

# Undergraduate physiotherapy students' knowledge of Diabetes Mellitus: Implications for education

**ABSTRACT:** *Diabetes mellitus is a growing public health concern and its prevalence is escalating exponentially, with a high frequency of morbidity, premature mortality, disability and loss of productivity. Since health education has become an important part of medical care physiotherapy students are potentially well suited to assist with the combat of this disease. The study aimed to determine the knowledge of diabetes mellitus and its risk factors of undergraduate physiotherapy students in the Western Cape. The study incorporated a quantitative, cross-sectional design. Three hundred and thirty eight (338) students completed the structured, self-administered questionnaire consisting of three sections, namely socio-demographic information, diabetes mellitus risk factors and the validated 24-item Diabetes Knowledge Questionnaire (DKQ-24). Both descriptive and inferential statistics were employed and the alpha level was set at  $p < 0.05$ . Overall, 60.7% of the study sample had adequate knowledge of diabetes mellitus ( $\geq 75\%$  correct answers), while 32.5% and 6.8% had marginal ( $60 \leq 74\%$  correct answers) and inadequate knowledge ( $< 59\%$  correct answers) respectively. Seven of the nine diabetes mellitus risk factors could readily be identified by 89.7% of the participants. Smoking (64.8%) and high blood pressure (69.0%) were not readily identified as common diabetes mellitus risk factors. Significant associations with diabetes risk factors were found for gender and year of study. The study has reinforced the need for continuous education of physiotherapy students regarding diabetes mellitus and its risk factors, as inadequate knowledge of diabetes mellitus could influence the effectiveness of patient education and therefore have dangerous consequences for the patient diagnosed with diabetes mellitus.*

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**KEY WORDS:** DIABETES MELLITUS, RISK FACTORS, KNOWLEDGE, PHYSIOTHERAPY STUDENTS

## BACKGROUND

Diabetes mellitus, an international pandemic, is a growing public health concern and its prevalence is escalating exponentially, with a high frequency of morbidity, premature mortality, disability and loss of productivity (Steyn 2007) and high health care costs (Levitt et al 1999). The disease affected approximately 170 million individuals worldwide in the year 2000 and is estimated to be 366 million by the year 2030 (Wild et al 2004). Among these affected people, almost 85% burden is in developing countries (Nguma 2010). Although communicable diseases still contributes the most to disease burden, Murray and Lopez (1997) reported that by 2020 non-communicable diseases (NCDs), including hypertension and diabetes, will surpass communicable disease as a cause of death. This coincides with findings from the Western Cape Burden of Disease Report (2007) which stated that chronic diseases of lifestyle are the major cause of death in the Western Province.

South Africa has been noted to be undergoing a process of rapid epidemiological transition in terms of patterns of health and disease (Steyn et al 2000). The prevalence of diabetes mellitus in South Africa has increased drastically over the years (Somers et al 2006) due to population growth, ageing, urbanization, and an increase in prevalence of obesity and physical inactivity (Wild et al 2004). It has been estimated that approximately 1.5 million South African's are suffering from diabetes mellitus, a disease that ranks third in South Africa in terms of mortality and morbidity for the general population (Steyn 2007).

Moodley and Rambiritch (2007) state that the greatest weapon in the fight against diabetes mellitus is knowledge. Health education has become an important part of medical care. Health care professionals such as physiotherapists have an important role to play in increasing awareness of diabetes mellitus, disease prevention and health promotion. Physiotherapists are in an

inimitable position to educate patients regarding the prevention of risk factors such as obesity and physical inactivity (Anthony et al 2004) as well as improving the functional ability of patients with diabetes mellitus and lessen the chances of physical impairments (Ozdirenc et al 2004). Various studies conducted among general practitioners, medical students and nurses showed inadequate knowledge of diabetes mellitus (Holstein, Widjaja, Nahrwold & Egberts 2000; Hessel, Moran & Boulton 1989) as well as inadequate skills for education and treatment of patients with diabetes (Talat, Nabeel & Naeen 2003; Shera, Jawad & Basit 2002). No

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studies regarding physiotherapy students' knowledge of diabetes mellitus has been conducted in South Africa. While chronic diseases of lifestyle are a major challenge for health care professionals in the Western Cape, it is imperative that higher education training institutions are linking the knowledge of students to the needs of the community. Therefore, the overall aim of this study was to establish undergraduate physiotherapy students' knowledge of diabetes mellitus and its risk factors at three (3) universities in the Western Cape, South Africa.

## METHODS

Ethical clearance and permission were obtained from the relevant authorities. The study employed a cross-sectional, quantitative design. The population included 619 undergraduate physiotherapy students registered for the 2009 academic year at three universities in the Western Cape, South Africa. All students were invited to participate in the study. Data collection was during June/July 2009 in either a class setting or not. The participation rate of less than 55% could be attributable to the nature of two of the universities' curriculum, as specific time for completion of the questionnaire in a class setting could not be done as a result of some of the students being on holiday and others on clinical placements.

The purpose of the study was clearly explained to the participants at the beginning of each session. Questionnaires for the other two participating universities were left with the specific class coordinators. Students were contacted by the class coordinator and asked to complete the questionnaire after the purpose of the study was explained to them. Each participant received an information sheet explaining their voluntary participation, confidentiality of information obtained as well as their right to withdraw from the study at any time with no impunity. Signed, informed consent was obtained from each participant.

Data were collected by means of a structured, self-administered questionnaire consisting of three (3) sections. Section one requested socio-demo-

graphic information such as gender, age, institution, year of study, study year during which diabetes mellitus is taught at the university, family history of diabetes mellitus, diagnosed with diabetes mellitus and race/ethnicity (included for statistical purposes). Self-description was used for ethnicity classification. The self-constructed section two consisted of true or false responses to nine (9) diabetes mellitus risk factors. Section three consisted of the 24-item Diabetes Knowledge Questionnaire (DKQ-24), developed and validated by Garcia et al (2001). It has twenty-four (24) true and false statements relating to diabetes mellitus knowledge and has been used in several international studies (Chilton, Hu & Wallace 2006; Mauldon, Melkus & Cagganello 2006). The DKQ-24 has demonstrated internal consistency with a reliability coefficient of 0.78. The questionnaire was piloted on ten (10) physiotherapy students to assess face validity and applicability of all the items for this population as well as the time it took to be completed. Only a few grammatical changes were made to section 1 and 2 before the final questionnaire was administered to the study sample.

Data obtained from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16.0. The data were subjected to both descriptive and inferential statistics. Demographic data were expressed as percentages, means and standard deviations. Data analysis included cross-tabulations using the Chi-square test for association between socio-demographic and specific variables (knowledge of diabetes mellitus and its risk factors). The alpha level was set at  $p < 0.05$ .

## RESULTS

Three hundred and fifty one (351) participants completed and returned the questionnaires. Only those questionnaires ( $n=338$ ) with fully completed sections 2 (diabetes mellitus risk factors) and sections 3 (DKQ-24) were included in the data analysis. Therefore thirteen (13) questionnaires were excluded.

Thus the final response rate was 54.6% (338/691). The low response rate was a concern but other college studies have also obtained participation rates of approximately 50%, so the present response rate is not out of line (Reifman & Watson 2003). The final sample consisted of 82.0% ( $n=277$ ) females and 18% ( $n=61$ ) males with a mean age of 20.80 years ( $SD=2.02$ ). The university representations were relatively equal in participation with 30.2% from University A, 32.5% from University B and 37.3% from University C. More than half of the students (63.6%) reported that they did not have a family history of diabetes mellitus.

## KNOWLEDGE OF DIABETES MELLITUS

The following criteria for knowledge categories were used: inadequate for  $\leq 59\%$ , marginal  $\geq 60-75\%$  was and adequate for  $\geq 76\%$  correct answers (Williams et al 1998). Overall, 60.7% of the study sample had adequate knowledge, 32.5% had marginal knowledge and 6.8% had inadequate knowledge of diabetes mellitus. Table 1 presents the responses to the 24-item Diabetes Knowledge Questionnaire (DKQ-24). Participants could select 'True' or 'False' for the different statements. The majority of the participants (97.3%) knew that there are two main types of diabetes. Furthermore, 96.4% of the participants agreed that the usual cause of diabetes is lack of effective insulin in the body. More than two thirds (66.9%) of the participants did not know that diabetic patients should cleanse a cut with iodine and alcohol and 60.9% did not know that eating too much sugar and other sweet foods is not a cause of diabetes.

Seven of the 24-item DKQ questions had significant associations with the year of study, as illustrated in Table 2. Significantly more of the 1<sup>st</sup> year participants had incorrect responses to the abovementioned seven diabetes knowledge items. This concurs with the significant association found between categories of knowledge of diabetes mellitus and year of study as significantly more 1<sup>st</sup> year students ( $\chi^2 = 42.048$ ,

**Table 1: Responses to the 24-item Diabetes Knowledge Questionnaire (n=338)**

Questions	Correct (%)	Incorrect (%)
Eating too much sugar and other sweet foods is a cause of diabetes. (False)	39.1	60.9
The usual cause of diabetes is lack of effective insulin in the body. (True)	96.4	3.6
Diabetes is caused by failure of the kidneys to keep sugar out of the urine. (False)	75.4	24.6
Kidneys produce insulin. (False)	88.2	11.8
In untreated diabetes, the amount of sugar in the blood usually increases. (True)	92.6	7.4
If I am diabetic, my children have a higher chance of being diabetic. (True)	88.8	11.2
Diabetes can be cured. (False)	88.5	11.5
A fasting blood sugar level of 11.5 mmol/l is too high. (True)	85.2	14.8
The best way to check my diabetes is by testing my urine. (False)	52.7	47.3
Regular exercise will increase the need for insulin or other diabetic medication. (False)	75.7	24.3
There are two main types of diabetes: Type 1 (insulin-dependent) and Type 2 (non-insulin-dependent). (True)	97.3	2.7
An insulin reaction is caused by too much food. (False)	74.6	25.4
Medication is more important than diet and exercise to control diabetes. (False)	83.1	16.9
Diabetes often causes poor circulation. (True)	92.0	8.0
Cuts and abrasions on diabetics heal more slowly. (True)	94.1	5.9
Diabetics should take extra care when cutting their toenails. (True)	83.4	16.6
A person with diabetes should cleanse a cut with iodine and alcohol. (False)	33.1	66.9
The way I prepare my food is as important as the foods I eat. (True)	92.9	7.1
Diabetes can damage my kidneys. (True)	84.9	15.1
Diabetes can cause loss of feeling in my hands, fingers, and feet. (True)	87.3	12.7
Shaking and sweating are signs of high blood sugar. (True)	71.3	28.7
Frequent urination and thirst are signs of low blood sugar. (False)	43.8	56.2
Tight elastic hose or socks are not bad for diabetics. (False)	72.5	27.5
A diabetic diet consists mostly of special foods. (False)	47.9	52.1

$p=0.000$ ) had inadequate knowledge of diabetes mellitus. This finding is not exceptional as all three universities only cover the diabetes topic in the 3<sup>rd</sup> and 4<sup>th</sup> year of their curriculum. Furthermore, significantly more participants from University A (14.7%) than University B (1.8%) and University C (4.8%) had inadequate knowledge of diabetes mellitus ( $p=0.002$ ).

No significant association were found between knowledge of diabetes mellitus and having a family history of diabetes mellitus ( $n=6$ ) and being diagnosed with diabetes mellitus ( $n=2$ ) respectively.

#### **KNOWLEDGE OF DIABETES MELLITUS RISK FACTORS**

The majority of the students were able to identify obesity (95.6%), unhealthy diet (96.2%), impaired glucose levels (93.8%), raised fasting blood glucose levels (94.7%) and high cholesterol (75.1%) as risk factors for diabetes mellitus. In contrast smoking (64.8%) and high blood pressure (69.0%) were not readily identified as common risk factors of diabetes mellitus, as illustrated in Table 3.

A significant difference was found between knowledge of risk factor items

and gender, with females more likely to identify an unhealthy diet ( $\chi^2 = 10.981$ ,  $p=0.027$ ) and obesity ( $\chi^2 = 18.786$ ,  $p=0.016$ ) as risk factors for diabetes mellitus. Furthermore, significantly more 1<sup>st</sup> year students did not identify smoking ( $\chi^2 = 25.230$ ,  $p=0.000$ ), while 2<sup>nd</sup> year students did not identify increased blood pressure ( $\chi^2 = 20.310$ ,  $p=0.002$ ) as risk factors for diabetes mellitus respectively.

**Table 2: Significant associations between year of study (1<sup>st</sup> year) and knowledge of diabetes mellitus**

Question	1 <sup>st</sup> year (%)	2 <sup>nd</sup> year (%)	3 <sup>rd</sup> year (%)	4 <sup>th</sup> year (%)
<b>Diabetes is caused by failure of the kidneys to keep sugar out of the urine.</b> True False (correct answer)	43.6 56.4 <b>p=0.000</b>	15.8 84.2	14.9 85.1	21.1 78.9
<b>Kidneys produce insulin.</b> True False (correct answer)	30.9 69.1 <b>p=0.000</b>	3.0 97.0	3.0 97.0	7.9 92.1
<b>Regular exercise will increase the need for insulin or other diabetic medication.</b> True False (correct answer)	36.2 63.8 <b>p=0.012</b>	17.8 82.2	23.9 76.1	18.4 81.6
<b>Cuts and abrasions on diabetics heal more slowly.</b> True (correct answer) False	84.0 16.0 <b>p=0.000</b>	98.0 2.0	98.5 1.5	97.4 2.6
<b>Diabetics should take extra care when cutting their toenails.</b> True (correct answer) False	64.9 35.1 <b>p=0.000</b>	86.1 13.9	94.0 6.0	93.4 6.6
<b>Diabetes can cause loss of feeling in my hands, fingers, and feet.</b> True (correct answer) False	76.6 23.4 <b>p=0.003</b>	91.1 8.9	94.0 6.0	89.5 10.5
<b>Shaking and sweating are signs of high blood sugar.</b> True (correct answer) False	53.96 46.1 <b>p=0.000</b>	77.2 22.8	67.2 32.8	81.9 18.1

**Table 3: Distribution of knowledge of DM risk factors**

Risk factor	Yes		No	
	n	%	n	%
High cholesterol	254	75.1	84	24.9
High fasting glucose levels	295	87.3	43	12.7
Impaired glucose levels	317	93.8	21	6.2
Raised blood glucose levels	320	94.7	18	5.3
<b>High blood pressure</b>	233	68.9	105	<b>31.1*</b>
<b>Smoking</b>	219	64.8	119	<b>35.2*</b>
Physical inactivity	289	85.5	49	14.5
Unhealthy diet	325	96.2	13	3.8
Obesity	323	95.6	15	4.4

\*not readily identified as a risk factor for diabetes mellitus

## DISCUSSION

It is estimated that 70% of patients with diabetes are living in developing countries (Ghazanfari, Ghofranpouri, Tavafian, Ahmadi & Rajab 2007). Diabetes mellitus is currently ranked 5<sup>th</sup> in the Western Cape Province, South Africa as cause of premature mortality (Western Cape Burden of Disease Reduction Project: Final Report 2007). Due to the projected increase in the prevalence of diabetes mellitus in the next twenty years, the importance of early detection and primary prevention cannot be stressed enough (Nisar et al 2008). The rising morbidity and mortality related to non-communicable diseases such as diabetes mellitus have major implications for the delivery of healthcare services. Increased awareness and knowledge of modifiable diabetes risk factors could be used to stem the present diabetic epidemic globally (Mayer-Davis 2008). Physiotherapists, as part of the multi-disciplinary team, are in many cases the first line practitioner and key source of information for patients suffering from diabetes mellitus (Garcia et al 2001). During their university training physiotherapy students are equipped with knowledge regarding prevention of diabetic complications by modification of risk factors such as obesity and physical inactivity, education on wound care as well as functional retraining after amputations (University of the Western Cape, 3<sup>rd</sup> year Physiotherapy Curriculum).

Williams et al (1998) stated that patient education plays a key role in the prevention and control of the adverse health effects of CDLs such as diabetes mellitus with knowledge of risk factors as well as the nature of the disease remaining the most important goals of diabetes mellitus education programmes. This study highlights that physiotherapy students demonstrate average knowledge of diabetes mellitus and its risk factors with almost forty percent (39.3%) of the participants having inadequate to marginal knowledge of diabetes mellitus. This could have a negative impact on the knowledge the students convey to their patients.

Acknowledgement of the risk factors of diabetes mellitus plays a pivotal role in its prevention. Rajaram (2007) states that the increased prevalence of diabetes mellitus in the South African population could be associated with risk factors being poorly monitored and prevented. It is of utmost importance that physiotherapy students should be able to identify well-known risk factors for diabetes mellitus in order to correctly inform their patients regarding the modifiable risk factors. The levels of knowledge of diabetes risk factors of the participants are promising as seven of the nine risk factors were readily identified by 89.7% of the participants. These results coincide with a study among medical students where 95% of the clinical students and 86% of the pre-clinical students have significant knowledge of the risk factors of diabetes mellitus (Mumtaz, Ashfaq & Siddiqui 2009).

Prevention is always better than cure. The benefits of exercise in diabetes prevention and management has been proven in several studies (Gill & Cooper 2008; Mayer-Davis 2008). The results of this study is promising as 83.1% of the students know about the key role physical activity plays in the prevention of diabetes and its complications.

The divergence in knowledge of diabetes mellitus between the participating universities can be due to the difference in the content of the module as well as teaching styles (didactic vs problem-based learning). The current curricula of the participating universities focus mainly on individual patient and disease management, aiming at preventing disease deterioration of the condition. Due to the rapid increase of diabetes mellitus cases globally, it will be impossible to manage all those affected with diabetes mellitus individually (Hjelm, Mufunda, Nambozi & Kemp, 2003). This means that measures have to be directed against the development of the disease, thus focusing on the healthy person. Preventive activities must be aimed at the entire society via community intervention programmes, and need to be integrated with measures directed against other diseases such as

hypertension and cardiovascular disease. Therefore the universities should move away from the 'individual disease management approach' to a population-based approach.

## LIMITATIONS AND RECOMMENDATIONS OF THE STUDY

The findings are relevant to students of the three universities in the Western Cape only and cannot be generalized to students of other South African universities. However, the present findings lay the groundwork for similar studies amongst health science university students. Lastly, casual deductions cannot be made about the results gained as the study utilized a cross-sectional study design.

## CONCLUSION

Knowledge of diabetes mellitus and its risk factors are essential for primary healthcare in order to prevent co-morbidities that can increase the burden of the disease. Although the results of the study revealed that almost 60% of the undergraduate physiotherapy students in the Western Cape have adequate knowledge of diabetes mellitus, some areas are still lacking. The lack of basic knowledge could influence the effectiveness of patient education and therefore have dangerous consequences for the patient diagnosed with diabetes mellitus. The physiotherapy curricula should include a sound knowledge base about diabetes mellitus and its management, as well as population-based health promotion programmes for patients with diabetes (prevention of possible complications) and health promotion activities to raise awareness among healthy people (prevention of the disease).

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