

Knowledge of diabetes mellitus and its ocular complications amongst diabetic patients attending private and public hospitals in eThekweni Municipality, KwaZulu-Natal province, South Africa

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Background: The prevalence of Diabetes Mellitus (DM) is increasing in South Africa as a result of changes in lifestyles and rising levels of obesity. Knowledge of management protocols for DM may empower patients to better control the disease and prevent secondary complications.

Aim: The aim of this study was to determine if there was a difference in the level of knowledge of DM and its ocular complications amongst public and private hospital diabetic patients.

Setting: The study was conducted in four private and four public hospitals in the eThekweni Municipality, KwaZulu-Natal Province.

Methods: A cross-sectional survey method was used to collect data from diabetic patients attending selected hospitals. Convenience sampling was used and analysis of descriptive and correlation statistics was done using Statistical Package for Social Sciences (SPSS) version 21.

Results: Participants ($N = 370$) consisted of 44% males and 56% females with 41.6% being from private and 58.4% from public hospitals. The ages of participants ranged from 20 to 79 years. Although most of the participants (74.8%) were knowledgeable about DM and its management, private sector patients were more knowledgeable about DM management than were public sector patients ($p = 0.000$). Furthermore, private patients had better knowledge of ocular complications related to DM ($p = 0.000$). Those (74%) who had previously attended a diabetic seminar had significantly better knowledge than those who had not ($p = 0.000$).

Conclusion: Patients with DM attending public hospitals will benefit from targeted education campaigns or seminars related to diabetes and its complications.

Introduction

Diabetes mellitus (DM) is a chronic disorder characterised by impaired glucose metabolism as a result of insulin deficiency or its resistance, leading to hyperglycaemia and subsequent development of vascular and neurological complications.¹ Generally, there are two types of DM: type 1 is primarily caused by autoimmune pancreatic β -cells destruction and is characterised by absolute insulin deficiency, whilst type 2 is characterised by insulin resistance and relative insulin deficiency.¹ The global prevalence of diabetes amongst all age groups was estimated to be 2.8% in 2000. The prevalence is projected to be 4.4% in 2030, with the number of people affected increasing from 171 million to 366 million.² An important factor for the upsurge of diabetes and hypertension is the growing prevalence of obesity.³ Increasing intake of refined carbohydrates have been linked to the upward trend in the prevalence of type 2 diabetes.⁴

In the past 20 years, the rates of obesity have tripled in developing countries that have adopted a more Westernised lifestyle involving decreased physical activity and overconsumption of cheap, energy-dense food.³ Such lifestyle changes are also affecting children in those countries; the prevalence of being overweight amongst children ranging from 1% to 25%, and prevalence of obesity ranging from 2% to 10%.³ The World Health Organization (WHO) projects that diabetes will be the seventh leading cause of death by the year 2030.⁵

South Africa, like many other developing countries, is experiencing an epidemiologic transition with a marked increase in the non-communicable diseases (NCD) burden,⁶ one of these being

Note: Additional supporting information may be found in the online version of this article as an Online Appendix: <http://dx.doi.org/10.4102/aveh.v74i1.36-1>

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diabetes mellitus (DM). According to Mashige et al.,⁷ epidemiologic studies have shown that the prevalence of DM is increasing in South Africa, similarly due to changes in lifestyles and longevity of the population. Diabetes is a major public health problem worldwide; therefore knowledge of the condition and its ocular manifestations amongst those affected is important because it improves self-management of the disease, thereby perhaps reducing its rate of progression and complications.⁸

Complications of DM include nephropathy, cardiovascular disease, neuropathy and eye damage.⁹ With regard to the eye, diabetes may cause alteration in the retinal microvasculature, leading to diabetic retinopathy, and if unchecked retinopathy may lead to blindness.¹⁰ Other than the retinopathy, ocular complications of diabetes may include cranial nerve palsies, decreased corneal sensitivity and healing, open and closed angle glaucoma, pupil abnormalities, cataract, retinal ischemia, haemorrhagic disorders and fluctuating refractive changes.¹¹ Diabetic retinopathy (DR) is the most common complication of diabetes and the leading cause of blindness in the Western world,¹¹ as well as in the developing countries. DR is the most common cause of incidental blindness in adult South Africans,⁷ and the retina is particularly vulnerable to microvascular changes in diabetes, with retinal damage being caused by both leakages from the breakdown of the inner blood-retinal barrier and microvasculature occlusion. The macula is highly vascularised and with DM its involvement leads to serious effects on visual function. Macular oedema results from leakage from the broken blood-retinal barrier.¹ The retinopathy damages small retinal blood vessels causing dot and blot haemorrhages, hard exudates and microaneurysms¹² leading to visual impairment and ultimately blindness. The ocular tissue damage as a result of retinopathy is preventable and treatable if detected early. Up to 25% of Type 2 diabetics show some degree of DR when first diagnosed, and 60% – 80% of these patients show evidence of DR after 15 years from the onset of diagnosis.¹³ Vision-threatening DR is most commonly observed in instances where there is a delay in the patients' referral to an ophthalmologist for management.¹⁴

The guiding principles for diabetes care by health care professionals include identifying people with undiagnosed diabetes; management of pre-diabetes to prevent or delay the onset of type 2 diabetes and its complications; providing ongoing self-management education and support for people with diabetes; provision of comprehensive patient-centred care to prevent or delay the onset of diabetes complications; and consideration for the needs of the special population, such as children, women of child-bearing age, older adults, high risk racial and ethnic groups.¹⁴

As in all chronic diseases, providing patients with necessary information about DM through patient education is the best method of controlling the disease and preventing further complications.¹⁵ Aetiology of diabetes is part of the knowledge that DM patients need in order to understand the nature of their condition. Diabetic patients, as well as the

general population, should be made aware of the possible systemic and ocular complications of the disease. Anecdotal evidence suggests that, in South Africa, following diagnosis with diabetes in private practices, patients are given a diet sheet, a prescription for medication and are informed to return for a follow-up visit at a specified time. Similar services are offered in the public sector, however adherence rates are considered to be poor,¹⁶ suggesting the need for greater educational intervention for this category of patients.

The diagnosis, treatment and monitoring of ocular complications of diabetes is commonly carried out by ophthalmologists and optometrists. General medical practitioners and nurses are also involved in diabetes management as they perform blood glucose testing, blood pressure testing and visual acuity tests. They may also provide education on lifestyle management to diabetic patients. Optometrists are trained to detect early signs of ocular complications of systemic diseases including diabetes, and refer relevant patients to ophthalmologists. With modern use of instruments, such as ocular coherence tomography, optometrists can play an essential role in early identification of diabetic retinopathy. Optometrists can also play a significant role in the education of patients about DM and its ocular complications.

Raising awareness of diabetic retinopathy has been shown to be a key element in the early diagnosis and treatment of this potentially blinding disease.¹⁶ Thus, health care practitioners should be involved in the awareness campaigns about DM and its systemic and ocular complications. Several studies have been conducted in parts of the world, including South Africa, on the awareness of diabetes and its complications in the general population as well as in diabetic patients.^{7,15,17,18,19,20,22} All of these studies concluded that knowledge or awareness of diabetes and its complications was inadequate, suggesting the need for increased and continuous education and awareness campaigns about the condition and possible complications for the general population and those with the disease.

The purpose of this study was to assess the knowledge of DM and its ocular complications amongst diabetic patients attending private and public health care facilities in the eThekweni Municipality, and to establish if there was any difference in knowledge level amongst the two categories of patients. The expected outcomes of this study were to identify whether more awareness or patient education activities are needed amongst diabetic patients in the eThekweni Municipality, and which group of patients, public or private sector, would most benefit from these efforts.

Methodology

This cross-sectional survey study targeting diabetic patients attending private and public health care facilities in the eThekweni Municipality was approved by the Biomedical Research and Ethics Committee (BREC), University of KwaZulu-Natal. Permission to collect data from the patients

was obtained from each hospital manager. A questionnaire on demography, knowledge of DM and its ocular complications was used to collect data from four private and four public hospitals using the convenience sampling method. Participants had to be diagnosed diabetic patients accessing private or public health services within the Municipality at the time of the study. Study sites included the following private hospitals: Chatsmed Garden Hospital, Life Entabeni Hospital, Netcare Umhlanga Hospital, Netcare Parklands Hospital and the following public hospitals: RK Khan Hospital, Prince Mshiyeni Memorial Hospital, Addington Hospital and St. Aidans Mission Regional Hospital. Data were analysed using the descriptive and correlation statistics of the Statistical Package for Social Sciences (SPSS), version 21. The significance level was set at 0.05.

Results

Demographic profiles

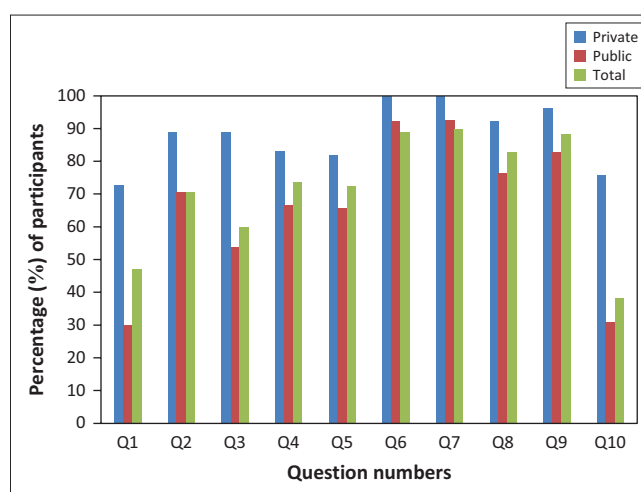
The respondents ($N = 370$) included 44% males and 56% females; with racial distribution comprising 139 (37.6%) African people, 184 (49.7%) Indian people, 36 (9.7%) white people and 11 (3%) mixed race people. Age groups (years) represented were: < 20 (4.10%), 20–39, (15.9%), 40–59 (55.4%), 60–79 (22.4%) and ≥ 80 (2.20%). The sample included 41.6% private practice and 58.4% public practice patients. The years of DM from initial diagnoses and corresponding percentages were < 5 (38.1%), 5–10 (30.3%) and > 10 (31.6%). Categories representing the participants' level of education were: no education (6.2%), primary school (25.9%), high school (50.3%) and tertiary education (17.6%).

Knowledge of diabetes

In general, most of the participants (74.8%) were knowledgeable about DM. Many (60%) knew the type of DM with which they were afflicted and the majority (89%) of the participants knew various ways of managing diabetes. However, less than half (47%) of the respondents knew that there are various types of DM, depending on classification, and these included 72.7% private and 30% public facility participants (Figure 1). Most patients were aware of the importance of lifestyle modifications and that controlling blood glucose level was important in reducing complications associated with DM; however many patients from the public facilities did not know how often they should monitor their blood glucose level. The percentages of respondents (private, public and total) who knew the correct answers to questions on DM (questionnaire, section 2, questions 1–10) are illustrated in Figure 1.

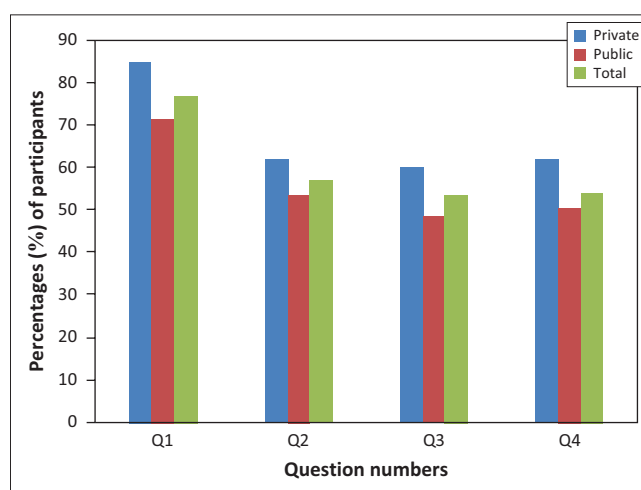
Knowledge of ocular complications and management

Many (61%) of the participants knew that DM causes ocular complications. The majority (70%) of the total participants (private and public) knew that DM could lead to visual impairment and blindness, however significantly fewer reported knowing of the specific ocular complications of



Note: Section 2 of the questionnaire: Online Appendix 1.

FIGURE 1: Showing the percentages (private, public and total) respondents who correctly responded to questions on Diabetes Mellitus.



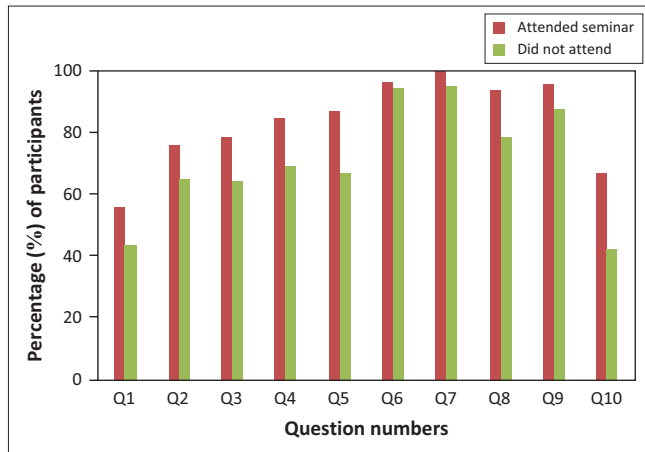
Note: Questions (Q1 to Q4) are shown in the questionnaire.

FIGURE 2: Showing the percentages of private, public and total subjects who correctly identified answers to questions 1–4 on ocular complications of diabetes.

DM such as cataracts (65.4%), diabetic retinopathy (70.2%) and glaucoma (55%). The majority (94%) of total participants knew of at least one cadre of health care professional whom they could consult to monitor ocular changes related to diabetes. The majority of participants (88.3%) knew that diabetes could lead to daily changes in vision and correctly reported that diabetics should see an eye care practitioner at least once a year (89%). All participants knew at least one procedure that eye care professionals could administer to monitor their ocular condition. Results for questions concerning their knowledge of ocular complications of DM amongst the respondents (private, public and total sample) are shown in Figure 2.

Knowledge and seminar attendance

Participants who had attended a diabetic seminar scored significantly higher (85.5%) relating to DM and its management, whilst those who had not attended a diabetic seminar averaged 74% on knowledge-based questions



Note: The questions are as shown in the questionnaire (Online Appendix 1).

FIGURE 3: Showing knowledge of Diabetes Mellitus amongst the participants who had attended diabetic seminars and those who have not attended such educational seminars.

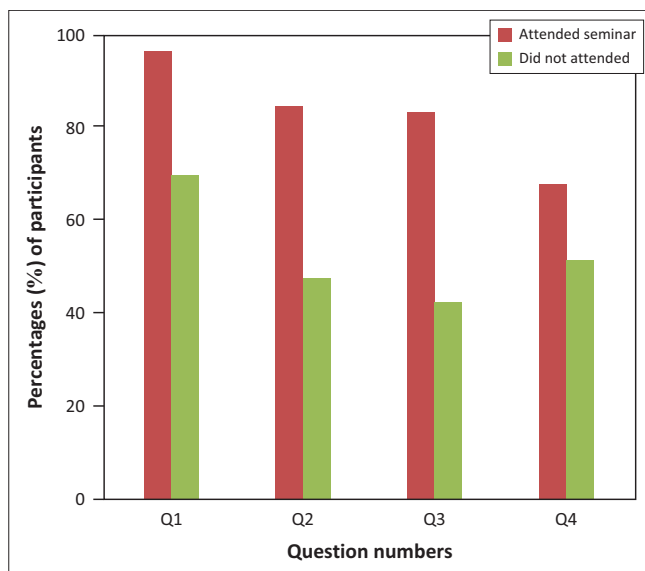


FIGURE 4: Knowledge of ocular complications amongst participants ($N = 370$) who had attended diabetic seminars (85.5%) and who have not attended such seminars.

($p = 0.000$) as illustrated in Figure 3. Knowledge of ocular complications amongst participants who had attended diabetic seminars and those who had not are shown in Figure 4.

Knowledge in relation to level of education

Knowledge of DM in relation to the different levels of education of participants is illustrated in Figure 5. Knowledge of ocular complications of DM was directly related to levels of education. Generally, the higher the level of education achieved, the greater the knowledge of the participant. The percentages of participants who responded correctly to questions on ocular complications in relation to the different levels of education are shown in Figure 6.

Discussion

Most of the participants in this study (49.7%) were Indians, which agrees with an earlier report¹⁹ that Indians in eThekweni

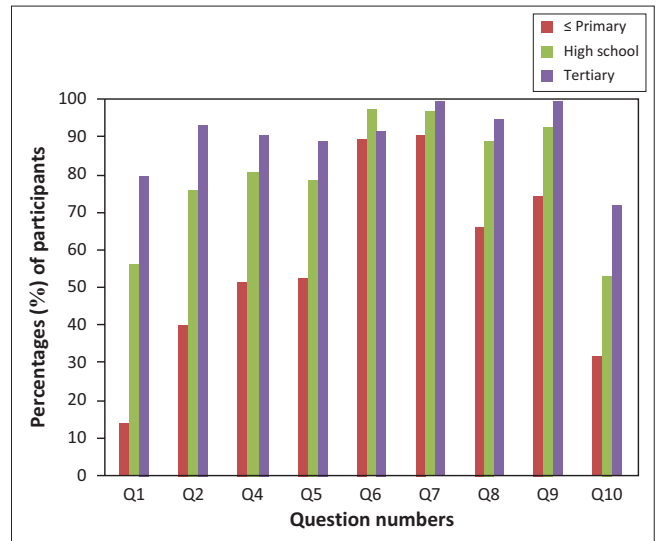


FIGURE 5: Showing the percentage of people answering correctly on questions relating to knowledge of Diabetes Mellitus as a function of level of education of participants.

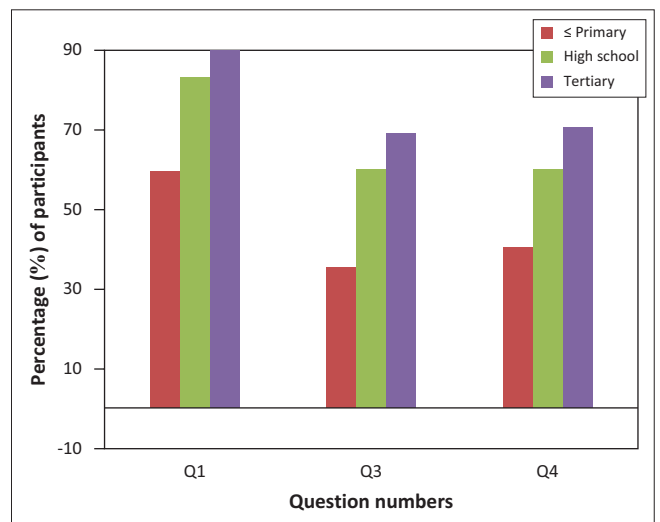


FIGURE 6: Showing the percentages of subjects who correctly answered the listed questions on ocular complications of Diabetes Mellitus in relation to the different levels of education.

Municipality have a higher prevalence of diabetes than their African counterparts. Also, the majority of the participants were aged 40 years and older, which is consistent with existing reports that the highest prevalence of DM in South Africa is amongst the elderly.^{6,22} Although the total sample population had a good level of knowledge of DM, as their scores in the various questions ranged from 47% to 89%, the private sector respondents were generally more knowledgeable than those of the public sector ($\chi^2 = 73.29$; $p = 0.000$). This greater level of knowledge amongst the private sector respondents can probably be attributed to higher levels of education amongst this category of patients, as shown in Figure 1. The higher the level of education achieved, the greater the knowledge of the participants.²³ Educated patients are likely to have better knowledge of their disease conditions as they are more likely to acquire information from books, magazines and through access to electronic media. Findings in the study supported

this assumption as those who had tertiary education were significantly more knowledgeable than those who had high school or primary school ($\chi^2 = 32.96$; $p = 0.0001$).

That a large proportion of the participants (89%) had good knowledge on the methods of managing DM, including managing by diet or exercise and medication, and a large percentage (89.7%) of them applied these methods regularly, is a positive finding in this study. Most of the respondents reported lifestyle changes, such as a healthy diet and exercise, as well as frequent blood glucose monitoring and regular medical check-ups as ways of managing their DM. These may be because of the educational intervention provided by the various health care practitioners with whom they have interacted. The treatment and management of, as well as awareness campaigns about DM and its possible complications should be an ongoing service offered by health care professionals.

As expected, patients who had attended seminars on DM had better knowledge ($\chi^2 = 28.4$; $p = 0.0003$) than those who had not attended such seminars. Such patients would naturally have obtained information from the seminars about their medical condition and how to better manage the condition. This suggests that DM seminars are an efficient medium of providing the DM patients with good knowledge about their condition and how to manage it. The lack of association between duration (from time of initial diagnosis) and knowledge of DM was surprising. Those who had longer duration of diagnoses would be expected to have better knowledge than those recently diagnosed with the condition, as the former would have had more interaction with health care personnel than the latter.

The participants in this study had fairly good knowledge about ocular complications of diabetes mellitus as many (77.3%) knew that diabetes could cause visual impairment and blindness. However, significantly fewer reported knowing of the specific ocular complications of DM such as cataracts (65.4%), diabetic retinopathy (70.2%) and glaucoma (55%). This may be as a result of the limited information that the patients had acquired about ocular manifestations of DM, suggesting a need for better quality education about DM and its ocular complications amongst the diabetics and the general population. Most (94.1%) of the respondents knew at least one health care practitioner who could monitor their eyes for DM changes. Further, 88.3% knew that diabetes can lead to daily fluctuation in vision and (89%) reported that diabetics should see an eye care practitioner at least once a year. These results could be because of personal experiences of the patients as well as the information that has been received from the hospital personnel, family or friends.

A major objective of this study was to establish whether there were differences in the level of knowledge of diabetic patients attending the private and public health care facilities. Those who attended the private health care facilities were

found to have better knowledge of DM as well as its ocular complications. However, a possible limitation of this finding is that some of the patients at private practice facilities may have attended public clinics and vice versa at one time or another and this may have some effects on the findings presented in this study. Also, the sources of knowledge of DM and its ocular complications that the respondents had were not investigated in this study. This is important as it could provide information on available areas of education and reveal areas that need to improve. It is hereby recommended that future studies should include larger population samples as well as inpatients in the hospitals concerned. Furthermore, study areas should include the rural, semi-urban and urban areas of the province as well as other parts of the country, thus allowing comparison of findings between urban and rural areas as well as different provinces in the country.

Conclusion

Participants in this study had fairly good knowledge of DM and its ocular complications. However, private practice patients had a significantly higher level of knowledge on diabetes and ocular complications compared to those of the public sector. Also, participants who had attended diabetic seminars had better knowledge, suggesting that such educational programs are effective in providing knowledge and awareness to DM patients. The findings are in agreement with the research results from previous studies in the country.^{6,19,20} This reveals a need for more educational programs on DM and its systemic and ocular complications. However, the authors recommend that such education and awareness campaigns should focus more on those attending the public hospitals. Both public and private medical, as well as eye care practitioners, should provide such programmes which may include educational leaflets as well as seminars.

Optometrists as primary eye care practitioners can play a pivotal role in raising awareness of ocular complications of diabetes and this role needs to be intensified to prevent ocular complications of the disease. Practitioners must provide educational support to patients with diabetes as well as the general population and patients need to also be aware of the roles of the various practitioners and the specific role that each of them play in the management of diabetes and its complications.

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Competing interests

The authors declare that they have no financial or other interests which may have inappropriately influenced them in writing this article.

Authors' contributions

L.P.D. (University of KwaZulu-Natal) provided leadership on the student project, with co-researchers being S.G. (University of KwaZulu-Natal), M.M. (University of KwaZulu-Natal), A.M. (University of KwaZulu-Natal), N.S.N. (University of KwaZulu-Natal) and N.G.N. (University of KwaZulu-Natal) who together conducted the fieldwork and compiled the initial draft of this article. D.v.S. (University of KwaZulu-Natal) was the initial supervisory lead, supported by O.A.O. (University of KwaZulu-Natal) who guided the analysis and write up of the data. Final article was compiled by D.v.S., O.A.O. and L.P.D.

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