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Original Article

Effect of Mobile Health Teaching Program about Diet and Exercise on Obesity Control among Faculty of Nursing Students: Randomized Controlled Trial

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ABSTRACT

Background: Obesity is a key risk factor for developing long-term health complications and global mortality. Lifestyle modifications including dietary intervention and increased physical activity can effectively treat obesity. T**his study aimed** to evaluate the effect of mobile health teaching program about diet and exercise on obesity control among faculty of nursing students using Randomized Controlled Trial (RCT) design on intervention and control purposive computer-generated random sample of male and female students studying at different levels in the academic year (2023-2024) at the Faculty of Nursing, Miser for Science and Technology University; Egypt. The study employed three tools, **Tool (I):** Demographic information questionnaire, **Tool (II):** Self-administrated Structured KAP Questionnaire & **Tool (III):** Anthropometric Measurements Scale. The study results showed statistically significant improvement in the mean level of knowledge, attitude, and practices of the intervention group of students after 4 and 6 months of the mobile health teaching program implementation compared to the control group. The study concluded that the mobile health teaching program about diet and exercise have positive effect on the faculty of nursing students' anthropometric measurements indicating obesity control. So, the study recommended investigating the effect of artificial intelligence social media applications on controlling body weight among different age groups.

Key words: Diet, Exercise, Mobile Health Teaching Program, Obesity Control.

Introduction

Overweight and obesity refer to abnormal fat accumulation **(WHO, 2021),** which has reached epidemic proportions globally, with at least 2.8 million people dying each year (**World Health Organization, 2017)**. The prevalence of obesity in the United States (US) rose from 30.5% to 41.9% between 1999 and March 2020. At the same period, the National Health and Nutrition Examination Survey data showed that the prevalence of severe obesity climbed from 4.7% to 9.2% **(NHANES, 2021)**. The Middle East region's

consensus estimates for the prevalence of overweight and obesity were 21.17 and 33.14, respectively **(Brenner et al., 2019)**.Obesity rates in the Middle East increased with age, with over 40s having the highest prevalence. However, overweight rates decreased from 34.83 to 32.85 between 2000-2020 **(Okati-Aliabad et al., 2022)**.

Obesity in Egypt affects the economy, workforce, and public health. The "100 million healthy lives" report shows 39.8% obesity. Preventing obesity can help achieve sustainable development goals by reducing non-communicable diseases (NCDs) and achieving gender, region, and socioeconomic levels **(Sedky et al., 2021)**. Genetics, the types and amounts of food and beverages consumed, physical activity levels, the amount of time spent on sedentary activities, irregular sleeping patterns, medical conditions or medications, and lifestyle are all potential causes of weight gain in adults **(National Institute of Child Health and Human Development, 2021)**. Obesity and overweight increase the risk of various illnesses such as high blood pressure, heart disease, stroke, type 2 diabetes, joint issues, liver disease, gallstones, certain cancers, breathing issues, sleep difficulties, and joint problems **(Cotter & Rinella, 2020)**. Also, it increases medical and surgical problems, cardio-metabolic comorbidities, and raises the risk of coronavirus illness **(Loh, Yaw, & Lau, 2023)**.

College and university mark the transition into adulthood, where students make independent lifestyle choices and potentially harmful habits, which can negatively impact their long-term health and disease risk **(Al-Awwad et al., 2021)**. Unhealthy eating habits and inactivity contribute to overweight or obese individuals, lowering quality of life and increasing risk of life-threatening diseases like diabetes, cancer, and heart disease **(Parkman, 2020)**. Maintaining a healthy Body Mass Index (BMI) of 18.5-24.9 kg/m2 through a balanced diet and regular physical activity is recommended for adults to prevent chronic diseases and improve quality of life **(Weir & Jan, 2022)**.

Digital tools like smartphones, applications, and social media are widely used by young adults and adolescents **(Garrido et al., 2019; Lattie et al., 2019)**. Social media like Facebook, WhatsApp and Twitter can be a cost-effective and powerful platform for delivering behavior modification interventions, allowing users to interact and self-present with broad and narrow audiences, enhancing engagement and perceived value **(Carraça et al., 2022)**, is increasingly used to provide social support for long-term conditions like obesity **(Pattanapongsa, Jiamjarasrangsi, & Hanvoravongchai, 2020)**. In-addition to enhance or maintain healthy behaviors (**Hunter et al., 2019);** the mobile health teaching program on diet and exercise improves physical activity levels, healthy diet behaviors, and body composition (**Goodyear et al., 2021)**.

Health teaching programs are essential for promoting wellness and preventing diseases within communities. These programs provide individuals with the knowledge and skills needed to make informed health decisions. By focusing on various aspects of health, such as nutrition, physical activity, mental health, and disease prevention, these programs empower participants to adopt healthier lifestyles. They often include interactive workshops, educational materials, and support from healthcare professionals. The goal is to create a supportive environment where individuals can learn, ask questions, and receive guidance tailored to their needs. Effective health teaching programs can lead to improved health outcomes, reduced healthcare costs, and a stronger, more health-conscious community **(Harvard T.H. Chan School of Public Health Executive Education, 2025).**

Aim of the study:

This study aimed to evaluate the effect of mobile health teaching program about diet and exercise on obesity control among faculty of nursing students.

Hypotheses:

H_1: The mobile health teaching program on diet and exercise will significantly reduce BMI among Faculty of Nursing students compared to the control group.

H_2: The mobile health teaching program will lead to significant improvements in dietary habits among Faculty of Nursing students compared to the control group.

H3: The mobile health teaching program will lead to significant increases in physical activity levels among Faculty of Nursing students compared to the control group.

Study design: Randomized Controlled Trial (RCT) design was utilized to conduct this study.

Setting: The study was carried out at the Faculty of Nursing, Miser for Science and Technology University; Egypt.

Participants: A purposive sample composed of male and female students in different study levels at the academic year (2023-2024), with total students' number (Population) of 1300.

Sample size:

The sample size calculated using the following formula: **n = N * (z^2 * p * (1 - p)) / d^2**

Where: n: is the sample size, N: is the population size, Z: is the confidence factor (typically 1.96), P: is the proportion of the phenomenon in the population (if not known, it can be assumed to be 0.5), d: is the expected amount of variation (if not known, it can be assumed to be 0.05). In this study, the desired level of confidence is 95%, and the expected amount of variation is 0.05, the required sample size is:

n = 1300 * (1.96^2 * 0.5 * (1 - 0.5)) / (0.05^2) = 298

This means that 298 students must be selected from the study population to be representative **(Smith et al., 2024).** The participants chosen randomly using computer-generated random numbers. The students were chosen from all studying levels based on some inclusion criteria including age ranges between 18 to 22 years old, with BMI ≥ 25 (classified as overweight or obese) but healthy, and not pregnant or lactating. Some are excluded from the study if having metabolic diseases like diabetes mellitus, hyper/ hypothyroidism, gastrointestinal disorders, chronic diseases as renal failure, hypertension, or liver failure; as these diseases need special diet programs and can affect the study results.

Tools of data collection: Three tools for data collection were used:

Tool (I) Nursing students' demographic information questionnaire that is composed of seven items with closed ended answers such as age, gender, study level, GPA, monthly income, number of family members, place of residence; and three open ended items: weight, height, and waist circumference in centimeter.

Tool (II) Self-administered Structured KAP Questionnaire: that is a validated tool used to assess knowledge, attitudes and practice of the nursing faculty students, composed of 42 items took around 60 min to be completed. It was adopted from **Reethesh et al. (2019).** The knowledge part contains 14 items which emphasizes mainly on participants' knowledge regarding risk factors and complications of obesity. The attitude part consisted of 15 items to assess perception of obesity and motivation to lose weight. The practice part with its 13 items focused on dietary habits and physical activity levels in the day-to-day life. The KAP questionnaire have total reliability of 0.93 indicating good internal consistency using the Cronbach alpha (**Pattanapongsa, Jiamjarasrangsi, & Hanvoravongchai, 2020)**.

Scoring system:

Score key for the KAP questionnaire range from 1 to 5. Each item has five options (a, b, c, d, and e). For items 6, 13, 14, 18, 24, 29, 30, 31, 33, 40; a=1 b=2 c=3 d=4 e=5. For items 1,2,3,4,5,7,8,9,10,11,12,15,16,17,19,20,21,22,23,25,26,27,2 8, 32, 34, 35, 36, 37, 38, 39, 41, 42; a=5 b=4 c=3 d=2 e=1.

Tool (III): Anthropometric Measurement Scale: The researchers used digital tool services, to assess the students' BMI, and waist-to-height ratio. The researchers asked students about their weight, height, and waist circumference measures, and then use the digital services to complete data. It was completed within five minutes; and contained two parts:

Part I: Body Mass Index (BMI) Scale:

This tool was used to measure overweight and obesity according to the National Institute of Health (NIH) website (https://www.nhlbi.nih.gov/health/educational/lose

_wtBMI/bmicalc.htm). The BMI was calculated from the height and weight.

Scoring system: The BMI score classified as: **Underweight** is Below 18.5, **Normal mean** is 18.5–24.9, **Overweight** means 25.0–29.9, and **Obesity** is 30.0 and above.

Part II: Waist-to-Height Ratio (WHtR) Scale:

The researchers used Waist-to-Height Ratio digital calculator, to measure how body fat is distributed throughout the body by inserting the waist circumference and height in centimeter into the digital calculator (https://WHtR.ORG), then click to calculate the Waist-to-Height Ratio. To correctly measure the waist level; the student should stand and place a tape measure around his/her middle, just above the hipbones, and measure the waist diameter just after breath out. The scale was completed.

Weight Category	Male WHtR	Female WHtR
Normal or healthy	0.46–0.53	0.46–0.49
Overweight	0.53–0.58	0.49–0.54
Obese	0.58–0.63	0.54–0.58
Highly Obese	>0.63	>0.58

Scoring system: The higher ratio indicated a higher concentration of abdominal fat. A Waist-to-Height Ratio categories distributed as:

Ethical considerations:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee affiliated to the Faculty of Nursing, MTI University. Participation in the study was voluntary and studied students were given complete full information about the goal and methodology of the study including their role before signing the informed consent.

Field work:

The tools were tested primarily through five experts; in Medical Surgical Nursing for testing face and content validity of the tools. The study was carried throughout the academic year, starting from October, 2023 to March 2024 (four-month mobile health teaching program application and a two-months follow-up). The study included two groups (control and intervention). The study implemented through three phases: phase one, the **Preparatory phase** that included preparing validated tools for data collection.

Phase two, the implementation that compiled random distribution of the students into both the intervention and control groups using computer program, and investigation of the total participated students' demographics information, knowledge, attitude, and practice related obesity, as well, measuring BMI, waist circumference, and waist-to-height ratio.

At baseline, the participants were measured for height, weight and waist circumference by the

researchers. A standard measuring tape was used to measure the participants' waist at the middle position of the waist between the lower edge of the last palpable rib and the top of the iliac crest, and ensure that the tape did not compress the skin but was snug around the waist and was parallel to the floor. Then, the researchers designed the mobile health teaching program, that is documented by a nutritionist. and implemented the mobile health teaching program for the purpose of controlling obesity among the intervention group.

With regard to the group, participated students didn't receive any intervention as they managed conventionally. **With regard to the intervention group,** students were invited to join a Facebook and WhatsApp private group that is created by the researchers on these platforms to send message for each participant's inbox to set a personal monthly weight loss goal. Health messages were published on the specified social media platform groups' pages regularly, including daily nutritional education messages in the morning, in addition to exercise education messages and videos three times a week in the afternoon.

Exercise for 30 min/day at least is effective including any sport as dancing or simple walking. Concerning diet and snacks, 400g of fruits and vegetables per day is recommended for prevention of obesity. Eating breakfast, eating slowly, and eating at home, small amounts of high-fat foods as an infrequent treat are simple instructions given to the intervention group students for controlling body weight. The participated nursing students reported their weekly body weight, to set a new weight goal. Diet and activity are adjusted after four weeks from starting the program.

Phase three, evaluation phase, included comparison between baseline obtained data, fourth month and six month using the same study tools to identify the improvement after implementation of mobile health teaching program. So, at the fourth and six-month, the weight, height, waist circumference, and KAP score of the nursing students were evaluated.

Statistical design:

The collected data coded, entered, and analyzed using Stand for Statistical Product and Service Solutions (SPSS) program version 24. After complete data entry, the analysis was conducted by applying frequency tables with percentages. Quantitative data described as mean and Standard Deviation (Mean ±SD). The differences in the mean level of the main outcomes between the intervention and the control groups were compared using t-test statistics between baseline and fourth month, and baseline and sixth month between groups, including BMI, waist circumference, and waist-to-height ratio (WHtR).

Result:

Table (1): shows no statistically significant difference between the intervention group and the

control group with regard to the demographic information, except in the monthly income which represent statistically significant difference among the two groups.

Table (2): Table shows that knowledge, attitudes, and practices have statistically significant improved over time after implementation of the intervention program among the intervention group. But there is no statistically significant improvement or change among the control group.

Table (3): shows statistically significant difference regarding BMI and Waist-to-Height Ratio (WHtR) throughout the study phases among the intervention group after the mobile health teaching program implementation, but there is no statistically significant relation regarding BMI and Waist-to-Height Ratio (WHtR) throughout the study phases among the control group.

Table (1): Demographic information of the faculty of nursing student (N= 298)

Demographic information	Control group		Intervention group		P- value
	N	%	N	%	
Age:					
18 - > 20	152	51.01	150	50.34	0.35
20 ≥ 22	146	48.99	148	49.66	
Mean ± SD	20.4 ± 1.6		20.2 ± 1.4		0.35
Gender:					
Male	108	36.25	102	34.23	0.87
Female	190	63.75	196	85.77	
Study level:					
1st	98	32.89	69	23.15	
2nd	93	31.21	95	31.88	0.49
3rd	67	22.48	66	22.15	
4th	40	13.42	43	14.43	
GPA (Mean ± SD)	2.8 ±0.9		2.7±0.5		0.28
Monthly income (Mean ± SD)	20.690±995		30.420±1200		0.045*
Place of residence:					
Urban					
Rural	182	61.07	180	60.40	0.47
	116	38.93	118	39.60	
Weight (Mean ± SD)	90 ± 7.4		90±9.2		0.14
Height (Mean ± SD)	169 ± 4.3		170± 3.2		0.23
Waist circumference (Mean ± SD	85.4 ± 4.2		84.6± 3.6		0.24

Table (2): Mean knowledge, attitude and practice behavior regarding diet & exercises for the faculty of nursing students throughout the study phases (N= 298)

Variables	Group	Before intervention	After 4- months	After 6- months	F (P value)	P1 (d)	P2 (d)	P3 (d)
Knowledge	**Control**	65.13±1.28	65.14±1.28	65.13±1.28	20.2(0.3)	0.3 (15.2)	0.3 (15.2)	0.3 (15.2)
	Intervention	65.15±1.28	90.16±3.01	78.10±2.08	24.03(<.001*)	<.001* (17.3)	<.001* (20.6)	<.001* (.7)
Attitudes	**Control**	30.22±1.07	30..23±1.06	30.22 ±1.06	38.15(0.25)	0.25 (22.01)	0.25 (22.01)	0.25 (22.01)
	Intervention	30.10±1.07	54.17±0.93	53.29±1.02	40.15(<0.001*)	<.001* (22.05)	<.001* (21.07)	<.001* (.9)
Practices	**Control**	27.23±1.16	27.23±1.16	272.3±1.16	40.12 (0.38)	0.38 (16.4)	0.38 (16.4)	0.38 (16.4)
	Intervention	28.25±1.19	57.30±2.11	56.46±2.07	45.17(<0.001*)	<.001* (18.6)	<.001* (16.6)	<.001* (.4)

F is repeated measures Anova, P1 is difference between before and after; P2 is difference between before and follow-up; and P3 is difference between after and follow up. * Statistically significant at $p \leq 0.05$; d is Cohen's effect size

Table (3): Total anthropometric measurements for the faculty of nursing students throughout the study period (N= 298)

Anthropometric Measurement	Group	Before intervention	After 4-months	After 6-months	F	(P value)
BMI	**Control**	30.2 ±5.3	30.1±5.1	30.3±4.8	5.716	0.50
	Intervention	30.45 ± 4.85	29.75 ± 4.75	30.2± 4.6	5.718	0.018*
WHtR	**Control**	0.58±0.06	0.58±0.05	0.58±0.04	1.223	0.40
	Intervention	0.58±0.07	0.57 ± 0.07	0.56 ± 0.07	0.955	0.024 *

F is repeated measures Anova, * Statistically significant at $p \leq 0.05$

Discussion:

Obesity is one of the most serious problems firing the global public health as it increases the risk of many common and less common chronic diseases **(WHO, 2018)**. Obesity is a preventable, easy, less expensive, and more effective than treating and management if it has developed **(Aktar Qureshi, & Ferdous, 2017)**. Mobile health applications are user-friendly and beneficial for weight loss, increasing treatment adherence through self-monitoring strategies, making them a valuable tool for individuals **(Dounavi &Tsoumani, 2019)**. So, this study aimed to evaluate the effect of mobile health teaching program about diet and exercise on obesity control among faculty of nursing students.

Regarding the studied nursing students' total knowledge level about diet and exercise on obesity control; the current study results found a marked statistical significant improvement in the intervention group of nursing students' knowledge score before, after 4- months and 6- months after mobile health program implementation.

This result is in line with the study by **Adhikari & Gollub (2021)**, who conducted a study entitled "Evaluation of the small changes, healthy habits pilot program its influence on healthy eating and physical activity behaviors of adults in Louisiana", and discovered that dietary health habits became healthier post intervention than before intervention. This was attributed to mobile health teaching program that focused on change to healthier food and physical activity behaviors and increased consumption of fruits, dark green vegetables and water. In the researches' opinion, the participant students responded to improvement their knowledge because they interested to control their weight for a better appearance.

Concerning the studied nursing students' total attitude; the current study results showed marked improvement in the intervention group of the studied nursing students before, after 4- months and 6- months of mobile health teaching program implementation with statistically significant changes. The study finding was supported by **Ibrahim et al. (2022)**, in the study measuring "Effect of Telephonic Weight Loss Coaching Program on Body Composition among Health Field University Students" which found positive changes in dietary health habits such as reduced number of meals taken out door, adopting healthy methods of cooking (parboiled) and vegetable oil was used in cooking rather than mixed fat in the study group compared to control group. The researchers' think that this change suggests that the mobile health teaching program have a highly positive effects on the attitudes of students toward the benefits of exercise.

In contrary, **Sogari et al. (2018)**, who conducted a study entitled " College Students and Eating Habits: A Study Using an Ecological Model

for Healthy Behavior in New York, USA"; reported that when young adults leave their home circumstances, unhealthy eating habits such as lower consumption of healthy options (i.e., fruit and vegetables), irregular meals (e.g., breakfast skipping), and increased intakes of unhealthy snacks and other "junk food" increase such as fried food. This was attributed to the transition phase from living at home to living alone/with roommates during the period of postsecondary education, change in interests, other life changes, and many food choices are deeply involved in this change.

According to the studied nursing students' total practice; the current study results showed marked improvement in studied nursing students' practice before, after 4- months and 6- month after program implementation with statistically significant changes. These findings were in the same line with **Ibrahim et al. (2022)**, which revealed that majority of the study group practiced exercise after starting the program.

Furthermore; **Castro et al. (2020)**, held a study about "The effects of the type of exercise and physical activity on eating behavior and body composition in overweight and obese subjects in Madrid, Spain", and they found that motivation to exercise increased post intervention compared to pre intervention. This was attributed to good acceptance of the mobile health program by university students. Moreover; this result was agreed with **Persson & Flodmark (2017)**, who studied "Nutritional habits and physical activity among university students in Thailand" and demonstrated that most study students practiced exercise 30-60 min 3-5 times/week post intervention. This was attributed to mobile health program as it offered weekly exercise videos that encouraged students to practice exercise regularly.

In the context of the anthropometric measurement, the findings of the current study indicated that, BMI was reduced among the studied nursing students after mobile health teaching program. In addition, there is statistically significant differences throughout the study phases among the intervention group. These findings were agreed with **Ibrahim et al. (2022)**, who confirmed that BMI was reduced among study group after intervention. As well as, this finding was in congruent with **Durá-Travé et al. (2020)**, who studied "effects of the application of a prolonged combined intervention on body composition in Caucasian undergraduate students with obesity Andalucía, Spain". They found that there was a reduction in BMI after intervention.

Also, this finding was in the same line with **Schmittdiel et al. (2017),** who studied "The Impact of Telephonic Wellness Coaching on Weight Loss among adults in Kaiser Permanente, Northern California", and they reported that a significant change in BMI that translates to weight loss 12 months after coaching initiation in study group compared to control group. This decrease in BMI was attributed to eating low caloric diet, to practicing regular exercise and changing their

health habits to healthier one as a result of complying with telephonic weight loss coaching program.

Also; this study indicated that WHtR was reduced among the intervention group of the studied nursing students after mobile health teaching program with statistically significant differences. It may be related to the text messaging use for reminders, such as those used by the researchers to induce self-monitoring or to promote behavior change. Also, text massages as a lifestyle intervention was promising in its feasibility and acceptability.

This research is in line with **Hebden, Chey& Allman-Farinelli (2012)**, who stated that interventions which last for four or more months provide a greater decrease in body weight, with multiple lifestyle changes. As well, this result is inconsistent with **Özaydın & Akın, (2024)**, who reported no statistical significant difference in the post-test between the experimental and control groups in terms of BMI, waist/hip ratio, and body fat percentage.

From the researchers' point of view, Facebook is a very popular social media platform compared to other social media. This study shows that Facebook could be an alternative tool for solving public health issues. Online social media is generally cheaper to implement but further cost-effective analysis is needed to confirm this. In terms of sustainability, the effect of the reduction in both BMI and WHtR was seen during the intervention period. In the long run, there could be many factors that are complex and that influence the change of BMI and WHtR. Furthermore, the use of Facebook is likely to be a low-cost alternative tool for solving health issues that will be beneficial to public health. This might reduce the budgets of old conventional methods of losing weight which take a relatively higher investment.

Conclusion and recommendations:

The study concluded that there is statistically significant improvement in the mean knowledge, attitudes, practices, BMI; and Waist-to-Height Ratio (WHtR) scores of the studied students among the intervention group after 4- and 6 months as compared to the per-intervention phase. Also, the study results prove that health education and support services through social media platform can be effectively used for weight reduction among university students. However, additional studies are needed to understand the mechanisms of action and the sustainability of the results in the long run.

The study recommended that nutritional educational programs among college students should be encouraged to promote healthier eating habits and lifestyles, as well as adhering to the cultures' eating habits, use different social media platform including new technology applications to control obesity. Also, future studies are needed for more investigations the effect of mobile health teaching program on physical, and diet behaviors among different targets and large sample size to provide strong evidence of obesity control among faculty of nursing students, Simple booklets

regarding coping strategies with healthy life style should be available and easily access in the faculty. Also, there is a need to determine the optimal length of mobile health-based intervention in order to optimize the therapeutic impact.

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