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Dr. Harshdeep Joshi
Maharishi Markandeshwar
Institute of Medical Sciences and Research
Ambala, (Haryana).
India.
Articles

Knowledge, attitude and practice of medical students towards complementary and alternate medicine  
Fauzia Imtiaz, Abeera Junaid, Sarmad Pirzada, Arham younus and Rafay Amir  

Terry J. Ellapen, Marco Barnard, Mariette Swanepoel, Henriette V. Hammill, Yvonne Paul and Gert L. Strydom
Full Length Research Paper

Knowledge, attitude and practice of medical students towards complementary and alternate medicine

Fauzia Imtiaz*, Abeera Junaid, Sarmad Pirzada, Arham younus and Rafay Amir

Department of Biochemistry, Faculty of Basic Medical Sciences, Dow Medical College, Pakistan.

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Complementary and alternative medicine has been an important part of Pakistani culture for a long time. Whilst it is widely practiced amongst the general population, this study aims to determine attitude and practices of medical students towards complementary and alternative medicine (CAM), and their willingness to learn about them and give advice to their patients about it in future. Cross sectional study was conducted using a self administered questionnaire on the medical students of a public and private sector medical college in Karachi. Students from all years of bachelor of medicine and bachelor of dental surgery (BDS) program were included and were approached using convenience sampling. The data was collected and analyzed using statistical package for social sciences (SPPS) version 21. The study included 246 students and showed they had a positive attitude regarding CAM. Only 18.3% respondents appeared not to be using any of the CAM modalities mentioned in the questionnaire. Participants were more inclined to opt for CAM for common ailments like headache flu rather than medical emergencies in which allopathic medicine was the first choice of treatment. Results showed willingness of 56.4% respondents to advice their patients about CAM in future .Regarding barriers pertaining to usage of CAM, the most important was the belief in the ineffectiveness of CAM (39.5%). Respondents in general believed in the effectiveness of CAM and showed willingness to be trained in various CAM modalities. Considering the widespread popularity of CAM methods amongst medical students, incorporating this in their curriculum could prove really helpful and may aid in better health care for patients in the future.

Key words: Complementary and alternative medicine, medical students.

INTRODUCTION

Complementary and alternative medicine (CAM) is the popular term for health and wellness therapies that have typically not been part of conventional medicine techniques. CAM focuses on the physical, emotional, mental and spiritual health of a person. It is an alternative form of healing used by patients widely in Asian countries like China, Japan, India and Pakistan (WHO Fact Sheets, 2007). The usage of CAM has also increased considerably in the past 10 years by the general population of western countries (Harris et al., 2006). In
United States, the use of CAM increased from 34 to 42% within 7 years. CAM therapies were used by 20 to 50% of the population in European countries and 52% population in Australia (Yeo et al., 2005). The reason behind the popularity of CAM can be dissatisfaction with conventional health care system or expensive treatments provided by it (Astin, 1998). Alternative medicine is often coincidental with patients beliefs about health and illness (Astin, 1998; Cowen and Cyr, 2015). Patients seek alternative therapies because they see them as less authoritarian and more empowering. CAM offers people more control over their health care decisions. However the statistics on the prevalence of CAM use in the general population of Pakistan is not available.

Many surveys done previously indicate that medical students are interested to know more about CAM however their courses do not provide sufficient amount of information on techniques and methods used in it. A survey held in Singapore in 2005 states that 91% of medical students believe that CAM could play an important role in their future practice (Yeo et al., 2005). The major reason for not including CAM in medical courses can be the lack of education, training, regulation and the evidence base for CAM practitioners (Shaikh and Hatcher, 2005).

In most countries, doctors are at the forefront of patient interactions and provide information and guidance to patients about safe and effective use of all medicine. However doctors usually regard their knowledge of CAM as being inadequate and they are not confident in answering many patients’ inquiries (Levine et al., 2003). Proper education of CAM would prepare physicians to ask patient information about the current use of CAM. Knowledge of CAM will help physicians to respond more effectively to the patient’s inquiries. A study held in Pakistan in 2007 reveals that about 51.5% students voted in favour of introducing CAM in medical education and 35.4% rejected the proposition (Kashif et al., 2007).

Studies have been carried out in many countries to determine the knowledge and attitude of medical students concerning CAM.

Majority of medical students welcomed the addition of CAM in their curriculum (Hussain et al., 2012). The research into the use of CAM is based on small scale studies in Pakistan that focuses on prevalence of use among medical students, cancer patients and other special patient population10. The present study was conducted for assessing the knowledge, attitude and behaviour of medical students in public and private sector universities of Karachi, Pakistan about complementary and alternative medicine.

METHODOLOGY

This was a cross sectional study conducted at public and private sector medical colleges in Karachi. Both colleges offer a five year medical education program leading to ‘Bachelor of medicine and Bachelor of surgery (MBBS) and a four year program leading to Bachelor of dentistry (BDS). The curriculum of these courses does not include any knowledge on CAM.

Students, from both courses were included irrespective of their class size, and convenience sampling was used to collect data. All consenting students were interviewed using the self administered English questionnaire. The time period for data collection was two months (January 2018 to March 2018). Keeping the expected frequency of all variables at 50%, the desirable sample size using a 95% confidence interval came out to be 379. The survey tool was approved by research department of Dow University of health sciences

The development of the questionnaire was based on the review of previous publications and was pre tested on 15 students who were later excluded from the study. After the pilot run, questionnaires were distributed to the larger population to collect the data. Apart from the demographic questions, the questionnaire comprises of 12 multiple choice questions relating to the knowledge, attitude and practices of medical students about CAM. The first part of the questionnaire dealt with the CAM methods most commonly sought by people, their frequency of usage and illnesses for which they were commonly preferred. The second part was based to assess the knowledge of students on 9 different CAM modalities. It was a yes/no question based on whether they knew about those CAM methods, believed in their effectiveness, wanted education in and if they would recommend it to their patients in future. The third part of questionnaire was on barriers pertaining to use of CAM on a professional level.

Data from questionnaires was entered and assessed using statistical package for social sciences (SPSS) version 21.0. Comparison was done to check intergender differences in the usage of CAM and its preference amongst students of different years. Variables frequency and percentages were calculated. Associations were determined using Chi-square test and P-value < 0.05 was considered significant. Tables and graphs were included to display the results

RESULTS

In total, 246 questionnaires were filled with a response rate of 92%. The study population included 145 students (58.9%) from MBBS and 82 (33.3%) from BDS with 19 (7.7%) people failing to mention their course of study. The total number of males and females were 81 and 164 respectively. Students from all years were included with 23 (9.3%), 75 (30.5%), 88 (35.8%), 34 (13.8%) and 26 (10.6%) being in the first, second, third, fourth and final years of their respective programs. The mean age of students was 21.06±1.79 yrs. Out of 246 respondents, only 45 (18.3%) reported no to be using any of the CAM modalities mentioned in the questionnaire.

Respondents had different reasons for opting for CAM rather than traditional allopathic medicine with the most common reason being family practices 102 (42.3%), past experiences 66 (27.4%), religious or spiritual beliefs 17 (7.1%) whilst 61 (23.2%) respondents did not specify a reason for their preference of CAM.

When asked which system of alternative medicine do students commonly opt for, variable responses were recorded with home remedies being the most popular choice 128 (52%), prayers 63 (25.6%), homeopathic 48 (19.5%) and herbal treatment being the least popular
Table 1. Difference in the usage of CAM.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Public sector</th>
<th>Private sector</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeopathic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19</td>
<td>29</td>
<td>0.58</td>
</tr>
<tr>
<td>No</td>
<td>87</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>Home remedies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>59</td>
<td>70</td>
<td>0.37</td>
</tr>
<tr>
<td>No</td>
<td>47</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Prayer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
<td>21</td>
<td>0.000*</td>
</tr>
<tr>
<td>No</td>
<td>63</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>Herbal treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18</td>
<td>20</td>
<td>0.56</td>
</tr>
<tr>
<td>No</td>
<td>88</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Preference of treatment for common ailments.

one 38 (15.4%). The only CAM modality in which intergender difference was significant was in the usage of home remedies (p=0.047).

Among public and private sector colleges, the difference for the usage of CAM was significant only for prayers (p=0.000) and not for any other CAM modality as shown in Table 1. Common ailments in the questionnaire include cold, headache, cough, general weakness, acidity and constipation. Figure 1 illustrates the preference of the participants for the treatment of these common ailments with either allopathic (traditional medicine), homeopathy (complementary medicine that makes use of natural substances in minute amounts to treat various ailments) or home remedies.

The results showed greater faith of all cohorts in CAM modalities for the treatment of various common ailments rather than using them at times of emergency like severe chest pain, choking, profuse bleeding etc. CAM was the first choice of treatment for 47.7% students suffering from common ailments whereas in cases of medical emergencies 69% said they would opt for allopathic medicine followed by home remedies (16.7%). The use of spiritual methods, herbal medicines and other CAM modalities was not a popular choice in emergency situations and was pursued by 14.3% of the respondents only. As the study was on medical practitioners, the relevance of taking CAM history from patients was also asked. Majority of the respondents (68%) answered in affirmative while only 13.9% medical students believed it to be unnecessary. There were no significant differences in the usage of CAM amongst the pre clinical (1st and 2nd year students) and clinical ones (3rd, 4th and 5th
Table 2. Significant differences in the usage of CAM amongst the pre-clinical and clinical ones.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-clinical</th>
<th>Clinical</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeopathic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>28</td>
<td>18.9</td>
</tr>
<tr>
<td>No</td>
<td>78</td>
<td>120</td>
<td>81.1</td>
</tr>
<tr>
<td>Home remedies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47</td>
<td>82</td>
<td>55.4</td>
</tr>
<tr>
<td>No</td>
<td>51</td>
<td>66</td>
<td>44.6</td>
</tr>
<tr>
<td>Prayer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21</td>
<td>43</td>
<td>29.1</td>
</tr>
<tr>
<td>No</td>
<td>77</td>
<td>105</td>
<td>70.9</td>
</tr>
<tr>
<td>Herbal treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10</td>
<td>28</td>
<td>18.9</td>
</tr>
<tr>
<td>No</td>
<td>88</td>
<td>120</td>
<td>81.1</td>
</tr>
</tbody>
</table>

Figure 2. % distribution of answers to questions given by participants who knew about alternate medicine methods.

Overall (60%), students believed that CAM usage could be benefitted from better when coupled to conventional allopathic medicine and the exclusive use of CAM modalities was quite rare (13.6%). For future reference, 56.4% of the respondents agreed to give advice to their patients about CAM although there was a difference in opinion of males and females regarding this. Females were more inclined to do so (67.1%) while 32.9% of males agreed to it.

Figure 2 shows distribution of opinions on the knowledge of various CAM modalities among students, their willingness to be trained in these methods, and future likelihood of recommending them to their patients. The most commonly known CAM modalities were found to be homeopathy (69.2%), herbal practices (66.2%) and body work (58.2%).

Barriers towards CAM

When asked about the barriers pertaining to use of CAM, the most important perceived barrier was the belief of ineffectiveness of CAM (39.5%). Also important was the fear of liability and distrust of CAM (23.1%). Other important barriers were lack of certified professionals (18.5%), profit motives of medical practitioners (10.5%) and philosophical differences between CAM and conventional practices (8.4%).

General attitude toward CAM

Despite large use of CAM modalities by respondents, there was a general belief amongst them regarding CAM having low status within modern medicine (74%).
medical practitioners, respondents believed that CAM has been an important part of their culture (61%) and that it should be incorporated in medical school’s curriculum (51%). Students believing in ineffectiveness of CAM to improve patient’s health were a small minority (15%). The results for general attitude of people toward CAM are shown in Table 3.

**DISCUSSION**

Despite the increasing popularity of allopathic healthcare system, it appears that CAM would serve to be an integral part of the health care for most of the population in Pakistan. It is essential to conduct similar studies in Pakistan that aims to bridge the gaps in the general attitudes/ perceptions of a medical student towards CAM. The study survey evaluates the knowledge, attitude and overall practices towards CAM among the medical and dental students studying in various medical colleges of Karachi, Pakistan.

The study revealed that home remedies were the most popularly used CAM modality (52%) while herbal treatment was the least popular among our survey population (19.5%). However, another study conducted on pharmacy students of Pakistan suggested massage therapy (83%) and herbal treatment (58%) as two of the majorly used CAM modalities. This difference in opinions could possibly be due to the difference in the impacts of the curriculums of these two distinctive courses, namely MBBS and D. Pharm.

Majority (67%) of the medical students believed that it was relevant to take CAM history from the patients they shall be treating while 60% of the population agreed to CAM being more beneficial when compared to conventional allopathic medicine, this has been supported by another study conducted at AKU, where 76.3% of the students agreed to the fact that CAM should be used in conjunction with the conventional medicine (Kashif et al., 2007).

Majority of the students identified family practices as the main factor which influenced their attitude towards CAM followed by past experiences as the second most popular factor. This implies that recommendations by family and friends as well as personal experiences are the major driving forces for the positive attitude towards CAM. Surprisingly, only 7.1% of the students stated religious and spiritual beliefs as the leading factor influencing their attitude towards CAM. This contrasts with a study conducted among the medical students of Singapore where half of the student believed that their religious and spiritual beliefs affected their attitude towards CAM (Virginia and Vicki, 2015).

Regarding various CAM modalities, the most widely known were homeopathy and herbal practices with 69.20 and 66.20% claiming to know about them, respectively. This is probably due to the relatively higher use of these two modalities in Pakistani households. This study shows that there is still a considerable number of students who are not aware about the various other CAM modalities specially ayurveda, neuropathy and osteopathy. Additionally, more students wanted education in the fields implying that there is need to include CAM in the medical curriculum in Pakistan. This however is in sharp contrast to a study conducted among pharmacy students in Pakistan in which 85% of the students disagreed to including CAM courses in their curriculum (Shahzad et al., 2012). Furthermore, the study results show that the students’ overall belief in CAM was very low, except in Body Work and Meditation in which 58.20 and 54.20% students claimed to believe in it, respectively. This overall lack of belief in CAM was reflected in the students’ unwillingness to suggest CAM modalities to patients in future.

In relation to the barriers against the use of CAM, majority of the students (39.5%) believed that the belief of ineffectiveness of CAM was the major barrier. This can be considered synonymous to the previous literature where lack of scientific evidence is cited as the major barrier to the use of CAM (Harris et al., 2006; Cowen and Cyr, 2015; Hussain et al., 2012) 23.10% believed fear of liability and distrust towards CAM as the major barrier

<table>
<thead>
<tr>
<th>Variable</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Other (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAM has low status within medicine</td>
<td>74</td>
<td>18</td>
<td>8.5</td>
</tr>
<tr>
<td>Patients on CAM hardly get better</td>
<td>15</td>
<td>58.1</td>
<td>27</td>
</tr>
<tr>
<td>CAM should be taught in medical schools</td>
<td>51</td>
<td>23.2</td>
<td>26</td>
</tr>
<tr>
<td>CAM is fairly unscientific</td>
<td>29</td>
<td>41.1</td>
<td>31</td>
</tr>
<tr>
<td>CAM is only effective in treating minor illnesses</td>
<td>59</td>
<td>15.4</td>
<td>26</td>
</tr>
<tr>
<td>A doctor should know CAM methods</td>
<td>73</td>
<td>13.4</td>
<td>14</td>
</tr>
<tr>
<td>CAM is important part of my culture</td>
<td>61</td>
<td>13.8</td>
<td>25</td>
</tr>
<tr>
<td>CAM is more effective than traditional medicine</td>
<td>47</td>
<td>25.2</td>
<td>28</td>
</tr>
<tr>
<td>CAM is important part of my professionalism</td>
<td>26</td>
<td>46.7</td>
<td>27</td>
</tr>
<tr>
<td>Results of CAM are due to placebo effect</td>
<td>30</td>
<td>19.5</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 3. Results for general attitude of people towards CAM.
which again corresponds to the lack of scientific evidence. Only 18.5% students believed that the lack of certified professionals of CAM was the most significant barrier. This implies that merely increasing the number certified professionals of CAM might not overcome the barriers to CAM use unless appropriate research is carried out for the specific CAM modalities, and scientific evidence favoring their use is provided.

Regarding the general attitude towards CAM, the students strongly agreed that CAM has low status in medicine. This can be attributed to the lack of knowledge about CAM in the medical curriculum. Students strongly disagreed to the statement that patients do not get better with CAM treatment which indicates that the students do consider CAM as an effective form of treatment. 51% of the students agreed that CAM should be taught in the medical school which is in accordance with another study conducted upon the medical students in Pakistan earlier (Kashif et al., 2007). There were mixed opinions on CAM being scientific with a slightly greater percentage of respondents considering it as scientific as those who didn’t. There was a strong agreement that CAM is only effective for treating minor illnesses. This could be due to personal experiences because people mostly use CAM for minor illnesses and few people use it for major illnesses as there is a lack of scientific data.

A large majority of respondents agreed that a medical practitioner should know about CAM methods which could be explained by the agreement of the considerable majority as CAM being a part of their culture. However, at the same time, most of the students disagreed to CAM being part of the medical profession. This may indicate that students consider it as an additional knowledge rather than a vital one. A greater percentage of the students considered CAM as cost effective (47%) than those who didn’t (25.20%). This opinion is supported by previous literature.1

Finally, when asked about the placebo effect, most of the students were unaware of the term (50%) while only 30% thought the effectiveness of CAM is due to the placebo effect. The younger generation opt allopathic mode of treatment both in their everyday and emergency. It could be due to lack of knowledge or some barriers in the use of CAM. It should be the integral part and included in the curriculum.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

Terry J. Ellapen1, Marco Barnard1, Mariette Swanepoel1, Henriette V. Hammill1, Yvonne Paul2 and Gert L. Strydom1

1Faculty of Health Science, Potchefstroom Campus, North-West University, PhASRec, South Africa.  
2Department of Sport and Dental Therapy, Tshwane University of Technology, Tshwane, South Africa.

The consistent review of developing patterns in any healthcare profession is important, as this allows the determination of whether the current practitioner registry meets the healthcare demands, or whether the patient market has become oversaturated with practitioners. The South African Biokinetics profession has been established for 35 years, but as never undergone an examination of its developing trends. The aim was to determine the emerging trends of the HPCSA registered students-in-training, intern-biokineticists, and practitioners. Additionally to ascertain whether the practicing biokinetic registry is equitable to the potential South African private healthcare demand. The HPCSA Annual Reports of 2012/2013 and 2016/2017 identified the number of students-in-training, intern-biokineticists and biokineticists. CMS reports of 2013-2015 identified the South African NCDs and HIV/AIDS prevalence. Annual students-in-training, intern-biokineticists, and practitioner registrations are growing at average of 4.6%, 43.5% and 6.5% per year. However, the conversion of intern-biokineticists to practitioners is progressively dwindling, nevertheless, this attrition of intern-biokineticists is not significant (p>0.05). Positive growth in students-in-training, intern-biokineticists and practitioners HPCSA registrations were identified. The number of practicing biokineticists in the South African private healthcare sector is reaching saturation point relating to the rehabilitation of NCDs and HIV/AIDS patients.

Key words: Intern-biokineticist, attrition and growth.

INTRODUCTION

The profession of Biokinetics promulgates the philosophy of exercise is medicine, which is founded on the salutogenic benefits of exercise and human movement (Strydom, 2005). A biokineticist is a final-phase exercise therapist who rehabilitates orthopaedic and non-communicable diseases (NCDs) in the post-medical and/or final phase of the pathogenic healthcare dimension (Strydom, 2005). Biokineticists are also strongly involved in health and wellness promotion campaigns within the fortogenic health paradigm as a preventive measure against development of NCDs, fighting to ensure continuing and improved quality of life for patients.
The scope of the profession also allows practitioners to be involved in health and wellness campaigns aimed at arresting the development of a sedentary lifestyle, NCDs, and the consequent reduction in patients' quality of life (HPCSA, 2017). South African healthcare legislation permits biokineticists to practice in the private healthcare sector and in selected public sector such as the South African Defence Force (HPCSA, 2017). Presently biokineticists are not employed by the South African Health Department in order to manage patients in public hospitals, clinics, or schools (Strydom, 2005). However, the South African biokinetic profession has admirable exercise therapeutic expertise to help manage the NCDs and HIV/AIDS epidemic, similar to the clinical skill set of the American College of Medicine clinical exercise physiologist (Evans et al., 2016; Ellapen et al., 2017). Australia, Europe and United States of America have embraced a multi-disciplinary strategic approach to combat the global NCDs and HIV/AIDS epidemic, which has enlisted the service of exercise therapists such as clinical exercise therapists (Arena et al., 2015). Exercise therapists have been identified auxiliary medical personnel that are instrumental in managing various NCDs and HIV/AIDS patients through exercise and structured physical activity rehabilitation programmes (Dishman et al., 2012). Regular structured rehabilitative exercise and physical activity has empirically demonstrated its value to enhance quality of life and longevity of the aforementioned patients (Dishman et al., 2012). The South African chapter of this global exercise therapy campaign to manage the NCDs and HIV/AIDS epidemic enlists the services of the South African exercise therapist, known as a biokineticist (Evans et al., 2016; Moss and Lubbe, 2011).

To better understand the impact of the aforementioned developing trends regarding biokinetic students-in-training and intern-biokineticists on the global growth of the profession, one needs to be briefly oriented with the education and training of Biokinetic graduates in South Africa. This background information will explain what it means to be a biokinetic student-in-training, an intern biokineticist and a practicing biokineticist, underlining their progression within the profession. Originally Biokinetics education and training entailed a three-year graduate credential in Human Movement Science or Human Kinetics and Ergonomics, which was followed by a post-graduate degree specialisation in Biokinetics, commonly referred to as the 3+1 model (Ellapen et al., 2017). During the postgraduate year of tuition (4th year), students commenced their mandatory two years of professional clinical internship (Nel, 2014). At this time, the incumbent student is required to register with the Health Professions Council of South Africa (HPCSA) and Biokinetics Association of South Africa (BASA) as a student biokineticist-in-training. After the academic completion of their post-graduate tuition, the student gains eligibility to begin their second year of clinical internship (5th year), and is afforded the opportunity to register as an intern-biokineticist with BASA and the HPCSA (BASA, 2018). The second year of clinical internship necessitates that the intern-biokineticist secures a clinical internship at a private biokinetic practice and/or at one of the biokinetics training institutions that are accredited by BASA and the HPCSA. There are 12 South African tertiary institutions that provide education and training, seven continue to offer the 3+1 model, while the other five institutions follow the new professional degree (Ellapen et al., 2017). The academic content of both degrees are similar, however in the new professional degree students start their clinical internship earlier (Ellapen et al., 2017). Students enrolling for the new professional Biokinetics credential need to register with BASA and HPCSA as a student-in-training from their first year of tuition (BASA, 2018).

Regular monitoring of emerging trends within a healthcare profession is important in order to determine whether the present quota of practitioners meets the healthcare needs, or whether the patient market has become saturated with too many practitioners, leading to the inevitable attrition of practitioners from the profession. Moss and Lubbe (2011) is the only study that has reviewed whether the number of practicing biokineticists meets the required private healthcare demand, but they did not consider the developing trends within the profession. As such there is a paucity of literature discussing both emerging trends and the attrition of the profession of Biokinetics.

Moss and Lubbe (2011) reported that there is an insufficient number of biokineticists practicing in the South African private health care sector given the high prevalence of biokinetic rehabilitative NCDs. Non-communicable diseases are chronic non-infectious diseases and may include cardiovascular and chronic respiratory diseases, as well as cancer and diabetes mellitus (Evans et al., 2016). Moss and Lubbe (2011) and Evans et al. (2016) confirmed that the aforementioned diseases can be rehabilitated by biokineticists. Based on 2007 statistics for the pharmaceutical treatment of NCDs, Moss and Lubbe (2011) recommended that 7472 biokineticists were needed within the South African private healthcare sector. This was calculated by employing a regression statistical calculation, which took the population demographics of biokinetic rehabilitative NCDs into account and can be equated to one biokineticist rehabilitating 100 NCD patients per month. The 2007 South African populace was estimated at 48 287 324 and in the context of our study this statistic can be further broken down into public and private healthcare dependants. The South Africa Health System Trust (HST) report revealed that 40 809 284 citizens were dependant on public healthcare, whilst approximately eight million citizens were made use of private healthcare due their personal financial status (HST, 2017). Within the group of approximately eight million citizens who
choose to use private healthcare, 747 199 people were identified with biokineticist rehabilitative NCDs (Moss and Lubbe, 2011). No subsequently follow-up study has been undertaken in order to determine whether the present number of biokineticists practicing within the South African private healthcare sector meets the pathogenic demand identified by Moss and Lubbe (2011). The primary and novel aim of the current study is to identify the emerging trends relating to biokinetic students-in-training and intern-biokineticists, as well as the registration of intern-biokineticists as practicing biokineticists, ultimately seeking to determine whether the profession is currently suffering from an attrition of practitioners. A secondary aim is to ascertain whether the present number of biokineticists practicing in the South African private healthcare sector meets its demand.

MATERIALS AND METHODS

The nature of this study was descriptive and observational in design. The authors consulted literature within the public domain, thereby not requiring ethical approval as per National Research Guidelines. Figure 1 provides a graphical display of the data collection and review processes. The HPCSA Annual Reports of 2012/2013 and 2016/2017 were reviewed so as to determine number of students-in-training, inter-biokineticists and practitioners within the profession of Biokinetics. Strydom (2005) have highlighted that it is illegal for biokineticist in South Africa to practise without HPCSA registration, and therefore only registered biokineticists were taken into consideration. The HPCSA Annual Reports provided statistics regarding the number of biokineticists and student-in-training registrations from 2007 to 2017 as well as intern-biokineticist registrations from 2012 to 2017 (HPCSA, 2013, 2017) (Figure 1). The South African HST was consulted in order to determine population demographics (HST, 2008, 2014). The South African Council of Medical Schemes (CMS) was consulted so as to identify the prevalence of biokinetic rehabilitative NCDs and HIV/AIDS (CMS, 2013, 2014, 2015, 2017) (Figure 1). Furthermore, only the private healthcare sector prevalence of NCDs and HIV/AIDS were identified, as per South African healthcare legislation pertaining to the profession of Biokinetics. It is important to note that the profession of Biokinetics exceeds the simple rehabilitation of NCDs, and includes the rehabilitation of orthopaedic injuries, as well as health and wellness campaigns, physical activity and performance enhancement (Ellapen et al., 2017). As such, the rehabilitation of HIV/AIDS falls within the scope of the profession of biokineticists and has therefore also been included in the private healthcare patient market. Due to the difficulty of ascertaining the statistics concerning the biokinetic rehabilitation of orthopaedic injuries within the South African private healthcare sector, this study has only focused on the growth rate of the profession of Biokinetics and the subsequent rehabilitation of NCDs and HIV/AIDS patients.

Descriptive (mean, standard deviation, percentages and frequencies) and inferential statistics (independent two-tail student t-test) were employed in the data analysis. Probability was set at p<0.05.

RESULTS

The results reviewed the developing trends of biokinetic students-in-training, intern-biokineticists and practicing biokineticists (Table 1). The statistics concerning students-in-training reflected student enrolment among the 12 tertiary training institutions. The steady increase in student registration from 2010 to 2017, illustrates the growth of the profession at the academic level. The number of intern-biokineticists has also grown by an average of 43.5% over the period from 2013 to 2017. The annual registration of practicing biokineticists reveals a positive average growth rate of 6.5% over the last 10 years (2007-2017) (Table 1). The optimal growth rate of the profession was derived from the total number intern-biokineticists registered in a specific year and their subsequent registration as practicing biokineticists the following year (Table 2). The HPCSA Annual Reports only provide statistics from 2012 to 2017, the authors were therefore only able to analyse the data over a five year period (2013-2017) (Table 2). During 2012 and 2013 the number of intern-biokineticists registered with HPCSA was less than the number of inter-biokineticists who registered as practicing biokineticist during the following year (2013 and 2014 respectively) thereby indicating positive growth (Table 2). However, during years from 2015 to 2017 the number of intern-biokineticists registered with HPCSA were progressively greater than the number of intern-biokineticists that registered as practicing biokineticists the following year, thereby highlighting the attrition of intern-biokineticists from the profession (Table 2). The authors completed an independent two tail t-test that indicated that the attrition of intern-biokineticists with regards to practicing biokineticists was non-significant (p>0.05) (Table 3). A comparative review of NCDs and HIV/AIDS in 2007 and in 2011(Tables 4 and 5) shows a significant upsurge in their prevalence (p<0.05). The 2011 statistics were used because they show the statistics for the same NCDs as of 2007; moreover, the 2017 statistics are unavailable at time of writing.

DISCUSSION

The discussion will be presented as follows: emerging trends regarding biokinetic students-in-training, intern-biokineticists, and practicing biokineticists. This will be followed by a review of the registration of intern-biokineticists as practicing biokineticists, highlighting their attrition. Finally the question of whether the number of practicing biokineticists in 2011 were equitable to manage the South African private healthcare sector’s NCDs and HIV/AIDS epidemic will be reviewed.

Students-in-training growth

The registration numbers of biokinetic students-in-training have increased by an average of 4.6% from 2007 to 2017. These statistics are encouraging and they exemplify the continued interest of the South African society with the profession. The growth in the number of students- in-
STEP 1
Reviewed HPCS A Annual Reports 2012/3 & 2016/7
Determine no. of intern-biokineticists (2012-2017)

STEP 2
Reviewed SA HST Reports 2008 & 2013/4
Determine the South African population size in 2007 & 2011

STEP 3
Determine no. of NCDs and HIV/AIDS patients in private and public health sector in 2007 & 2011

STEP 4
Review of the growth trends of the profession of Biokinetics from 2007-2017
Determined mean growth rate of intern-biokineticists (2012-2017)

STEP 5
Determined a positive upsurge in NCDs and HIV/AIDS in the South African private healthcare sector between 2007 & 2011

STEP 6
Compare no. of practicing biokineticists to no. of NCDs and HIV/AIDS patients in the private health sector in 2011
The South African private health sector need 1063 biokineticists, but had 1020 practitioners (95.9%)
Table 1. Growth rate of biokinetic students, interns and practitioners from 2007 to 2017.

<table>
<thead>
<tr>
<th>Year</th>
<th>Biokinetic students-in-training (% growth rate)</th>
<th>Intern-biokineticists (% growth rate)</th>
<th>Practicing biokineticists (% growth rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>399</td>
<td>not available</td>
<td>823</td>
</tr>
<tr>
<td>2008</td>
<td>364 (-9.6%)</td>
<td>not available</td>
<td>844 (2.4%)</td>
</tr>
<tr>
<td>2009</td>
<td>344 (-5.8%)</td>
<td>not available</td>
<td>902 (6.4%)</td>
</tr>
<tr>
<td>2010</td>
<td>475 (+27.5%)</td>
<td>not available</td>
<td>959 (5.9%)</td>
</tr>
<tr>
<td>2011</td>
<td>481 (+1.2%)</td>
<td>not available</td>
<td>1020 (5.9%)</td>
</tr>
<tr>
<td>2012</td>
<td>531 (+9.4%)</td>
<td>34</td>
<td>1099 (7.1%)</td>
</tr>
<tr>
<td>2013</td>
<td>516 (-2.9%)</td>
<td>85 (60%)</td>
<td>1191 (7.7%)</td>
</tr>
<tr>
<td>2014</td>
<td>529 (+2.4%)</td>
<td>265 (67.9%)</td>
<td>1305 (8.7%)</td>
</tr>
<tr>
<td>2015</td>
<td>566 (+6.5%)</td>
<td>410 (35.3%)</td>
<td>1384 (5.7%)</td>
</tr>
<tr>
<td>2015</td>
<td>635 (+10.8%)</td>
<td>595 (31.0%)</td>
<td>1505 (8.0%)</td>
</tr>
<tr>
<td>2016</td>
<td>684 (+7.1%)</td>
<td>777 (23.4%)</td>
<td>1618 (6.9%)</td>
</tr>
<tr>
<td>Mean (SD) (%)</td>
<td>502.1 (+106) (+4.6%)</td>
<td>361 (+290) (+43.5%)</td>
<td>1150 (±272.6) (6.5%)</td>
</tr>
</tbody>
</table>

Table 2. Variation rate of the transition of intern-biokineticists to practicing biokineticists (2012-2017).

<table>
<thead>
<tr>
<th>Year</th>
<th>Intern-biokineticists registered with HPCSA</th>
<th>Practicing biokineticists registered with HPCSA</th>
<th>Number of intern-biokineticists registered as practicing biokineticists as HPCSA records (Present year biokineticists –previous year intern-biokineticists)</th>
<th>Variation in the number of intern-biokineticists who either did or not register as practicing biokineticists the next year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>34</td>
<td>1099</td>
<td>not available</td>
<td>not available</td>
</tr>
<tr>
<td>2013</td>
<td>85</td>
<td>1191</td>
<td>92</td>
<td>+58** (+63.0%)</td>
</tr>
<tr>
<td>2014</td>
<td>265</td>
<td>1305</td>
<td>114</td>
<td>+29** (+25.4%)</td>
</tr>
<tr>
<td>2015</td>
<td>410</td>
<td>1384</td>
<td>79</td>
<td>-186** (-235.4%)</td>
</tr>
<tr>
<td>2016</td>
<td>595</td>
<td>1505</td>
<td>121</td>
<td>-289** (-238.8%)</td>
</tr>
<tr>
<td>2017</td>
<td>777</td>
<td>1618</td>
<td>113</td>
<td>-482** (-426.5%)</td>
</tr>
</tbody>
</table>

Table 3. Comparative difference between intern-biokineticists registered with HPCSA and the actual biokineticists registered the following years (2012-2017).

<table>
<thead>
<tr>
<th>Number of intern-biokineticists registered with HPCSA</th>
<th>Number of intern-biokineticists registered as practicing biokineticist in the following year</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>103.8 (±17.5)</td>
<td>277.8 (±231.7)</td>
<td>0.066</td>
</tr>
</tbody>
</table>

training is directly associated with the education and training component of the profession that falls under the preview of the 12 South African tertiary institutions, indirectly suggesting that students are satisfied with their education and training. However, a more direct analysis of the perceptions that biokinetics students-in-training have concerning the quality of their education and training should be undertaken. Despite this, it must be noted that the 4.6% growth in the number of biokinetic students-in-training is far below the international exercise therapy student enrolment growth rate of 35% (Rivers et al., 2015).

Intern-biokineticists growth

The progression of students from students-in-training into intern-biokineticists is marked by an average positive growth of 43.5% (from 2013 to 2017). This is suggestive of the fact that students are keen to gain credentials and these statistics furthermore reflect the work integrated learning stage of the clinical internship of a biokineticist,

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Addison’s disease</td>
<td>60</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Asthma</td>
<td>13040</td>
<td>15360</td>
<td>+17.8</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Bipolar mood disorder</td>
<td>1000</td>
<td>2380</td>
<td>+138</td>
</tr>
<tr>
<td>Cardiac failure and cardiac myopathy</td>
<td>2650</td>
<td>4140</td>
<td>+56.2</td>
</tr>
<tr>
<td>Chronic obstructed pulmonary disease</td>
<td>1600</td>
<td>1300</td>
<td>-18.7</td>
</tr>
<tr>
<td>Chronic renal disease</td>
<td>200</td>
<td>300</td>
<td>+50</td>
</tr>
<tr>
<td>Crohn’s disease</td>
<td>200</td>
<td>150</td>
<td>-25</td>
</tr>
<tr>
<td>Diabetes insipidus</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Diabetes Type 1</td>
<td>2800</td>
<td>2600</td>
<td>-7.1</td>
</tr>
<tr>
<td>Diabetes Type 2</td>
<td>14400</td>
<td>23300</td>
<td>+61.8</td>
</tr>
<tr>
<td>Dysrhythmia</td>
<td>2820</td>
<td>3430</td>
<td>+21.6</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>3480</td>
<td>4130</td>
<td>+18.6</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>2100</td>
<td>2700</td>
<td>+28.5</td>
</tr>
<tr>
<td>Haemophilia</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Hyperlipidaemia</td>
<td>30220</td>
<td>34430</td>
<td>+13.9</td>
</tr>
<tr>
<td>Hypertension</td>
<td>60980</td>
<td>82560</td>
<td>+35.8</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>10990</td>
<td>14280</td>
<td>+29.9</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
<td>700</td>
<td>800</td>
<td>+14.2</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>2000</td>
<td>2600</td>
<td>+30</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>300</td>
<td>500</td>
<td>+66.6</td>
</tr>
<tr>
<td>Systemic lupus erythematosus</td>
<td>200</td>
<td>220</td>
<td>+10</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>400</td>
<td>300</td>
<td>-25</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>4940</td>
<td>9380</td>
<td>+89.8</td>
</tr>
<tr>
<td>Sum</td>
<td>161760</td>
<td>212 460</td>
<td>+31.3</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Total of prevalence of NCDs in 2007</th>
<th>Total of prevalence of NCDs in 2011</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>161760 (±13018.8)</td>
<td>212 460 (±17297.7)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

which falls under the preview of both academic training institutions and private practitioners. This is a unique stage of clinical training, unlike the other South African exercise therapy profession of Physiotherapy (HPCSA, 2017).

**Biokinetic practitioners’ growth**

The growth in the profession of Biokinetics can be determined by the subsequent yearly variation in number of registered practicing biokineticists with the HPCSA. This statistic shows a gradual annual growth of an average of 6.5%, comparable to that of Physiotherapy (3.8%), which is another South Africa auxiliary medical exercise therapy profession registered with the HPCSA (HPCSA, 2017). Despite this, the degree to which intern-biokineticists subsequently register as practicing professionals can be seen to fluctuate. The number of intern-biokineticists who continue with the profession of Biokinetics has steadily decreased from 2015 to 2017, reflecting a concern in the long term growth of the profession. It is recommended that an investigation be conducted in order to determine why intern-biokineticists are no longer registering as practicing biokineticists. While attrition is largely described as the departure of an employee from their employment due to premature voluntary resignation of service, death, illness, superannuation and/or emigration (Lopes et al., 2017), in this scenario, the attrition of intern-biokineticists can be
Described as the departure of graduate healthcare practitioners from the profession of Biokinetics due to voluntary non-registration. Several factors predispose attrition within the healthcare sector, including poor salaries and/or employment financial benefits, limited opportunities for professional development and mentorship, overworked, a lack of personal job satisfaction and a hostile work environment (Rakgokong, 2007; MacKusick and Minick, 2010). Ellapen et al. (2017) have reported that the alleged accusation of biokineticists trespassing upon the scope of profession of Physiotherapy has encouraged many biokineticists to leave the profession. Moss and Lubbe (2011) have furthermore reported that many biokineticists leave the profession in order to seek employment as pharmaceutical sale consultants due on one hand to the limited patient market, and on the other hand to the substantially more lucrative salary packages of pharmaceutical sale consultants. The attrition of healthcare professionals prevents the healthcare system from satisfying the needs of the populace, thus adversely influencing society's health and wellbeing (Lopes et al., 2017). To date there is no literature which identifies the attrition of South African biokineticists from the profession, a fact which has encouraged the drafting of this novel communication. It is recommended that investigations be conducted so as to determine the predisposing factors which are contributing to the attrition of intern-biokineticists from the profession.

Does the number of practicing biokineticists meet the demands of the patient market?

The South African population has grown exponentially, increasing from 48 million in 2007 to 51 million in 2011 (HST, 2008, 2014). Accompanying this increase in the South African populace is an upsurge of NCDs and of HIV/AIDS (HST, 2017). Of the 51 770 560 South African citizens, HST estimates that 43 053 190 are dependent on public healthcare, while 8 717 370 citizens can afford private healthcare (HST, 2017). Now, in order to understand the market for practicing biokineticists in the South African private healthcare sector it is important to understand the concept of potential market demand. Potential market demand is considered to be the total number of patients and/or customers for whom rehabilitation may be pertinent, or who are interested in rehabilitation services (Woods, 2004). This potential market is influence by the following customer factors: (i) customers/patients ability to afford the service/rehabilitation, (ii) the applicability of the service/rehabilitation to the customer/patient, (iii) the inaccessibility of the service/rehabilitation, (iv) ignorance regarding the availability of the service/rehabilitation, (v) customers/patient disinterest in the service/rehabilitation and (vi) customers/patients who actually seek the service or rehabilitation rendered (Moss and Lubbe, 2011). Roger (2000) reported that the potential market refers to the maximum number of customers/patients who may buy/seek the product/service/rehabilitation, but not the actual number who will realistically purchase the service.

In 2011 it was estimated that 212 460 patients were identified as suffering from either NCDs and/or HIV/AIDS in the private healthcare sector (CMS, 2017). Adopting Moss and Lubbe’s (2011) regression calculation, the South African private healthcare sector potential market demand is 2125 exercise therapists (one exercise therapist being required in order to rehabilitate 100 NCDs patients per month). However, one needs to be mindful of the fact that the profession of Biokinetics is only one of the two exercise therapy professions that are capable of rehabilitating NCDs in the South African private healthcare sector (the other being Physiotherapy). It would therefore be wise to estimate that only 50% of the South African private healthcare patient market may seek biokinetic rehabilitation. The other 50% of the potential patient market may seek physiotherapy, they may be unable to afford rehabilitation, be ignorant of the rehabilitation available and/or be disinterested in rehabilitation (taking consumer factors into account) (Moss and Lubbe, 2011). Taking the aforementioned six consumer factors that influence the potential market demand into consideration, a more realistic potential market demand for biokineticists would be 1063 practitioners. In so far as in 2011, 1020 practicing biokineticists were registered with the HPCSA, we can see that this constitutes 95.9% of estimated 1063 practitioners needed (HPCSA, 2017). These statistics suggest that the market demand for biokineticists for NCDs and HIV/AIDS rehabilitation has almost reached a saturation point. The probability over-saturation of biokineticists in the private healthcare and biokinetic tertiary training institutions should be cognizant of the aforementioned statistics and of the subsequent threat of market over-saturation, as this would ultimately limited student enrolment due to deteriorating career prospects. Despite this one needs to be mindful that the rehabilitation of NCDs and of HIV/AIDS is merely one element of the scope of profession of Biokinetics, which also includes final-phase rehabilitation of orthopaedic injuries, health and wellness programmes, human performance enhancement in the work environment and in the sports arena. It is postulated that surplus biokineticists satisfy the above mentioned needs beyond the rehabilitation of NCDs and of HIV/AIDS. Nevertheless, BASA needs to expedite the process by which biokineticists will become eligible for work in the public healthcare sector as recommended by Evans et al. (2016). The successful rehabilitation of the profession of Biokinetics of NCDs and HIV/AIDS in the private healthcare can serve as evidence that the profession will be of great value within the public healthcare sector. It can furthermore be postulated that the near saturation of
demand for biokineticists in the South African private healthcare sector has influenced the attrition of intern-biokineticists away from the profession. A vigorous investigation should be conducted so as to determine the underlying reasons for intern-biokineticist attrition.

Conclusion

The number of practicing biokineticists in South Africa is progressively growing, accompanied by both student-in-training and intern-biokineticists demographics. Despite this a recent attrition of intern-biokineticists from the professions (2015 to 2017) can be noted. An investigation identifying the reasons for this attrition should be undertaken in order to determine the predisposing factors influencing their decision. The growth in the number of biokineticists together with the upsurge in the prevalence of NCDs seems to be equitable as per 2011 statistics. However, a new threat of oversaturation of biokineticists in the South African private healthcare sector seems inevitable. It is strongly advised that BASA and the various South African biokinetic training institutions take note of these emerging trends.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENT

The authors would like to thank Marco Barnard for his industrious efforts in sourcing the statistics for this communication.

REFERENCES


Related Journals:

- Clinical Reviews and Opinions
- Journal of Medicinal Plant Research
- African Journal of Pharmacy and Pharmacology
- Journal of Dentistry and Oral Hygiene
- Journal of Parasitology and Vector Biology
- Journal of Pharmacognosy and Phytotherapy
- Journal of Medical Laboratory and Diagnosis
- Journal of Diabetes and Endocrinology
- Medical Practice and Reviews

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