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ORIGINAL ARTICLE

The Inclusion of Sports and Exercise Related Module into Pharmacy Curriculum: Non-Pharmacological Approach on Students' Health Parameters

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ABSTRACT

Objectives: To promote a holistic approach to healthcare, the University of Cyberjaya introduced a unique elective course called sports pharmacy, which incorporates components of lifestyle interventions. Customers increasingly seek guidance about lifestyle factors that impact their health. Pharmacists with expertise in sports and exercise can meet this need. However, there is a lack of studies on the impact of non-pharmacological approaches (NPAs) on health parameters among healthcare professionals and pharmacy students in Malaysia. The objectives of this study were to compare students' health parameters based on NPAs and identify the factors that motivate students to maintain their health.

Materials and Methods: The study comprised 47 Year 4 pharmacy students in the pre- and post-practical phases (September 2018 and November 2018), followed by the post-resting phase (May 2019). The data collection form in the Sport Pharmacy course was used for the data collection.

Results: Nearly half of the students initially displayed a normal body mass index (BMI). However, after the post-resting period, there was a noticeable increase in the number of students categorized as obese and those with elevated total cholesterol (TC) and fasting blood glucose (FBG) levels. Specifically, in the pre-study phase, out of 47 participants, 22 were within the normal BMI (47%), six underweight (13%), nine overweight (19%), and ten obese (21%). The intervention phase showed a slight reduction in the overweight category, while the obese category showed an increase. For TC, the pre-phase had 70% of participants within the normal range, with 26% borderline high and 4% high. Post-study, showed an improvement, likely influenced by controlled dietary intake and physical activity. In the post-resting phase, however, there was a regression as the majority did not adhere to the non-pharmacological regimen. FBG demonstrated significant changes after the intervention, particularly within the normal range (≤ 6.0 mmol/L), showing the only statistically significant change across parameters. While the post-resting phase saw a minor increase, it remained below baseline. Approximately 23% continued diet control, while 32% maintained physical activity. Key motivations included health improvement, visible results, and improved well-being, while lack of motivation, time, and study schedules were primary discontinuation factors.

Conclusion: The 10-week intervention significantly impacted FBG but had limited influence on BMI and TC. Post-resting outcomes highlight that only a small fraction maintained the non-pharmacological approach, resulting in no marked changes in any parameters. Recommendations include further long-term studies to confirm the sustained benefits and the role of educational institutions in supporting such interventions.

Keywords: Non-pharmacological, body mass index, fasting blood glucose, total cholesterol, pharmacy students

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INTRODUCTION

Sports pharmacy is defined as the science and practice of dispensing medication and medical equipment for individuals participating in exercise or sport and the provision of information and advice on exercise programs, treatment, and prevention of simple injuries.[1] A sports pharmacy course is offered by the Faculty of Pharmacy, University of Cyberjaya as an elective course in Year 4 Semester 1 of Bachelor of Pharmacy. This course equips students with knowledge and evidence-based advice on the promotion and maintenance of good health through an active lifestyle.[1] There is a practical session where students need to conduct a non-pharmacological approach of diet control and physical activity (DCPA) for 10 weeks as part of their assessment.

Human health status can be defined by a variety of physiological health parameters, such as body mass index (BMI), fasting blood glucose (FBG), and total cholesterol (TC).[2] According to the World Health Organization (WHO), BMI is defined as a person's weight in kilograms divided by the square of the person's height in meters (kg/m²).[3] Both low BMI (< 22.6 kg/m²) and high BMI (> 27.5 kg/m²) were associated with an increased risk of death from any cardiovascular disease (CVD), cancer, or other causes, resulting in an overall U-shaped association among East Asians but not among Indians and Bangladeshis.[4] According to the Malaysian Clinical Practice Guideline on the management of type 2 diabetes mellitus (2015), FBG is used as a diagnostic tool for type 2 diabetes mellitus based on venous plasma glucose levels in symptomatic individuals.[5] Yiling et al.[6] found that the prevalence of retinopathy began to rise precipitously after FPG levels exceeded 5.8 mmol/L. Based on the Malaysian Clinical Practice Guideline on the Management of Dyslipidemia (2017), TC > 5.2 mmol/L is used as one of the diagnostic tools for dyslipidemia.[7] Raised TC is estimated to cause 2.6 million deaths and 29.7 million disability-adjusted life years (DALYs).[2] In both developed and developing countries, raised TC is a major cause of disease burden as a risk factor for ischemic heart disease (IHD) and stroke.[2]

Non-pharmacological approaches (NPAs) are defined as science-based and non-invasive interventions for human health without involving using of drugs.[8] Examples are physical activity and diet control. Physical inactivity has been identified as the fourth leading risk factor for mortality worldwide (6% of deaths globally).[9] In addition, physical inactivity is predicted to be the main cause of approximately 21-25% of breast and colon cancers, 27% of diabetes, and approximately 30% of IHD burden.[9] The WHO recommends that adults aged 18-64 years should perform at least 150 minutes of moderate-intensity aerobic physical activity throughout the week, at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activities to maintain their health status.[9] Based on the WHO (2018) recommendations, a healthy diet helps protect against malnutrition in all forms, as well as NCDs.[9] An adequate, well-balanced diet together with regular physical activity is a cornerstone of good health.[9] Nybo et al.[10] found that FBG was reduced to a similar extent in the intense interval running and moderate-intensity running groups but remained unchanged in the strength training and control groups.

McManus et al.[11] found that the Mediterranean diet group with moderate fat had significantly reduced weight and BMI at 6, 12, and 18 months, with an average weight loss of 4.8 kg, compared with the low-fat diet group.

Social cognitive theory, including self-efficacy, is defined as the belief that one can organize and execute a course of action to achieve a specific goal and outcome expectations, which are beliefs that if a certain behavior is performed, it will lead to an anticipated outcome.[12] Based on the theory of self-efficacy theory, emphasis on the importance of individuals' perceptions of their personal capabilities as key determinants of successful outcomes is essential for promoting behavioral change to affect others. Pharmacy students need to experience the activities of healthy eating and physical exercise as conceptualized in the 7 pillars of self-care.[13] Pharmacists and pharmacy students recalled limited opportunities for education in sports pharmacy. There is a growing need for specialist pharmacists in the fields of sport and exercise.[13]

Ilow et al.[14] reported that 7.5% of males and 7.1% of females were overweight among 1168 pharmacy students in Poland. In this study, hypertension was diagnosed in 27.2% of males and 7.8% of females.[14] Most of the students did not consume enough fruits and vegetables (female students 61.8%, male students 75%).[14]

Furthermore, 41.9% of female students and 31.9% of male students.[14] Bastardo[15] also reported a similar finding: 106 (62%) pharmacy students did not exercise regularly, and male students (84.1%) were more likely to consume alcohol than female students (59.8%). Physical inactivity and unhealthy diets showed that there is a need for pharmacy students to practice NPAs such as DCPA to maintain their health conditions. The aim of this study is to determine the impacts of NPAs on health parameters, such as BMI, FBG, and TC, among Sports Pharmacy students.

MATERIALS AND METHODS

Participants and study design

This study was divided into pre- and post-resting phases conducted at the University of Cyberjaya in Cyberjaya. The pre- and post-phase phases were conducted from September 2018 to November 2018, and the post-resting phase was conducted in May 2019 after 6 months of resting from the post-study. In the study conducted, a group of 47 Year 4 Pharmacy students who chose to take Sport Pharmacy during their Semester 1 in 2018 were selected as participants. The study protocol was approved by the University of Cyberjaya Research Ethics Review Committee (approval number: CUCMS/CRERC/FR/030, date: 11.07.2019). Informed consent was obtained from all participants.

A data collection form, as used in the Sport Pharmacy course, was administered to participants in the pre-phase, post-phase,

and post-resting phases to document health parameters. Students measured their baseline health parameters during the pre-phase and after conducting the practical session.

In the pre-study phase, respondents' health parameters, such as TC, FBG, and BMI, were measured as baseline health parameters. Subjects were required to fast for at least 8 hours before the measurement of TC and FBG. TC and FBG were measured by withdrawing aseptically two drops of blood sample from the subject's fingertip. BMI was measured using a weighing machine and a stadiometer. Then, the respondents performed 10 weeks of diet control and exercise.

Diet control was defined as the restriction of food calorie intake per day based on the resting metabolism of the respondent as measured in the pre-study. Participants recorded their food intake daily, including breakfast, lunch, dinner, and snacks, and the total food calorie intake. Participants were encouraged to conduct at least 150 min of moderate-intensity aerobic or 75 min of vigorous-intensity aerobic exercise throughout the week. Diet intake and physical activity were submitted as a weekly report online every Sunday. In the 11th week, a post-study phase was conducted in which respondents' health parameters were re-measured. The post-resting phase was conducted 6 months later in May 2019 in which participants' health parameters were re-measured to compare differences in health parameters between the post-resting and post-resting studies.

Statistical analysis

All results were analyzed using the Statistical Package for Social Sciences (SPSS) software (version 25). Results were expressed as mean ± standard deviation for quantitative variables, such as BMI, TC, and FBG in pre-, post, and post-resting periods. Statistical significance was set at $p < 0.05$. A paired samples t-test was performed to compare the mean difference in TC between the pre- and post-studies. The Wilcoxon signed-rank test was used to compare the median difference in BMI and FBG between the pre-and post-resting phases, post- and post-resting phases, and the median difference in TC between the post- and post-resting phases. Multiple Response Analysis was used to study the factors for continuing or not continuing DCPA.

RESULTS

Table 1 presents the health parameters of students in the post and post-resting phase. In the pre-phase, out of 47 participants, 22 were within normal BMI (47%), six were underweight (13%), nine were overweight (19%), and ten were obese (21%). Twelve participants (26%) showed borderline high TC (5.2-6.2 mmol/L) and two participants (4%) showed high TC while the rest (70%) were within normal TC level (< 5.2 mmol/L). Only one respondent had a low FBG level (< 3.9 mmol/L), whereas the remaining (98%) showed normal FBG level (≤ 6.0 mmol/L).

In the post-study, out of 47 students, the same number of participants were within normal BMI (49%) and underweight (13%) categories. Eight participants were overweight (17%) and 11 were obese (21%). Eight participants (17%) showed borderline high TC, two participants (4%) showed high TC, and the remaining participants (79%) were within the normal TC level. Moreover, three participants (6%) had Impaired FBG (6.1-6.9 mmol/L), whereas the rest (94%) showed normal FBG levels.

In the post-resting study, the same number of participants remained in each BMI category. Four participants (9%) showed borderline high TC and six participants (13%) showed high TC, and the remaining (79%) showed normal TC level (≤ 5.2 mmol/L). Two respondents (4%) showed impaired FBG and only one respondent (2%) showed high FBG, whereas the remaining (94%) showed normal FBG levels.

Figure 1 shows that only 11 (23%) students continued their diet control, whereas 36 (77%) students did not continue their

Table 1. Comparison of pre-, post, and post-resting health parameters

		Pre		Post		Post-resting	
n		47		47		47	
Health parameters	Category	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)
BMI	Underweight	6 (13)	23.41 (4.99)	6 (13)	23.13 (4.75)	6 (13)	22.91 (4.83)
	Normal	22 (47)		22 (49)		22 (47)	
	Overweight	9 (19)		8 (17)		8 (17)	
	Obese	10 (21)		11 (21)		11 (23)	
TC	Normal	33 (70)	4.73 (0.81)	37 (79)	4.6 (0.66)	37 (79)	4.35 (1.22)
	Borderline high	12 (26)		8 (17)		4 (9)	
	High	2 (4)		2 (4)		6 (13)	
FBG	Low	1 (2)	5.12 (0.05)	0 (0)	5.09 (0.48)	0 (0)	5.45 (0.52)
	Normal	46 (98)		44 (94)		44 (94)	
	Impaired FBG	0 (0)		3 (6)		2 (4)	
	High	0 (0)		0 (0)		1 (2)	

n: Number, SD: Standard deviation, BMI: Body mass index, TC: Total cholesterol, FBG: Fasting blood glucose

diet control during the post-resting study. The main factors associated with continued diet control in the post-resting study are presented in Table 2. Out of 11 respondents who continued their diet control, the main factors for continuing were health (34.8%), followed by seeing results (getting fitter and healthier) (30.4%) and feeling better (26.1%). Only one respondent chose friends, praise, or rewards (4.3%) as the main factors for continued diet control. The main factors for not continuing diet control in the post-resting study are presented in Table 3. Among the 37 respondents who did not continue their diet control, their main factors were lack of motivation (33.8%), followed by study schedule (24.3%) and lack of time (21.6%). Four students chose financially and did not suit their needs (5.4%) as their main reasons for not continuing their diet control. Only three students chose lack of results (4.1%), whereas two students chose too restrictive and other reasons, such as laziness (2.7%), as their main factors for not continuing their diet control.

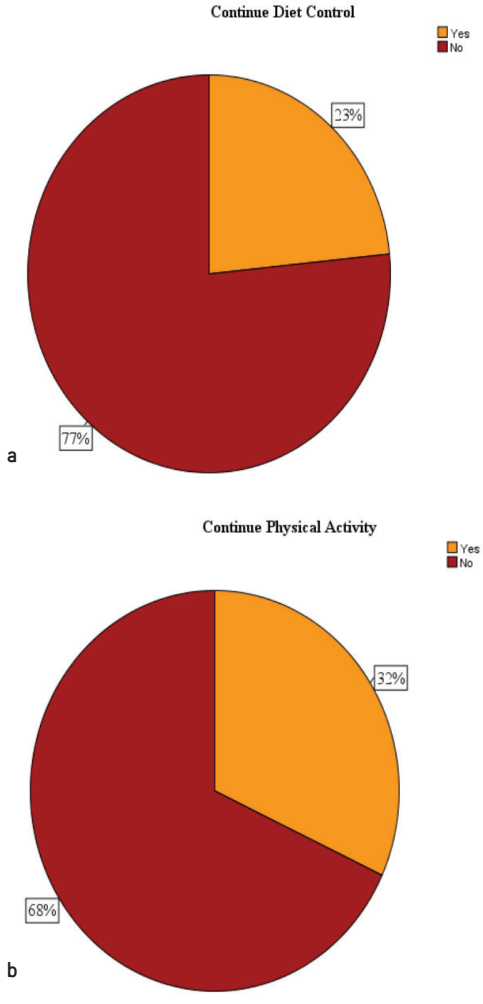

Figure 1. (a) A total of 23% of Year 4 Pharmacy students continued their diet control post-resting. Most Year 4 Pharmacy students (77%) did not continue diet control during the post-resting study. (b) Only 32% of Year 4 Pharmacy students continued physical activity during the post-resting study. Most Year 4 Pharmacy students (68%) did not continue physical activity in the post-resting study

Figure 1 shows that only 15 (32%) students continued physical activity, whereas 32 (68%) students did not continue physical activity in the post-resting study. The main factors associated with continuing physical activity in the post-resting study are presented in Table 4. The top 3 reported factors for continuing physical activity in the post-resting study were health (21.4%), having fun (21.4%), and feeling better (21.4%), respectively. A small proportion of students chose to see results (14.3%) and good appearances (11.9%), respectively. Only three students chose friends, whereas only one student chose praise or rewards as their main motivating factor for

Table 2. Factors for continuing diet control

Factors for continued diet control	Responses (n)	Percentage (%)
Friends	1	4.3
Praise/Rewards	1	4.3
Feeling better	6	26.1
Seeing results (Getting fitter and healthier)	7	30.4
Health	8	34.8
Total	23	100.0

Table 3. Factors for not continuing diet control

Factors associated with not continuing diet control	Responses (n)	Percentage (%)
Too restrictive	2	2.7
Other	2	2.7
Lack of results	3	4.1
Financial	4	5.4
Did not suit needs	4	5.4
Lack of time	16	21.6
Study schedule	18	24.3
Lack of motivation	25	33.8
Total	74	100.0

Table 4. Factors associated with continued physical activity

Factors associated with continued physical activity	Responses (n)	Percentage (%)
Praise/Rewards	1	2.4
Friends	3	7.1
Appearance	5	11.9
Seeing results	6	14.3
Feeling better	9	21.4
Health	9	21.4
Having fun	9	21.4
Total	42	100.0

continuing physical activity. Table 5 shows the main factors for not continuing physical activity in the post-resting study among 33 respondents: lack of motivation (38.5%), followed by lack of time (29.2%) and study schedule (23.1%). Two students chose financial and lack of results (3.1%) as their main factors for not continuing physical activity. Only one student's choice did not suit their needs, and the other was the main reason for not continuing physical activity.

Table 6 shows that there was a significant difference ($p < 0.05$) in FBG levels after 10 weeks of non-pharmacological treatment. However,there were no significant changes in BMI and TC after 10 weeks of NPAs. In addition, Table 6 shows that no significant differences were observed in BMI, TC, and FBG between the post- and post-resting study.

DISCUSSION

After implementing the non-pharmacological approach for 10 weeks, there was a slight decrease in the mean BMI from 23.41 kg/m^2 to 23.13 kg/m^2. A slight increase in the proportion of pharmacy students who were in the normal BMI category (49%) and a slight decrease in the percentage of students who were in the overweight category (17%) after completing 10 weeks of the non-pharmacological approach due to students who might want to control their weight by controlling their diet and conducting physical activity to lose weight. No underweight respondents were able to manage to go into the normal category because all students in this category were female who might want to control their weight to prevent weight gain. At the same time, no respondents in the obese category were able to manage to go into the normal BMI or overweight category due to the physical activity conducted might not be vigorous enough to lose weight or their diet was not well controlled. Although the mean BMI in the post-resting study was lower than that in the post-study, there was a slight decrease in the percentage of students in the normal BMI category and an increase in the proportion of students in the obese category in the post-resting study, which might be due to some participants gained weight as they did not carry out the non-pharmacological approach in the post-resting study.

There was a slight increase in the proportion of pharmacy students (79%) who showed normal TC levels and a decrease in the proportion of borderline TC levels (17%) in the post-study period, which might be due to participants becoming aware of their TC levels by controlling their diets and conducting physical activity regularly during the non-pharmacological approach period. No change in the percentage of participants with high TC levels might be due to some respondents not controlling their diet and conducting physical activity regularly although they knew their TC levels were higher than the normal range. There was a slight reduction in mean TC from 4.73 to 4.6 mmol/L after 10 weeks of the non-pharmacological approach. Although the mean TC in the post-resting study was lower than that in the post-study, the results of the post-resting study showed an increase in the percentage of students who had high TC levels as compared with the post-study (4%) which might be due to the participants not carrying out the non-pharmacological approach in the post-resting study.

They might eat foods high in fat content more frequently because they did not control their diet in the post-resting study.

Table 5. Factors for not continuing physical activity

Factors associated with not continuing physical activity	Responses (n)	Percentage (%)
Did not suit needs	1	1.5
Other	1	1.5
Financial	2	3.1
Lack of results	2	3.1
Study schedule	15	23.1
Lack of time	19	29.2
Lack of motivation	25	38.5
Total	65	100.0

Table 6. Study comparisons for BMI, TC, and FBG

Health parameters	Study comparison	n	Differences	Test statistic	*p* value	Notes
BMI	Comparison of BMI before and after study	47	0 (0)	-1.732	0.083	Wilcoxon signed-rank test
BMI	Comparison of BMI between post- and post-resting study	47	0 (0)	-1.63	0.102	Wilcoxon signed-rank test
TC	Comparison of pre- and post-study TC	47	0.085 (0.62)	0.94 (46)	0.351	Paired *t*-test
TC	Comparison of post- and post-resting TC	47	0 (0)	-0.85	0.396	Wilcoxon signed-rank test
FBG	Comparison of FBG before and after study	47	0 (0)	-2.00	0.046	Wilcoxon signed-rank test
FBG	Comparison of FBG levels between post- and post-resting studies	47	0 (0)	-0.33	0.739	Wilcoxon signed-rank test

TC: Total cholesterol, FBG: Fasting blood glucose, SD: Standard deviation, BMI: Body mass index

In addition, they did not conduct physical activity regularly during the post-resting study.

In the pre-study, only one participant had low FBG, which might be due to the participant being in the underweight category or fasting too long before the measurement of FBG. An increase in the impaired fasting glucose proportion observed in the post-study might be due to the participants not conducting a non-pharmacological approach as instructed in the Sport Pharmacy course as these were self-conducted by respondents. There was a slight decrease in impaired fasting glucose percentage in the post-resting study as compared with the post-study (6%) but one respondent showed high FBG as not observed before in the pre-and post-study, which might be due to the participant not carry out the non-pharmacological approach in the post-resting study. A slight decrease in the mean FBG (5.12 mmol/L to 5.09 mmol/L) was observed from pre to post-study. However, mean FBG levels were increased in the post-resting study, which might be due to the respondents consuming foods high in sugar content more frequently as they did not control their diet in the post-resting study. In addition, they did not conduct physical activity regularly during the post-resting study. Therefore, an increase in mean FBG was observed in the post-resting study.

After 10 weeks, the implementation of non-pharmacological methods resulted in notable changes in the FBG level. However, no substantial variance was observed in the BMI and TC levels. Moreover, no significant differences were observed in BMI, FBG, and TC between the post- and post-resting studies because most students did not continue NPAs in the post-resting study. In neither the diet and physical activity group nor the diet with delayed physical activity group did Goodpaster et al.[16] find any significant change in FBG and TC after a 1-year intervention.

However, the findings of the present study were in contrast to those of this study, which reported a significant difference in body weight and BMI after 1 and 2 years of diet and physical activity interventions.[16] This study concluded that the addition of physical activity, regardless of whether initiated early in the program or delayed, promoted greater weight loss and reduction in BMI.[16] Similarly, Mensink et al.[12] also reported a significant difference in BMI between the intervention group and control group after 1 and 2 years due to changes in body weight. However, this study reported no significant change observed in TC level between the lifestyle intervention and control groups after one and two years of lifestyle intervention, which was similar to the findings of the present study, although a slight increase in TC was observed over time in both groups.[12] In contrast, Zhang et al.[17] found that lifestyle interventions, which included physical activity, diet, and behavioral modification, could significantly improve lipid profiles, including TC. They reported that combined physical activity and diet strategy had the strongest effect on improving CVD profiles compared with diet intervention alone or physical activity alone. Posttests from previous studies were conducted immediately after combined diet and physical activity intervention. There were no resting periods in these studies that could be used to compare the post-resting results of the present study.

Only 23% of participants continued their diet control and 32% continued their physical activity during the post-resting study. Al-Naggar et al.[18] found that more than half of Malaysian university students are physically inactive (53.7%).[19] The percentage of students who practiced physical activity in this study was in contrast to that observed in previous studies.[19-21] The percentage of students practicing diet control was lower than that reported by Yousif et al.[22] who reported that nearly half of students did not control their diet (45.8%), whereas 28.7% controlled their diet and 25.5% were emotional eaters. A low percentage of students continued physical activity and diet control reflects insufficient healthy lifestyle practices among university students despite practicing physical activity and diet control in the Sport Pharmacy course.[20] Being a student in a health university college was found to be associated with a high risk of physical inactivity.[23] Heavy academic study was one of the barriers to university Chinese students' participation in physical activity.[24]

Among the students who continued their diet control in the post-resting study, the main factors for continuing their diet control were health (34.8%), followed by seeing results (30.4%) and feeling better (26.1%). Only a small proportion of students chose friends, praise, or rewards (4.3%), respectively. This coincides with a study conducted by Tok et al.,[25] which reported that the main reasons for practicing diet control in both males and females were health (43.4% and 31.4% respectively). The present study showed that health, having fun, and feeling better were the main three factors for continuing physical activity in the post-resting study. Only a minority of students chose to see results, good appearance, friends, and praise or rewards as their main factors for continuing physical activity. According to Driskell et al.,[26] a study found that health, enjoying themselves, and wanting to lose weight were three factors that impacted students' habits regarding physical activity. A study conducted by Romaguera et al.[21] conducted a study on Spanish university students and found that most students engaged in physical activity to keep themselves fit, and healthy, enjoy themselves, and engage in social interaction (with their friends). The present study noted that participants in this study were pharmacy students who had good knowledge about health and knew that DCPAs were examples of NPAs that could maintain their health. This might be explained by the fact that students chose health, seeing results, and feeling better as their main factors for continuing the non-pharmacological approach in their post-resting study.

For students who did not practice DCPAs, factors for not practicing diet control were lack of motivation, followed by study schedule and lack of time, respectively. A minority of students chose other reasons, such as financial, did not suit their needs, lack of results, too restrictive, and others, such as laziness, as the main factors for discontinuing DCPAs in the post-resting study. This coincides with a study conducted in Saudi Arabia by Majeed[27] who found that the main barriers to diet control were lack of time, followed by lack of access to healthy foods and taste preferences. A similar finding was reported by Silliman et al.,[28] who reported that the most common barriers cited to

practicing diet control were lack of time, followed by lack of money and taste preferences.

Daskapan et al.[29] reported that the most important barrier to not participating in physical activity among Turkish university students was lack of time due to a busy study schedule, followed by parents, social and family responsibilities, and lack of energy. Similarly, barriers to physical activity among Egyptian students reported by El-Gilany et al.[30] included time limitation, lack of friends to encourage them, lack of motivation, financial issues. Awadalla et al.[23] reported that more than half of students chose personal factors as significant barriers of not practicing physical activity, such as time limitation (51.3%). In this study, only 19.6% chose lack of motivation as their significant barrier to not practicing physical activity, which was much lower as compared to the present study.

The present study noted final year pharmacy students who were busy in their studies and had little time for DCPA. This may be explained by the fact that students chose their study schedule and lack of time as their main barriers to DCPA. A busy study schedule and lack of time might cause patients to not be motivated to practice a non-pharmacological approach in their daily lives. They prioritized their academics over DCPA. Another reason for students not practicing diet control might be the wide availability of local traditional cuisines and snacks, such as *nasi lemak*, curry, and *roti canai*, at cafeterias on campus. The emergence of fast food outlets around the campus area and the convenience of transportation systems are believed to be contributing factors for not practicing diet control.[31]

Study limitations

In this study, the respondents might have underestimated their caloric intake or exaggerated the amount of exercise based on response bias because the respondents were self-conducted and self-reported their physical activity and diet intake in their weekly reports.[32] No monitoring of a non-pharmacological approach was conducted by respondents in pre-, post, and post-resting studies. Second, the study subjects consisted of mostly females, which might have contributed to the bias in the results of the present study. Third, the method of measuring health parameters might influence outcome.[32] Based on the Malaysian Clinical Practice Guideline on the Management of type 2 diabetes mellitus (2015), FBG levels should be measured using venous blood samples instead of capillary blood samples.[5] This may affect the accuracy of FBG results. Fourth, the incomplete weekly reports submitted by most respondents resulting in the measurement of food calories per week could not be analyzed for diet control in this study. Fifth, the equipment used in the study, such as a blood glucose meter and weighing scale, were not validated. This could affect the validity of the study results.

CONCLUSION

Significant results for FBG were achieved through a non-pharmacological approach consisting of physical activity and diet control administered over 10 weeks. However, there was no notable influence on BMI or TC. The post-resting phase failed to produce significant changes in BMI, FBG, and TC due to the minority of patients who continued non-pharmacological practices in their daily routine. Barrier identification revealed a lack of motivation, insufficient time, and conflicts with study schedules as hindrances to maintaining non-pharmacological methods among pharmacy students. Long-term follow-up studies should be conducted to

confirm whether pharmacy students continue practicing NPA, and the benefits of these methods should be maintained after the course ceases. The university plays an important role in improving the compliance of pharmacy students with a non-pharmacological approach by reviewing practical assessments of the course to motivate and encourage pharmacy students to practice a non-pharmacological approach in their daily lives. Creating environments conducive to change and promoting healthy habits is also important in the university context.

Pharmacists should be able to discuss the health benefits of exercise, and practical skills in patient counseling should be practiced to encourage appropriate self-care and the dispensing of self-care advice to patients. Maintaining normal health parameters among pharmacy students is important because they are professional students who need to provide pharmaceutical care and patient education to the public. Periodic monitoring through a continuous survey of students' physical and dietary lifestyles can be a wise move to improve their status.

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Ethics

Ethics Committee Approval: The study protocol was approved by the University of Cyberjaya Research Ethics Review Committee (approval number: CUCMS/CRERC/FR/030, date: 11.07.2019).

Informed Consent: Informed consent was obtained from all participants.

Authorship Contributions

Concept: A.R.M.T., A.F.M.L., Design: A.R.M.T., W.S.W.Z., M.A.N., Data Collection or Processing: V.J.H., W.S.W.Z., Analysis or Interpretation: V.J.H., W.S.W.Z., Literature Search: A.R.M.T., V.J.H., M.A.N., F.S.A.R., A.F.M.L., Writing: A.R.M.T., M.A.N., F.S.A.R., A.F.M.L.

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