Obesity: A preliminary report of an introductory service-learning course on the role of pharmacy students in health promotion

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ABSTRACT

Lifestyle diseases such as obesity have been neglected in developing countries partly due to a more urgent focus on infectious diseases in these countries. The incidence of obesity is on the increase in developing countries, with a marked rise in childhood obesity. A health promotion activity employing service-learning principles required final year pharmacy students to prepare a pilot-tested computer-based quiz, using a pre- and post-intervention test design, along with other learning material, for participants at the 2007 Sasol National Festival of Science and Technology (SciFest). Interactive models, posters and information leaflets were used in explaining the prevention and control of obesity to learners. The results showed that the pre-existing knowledge of the participants was good. There was a further improvement after the educational intervention. Activities such as this are important in heightening awareness of obesity in learners as it is likely to reduce the incidence of obesity later in life. Furthermore, the activity also served to increase awareness of the role of pharmacists in the prevention of lifestyle diseases such as obesity.

OPSOMMING

Leefwysesiektes soos obesiteit word verwaarloos in ontwikkelende lande weens die fokus op aansteeklike siektes. Voorvalle van obesiteit het verdriedubbel in ontwikkelende lande, met 'n skerp styging in kinderobesiteit. Die huidige gesondheidsprogram bied 'n indiensopleidingskursus aan, waar finalejaar-aptekerstudente 'n loodsprogram aanbied met behulp van 'n rekenaar vasvraprogram waar 'n voor- en na-toets saam met ander leermateriaal gebruik word vir bywoners van die 2007 Sasol Nasionale Wetenskapfees. Interaktiewe modelle, plakkate en inligtingspamflette is as hulpmiddels gebruik om die voorkoming en beheer van obesiteit aan leerders te illustreer. Die resultate het gewys dat die kennis van die deelnemers goed was. Dit het ná opvoedkundige raadgewing verder verbeter. Projekte soos hierdie is belangrik om leerders van obesiteit bewus te maak, aangesien dit baie moontlik die voorkoms van obesiteit later in deelnemers se lewens kan verminder. Die projek poog verder om bewustheid oor die rol wat aptekers in die voorkoming van leefwysesiektes soos obesiteit kan speel, te verhoog.

INTRODUCTION

Obesity is one of the Chronic Non-Communicable Diseases (CNCDs) resulting in a public health problem which contributes significantly to increasing morbidity and mortality (WHO/FAO 2003). The World Health Organization's (WHO) projections indicate that a global estimate of 400 million obese people in 2005 is expected to increase to 700 million by 2015 (WHO 2006). Though the rates of obesity have tripled in developing countries in the past 20 years, this growing challenge has not been addressed proactively. Instead, there is continued adoption of Western lifestyles associated with decreased physical activity and over-consumption of cheap energy-dense food (Hossain, Kawar & El Nahas 2007; WHO 1998).

Improvements in the standard of living, especially in developing countries, have resulted in sedentary lifestyles characterised by over-nutrition and reduced physical activity, culminating in a positive energy balance and increased body weight (Lau *et al.* 2007). Obesity is a major problem especially among adult women in developing countries (WHO 1998). Studies show that urbanised African communities have a higher incidence of obesity and are less prudent in their choice of diet than their rural counterparts (Puoane *et al.* 2002). Increasing urbanisation associated with development and rural-urban migration is likely to have a major impact on the obesity epidemic in South Africa. Traditional and cultural perceptions regarding body size further complicate the prevention and management of obesity since being overweight is considered a reflection of success and affluence among Africans (Bradshaw *et al.* 2003).

The rapid worldwide increase in childhood obesity is a challenge because obese children tend to mature into obese adults. Prevention of childhood obesity is a public health priority because obesity-related health problems now occur at a much earlier age and progress into adulthood. Furthermore, excess body weight is a key risk factor for CNCDs such as hypertension, diabetes, coronary heart disease and stroke. Obesity is one of the key factors contributing to high mortality in developing and developed countries, adding to the burden of diseases (WHO 2002).

Thus, education of health professionals, particularly pharmacists, should include knowledge and skills with respect to the prevention of obesity (Lau *et al.* 2007). Health promotion is an integral component of pharmaceutical care which requires pharmacists to be patient- rather than product-focused. Health promotion seeks to foster conditions enabling populations to be healthy and to make healthy choices. Service-learning is an effective teaching and learning method which can be used in providing health promotion opportunities for future pharmacists in the management of lifestyle diseases.

Service-learning is a credit-earning educational experience in which students participate in an organised service activity that meets identified community needs. Such learning should encourage students to reflect on the service activity in such a way as to gain further understanding of course content, a broader

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TABLE 1
Assessment of acceptability of quiz and interactive presentation

ASSESSMENT QUESTIONS	RESPONSES		
How easy was it to read the questions/quiz?	Easy		Average
	36		3
What did you think of the sentences in the question/quiz?	Right		Too short
	36		3
Are there any words that you did not understand in the quiz?	No	A few	Many
	22	16	1
Did you learn anything new by listening to the presentation?		Yes	
		39	
Did you like having pictures in the presentation?	Yes		No
	9		Unanswered
Do you think the pictures helped you understand and remember the information better?	Yes		Unanswered
	38		1
Are there any words that you did not understand in the presentation (Intervention slides)?	No	A few	Unanswered
	17	18	4
Was the presentation too long?	Yes		No
	2		37
Did you have fun while listening to the presentation?	Yes		No
	38		1

appreciation of the discipline, and an enhanced sense of civic responsibility (Bringle & Hatcher 1996). In addition to ongoing student reflection, equal benefit to both the community and the student is another inherent characteristic of service-learning (Eyler & Giles 1999).

In response to these requirements, members of the Faculty of Pharmacy, Rhodes University, South Africa used the opportunity provided by the 2007 Sasol National Festival of Science and Technology (SciFest) to design a service-learning health promotion elective for final year pharmacy students aimed at creating awareness of priority health conditions such as obesity among the SciFest attendees (Karekezi *et al.* 2007). SciFest provided an opportunity to carry out a pre- and post-intervention activity to raise awareness of obesity and prevention in learners attending SciFest 2007.

METHOD

With facilitators' inputs, three final year pharmacy students designed an interactive computer-based quiz to assess the level of knowledge of obesity amongst SciFest participants. As the attendees of SciFest vary widely in age, it was decided to design a quiz for learners in the age range 11-15 years since it is this group which is likely to adopt certain lifestyles into adulthood. In addition, a quiz for this age range should also be comprehensible by others on either side of the aforementioned age range.

To ensure a successful outcome, the quiz was piloted on 39 Grade 6 learners at an independent school to assess its suitability, level of difficulty and comprehensibility for the intended participants. The quiz was designed to assess pre-intervention knowledge of obesity and its prevention. Thereafter, information about obesity was provided. The responses of the pilot-test participants' assessment questions are shown in Table 1. Using the information from the pilot-test, changes were made to the quiz. The quiz was then adapted to a specially designed computer programme, BKnow®, to be used at SciFest. The BKnow presenter software was used to integrate multiple-choice questions into a Microsoft PowerPoint presentation. The quiz slides were designed such that Scifest participants chose one of the options on each slide. Each possible option was tagged with a pop-up consequence: congratulatory for a correct choice or an explanation as to why the chosen option was incorrect. Demographic data of respondents and responses to the quiz were logged as Extensible Markup Language (XML). For the analysis of the logged XML, an interpreter was written in Python. This produced tables of responses which were analysed statistically.

SciFest 2007 featured 568 events over seven days with 45 223 visitors (SciFest 2007). The sample frame for this health promotion activity consisted of learners attending SciFest. All attendees who voluntarily visited this exhibit were invited to take part in the computer-based quiz and interact with exhibitors.

The pre-and post-testing using the quiz was an independent activity and was done sequentially by the participants. The pre-intervention question slides of the quiz on the computer screen were followed, without interruption, by the educational 'intervention' slides addressing the questions posed during the pre-intervention. The educational 'intervention' slides were designed to be immediately followed by the post-intervention slides which comprised the same set of questions as in the pre-intervention. The quiz was designed to show the participants their scores for the number of correct responses to both pre- and post-intervention questions.

To raise awareness of obesity prevention amongst SciFest attendees, the pharmacy students also designed and built two interactive models to explain the link between food intake and obesity. These interactive models were specifically designed for SciFest participants who could not take the quiz due to lack of reading readiness and/or language proficiency. However, any attendee was free to explore the models especially since the purpose of these was to promote a healthy lifestyle. The first of the models was a 'traffic light' model built from cardboard. Three holes were cut out on the front of the 'traffic light'. The circumferences of the holes were painted red, orange and green respectively. This model was used by the SciFest participants to classify foods. Participants were shown pictures of various foods and were asked to put the healthy foods that should be eaten often in the green opening, foods that should be eaten in moderation in the orange opening and unhealthy foods that should be avoided, in the red opening.

The second model was a 'food-group pyramid' jigsaw puzzle made from wood. The puzzle pieces were cut into sizes correlating with the proportion of each food group necessary to meet recommended daily requirements for that food group. Successful completion of the puzzle was designed to provide SciFest participants with some indication of the recommended daily dietary requirements for each food group. SciFest participants were instructed on how to use these models. The entire process was monitored by the three final year pharmacy students, a SciFriend who served as an isiXhosa[1] interpreter and the course facilitators using structured interactions with the participants.

The pharmacy students also prepared a poster and an information leaflet on obesity. The information leaflet contained tips on healthy living and guidance for establishing vegetable gardens at home. It was designed to reach a broader audience

1.The main local language in the Eastern Cape, South Africa.

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TABLE 2
Frequencies and percentages of correct answers (n=157)

QUESTION	FREQUENCY	PERCENTAGE
Is obesity being too fat or too thin?	135	86.0
Can obesity cause other health problems?	143	91.1
Can children be obese?	141	89.8
Which group of pictures shows healthy foods?	144	91.7
Which activities are good for you?	147	93.6
If I do not exercise and do not eat healthy food, could I be unhealthy and get fat?	144	91.7
If I start eating healthily and exercising now, will I be healthier when I am older?	145	92.4
Does the food you eat get changed in your body to energy that is used to learn and play?	150	95.5
If you eat too much and do not use energy, will you get fat?	138	87.9

TABLE 3
Observed frequencies and percentages of correct responses for the pre- and post-intervention questions, and the means ± standard errors of pre- and post-intervention percentage scores (n=146)

QUESTION	PRE-INTERVENTION	POST-INTERVENTION	P-VALUE (1-SIDED)
Is obesity being too fat or too thin?	129 (88.4%)	132 (90.4%)	0.309
Can obesity cause other health problems?	134 (91.8%)	136 (93.2%)	0.401
Can children be obese?	134 (91.8%)	136 (93.2%)	0.377
Which group of pictures shows healthy foods?	136 (93.2%)	142 (97.3%)	0.054
Which activities are good for you?	136 (93.2%)	144 (98.6%)	0.019*
If I do not exercise and do not eat healthy food, could I be unhealthy and get fat?	134 (91.8%)	140 (95.9%)	0.090
If I start eating healthily and exercising now, will I be healthier when I am older?	139 (95.2%)	142 (97.3%)	0.254
Does the food you eat get changed in your body to energy that is used to learn and play?	139 (95.2%)	143 (97.9%)	0.145
If you eat too much and do not use energy, will you get fat?	131 (89.7%)	137 (93.8%)	0.090
Mean ± s.e.	92.2 ± 1.3%	95.3 ± 0.9%	0.001**

* = Significant at 5%, ** = Significant at 1%.

and was thus available in English and isiXhosa to all visitors of the exhibit including those who participated in the quiz. This leaflet did not constitute part of the quiz intervention but instead served as a take-home information leaflet to share with family and friends.

The participants who visited this health promotion exhibit were free to explore the models under supervision, and had access to information about obesity from the poster (either from exhibitors or by reading the poster themselves) and also by reading the information leaflet. Activities related to exploring models and obtaining information from posters were independent of each other and also independent of taking the computer-based quiz.

This activity was an attempt to promote health with a focus on obesity from a health promotion perspective rather than from a research angle. Personal information was not collected and invasive methods were not used on the participants. This activity was, however, conducted based on the Pharmaceutical Care elective for final year pharmacy students which has the approval of Rhodes University's Faculty of Pharmacy.

RESULTS

Feedback provided by pilot-test participants for the quiz and interactive presentation is shown in Table 1.

Comments were made by learners during the pilot-test. 25 learners did not understand the word 'chronic', 10 did not understand the word 'hypertension', and eight did not understand the word 'acute'. Other words that learners in the pilot study highlighted as difficult were: 'pulses', 'grains', 'equation', 'globally', 'calcium', 'overweight', 'delicious' and 'intervention'. While optimising the quiz for SciFest participants, definitions or explanation of words not understood by pilot-test participants were provided. For example, 'pulses' was explained as 'seeds that you can eat'.

Dependent t-tests on test percentage scores and McNemar χ^2 tests on the percentage of correct answers obtained for each question before and after intervention were used to assess whether the intervention made a difference in the understanding of obesity and the concepts of a healthy lifestyle. Independent t-tests and ANOVA procedures were performed to test for age, gender and type of school effects on test percentage scores before and after the intervention. All tests were performed using Statistica© (StatSoft Inc. 2007) and significance was set at the 0.05 level.

The demographics of the participants were captured in the first five questions of the quiz, in which 157 participants participated. The results obtained show that 98 participants (62.4%) were between the ages of 11 and 15 years, 27 (17.2%) participants were between the ages of 16 and 18 years, 23 participants (14.6%) were between 6 and 10 years old, and 9 (5.7%) were older than 19 years. Of the total number, 72 (45.9%) were female and 85 (54.1%) were male. Regional distribution shows that 142 (90.4%) were from the Eastern Cape. The remainder were from other South African provinces. The demographics show that 91 participants (58%) attended a government school, 50 (31.8%) attended an independent school, 3 had not commenced with their schooling and 11 had completed school.

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The first knowledge assessment involved determining the number of participants who knew what a chronic disease is. Of these, 93 participants (59.2%) answered correctly and the remainder of 64 (40.8%) answered incorrectly.

Pre-intervention results

The results from the pre-intervention questions are shown in Table 2. The results of the pre-intervention study show that the participants had good prior knowledge of obesity, its effects and how it can be prevented. The question with the lowest correct percentage score was 'Is obesity being too fat or too thin?' for which 86.0% of the participants answered correctly (Table 2).

Comparison of pre- versus post-intervention results

93.0% (n=146) of the participants who answered the pre-intervention questions continued through to the post intervention questions. McNemar's dependent chi-square test was used and the results are shown in Table 3.

The intervention resulted in a significant increase in correct responses to 'Which activities are good for you?' (P=0.019) and a markedly significant improvement in the participants' overall percentage scores (P=0.001).

The results show an increase between the pre- and post-intervention mean percentage scores for males (pre: 89.8 ± 1.9%; post: 93.8 ± 1.4%) and females (pre: 92.6 ± 1.5%; post: 97.1 ± 0.9%). The results show no significant gender differences for either pre- or post-intervention mean percentage scores (pre: Male: 89.8 ± 1.9%, Female: 92.6 ± 1.5%; post: Male: 93.8 ± 1.4%, Female: 97.1 ± 0.9%; P > 0.05). Significant differences in mean percentage scores were found between participants from government and independent schools both before (pre: Government: 88.4 ± 1.9%, Independent: 96.9 ± 0.9%; t=3.17, df=139, P=0.002) and after (post: Government: 93.2 ± 1.4%, Independent: 99.1 ± 0.6%; t=3.12, df=130, P=0.002) intervention. Pre- and post-intervention mean percentage scores were greater in the older participants. The age effect, however, was not significant. The mean standard error scores of the participants in the age groups are: '6 to 10 years' (pre: 88.4 ± 2.7%; post: 95.5 ± 2.0%), '11 to 15 years' (pre: 89.8 ± 1.8%; post: 93.8 ± 1.3%), '16 to 18 years' (pre: 95.9 ± 1.8%; post: 98.7 ± 0.7%), and '19 years or older' (pre: 97.5 ± 1.6%; post: 100.0 ± 0.0%) (ANOVA: pre: F=1.82, df=3, 153, P=0.145; post: F=1.88, df=3, 142, P=0.135).

DISCUSSION

SciFest provides an ideal opportunity to target learners in various age groups with respect to interventions in health promotion for different health conditions such as obesity. The present study takes advantage of this opportunity because such interventions in early life are known to have positive outcomes later in life.

The results show that pre- and post-intervention mean percentage scores were higher in the older participants although the age effect was not significant. This would imply that the intervention is able to deliver the message in a way that is understandable across the age groups. 62% of the participants were of the age range 11-15 years and their scores increased from 89.8% pre- to 93.8% post-intervention.

The prevalence of obesity in South Africa's adult population across all racial groups is 57% for women and 29% for men (Van der Merwe & Pepper 2006). Amongst South African children aged 13 to 19 years, the prevalence of obesity is 17% and 4% respectively (Medical Research Council 2003). In women, obesity sets in at an early age and 10% of women are obese at 15 to 24 years (Puoane *et al.* 2002). The increasing prevalence of obesity in children, especially girls (Van der Merwe & Pepper 2006; Monyeki, van Lenthe & Steyn 1999), requires that health promotion is targeted at this population group. Even though 46% of our participants were females, the gender effect was not statistically significant. The pre-intervention scores of female participants, however, were higher than those of the males: 96.2% compared to 89.8%.

An interesting observation is that 58% of the participants attended government-funded schools compared to 31.8% from independent schools. There was a significant difference in both the pre- and post-intervention mean percentage scores between participants from government-funded and independent schools, with the latter group scoring higher. This result may be expected from the differences in facilities and human resources available in the types of school. The average ratio of pupils to teacher in government-funded schools is 32.6 to one, compared to 17.5 to one in independent schools (South Africa.info 2006). The lower pupil to teacher ratio in independent schools (UNESCO Institute for Statistics) may contribute to the better performance of these students in this quiz. The lack of physical education facilities in government-funded schools and the historic absence of these in disadvantaged communities (Medical Research Council 2003; Bourne, Lambert & Steyn 2002) may also contribute to these participants' lower mean scores on the quiz.

With regard to the comprehension of terminology, only 59% of the participants understood the term 'chronic disease'. For the nine pre-intervention questions attempted by 157 participants, scores were below 90% only for three questions (Table 2). The response to the three questions (Table 2) demonstrates that these participants were not able to identify obesity as a health problem; the consequences of an imbalance in energy intake and expenditure; and that childhood obesity can occur. Emphasis on primary healthcare delivery instead of prevention has dominated the healthcare system in South Africa, resulting in fragmented health promotion activities (Bourne *et al*. 2002). In Grahamstown, a lack of resources such as materials, time and manpower results in inadequate health promotion in public sector primary health care clinics (Shiri *et al.* 2007). This is evidenced by the current percentage (58%) of unfilled positions in the healthcare sector of the Makana Local Services Area (Department of Health 2006). This high vacancy percentage is likely to impact negatively on the quality of care offered to patients because healthcare professionals are overburdened with the management of acute and infectious diseases. They therefore have little time for prevention activities and implementation of government policies.

The question 'Which activities are good for you?' posed in the quiz resulted in a statistically significant improvement in the percentage of correct responses after the intervention. Nutritional transitions are likely to accompany changes in social, economic and physical environment. These include consumption of energy-dense foods, foods low in fibre, increased intake of sugar and sweetened drinks, a decrease in physical activity and a more sedentary lifestyle. These factors are further facilitated by globalisation of food markets; limited time and space available at school for play; and the increasing adoption of Western diets by families (Doak *et al.* 2006). This, coupled with the challenges of obesity management in South Africa due to the positive values ascribed to obesity by the black population, requires culturally sensitive interventions. These interventions may be more successful when targeted at the youth, who are likely to be more amenable to lifestyle changes (Puoane *et al.* 2002; Haskins, Paxson & Donahue 2006). Such interventions would encourage children to adopt healthy lifestyles from an early age (Kruger *et al*. 2005).

The results show that among the participants there is already a body of knowledge regarding obesity, its effects and how it can be prevented. However, knowledge of health risk does not necessarily lead to a reduction in risk-taking behaviour (Padgett & Biro 2003). In addition, risk to personal safety and increased prevalence of urban violence in South Africa may discourage engagement in physical activity (Bourne *et al*. 2002).

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Lack of sporting facilities and cultural belief obesity is a sign of prosperity may further discourage physical activity (Kruger *et al*. 2005).

The burden of disease estimates for South Africa showed that 21% of the disease burden is attributable to CNCDs, compared to the 25% attributable to infectious diseases (Bradshaw *et al.* 2003). Despite the serious challenges of obesity, the WHO resolution on diet, physical activity and health was adopted by member states only in 2002 (WHO 2004). Obesity in South Africa has developed largely unchecked initially because of the assumption that obesity is without consequence in the black population (Walker *et al.* 1990). In addition, the focus of the current healthcare system is the eradication of infectious diseases and under-nutrition rather than lifestyle diseases (Kruger *et al*. 2005). These factors, coupled with cultural beliefs regarding body size, may have contributed to the obesity epidemic amongst the black population and the development of co-morbid conditions such as hypertension, glucose intolerance and diabetes (Van der Merwe & Pepper 2006).

Whilst the control of infectious disease is very important, continued focus on this in developing countries results in a greater likelihood of death from preventable CNCDs. Until the current global focus changes from treatment to prevention, developing countries will continue to bear the cost of CNCDs which have increased to a large extent (Anderson & Chu 2007). Though the reality of competing demands for resource allocation results in difficult public health policy options, more intensive efforts are required in the promotion of healthy lifestyles (Bourne *et al*. 2002). Focus on education and addressing environmental and societal factors to support behaviour change are suggested as strategies to reduce the incidence of obesity in South Africa (Kruger *et al*. 2005).

The incidence of obesity is known to increase in concert with increased westernisation. South Africa and other developing countries have not escaped this, as evidenced by the increasing morbidity and mortality caused by CNCDs such as obesity. Should the health sector focus continue to ignore CNCDs in favour of infectious diseases, the mortality due to CNCDs in developing countries could surpass that of developed countries.

LIMITATIONS

Several obstacles were encountered while implementing this health promotion activity. Firstly, the time available to implement this elective was limited to less than five weeks from the start of the academic term to the opening of SciFest. Secondly, designing a limited number of quiz items comprehensible across age groups to check and provide basic understanding of key messages about obesity and its prevention was taken as a key step. In addition, due to time constraints, the pilot-testing of the quiz was focussed on learners in the narrow age range of 11-15 years. Lastly, the quiz was designed with different numbers of items and scales, meaning that validity tests could not be performed on them.

Furthermore, this was a health promotion exhibit open to all to provide learning opportunities for pharmacy students using service-learning principles. An exhibit environment is not amenable to research-based, controlled activities. Thus it was difficult to restrict participation in the quiz to a specific age group due to wide interest from learners of all age groups as well as from those who had already completed their schooling. The time available for voluntary participation of learners in this activity was sometimes limited as some schools specified the time learners should spend at each exhibit. This resulted in some learners not completing the post-intervention quiz or not interacting with the models or reading the poster.

Although as a once-off health promotion exhibit this activity does not offer sustainable ways of positively influencing participants in the prevention of obesity, it does, as a service-learning elective, provide pharmacy students with ample opportunities to learn the importance of implementing health promotion while providing service to the community.

CONCLUSION

This health promotion intervention revealed that participants in SciFest had pre-existing knowledge of obesity which was enhanced by the intervention. Despite the high level of participants' knowledge, educational interventions such as this are needed to create an awareness of the importance of putting this knowledge into practice in their daily lives. It is essential that the youth in this country are educated on lifestyle diseases such as obesity using interventions such as those used in this study. The responsibility of organising such health promotion interventions lies with healthcare professionals, particularly pharmacists, since they are often the first port of call in the community. Engaging pharmacy students in health promotion at an early stage of their career development contributes to a mindset change by creating an awareness of their professional responsibilities, increasing their experience of community engagement and developing their role in preventing CNCDs. Activities such as these contribute to skills development for a patient-focussed practice.

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