HIV and AIDS knowledge of Pharmacy students at the University of Limpopo (Medunsa Campus)/Tshwane University of Technology before and after a teaching intervention

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Abstract: Healthcare workers need to be qualified to deal with the specific requirements of the HIV/AIDS syndrome, which demands technical and scientific knowledge and understanding of the disease. Adequate knowledge about HIV/AIDS is an important means to reduce stress and could result in better care and improve information to the general public. Because of the community service nature of pharmacies, pharmacists are in the front line when it comes to treating minor illnesses, as patients will often approach a pharmacist with a health query before they see a medical practitioner. Hence, pharmacists have opportunities to recognise potential opportunistic infections or other HIV-associated complications and to refer patients for evaluation and management.

The objective of this study was to assess the level of scientific knowledge of HIV/AIDS of undergraduate pharmacy students before and after a teaching intervention aimed to improve students' scientific knowledge of the subject. A controlled study was carried out by administering pre- and post-intervention questionnaires to control and study groups. The study group was taken from the various BPharm student groups during 2004 and 2005. Although each group acted as its own control, an additional control group of first year dentistry students was included in 2005. The mean HIV/AIDS knowledge scores and the knowledge gains of the control and study groups were compared before and after the intervention. The knowledge gains from the interventions were statistically significant. The increases indicate the positive effect of the teaching intervention. The teaching intervention can therefore be recommended to be part of the undergraduate BPharm curriculum.

Keywords: HIV/AIDS, pharmacists, knowledge, education, intervention

Disciplines: Health studies, Sociology, Education

1. Introduction

From its beginning, the HIV/AIDS epidemic has been accompanied by a climate of fear, ignorance and denial, leading to stigmatisation of and discrimination against people with HIV/AIDS. Ignorance and fear underlie HIV-related stigma. An inadequate understanding of the modes of HIV transmission causes fear of transmission from casual contact

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(Letamo, 2004). Fear of contagion and fear of death have clear negative effects on health care workers' attitudes toward and treatment of HIV-positive patients. HIV/AIDS has generated concern, fear, anxiety and prejudice among both health care personnel and the general public (Prasad, 2001). The knowledge and attitudes of health care personnel regarding HIV/AIDS comprise an important dimension in the delivery of quality care to persons living with HIV/AIDS (ASHP Statement, 1993).

With no cure for HIV and a safe and effective vaccine several years away, the number of cases will increase well into the 21st Century. Additionally, the decrease in opportunistic infections brought about by highly active antiretroviral therapy (HAART) means that the care of patients infected with HIV will be largely transferred to the outpatient setting (Cantwell-Mcnelis & James, 2002).

By far the most significant component of any health system is its health personnel. Without a foundation of skilled human resources, health care systems cannot function adequately or effectively, particularly in the public sector and at the primary level of care. Given that health workers are expected to provide care and accurate information on this subject matter to patients and their relatives, as well as to the general public, it is clearly important that they have credible and accurate knowledge of the disease (Umeh *et al*, 2008). This need applies particularly to pharmacists because of the community service nature of pharmacies, where pharmacists are in the front line when it comes to treating minor illnesses. Patients often approach a pharmacist with a health query before they see a medical practitioner. Pharmacists should therefore have the ability to recognise potential opportunistic infections or other HIV-associated complications and refer patients appropriately for evaluation and management.

The magnitude of the HIV/AIDS epidemic has increased demands on pharmacists and other health care workers. Specific knowledge and skills are required to counsel and advise patients on HIV prevention and treatment (Myers, *et al,* 1998).

During 1994, Sheridan and colleagues found that pharmacy students at the University of London had a significantly increased knowledge of HIV/AIDS after attending a series of lectures on the topic as part of their undergraduate course. In a study to explore pharmacy students' knowledge and beliefs about HIV/AIDS, Blumenthal and colleagues (2002) found that students would benefit from more time on HIV/AIDS topics, including AIDS treatment medication and prevention. Based on these findings educators need to examine approaches to teaching about HIV/AIDS that can increase knowledge and influence the actual treatment of individuals who have this disease.

Additionally, graduates in health sciences must be equipped to meet the demands of their professional calling. Pharmaceutical educators must teach pharmaceutical care to students. Pharmacy curricula should be designed to produce graduates with sufficient knowledge and skills to provide pharmaceutical care competently, particularly for HIV/AIDS patients (ASHP Statement, 1993). In Africa, HIV/AIDS is most prevalent within the 15-24 year old age group (Santis, W. *et al*, 2003). There is a gap in programmes targeting youth of ages 18-24 years, for example those enrolled in tertiary education institutions (Cornelissen, 2005).

From the above studies and others carried out to assess the knowledge of pharmacy students regarding HIV/AIDS it is evident that basic undergraduate training in this subject is essential. The pharmacist's role in AIDS patient care is likely to grow in the coming years as more AIDS patients live longer and receive treatment that is more consistent with chronic care.

As HIV/AIDS continues to spread and affect the lives of millions of people, a sense of urgency has developed about the imperative need to stop the epidemic. With an effective vaccine unlikely to be available for at least 10 years, prevention of transmission through education and behaviour change remains important to halt the epidemic's spread. The main behaviour change strategies available which aim to prevent HIV infection include raising awareness and educating people about the disease (Harrison *et al*, 2000). All over the world, national HIV/AIDS agencies, along with nongovernmental organisations and the media, have implemented programmes to expand the response to the epidemic.

The main goal of these efforts is to prevent the transmission of HIV (Fisher & Foreit, 2002). However, together with knowledge, behavioural change strategies are necessary to reduce HIV transmission and these strategies themselves need to be combinations of approaches at multiple levels of influence (Coates *et al*, 2008).

Having set a general picture we now look specifically at the country which has the largest number of individuals affected by AIDS in the world. South Africa is experiencing an explosive epidemic of HIV/AIDS and in 2003 the South African government approved and initiated a Comprehensive National Plan on HIV and AIDS Care, Management and Treatment, which aims, among other objectives, to provide access to antiretroviral treatment to more than 1.4 million South Africans by 2008 (www.cdc.gov - 26-01-2006). The plan will necessitate the pharmacist's involvement in the dispensing of treatment and the management of effective medicines' use. A trusting relationship between the pharmacist and the patient is essential. Hence, pharmacists should be at ease with the disease and have sufficient knowledge about HIV and its consequences.

As the knowledge and attitudes of health care workers regarding HIV/AIDS still leave much to be desired, even after two decades of sustained effort, many health care workers still harbour a morbid fear of the disease (Bhatnagar & Bhalwar, 2005). In this paper we focus, on the knowledge of pharmacy students about HIV and AIDS and to what extent the situation can be improved by a targeted short course.

2. Aim

To assess the baseline level of knowledge and understanding of HIV/AIDS of undergraduate pharmacy students at the University of Limpopo (Medunsa Campus)/Tshwane University of Technology Schools of Pharmacy and to determine the effect of a teaching intervention aimed to improve students' knowledge on the subject.

3. Method

3.1 Study design
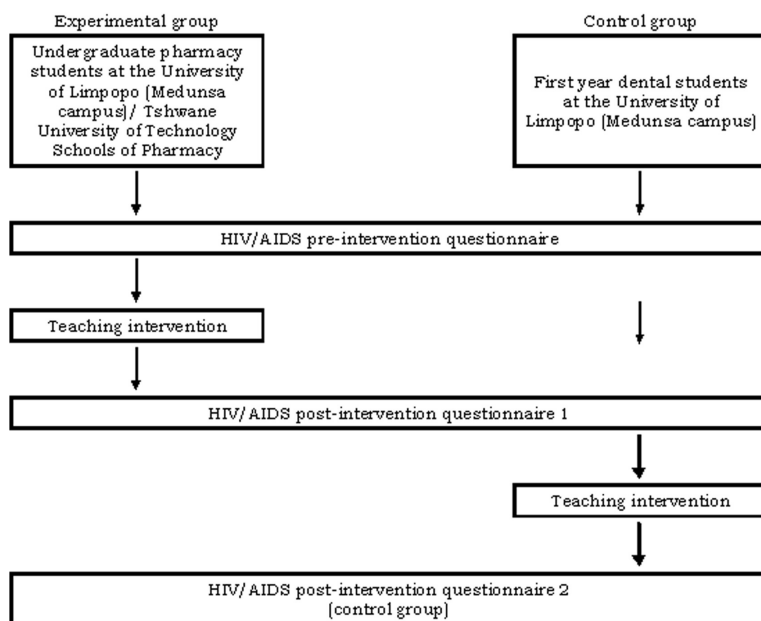
3.2 Target population

The target population consisted of all undergraduate pharmacy students (180) from the University of Limpopo (Medunsa Campus)/Tshwane University of Technology Schools of Pharmacy in 2004 and 2005.

All undergraduate pharmacy students in the respective years formed the study groups, with each group acting as its own control, due to the before-and-after nature of the experiment. First year dental students (53) from the University of Limpopo (Medunsa Campus) in 2005 were included as an additional, external control.

3.3 Survey instrument

A structured HIV knowledge questionnaire was designed specifically for this study to determine the level of knowledge and understanding of HIV/ AIDS of pharmacy students at the University of Limpopo (Medunsa Campus)/Tshwane University of Technology Schools of Pharmacy and to determine the effect of the teaching intervention. The questionnaire was administered to the study and control groups at the pre-test and post-test 1 stage. As a favour to the Dentistry Department the control group also completed the teaching intervention at a later stage after which post-test 2 questionnaires were administered to the control group. This questionnaire was designed in the true/false format and consisted of 40 questions.

3.4 Ethical approval

Ethical approval for the study was obtained from the Medunsa Research,

Ethics and Publications Committee.

3.5 Intervention (the teaching programme)

The authors, other members of the University of Limpopo (Medunsa Campus) School of Pharmacy and some external experts compiled a teaching programme according to the FIP/WHO guidelines and layout as a continuing professional development (CPD) course for pharmacists (accredited by the South African Pharmacy Council). The course was then adapted for undergraduate teaching purposes by excluding certain topics (Drug supply and quality assurance was excluded due to time constraints). The teaching programme is available in printed format as well as in interactive format on a CD-ROM (School of Pharmacy, 2003).

The teaching programme was presented in a two and a half hour session. It consisted of eight modules, which covered the following aspects.

- General knowledge
- Transmission
- Antiretroviral treatment
- Diagnosis
- Counselling
- Signs and symptoms
- Opportunistic infections
- Post-exposure prophylaxis
- Palliative care

3.6 Statistical analysis

All statistical procedures were perform-a from the HIV/AIDS knowledge questionnaires were analysed for all groups. Differences between pre-test, post-test 1 and post-test 2 scores for the control group and differences between pre-test and post-test 1 scores for the other study groups were analysed. A paired t-test was used for comparison of the mean pre and post-intervention scores within groups. Responses were paired per respondent so that each served as his/her own control and to reduce bias. Paired comparisons could only be conducted on subjects who completed both the pre- and post-assessment. In some comparisons this requirement resulted in a reduction of sample sizes.

Some other aspects of the data were also analysed: A Pearson correlation analysis was performed to determine whether there was a relationship between HIV/AIDS knowledge and age.

3.7 Null hypothesis

The knowledge of pharmacy students from the University of Limpopo (Medunsa Campus)/Tshwane University of Technology Schools of Pharmacy regarding HIV infection and AIDS will not improve after a

teaching intervention.

4. Results

Changes in the HIV/AIDS knowledge scores from the pre-test to post-test 1 and post-test 2 were calculated for the control group. Subsequently, the changes from the pre-test to post-test 1 scores were calculated for the study groups. Changes from pre-test to post-test 1 and to post-test 2, where applicable, were converted to a scale where positive changes (improvements) were indicated by positive numbers and negative changes (deteriorations) were indicated by negative numbers. A zero value indicated no change.

Five groups of students (Control group, 1st year 2004, 1st year 2005, 3rd year 2005 and 4th year 2005) completed the HIV/AIDS Knowledge Questionnaire. The HIV Knowledge Questionnaire consisted of

- two questions on demographic characteristics (age and gender), and

- forty questions/statements in the true/false format.

Results of the pre-test, post-test 1 and post-test 2 for the control group were analysed. Subsequently, results of the pre-test and post-test 1 for the study groups were analysed. A paired t-test was used for comparison of mean pre and post-intervention scores. Results are presented in the form of tables followed by a short discussion.

4.1   Composition of student groups

Table 1:   Age distribution of students

Group		Number of students	Response rate	< 20 years	20-22 years	23-25 years	> 25 years
Control group		53	52 (98%)	26 (50%)	15 (29%)	7 (13%)	4 (8%)
Study groups	**1st year 2004**	46	43 (93%)	23 (54%)	13 (30%)	1 (2%)	6 (14%)
	1st year 2005	51	49 (96%)	19 (39%)	20 (41%)	3 (6%)	7 (14%)
	3rd year 2005	38	37 (97%)	1 (3%)	20 (54%)	4 (11%)	12 (32%)
	4th year 2005	45	43 (96%)	1 (2%)	23 (54%)	9 (21%)	10 (23%)
Sub-total of study groups		180	172 (96%)	44 (26%)	76 (44%)	17 (10%)	35 (20%)
Total		**233**	**224 (96%)**	**70 (31%)**	**91 (41%)**	**24 (11%)**	**39 (17%)**

Table 2:   Gender distribution of students

Group		Number of students	Response rate	Male	Female
Control group		53	52 (98%)	21 (40%)	31 (60%)
Study groups	1st year 2004	46	44 (96%)	10 (23%)	34 (77%)
	1st year 2005	51	48 (94%)	22 (46%)	26 (54%)
	3rd year 2005	38	36 (95%)	14 (39%)	22 (61%)
	4th year 2005	45	44 (98%)	8 (18%)	36 (82%)
Sub-total of study groups		180	172 (96%)	54 (31%)	118 (69%)
Total		**233**	**224 (96%)**	**75 (33%)**	**149 (67%)**

4.2   Comparison of percentage knowledge scores in the various age categories at pre-test, post-test 1 and post-test 2

Students from the control group did not receive an intervention between the pre and post 1 questionnaire. Only after data were collected from the pre- and post-1 questionnaires did they receive the intervention.

Table 3:   Mean percentage knowledge scores in the various age categories: control group

Age	Number	Pre-test	Post 1	Post 2	Difference pre-post 1	Difference pre-post 2	*p*-value (pre-post 2)
<20	26	41.73	42.69	70.48	0.96	28.75	<0.0001***
20-22	15	49.17	49.00	75.33	-0.17	26.16	<0.0001***
23-25	7	58.57	52.50	71.79	-6.07	13.22	0.0044**
>25	4	50.63	48.75	75.63	-1.88	25.00	0.0114**

***Statistically very highly significant, paired t-test. *p*< 0.0001

** Statistically highly significant, paired t-test. *p*< 0.01

Data

The differences found in the control group at post-test 1, compared with pre test, were not significant in any of the age groups, or in the control group as a whole. This means that the changes observed in knowledge scores can be assumed to have occurred due to chance alone.

Table 4:   Mean percentage knowledge scores in the various age categories: study group, 1ˢᵗ year 2004

Age	Number	Pre-test	Post 1	Difference pre-post 1	*p*-value (pre-post1)
<20	23	26.52	63.48	36.96	<0.0001***
20-22	13	32.12	69.23	37.12	<0.0001***
23-25	1	27.50	67.50	40.00	n/a
>25	6	41.25	74.58	33.33	0.0007***

Table 5:   Mean percentage knowledge scores in the various age categories: study groups, 2005

Group	Age	Number	Pre-test	Post 1	Difference pre-post 1	*p*-value (pre-post1)
1ˢᵗ year 2005	<20	19	33.94	64.34	30.39	<0.0001***
	20-22	20	35.75	71.37	35.62	<0.0001***
	23-25	3	43.33	73.33	30.00	0.0267*
	>25	7	48.57	71.78	23.21	0.0076**
3rd year 2005	<20	1	62.50	85.00	22.50	n/a
	20-22	20	71.87	85.87	14.00	<0.0001***
	23-25	4	65.00	83.75	18.75	0.0287*
	>25	12	70.83	85.20	14.37	<0.0001***
4th year 2005	<20	1	65.00	85.00	20.00	n/a
	20-22	23	69.24	83.37	14.13	<0.0001***
	23-25	9	68.05	78.06	10.00	0.0001**
	>25	10	74.50	84.50	10.00	0.0103*

***Statistically very highly significant, paired t-test. *p*< 0.0001

** Statistically highly significant, paired t-test. *p*< 0.01

* Statistically significant, paired t-test. *p*< 0.05

Data

The mean percentage knowledge scores of the students in the control group (Table 3) in the various age categories showed an increase in HIV/AIDS knowledge scores from pre-test to post-test 2, after they received the intervention. Mean percentage knowledge scores of all the other students in the other groups in the various age categories showed an increase in HIV/AIDS knowledge from pre-test to post-test 1 (Tables 4 and 5).

A regression and correlation analysis was conducted for each group based on the raw pre-test scores and actual ages of the students. Results are summarised in Table 5a.

Table 5a: Regression and correlation analysis

Group		Regression equation	Pearson correlation, r	*p*-value
Control group		? = 37.4+5.3x	0.457	<0.001**
Study group	**1st year 2004**	? = 22.0+4.7x	0.455	0.002**
	1st year 2005	? = 27.9+4.8x	0.396	0.005**
	3rd year 2005	? = 71.1-0.2x	-0.022	0.895
	4th year2005	? = 63.9+2.3x	0.192	0.218

y = Pre-test score

 x = age

** Statistically highly significant, *p*< 0.01

Data

The increasing trend in pre-test scores with age is reflected in the regression equation for all the groups except the third year group where the regression equation showed a downward trend. Three of the five correlation coefficients were statistically significant.

The majority of all the pharmacy students (72%) analysed were younger than 23 years of age (Tables 4 and 5). From all the different age groups analysed, except in the third year group, students in the older than 25 years category obtained the highest HIV/AIDS knowledge scores at pre-test level. An increasing trend in pre-test scores with age is evident in the majority of groups.

comparison of percentage knowledge scores of males and females at pre-test, post-test 1 and post-test 2

Table 6:   Percentage knowledge scores of males and females: control group

Group/Gender	Number	Pre-test	Post 1	Post 2	Difference pre-post 1	Difference pre-post 2	*p*-value
Control group							**Pre-post 2**
Male	21	45.00	43.81	71.31	-1.19	26.31	<0.0001***
Female	31	48.06	47.98	73.23	-0.08	25.17	<0.0001***

 *** Statistically very highly significant, paired t-test. *p*<0.0001

Table 7:   Percentage knowledge scores of males and females: Study group, 1st year 2004; 1st, 3rd and 4th year 2005

Group	Gender	Number	Pre-test	Post 1	Difference pre-post 1	*p*-value (pre-post 1)
1st year 2004	**Male**	10	31.75	69.25	37.50	<0.0001***
	Female	34	30.96	65.51	34.56	<0.0001***
1st year 2005	**Male**	22	37.84	69.09	31.25	<0.0001***
	Female	26	35.76	68.07	32.30	<0.0001***
3rd year 2005	**Male**	14	69.64	83.75	14.10	<0.0001***
	Female	22	70.34	85.79	15.45	<0.0001***
4th year 2005	**Male**	8	75.31	82.81	7.50	.0596
	Female	36	69.02	82.56	13.54	<0.0001***

*** Statistically very highly significant, paired t-test. *p*<0.0001

Data

Sixty-nine percent of all the pharmacy students surveyed were females. In all the years/groups female percentages exceeded the percentage of males. From all the pharmacy student groups analysed, except for the third year group, males had slightly higher HIV/AIDS knowledge scores than females at pre-test level.

Table 7 also indicates the statistically significant differences in HIV/AIDS knowledge scores from pre-test to post-test 1 of males and females in the study groups. The mean percentage knowledge scores of the male and female students in the control group showed an increase of 26.31 and 25.17 respectively from pre-test to post-test 2 after they had received the intervention. The mean percentage knowledge scores of all the other male and female students showed increases in HIV/AIDS knowledge from pre-test to post-test 1 which were statistically highly significant except in the case of fourth year males, where it was close to being significant (p=0.0596).

The data were tested for normality as part of statistical analysis with the SAS univariate procedure. Changes in test scores were normally distributed at each test phase in all groups except in the third-year group. In this group, median scores were 72.5% at pre-test and 87.5% at post-test 1, and non-parametric analysis using the Wilcoxon signed rank test confirmed that the median increase of 12.5% was significant (p<0.0001).

4.4 Overall comparison of percentage knowledge scores of students at pre-test, post test 1 and post-test 2

Assessment	Number	Mean	Std Dev	Min	Max	*p*-value
Pre	53	46.60	11.01	17.50	75.00	
Post 1	53	46.13	12.67	10.00	75.00	
Post 2	53	72.41	7.21	55.00	92.50	
Change from Pre to Post 1	53	-0.47	7.27	-15.00	17.50	0.6388
Change from Pre to Post 2	53	25.81	12.60	2.50	57.50	<0.0001 ***

Table 8: Overall percentage knowledge scores of students: control group

*** Statistically very highly significant, paired t-test. *p*< 0.0001

Group	Assessment	Number	Mean	Std Dev	Min	Max	*p*-value
1st year 2004	Pre	46	31.47	11.42	12.50	62.50	
	Post 1	46	66.47	10.24	45.00	90.00	
	Change from pre to post 1	46	35.00	11.24	-7.50	55.00	<0.0001 ***
1st year 2005	Pre	51	37.50	12.17	15.00	72.50	
	Post 1	51	68.87	9.63	45.00	90.00	
	Change from pre to post 1	51	31.37	9.82	0.00	57.50	0.0001 ***
3rd year 2005	Pre	38	70.52	9.00	47.50	87.50	
	Post 1	38	85.13	6.01	70.00	95.00	
	Change from pre to post 1	38	14.60	10.91	-7.50	45.00	0.0001 ***
4th year 2005	Pre	45	70.50	10.60	45.00	95.00	
	Post 1	45	82.50	8.90	60.00	97.50	
	Change from pre to post 1	45	12.00	8.68	-7.50	30.00	<0.0001 ***

Table 9: Overall percentage knowledge scores of students: study groups 2004 and 2005

*** Statistically very highly significant, paired t-test. *p*< 0.0001

Data

The percentage knowledge scores of all the groups of students were compared at pre-test, post-test 1, and post-test 2 where applicable, to determine the change in scores. Tables 8 and 9 illustrate the differences in mean scores for the groups of students from pre-test to post-test 1 and post-test 2. A statistical significant difference (*p* = 0.0001) was indicated in HIV/AIDS knowledge scores from pre-test to post-test 1 and for the control group from pre-test to post-test 2.

The knowledge of both the first year pharmacy student groups (2004 and 2005) increased after the intervention to almost the pre-intervention level (± 70%) of the third and fourth year groups. Both these first year pharmacy student groups achieved a greater than 30% actual knowledge gain (off a low baseline <40%).

4.5 Achievement levels of all the students before and after the intervention

For this comparison, an achievement level mark of 60% was used. Sixty percent indicates a level of sufficient basic HIV/AIDS knowledge, which would offer some confidence in the ability of the learner to respond to patients. Pharmacy students' knowledge was considered adequate if 60% or more of the students responded with the correct response. Table 10 illustrates the major improvements from pre-test to post-test 1.

Table10: Percentage of students who achieved a knowledge score of =60%

Group	Number	% Passed at pre-test	% Passed at post-test 1	*P* value (post-test 1 vs pre-test)	% Passed at post- test 2	*P* value (post-test 2 vs pre-test)
Control group	53	11.3 (6/53)	17.0 (9/53)	0.403	96.2 (51/53)	<0.001 ***
Study groups						
1st year 2004	46	2.2 (1/46)	80.4 (37/46)	<0.001 ***	n/a	n/a
1st year 2005	51	3.9 (2/51)	86.3 (44/51)	<0.001 ***	n/a	n/a
3rd year 2005	38	86.8 (33/38)	100.0 (38/38)	0.054	n/a	n/a
4th year 2005	45	91.1 (41/45)	100.0 (45/45)	0.117	n/a	n/a

Data

A very low percentage of first year students, two percent in 2004 and four percent in 2005, obtained the achievement level mark of 60% at pre-test level. It is evident that these students had little or no exposure to HIV/AIDS information previously. After the teaching intervention the first year students' achievement level marks increased to 80% and 86% respectively.

High percentages (87% and 91%) of third and fourth year students respectively obtained the achievement level mark of 60% at pre-test and 100% of the students obtained the achievement level mark of 60% at post-test 1. The high percentage at pre-test level shows that senior pharmacy students have been exposed to HIV/AIDS information and that they increased their knowledge even further after the intervention.

The mean HIV/AIDS knowledge scores of the control group and the various groups of pharmacy students were compared. The level of HIV/AIDS knowledge of the pharmacy students increased significantly after

completion of the teaching intervention while HIV/AIDS knowledge of the control group also increased after they received the teaching intervention. The increase in HIV/AIDS knowledge scores indicates the positive effect of the teaching intervention.

5. Discussion and Conclusion

5.1   Discussion of results

To assess HIV/AIDS knowledge, undergraduate pharmacy students completed an HIV/AIDS Knowledge Questionnaire. The HIV/AIDS Knowledge Questionnaire consisted of statements covering different HIV/AIDS topics.

When the baseline (pre-test) HIV/AIDS knowledge of students from the control group and the pharmacy student groups in their respective age categories was analysed, it was found that students in the older than 25 years category obtained higher HIV/AIDS knowledge scores. An increasing trend in HIV/AIDS knowledge pre-test scores with age was observed (Tables 3 to 5). In addition, Tables 3 to 5 illustrate that the mean percentage HIV/AIDS knowledge scores of students from the control group and the different pharmacy student groups, in the various age categories, increased after they received the teaching intervention.

Sixty nine percent of all the pharmacy students who participated in this study were females. In all the years/groups female percentages exceeded the percentage of males. From all the pharmacy student groups analysed, except for the third year group, males obtained slightly higher HIV/AIDS knowledge scores than females at baseline level (Tables 6 and 7). Data from a previous study to analyse the levels of knowledge about HIV/AIDS prevention in 23 developing countries found that levels of knowledge are almost always higher among men than among women (WHO, 2003). Also, a study conducted by Li and colleagues (2004) to assess the overall AIDS knowledge among students in China revealed a significant gender difference in AIDS knowledge, with males being more knowledgeable than females (Li, 2004).

Tables 6 and 7 also illustrate that the mean percentage HIV/AIDS knowledge scores of all the male and female students increased after they received the teaching intervention. Table 9 illustrated that if pharmacy students receive the teaching intervention early in their first year, their HIV/AIDS knowledge immediately increases to the baseline HIV/AIDS knowledge level of the third and fourth year students.

In Table 10, at baseline level, only two percent of first year students in 2004 and three percent of first year students in 2005 obtained the achievement level mark. The results at baseline level indicated that HIV/AIDS knowledge was inadequate. After the teaching intervention the first year students' achievement level marks increased to 80% and 86% respectively.

The high percentage (91%) of third and fourth year students who obtained the achievement level mark at baseline level indicates that senior pharmacy students have been exposed to HIV/AIDS information. They increased their knowledge even further after the intervention.

5.2   Conclusion

HIV/AIDS knowledge is one of the fundamental requirements for pharmacists to be able to perform their role in the management of HIV.

The null hypothesis investigated by this study stated "The knowledge of pharmacy students from the University of Limpopo (Medunsa Campus)/ Tshwane University of Technology Schools of Pharmacy regarding HIV infection and AIDS will not improve after a teaching intervention".

Two-sample t-tests were performed on the data to test the null hypothesis by comparing the mean differences of the control group with the mean differences of the study groups before and after the teaching intervention. Statistically very highly significant differences with probability values <0.0001 were detected.

The null hypothesis was therefore rejected by this study.

In South Africa, with its diverse cultures, HIV/AIDS education programmes should be developed within the context of the specific cultural beliefs and values of the target groups. Such programmes will help to eliminate myths and misconceptions about HIV/AIDS. Health educators should invite young people/students to help plan, implement and evaluate HIV/AIDS programmes.[1]

Educators and peers should be trained to provide an effective HIV/AIDS education programme, as effective programmes offer accurate information.

HIV/AIDS education programmes should encompass both knowledge and skills.

HIV is spread mainly by behaviours – sexual and drug taking – that are generally private, sometimes illegal, and often difficult to discuss openly. But they are the engines driving the epidemic.   When it became apparent that people were not going to change their sexual behaviour merely because they were told they should, UNICEF rallied around the idea of teaching life skills as part of HIV/AIDS education, as this approach will allow people to act upon their knowledge. The assumption is that people are lacking in certain skills (for example, assertiveness, decision-making, refusal and negotiating skills), which, if taught and learned, they would be able to apply in different situations, thereby reducing their risk of HIV infection.

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APPENDIX 1:

HIV/AIDS KNOWLEDGE QUESTIONNAIRE

(Pre/Post-intervention questionnaire)

Please complete the following:

Date: _____   Year of study: _____

Student nr:_____

Age: Gender:

(Please mark one)   (Please mark one)

Please indicate your answer by an X in the appropriate box

<20			M	
20-22			F	
23-25				
>25				

	QUESTION	TRUE	FALSE
1	HIV and AIDS are one and the same thing		X
2	CD4+ T-lymphocytes are the major cellular targets for HIV	X	
3	HIV can be transmitted through breast milk	X	
4	HIV can be contracted by donating blood		X
5	HIV-1 Subtype C predominates among the heterosexual population in South Africa	X	
6	Reverse transcriptase is an important enzyme in retroviruses	X	
7	NRTI's inhibit the transcription of viral RNA into DNA	X	
8	The ELISA test detects antibodies to HIV	X	
9	The "window period" is the period between infection and the development of AIDS		X
10	A negative test result exclude the possibility of an infection		X
11	A positive result does not have to be confirmed		X
12	Post test counselling does not have to take place if a patient is negative		X
13	Failure to thrive is indicative of possible HIV infection in children	X	
14	Nevirapine monotherapy is recommended to reduce vertical transmission	X	
15	All babies born to HIV infected women are infected with HIV		X
16	Candidiasis is one of the most frequent fungal infections seen in HIV	X	
17	TB is the leading cause of HIV-associated opportunistic infections in developing countries	X	
18	Primaquine is used for TB prophylaxis		X
19	Oral thrush can lead to serious wasting	X	
20	Typhoid vaccine should be given to HIV positive patients		X
21	Zidovudine and zalcitabine are classified as NRTI's	X	
22	The most common side effect of nevirapine is skin rash	X	
23	Patients with CD4 counts below 2000cells/mm3 should be offered ART		X
24	HAART will eliminate the HI virus from the body		X
25	The viral load test is used to monitor drug therapy	X	
26	Two NRTI's together with a PI or a NNRTI is an effective triple drug regimen	X	
27	A patient needs to comply only 80% to the treatment regimen to obtain maximal results		X
28	When the patient viral load is undetectable, the antibody test will be negative		X
29	PEP is best within 1-2 hours	X	
30	PEP will eliminate the risk of viral transmission		X
31	The viral burden is high during seroconversion	X	
32	The exposed person should be tested immediately	X	