

CHAPTER 1

INTRODUCTION

STATEMENT OF THE PROBLEM

Type 2 DM Mellitus (Type 2 DM) is present in the populations of almost all the countries in the world and is a significant disease burden in most developed countries.¹ Evidence suggests that populations in Africa develop Type 2 DM at an increasing rate as they reject their traditional lifestyles.² Studies in Durban, the greater Cape Town and Mangaung areas in the 1990's report prevalence rates for Africans of between 3 and 8%.³ The NHANES I study indicated that the life expectancy was eight years lower for adults with diabetes in the age group 55-64 years.⁴ Furthermore, newly released figures by the Medical Research Council of South Africa indicate that diabetes is the tenth most common cause for total life years lost in females in South Africa.⁵

Type 2 DM is a non-communicable disease characterised by disorders of insulin action and insulin secretion. The disease occurs primarily in adults. The diagnosis is usually made after the age of 40 years, although indications are that age of onset is decreasing, with diagnosis now being made in children and adolescents.⁶ It is a chronic illness that can have a profound influence on all aspects of life and can affect most organs of the body. The long-term effects of diabetes result from its vascular complications: the micro-vascular complications of retinopathy, neuropathy and nephropathy, and the macrovascular complications of cardiovascular, cerebrovascular and peripheral vascular diseases.⁷

Type 2 DM affects the emotions, way of life and thus quality of life of the individual with diabetes. Due to the high morbidity and mortality of the disease, Type 2 DM has been targeted as one of the chronic diseases in South Africa, which is in need of special attention, especially at primary health care level.⁸

One such community and primary care facility is the Mamelodi Hospital in Mamelodi, a suburb north-east of Pretoria in the Gauteng Province in South Africa. Mamelodi covers an area of 48.9km². The suburb is divided into nine sections and has a population of 256 118 people.⁹ It is serviced by six primary care clinics.¹⁰ The Mamelodi hospital serves most patients with Type 2 DM residing in the suburb.¹¹ The diabetes outpatient clinic at the Mamelodi hospital sees patients two days per week.

Type 2 DM patients, who, on a regular basis attend the outpatient diabetes clinic at Mamelodi Hospital, receive medication. They also receive education about their disease on an individual basis by the attending physician. Education is limited due to the large numbers of patients attending the clinic on any given day. A health educator visits the clinic every Thursday and gives education to the patients, waiting to see the doctor. Patients are advised to eat correctly and to increase their physical activity. These are the cornerstones of Type 2 DM management in South Africa.⁸

Physical activity, one of the cornerstones of diabetic treatment, is a low cost, non-pharmacological intervention that has been shown to be effective in metabolic control.⁷ Solid evidence exists that exercise on its own can significantly enhance insulin sensitivity and glucose homeostasis in the absence of any change in body mass or composition.^{12,13} Exercise has the following advantages; a reduction in medication, as well as of risk factors for diabetic complications such as hypertension and weight loss.^{14,15}

It is also a means of giving positive health advice to patients, since most of the other recommendations to patients are difficult for patients to comply with, such as not to eat high-fat food, not to eat sugar and to consume smaller portions.¹⁶ It is therefore an ideal intervention to use in the management of Type 2 DM in the South African population with its limited health resources.⁸

An empirical observation of the patients attending the diabetes outpatient clinic is that, despite the education and advice, many women with Type 2 DM are typically overweight, have high blood pressure, poor blood glucose control and lead sedentary lifestyles.

Therefore, the question may be asked: can increased physical activity become part of a lifestyle and contribute to improved haemoglobin A_{1c} (HbA_{1c}) levels of female diabetics in the urban black community of Mamelodi in South Africa?

SIGNIFICANCE OF THE PROBLEM

Despite the scientific evidence that physical inactivity plays a role in the development of Type 2 DM, these messages have not reached the public.¹⁷ Physical activity is still vastly under-utilised in the management of diabetes. The majority of individuals remains sedentary or does too little exercise to achieve health benefits.¹⁸

Furthermore, the increasing costs of Type DM care directly influence the limited public health resources in South Africa. Diabetes-related complications contribute to an increase in direct economic costs for the treatment of the disease and indirect economic costs of morbidity, disability and premature mortality.¹⁹ Primary prevention of the disease or effective management of the disease can, however, reduce the financial burden of diabetes.¹³

Physical activity offers a low cost intervention for the management of Type 2 DM, both as preventative measure and to control diabetes-related complications. Ongoing prospective studies have consistently provided evidence documenting the protective effects of activity for other chronic diseases. These included coronary heart disease, hypertension, and osteoporosis.^{18,20} It also presents a way for patients to be actively involved in their own health care.²¹

Regular physical activity and exercise for health purposes is however, foreign to the traditions of the adult African people.²² In an ethnographical survey of the black culture of South Africa, the words “exercise” or “physical activity” does not even appear. The only reference is to games children play and dancing.²³ Traditionally household tasks and gardening were done collectively: however, in urban environments women no longer take part in hard physical work, for example, working in the fields and the making of floors and/or plastering of walls. The urban black person therefore, still complies with some cultural habits and beliefs, but has a more sedentary lifestyle than their rural counterparts, and also follows a westernised diet.

Another important factor is that African people have a poor understanding of the concept of “chronic” disease.²² Patients with Type 2 DM therefore, have to be educated about their disease and their role in the management thereof.²⁴

JUSTIFICATION FOR THE RESEARCH

The patient with Type 2 DM is at risk of developing many complications related to their disease. Prevention and early screening for complications and early intervention are paramount for good diabetes care. Glycaemic control is fundamental to the management of diabetes. The goal is to achieve normal or near-normal glycaemia with an HbA_{1c} - goal of lower than 7%.²⁵ Lifestyle modification is recommended in all patients as part of the treatment of diabetes. They should follow a low cholesterol diet and be encouraged to exercise and to loose weight.²⁶

The American Diabetes Association²⁵ recommends a regular physical activity programme, adapted for any complications (if present), for all patients with diabetes who are able to participate in such activities. Category A-evidence also shows that combined diet and physical activity interventions are effective in people with diabetes in producing weight loss. Increasing physical activity has beneficial effects on metabolic control over and above the effect on body mass.⁷

Physical activity has been shown to be effective in improving hypertension, decreasing anxiety and depression. It also enhances feelings of well-being and improves performance of work.²⁷

The increasing prevalence and burden of Type 2 DM in South Africa compel health care providers to look at cost-effective ways to successfully manage the disease especially at primary care level.

There is therefore a need for research in the management of non-communicable diseases and their risk factors in the multicultural population of South Africa.²⁸

A literature review revealed gaps in the level of knowledge concerning the effectiveness of physical activity in the control of hyperglycaemia in the South African context, and especially with regard to the urban black Type 2 DM patients. Because of the increasing prevalence and burden of the disease, it was decided to address the gap in our knowledge with regard to the effect of exercise on the HbA_{1c} levels of black female diabetics residing in the suburb of Mamelodi.

THE PURPOSE OF THE STUDY

To establish the effectiveness of an exercise intervention on the change in baseline adjusted mean HbA_{1c} between an exercise and relaxation group after 12 weeks.

AIMS OF THE STUDY

The study was conducted in three phases. The data obtained in the first two phases were used to plan and implement the final phase, which was a randomised-controlled trial.

FIRST PHASE

The aim of this study was to obtain baseline data from female Type 2 DM patients on:

- General health status.
- Demographics.
- Knowledge of and attitudes towards diabetes and exercise.
- Current physical activity levels.

SECOND PHASE

The aims of this study were to:

- Investigate the personal and environmental barriers to doing exercise amongst black females with Type 2 DM residing in Mamelodi.
- Investigate the participants' knowledge and perceptions of exercise and the kind of exercise they wished to do.
- Establish the outcome expectations of performing physical activity in this sample of subjects.

FINAL PHASE

The aim of this phase was to establish the efficacy of an exercise intervention to decrease HbA_{1c} over a period of 12 weeks, in Type 2 DM black female subjects, aged 40 to 65 years.

Secondary outcomes were body mass index, walking distance, health-related quality of life and subjective experience of the subjects.

HYPOTHESIS

An exercise intervention will decrease the HbA_{1c} by 1% given a SD of 2.23% with $\alpha=0.05$ and $\beta=0.10$ in a sample of 144 female Type 2 DM patients, aged 40-65 years.

THE TYPE OF STUDY THAT WAS DONE

As previously mentioned, the study was conducted in three phases.

FIRST PHASE

Quantitative data were obtained:

- Demographic data were obtained by means of a questionnaire.
- Clinical data to establish the present health status were obtained by general examination of the patients for body mass index, blood pressure and HbA_{1c}-level.
- The Diabetes Knowledge Form C (DKNC) scale was used to measure the knowledge of the sample group.²⁹
- The Modified Baecke questionnaire on physical activity for older adults was used to measure the present physical activity status of the sample group.³⁰
- The attitudes of the sample were investigated by means of the Revised Diabetes Attitude Scale-III (DAS III).³¹

SECOND PHASE

Demographic and qualitative data were obtained. Demographic data were obtained by means of a questionnaire.

The phenomenological approach by means of focus group interviews was used to:

- Investigate the participants' personal and environmental barriers to doing exercise.

- Investigate the participants' knowledge and perceptions of exercise and the kind of exercise they wanted to do.
- Establish the outcome expectations of performing physical activity in this sample of subjects.³²

FINAL PHASE

A single blind, randomised controlled clinical trial design was used for the final phase of the study. The two groups only differed with respect to exercise prescribed.

Subjects, who arrived for the baseline test, were randomised into either an exercise group or a relaxation group by means of block randomisation by computer.³³ (<http://www.randomisation.com>)

DEFINITIONS

Key concepts around which the study was built are defined in Appendix A. The terms were defined according to the meaning that will be attached to them for the purposes of this study.

OUTLINE OF THE THESIS

CHAPTER 2

The literature that has been reviewed is presented.

CHAPTER 3

In this chapter the study conducted in the first phase of the research is presented. The research question asked was: "What is the knowledge of, attitudes towards their disease and current physical activity levels of urban female patients with Type 2 DM residing in Mamelodi?"

CHAPTER 4

The methodology and results of the study of personal and environmental barriers to performing physical activity, as well as the outcome expectations of the study population are presented in this chapter. This was the second phase of the research. The question addressed was: "What are the personal and environmental barriers to and outcome expectations of performing physical activity of urban black female patients with Type 2 DM in Mamelodi?"

CHAPTER 5

The research question for the final and third phase of the research was: "What is the effectiveness of a twelve week exercise intervention to decrease the HbA_{1c} in a sample of black female Type 2 DM patients residing in Mamelodi?" Data on the secondary outcomes of this study, namely walking distance, body mass index, health-related quality of life and subjective experience of the subjects are also presented in this chapter.

CHAPTER 6

The thesis is concluded with chapter six. New knowledge obtained from the three phases of the study will be highlighted. The value of the findings of the research and limitations of the study will also be discussed.

CHAPTER 7

Recommendations for future research in the field of exercise for Type 2 DM are made.