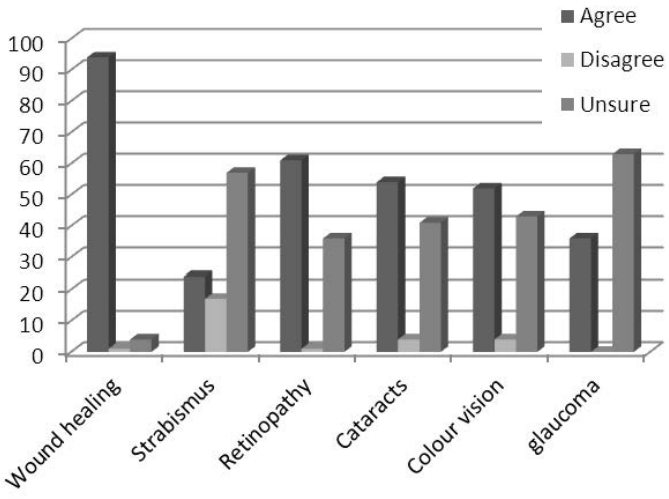

Figure 1: Respondents' knowledge of the ocular effects of DM.

Most participants (73%) felt that it was very important for diabetics to have an eye examination even if they could still see clearly, 18% felt it was slightly important while 9% felt that it was not important. Similarly, 76% indicated that it was very important to have an eye examination even if their diabetic condition was under control, 19% thought it was slightly important while 4% thought it was not important. Two-thirds (66%) of the respondents reported that they did not know about laser treatment for diabetic eye disease and 34% reported that they did. The majority (72%) of respondents stated that cost of an eye test was not a barrier for an eye examination while 22% cited cost as a barrier. Similarly, 68% reported that the cost of checking their blood sugar levels was

not a barrier to doing so with 32% reporting that it was.

Participants' knowledge about management and control protocols of diabetes mellitus

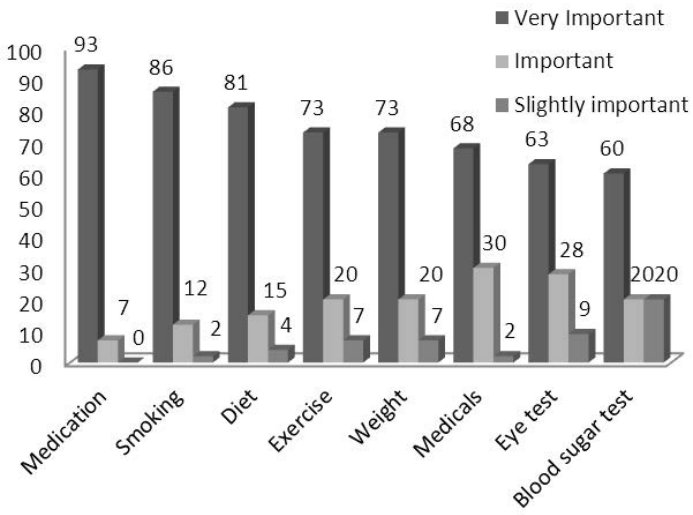

Figure 2: Patients importance ratings of factors that are involved in the management of DM.

The majority (98%) of respondents agreed that controlling their blood glucose levels may help to minimize or delay the onset of diabetic complications. The various percentage ratings by patients of factors that are involved in the management of DM are shown in Figure 2.

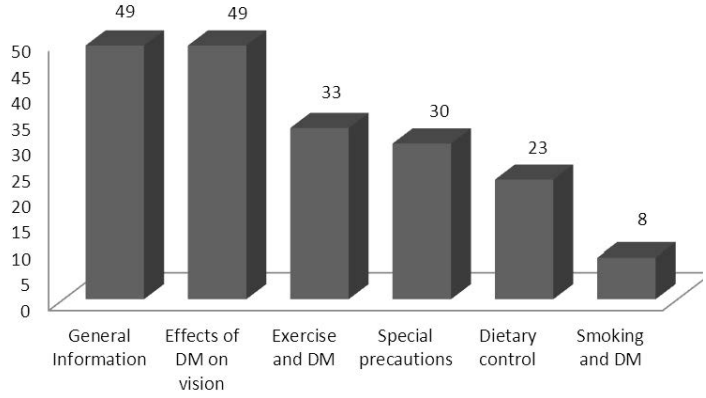

Figure 3: The information that the respondents would like to get from clinicians about diabetes.

Many (60%) felt that they were provided with adequate information about the possible effects of diabetes on the eyes when they were diagnosed with their condition and 40% felt the information provided was inadequate. The proportion of the respondents with regards to the type of information they would like to receive about DM is shown in Figure 3. Many of the respondents would like information on diabetes to be provided to them by the general practitioner (74%) and lesser percentages preferred this information from optometrists (44%), ophthalmologists (19%), physicians (14%), pharmacists (11%) and nurses (7%).

This information would be preferred by 68% of the respondents to be on a continuous basis, while 23% would prefer it once and 9% twice. Respondents chose pamphlets (44%), as preferred means of communication, followed by personal communication (30%). Fewer subjects preferred books (23%), internet (19%), magazine (18%) and the syntax messaging system facility on the cellular phones (SMS) (8%).

Practices of diabetes-related control and management

More than half (54%) of the respondents reported blood sugar levels of 7-10 mmol/l, 8% reported that their sugar levels were in excess of 10 mmol/l while only 36% reported normal sugar levels of less than 7 mmol/l. One respondent (1%) did not know what their usual blood glucose reading was. When asked when the last blood glucose test was done, 13% reported the day before, 12% within the week, 16% within the previous month, and 12% could not remember. One quarter of the respondents reported having their last eye examination a year previously and 34% two years previously while 41% had their eye examination three or more years previously.

The majority of respondents (82%) reported owning a glucometer yet less than a third (29%) of the respondents reported that they measured their blood sugar daily, 27% measured it every second day, 29% less than weekly and 16% measured their glucose levels only when they went to the doctor (Figure 4).

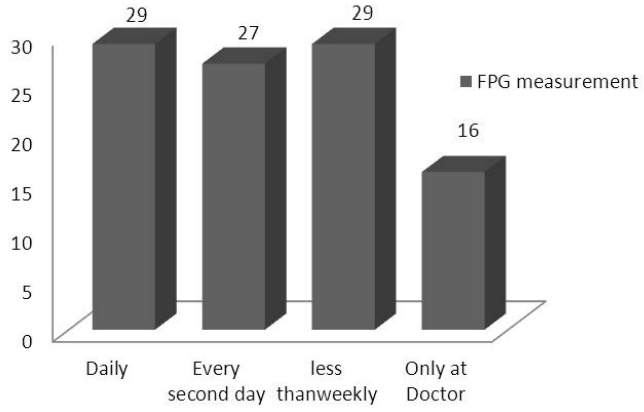

Figure 4: Patient testing of Fasting Plasma Glucose (FPG)

Exercise was not prioritised by patients with 61% not participating in any regular exercise. Similarly, 63% reported not undergoing regular eye examinations. Most (84%) respondents did not know their body mass index (BMI). The responses to the other questions on the practices of different modes of DM control are shown in Figure 4.

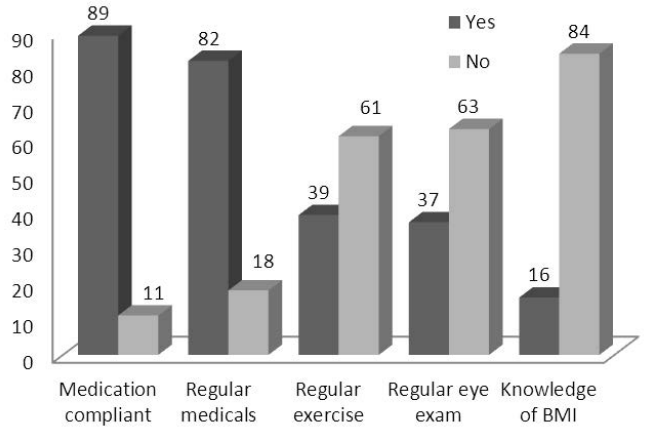

Figure 5: Percentage of respondents knowledge and practices of different areas of DM control.

Discussion

Diabetes is characterised by hyperglycaemia and the main objective of treatment is reducing the hyperglycaemia to minimize the risk of possible complications of the disease. Treatment and management protocols are often dependent on the knowledge and practices that diabetic patients have about the disease as this affects the compliance and ultimately the successful management of the disease.

A limitation of the study is the possibility of bias caused by the relatively small number of participants obtained from a single optometric practice. Therefore the results cannot be generalized for all diabetic patients in the Western Cape or of the country.

The average age of respondents was 57 years indicating an increased incidence of DM with age, agreeing with previous studies[18-20] which have shown that the prevalence of DM is higher amongst those older than 50 years. As the study was conducted in one town in the rural Western Cape, it is quite expected that the majority of respondents identified themselves as Coloureds. A large number of respondents reported having hypertension and cholesterol reinforcing the indication that there is a higher prevalence of these conditions in diabetic patients as these form part of the Metabolic Syndrome[21], a concept consisting of elevated fasting plasma glucose (FPG), hypertension, hypercholesterolaemia and obesity. The Metabolic Syndrome is an indicator of the potential risk of insulin resistance and ultimately clinical diabetes[21]. The average BMI of respondents was 31.26 kg/m^2, which is indicative of the relative obesity of the subjects.

The results of this study showed that the majority (77%) of diabetic patients had their initial diagnosis done by the GP. This could be due to the fact that GP's are often the first point of consultation and care for people with DM[20]. This view is reflected by responses in this study as 74% of the respondents indicated that they would like general information on DM and its effects on the eyes to be provided to them by the GP in the form of pamphlets and personal communication (Figure 3). The GP therefore carries a large responsibility with regards to educational and awareness programmes that reinforces continued management of DM and the need for regular physical and eye examinations.

Despite 56% of the respondents knowing that there were two main types of DM, a significant proportion (44%) were unaware of this. Furthermore, a large proportion (49%) did not know what type of DM they had. This is of concern as patient compliance and proper self-management of DM is facilitated by the knowledge of the type of DM that one has. This result contrasts with those of Mashige *et al*[20] who found that 96% of the respondents in their study in the Public Sector and metropolitan Durban knew about the existence of two main types of DM and only 5% did not know what type of DM they had. Significantly, the respondents in this study were all recipients of private health care and it might be assumed that this would have beneficial effects in terms of patient knowledge, yet the opposite appears true. Because of the nature of the health care received by the respondents, the poor knowledge of DM in the current study could not be attributed to a lack of access to health facilities in the geographical area compared to the more metropolitan area in which the study of Mashige *et al*[20] was conducted. The question needs to be asked whether the treating physicians are educating their diabetic patients about the disease as part of the management process. A significant proportion of the respondents were not knowledgeable about the importance of the HbA1c test. A possible explanation for this is that it

is not routinely used by local GP's in their management of DM, many of whom may prefer the fasting or random blood glucose tests, despite universal acceptance of the HbA1c test as a measure of DM treatment efficacy[22]. This is reflected by responses in this study by respondents, the majority of whom indicated that FPG was a very important test, and their relative ignorance of the HbA1c test.

Although many respondents knew that DM could affect their eyes (97%) and that regular eye examinations were very important (63%), only 24% reported that they had an eye examination in the previous year. A significant proportion was not certain of the specific effects of DM on the eye. Therefore, it is possible that inadequate knowledge of the effect of DM on vision is negatively impacting good practice or behaviour change among diabetic patients. Because diabetic patients have a higher prevalence of ocular complications, it is important for diabetic patients to be aware of the ocular complications of DM as diabetic-related conditions such as cataracts, retinopathy and secondary glaucoma can lead to vision loss and blindness[7-10]. It is therefore recommended that all health care practitioners, and particularly those involved in eye care, should advise diabetic patients about the specific ocular effects of DM. Furthermore, diabetic patients should be carefully monitored for colour vision changes, optic nerve head damage, intra-ocular pressure (IOP), retinopathy, maculopathy and oculomotor function as these may indicate the progress of their diabetic condition. Many diabetic patients regarded an eye examination as very important even if they could still see clearly or their diabetes was well-controlled. Whilst this is a positive result, as retinopathy is often seen even in those diabetic cases that are classified as mild and well-controlled, it is a sentiment that needs to be reinforced at each GP visit. This is especially pertinent given that only 24% of respondents indicated that they had an eye examination in the previous year. It is clear that, despite their awareness of the need for regular eye examinations, privately-funded diabetic patients in this study are not adhering to these recommendations or are not receiving them. This is concerning, particularly as the majority of respondents indicated that cost was not a factor in presenting for an eye examination, which should be covered by the private health insurance or medical aid. The disinclination by these participants to have an eye examination may be due to denial, negligence or apathy on the part of patients, suggesting that good knowledge is not associated with better outcomes in terms of compliance with regular eye examinations.

The benefits of medication and lifestyle modification in DM management have been reported in several publications[12-14]. The results of DM management characteristics in this study indicate that many participants agreed that lifestyle modification (cessation of smoking, diet, exercise) together with medication, medical check-ups, eye examination and blood sugar testing were very important factors in the management of DM (Figure 2). These findings imply acceptable knowledge of management protocols of DM.

Most (62%) of the respondents had habitual measurements of fasting plasma glucose (FPG) of greater than 7 mmol/l. This result indicates that these patients would be at risk for long-term complications of diabetes[23]. The high FPG levels could possibly be due to poor frequency of testing their FPG as only 21% reported testing their glucose levels daily. If so, this implies poor practices on the part of the diabetic patients regarding the management and control of their DM, as many (82%) reported owning a glucometer and 68% reported that the cost of measuring blood glucose was not a barrier. Another explanation is that their blood glucose is poorly controlled due to diet, inadequate medication strength, non-modification of lifestyle or other factors not elicited by this study. This suggests the need for health care providers to emphasize the importance of blood glucose testing in the management of DM. Many demonstrated good diabetic management practices in terms of taking their medication regularly and as prescribed (89%), and undergoing regular medical check-ups (83%). However, most patients were not implementing specific lifestyle modifications such as regular exercise, eye testing and BMI control, which suggest poor practices in relation to diabetes management. These results could also be due to the fact that at first diagnosis of Type 2 DM, many patients are often falsely given the impression that it is not a serious condition. This is exacerbated when patients are advised that the management consists largely of lifestyle modifications such as diet and exercise[24]. In contrast with current practice involving GP's managing the DM patient alone, it is suggested that diabetes treatment is best facilitated by a team approach consisting of health care professionals including dieticians, psychologists and eye care professionals.

Conclusion

The results of the current study suggest that knowledge about DM and its ocular effects often was deficient. Also, practices of diabetic patients towards care and management of DM were poor in key areas such as eye examination, exercise and BMI awareness. The lack of knowledge and poor practices of diabetic patients about the disease can lead to systemic and ocular complications[15, 16]. Current patient education may be inadequate or patients may be negligent or apathetic with regards to the education provided to them. With the expected rise in the number of patients with DM, and the long-term complications associated with it, all health care professionals have an important role to play in managing patients with DM. A comprehensive multidisciplinary management approach would likely have a significant impact on the diabetic patient's quality of life. The GP should perform regular screening for systemic complications and reinforce patient education. Eye care professionals should examine the vision and advise on the ocular manifestations of DM in a co-management role as a recognised member of the treatment team which should include the dietician and psychologist. However, for these interventions to succeed, health care professionals also need to be provided with the necessary knowledge. Optometry can play a leading role in this regard by empowering practitioners with additional training and certification to become fully-fledged diabetes co-management health care providers

Notwithstanding the limitations of this study, these findings have significant implications for the quality of diabetes education and knowledge available in rural areas such as Malmesbury. Future studies that assess the effectiveness of education programmes could be useful towards improving management or treatment of diabetes.

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