

Effect of Implementing A Health Education Program on Nutritional Behaviors and Self-efficacy of Overweight Nursing Students

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Abstract

Background: Health education is a part of health care concerned with raising people's awareness, enabling them to deal effectively with their illness, changing attitudes, and promoting healthy behaviors. Individual's behavior can be the main cause of health problems, and it also can be the main solution. **Aim:** determine the effect of implementing a health education program on nutritional behaviors and self-efficacy of overweight nursing students. **Design:** A quasi- experimental research design was used. **Setting:** the study was carried out at the Faculty of Nursing, Damanhur University at the Medical Surgical Nursing Department. **Subjects:** 108 overweight nursing students were assigned randomly by systematic random sampling into two equal groups (study and control groups), 54 students in each group. **Tools:** Four tools were used **Tool (I)** Nursing students' knowledge assessment about healthy nutrition. **Tool (II)** Nursing students' nutritional behavior assessment. **Tool (III)** Anthropometric measurements and **Tool (IV)** Nursing Student's Self-Efficacy Scale. **Results:** After the implementation of the health promotion program a statistically significant improvement was found in nursing student's nutritional behavior in favor to study group. There was statistically significant difference in body mass index for study group pre and post the program. A statistically significant difference was found in students' self-efficacy mean score pre and post the program implementation in study group. **Conclusion:** The results of the current study concluded that implementing health education program based on Pender health promotion model has a positive effect on improving nursing students' knowledge and self-efficacy leading to improving students' nutritional behavior. **Recommendations:** Conducting periodically routine screening by measuring body mass index for undergraduate nursing students who are at high-risk for obesity.

Keywords: Health Education Program, Nutritional behaviors, Overweight Nursing Students, Self-efficacy.

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Introduction

Health education is considered the heart of nursing practice. It plays a significant and vital role in providing people with knowledge, abilities, and attitudes they need

to deal effectively with their illness and modifying unhealthy behaviors. As individual's behavior can be the main cause of health problems, and it also can be the main solution (Laverack, 2017).

Nursing students are role models in the society and their behavior influence the quality of care they provide. They have great burdens in their study and professional nursing work and face many work-demands and challenges (Manivannan, 2018; Hwang & Oh, 2020).

Therefore, it is imperative for nursing students to engage in healthy nutritional behaviors that promote health, maintain physical and mental competencies necessary to deliver the higher quality nursing care and reducing the risk for overweight and diseases (Abozeid et al., 2020; Aslani et al., 2021).

Nursing students are facing many stressors rather than other college, such as nature of study of practical and clinical burdens, and clinical environment difficulties. These stressors are destructive agents of their emotional and physical fitness and reflect negatively on their lifestyle. Plus, it contributes to enforce them to gain weight unconsciously (Urbanetto, et al., 2019).

Overweight is a predominant factor for many chronic diseases. Also, it is a crucial nutritional health problem that is prevalent among nursing students and affects negatively on nursing students' health status and quality of life. Plus, it limits their productivity, work motivation and self-efficacy (Mosleh, et al., 2020).

Self-efficacy is an important attribute among nursing students and motivates them engaging in weight control behaviors. Also, it is a significant indicator for success in following healthy nutritional behaviors and preventing overweight (Shamsalinia et al., 2019).

Subsequently, it is important to maintain higher self-efficacy level among nursing students through providing health education programs for adoption of healthy nutritional behaviors and preventing overweight using a conceptual health education models or theories that aid in assessing, planning,

implementing, and evaluating the managing of health-related problems (Besely et al., 2018).

Pender's health promotion model (PHPM), derived from social cognitive theory, and includes three groups of factors that influence health behavior, **firstly**, individual characteristics and experiences; **secondly**, behavior-specific cognitions and affect; and **thirdly**, behavioral outcome (Health Promoting Behavior). The model shows how these three factors can both directly and indirectly influence health-promoting behavior behaviors (Shahroodi et al, 2022).

Aims of the Study

This study aimed to determine the effect of implementing a health education program on nutritional behaviors and self-efficacy of overweight nursing students.

Research hypotheses.

- Nursing students who are attended health education program using Pender's health promotion model exhibit higher mean scores in healthy nutritional behaviors than those who do not attend.
- Nursing students who are attended health education program using Pender's health promotion model exhibit higher mean scores in self-efficacy than those who do not attend.

Materials and Method

Materials

Design: A quasi experimental research design was used to conduct this study.

Settings: This study was conducted at The Faculty of Nursing, Damanhur University, at the Medical Surgical Nursing Department.

Subjects: All first-year nursing students who were enrolled in Medical Surgical Nursing department (fundamental course),

Faculty of Nursing, Damanhur University, during the first academic semester of the academic year 2022-2023, were assessed for overweight.

This assessment was conducted through measuring weight, height to calculating BMI with the formula of weight in kilograms divided by height in meters squared (kg/m^2). Based on WHO (2021), if BMI is from 25-29.9 kg/m^2 , it falls within the overweight range. Then, according to the revealed results about 108 out of 150 overweight nursing students were included in the study. The sample size was selected using purposive sampling methods, based on (Epi-info7) program based on the following parameters: population size = 150, expected frequency =50%, acceptance error =5%, confidence coefficient =95%, minimum sample size= 108. Students suffering from any chronic diseases and receiving medications were excluded from the study.

Tools: four tools were used:

Tool one: Nursing students' knowledge assessment about healthy nutrition questionnaire. This tool was developed by the researcher after reviewing related literature (El-Bagoury et al.,2017; Salem, & Said, 2018) . This tool was used to assess nursing students' knowledge about healthy nutrition. It was consisted of three parts:

Part I: Benefits of healthy nutrition. This part was included 10 items about the benefits of health nutrition.

Part II: Barriers of healthy nutrition. This part was used to assess nursing student's barriers to follow healthy nutrition. It was divided into three dimensions with 15 items in terms of: personal barriers (5 items), social barriers(5items), and situational/environmental barriers (5 items).

Part III: Interpersonal influences of healthy nutrition. This part was used for assessing family/friends support for healthy nutrition and included 5 items.

Scoring system: The students' responses were scored as yes=1 for correct answer and

No=0 for incorrect answer. Total scores were 0-30 and were represented by percentages as followed:

- Less than 33.3% illustrated poor healthy nutritional knowledge.
- From 33.3% to $\geq 66.7\%$ illustrated fair healthy nutritional knowledge.
- More than 66.7% to 100% illustrated good healthy nutritional knowledge.

In addition to, nursing students' socio demographic, academic and clinical data were attached and was consisted of 2 parts:

Part I: Socio demographic and Academic Data: This part was included information about the students' personal data as; age, sex, residence, parent's education, parent's work, family income and previous educational grade.

Part II: Clinical Data: This part was included information about the students' clinical data as; family history of overweight and reasons of overweight (inactivity, increase calories (overeating), or psychological factors).

Tool two: Nursing students' nutritional behavior assessment. This tool was developed by the researcher after reviewing of relevant literatures (Abraham et al.,2018; Lai et al.,2022). It was developed for assessing nursing students' nutritional behaviors. It was included approximately 20 statements about: types of foods, amount, methods of food preparation & cooking and eating inside and outside the home and frequency of water drinking and soda ...etc. The nursing students' responses were ranged according to five point-likert scales ranged from Never (1), rarely (2), sometimes (3), often (4) and always (5). Negative statement had a reversed score. Total scores were from 20 to 100 and were represented by percentages as followed:

- Less than 33.3% indicated poor perceiving nutritional behaviors.

- From 33.3% to \geq 66.7% indicated neutral perceiving nutritional behaviors.
- More than 66.7% to 100% indicated good perceiving nutritional behavior.

Tool three: Anthropometric measurements. This tool was used to measure weight and height to calculate Body Mass Index (BMI) with the formula of weight in kilograms divided by height in meters squared (kg/m^2) which is based on WHO, (2021) for screening overweight/obesity (Rabie, et al., 2019).

Tool four: Nursing Students' Self-Efficacy Scale. This tool was adapted from Shamsalinia, et al., (2019). It was a self-reported scale for assessing nursing student's self-efficacy regarding healthy nutrition. It was consisted of 10 statements.

Scoring system: Responses were measured against 5 points rating scale as followed; ranged from strongly agree (5) to strongly disagree (1). The total scores were from 10 to 50 and were represented by the following percentages:

- Less than 33.3% indicated low self-efficacy.
- From 33.3 % to \geq 66.7% indicated moderate self-efficacy.
- More 66.7% to 100% indicated high self-efficacy.

Method

Approvals from the Research Ethics Committee and post-graduate studies committee at the Faculty of Nursing, Alexandria University was obtained before conducting the study.

An official permission to conduct the study was obtained from Dean, Vice Dean of students' affairs, and the head of Medical-Surgical Nursing department, of the Faculty of Nursing, Damamhur University after explaining the aim of the study.

The study tools were tested for content validity by 5experts 2 experts in the field of Medical Surgical Nursing and 3 experts in Nursing Education field. The necessary modifications were done accordingly.

A pilot study was carried out on 10% of the study sample to test the clarity and applicability of the research tools.

Reliability of the tools was tested using Cronbach's Alpha test. The reliability coefficient was 0.896 for tool one, 0.858 for tool two and 0.976 for tool four which is acceptable.

The study was conducted in four phases, assessment, planning, implementation, and evaluation.

Phase I: Assessment phase. Initial assessment of all study subjects (study and control group) was carried out pre-implementation of the health education program using Pender health promotion model by the study tools. **Tool 1** to assess nursing student's knowledge about healthy nutrition, **tool II** to assess nursing student's nutritional behavior, and **tool IV** to assess nursing student's self-efficacy, in addition to socio demographic, academic& clinical data respectively to collect the needed data.

Phase 2: Planning phase: Priorities, objectives and outcomes of the health education program using Pender model were formulated based on the results of the initial assessment. The program's content was formulated according to concepts of Pender health education model. •A colored booklet was developed by the researcher in simple English language to be distributed to each student of the study group.

Teaching methods: the researcher instructions were planned through interactive lecture, group discussion and brainstorming.

Media used: Power-point presentation and colored booklet were used to support the given information.

Phase 3: Implementation phase: After the pretest, the researcher was implemented health education program based on Pender health promotion for the study group, on 4 sessions; each session was continued for 45-60 minutes, one session/week for one month.

The first session: It included knowledge regarding healthy diet, food guide pyramid and different healthy foods groups. Also, knowledge about unhealthy nutrition. In addition, the researcher provided them knowledge about overweight (definition, causes, severity, and complications). Group discussion was allowed to ensure their complete understanding and feedback was taken at the end of each session. A colored booklet about healthy and unhealthy nutrition distributed to nursing students.

The second session: In this session the researcher asked the students to express their previous and past behavior related to diet modification and weight reduction, discuss causes of failure or success to change their behavior through group discussion. Also, included students' perception of benefits, barriers, and self-efficacy of healthy nutritional behavior. Also, it included strategies to promote self-efficacy and overcome barriers of healthy nutritional behavior such as providing knowledge about healthy nutrition, maintaining time & stress management, encouraging social support from family, friends, and peers, promoting nursing students' self-efficacy, and promoting engagement in social real-life relations.

The third session: In this session the researcher clarified the concept of activity related –affect as their positive feelings during and after practicing healthy nutritional behaviors. Also, in this session the researcher discussed interpersonal relations (about family, friends & peers) as social support and role models to support and encourage the healthy nutritional behaviors.

The fourth session: In this session the researcher fostered commitment toward maintaining healthy nutritional behavior and taking action to follow healthy diet. Finally,

the researcher reviewed and summarized the content of previous sessions, gave explanation, clarifications and answered the students' questions and evaluated the complying of health nutritional behavior that is the desired behavioral end point or outcome of health education program.

Phase 4: Evaluation phase : Study tools (I, II, III & IV) were used again with both subjects' groups, immediately (first assessment) and 3 months post completion of health education program sessions (second assessment), and post 6 months (third assessment) to evaluate the effect of implementing a health education program using Pender's health promotion model on nutritional behaviors and self-efficacy of overweight nursing students.

Ethical considerations:

Written informed consent was obtained from students after explaining the aim of the study and the right to refuse to participate in the study and/ or withdraw at any time. Student's privacy was respected. Data confidentiality was ascertained during implementation of the study.

Results

Table (1) Shows distribution of nursing students of both groups according to their sociodemographic and academic data. Concerning the students' age, more than two thirds (68.5%, 70.4%) of nursing students of both groups aged 18 years respectively. Also, more than half (55.6%, 53.7%) of them were females respectively. Regarding residence, three quarters (77.8%) of nursing students of the study group compared to more than two thirds (68.5 %) of nursing students of control group were rural residents. In addition, concerning family income, it was observed that the majority of nursing students of both groups had enough income (96.3%, 87.0%) respectively.

In relation to parent's education, it was noted that half (51.9%) of fathers of study

group compared to 42.6% of fathers of control group had university education respectively, and more than half (57.4%, 53.7%) of mothers of both groups were secondary education. As regards to parent's occupation, it was found that 50.0% and 57.4% of student's fathers of both groups were employee. While 81.5%, 72.2% of the student's mothers of study and control groups were housewife respectively. There is no statistically significant difference between study and control groups concerning their socio-demographic and academic characteristics.

Table (2) clarifies distribution of nursing students of both groups according to their clinical data. Regarding family history of overweight, it was noticed that about three quarters (70.4%) of nursing students of the study group compared to more than half (57.4%) of nursing students of the control group had no family history of overweight. In relation to perceived reasons of overweight, more than half (57.4%) of nursing students of study compared to two thirds (66.7%) of nursing students of control group were overweight related to increase calories (overeating). In addition, the majority (90.7%) of students of study and control groups were not attend any sessions or programs about nutrition or weight reduction.

Table (3) display comparison between of study and control groups according to overall nursing students' knowledge assessment about healthy nutrition pre, immediately, three and six months post the program implementation. **Regarding to benefits of healthy nutrition**, there is a statistical significance improvement in mean score of healthy nutrition benefits between study and control groups immediately, three and six months post the program implementation (p=<0.001, <0.001and<0.001respectively) in favor to study group as compared to pre starting the program.

In relation to barriers of healthy nutrition, pre the program this table revealed that there was no statistical significance difference in mean scores of healthy nutrition's barriers between study and control groups, while immediately, three and six months post the program implementation there was a statistical significance decrease in mean score of healthy nutrition's barriers between study and control groups (p=<0.001, <0.001and<0.001respectively). in favor to study group as compared to pre starting the program

As regards interpersonal influences of healthy nutrition, there was statistically significant increase in mean scores of interpersonal influences of healthy nutrition of both groups immediately, three and six months post the program (p=<0.001, <0.008, <0.001respectively).

Regarding overall nursing students' knowledge assessment about healthy nutrition. Pre the program, it was noticed about three quarters (74.1%, 70.4%) of nursing students of both study group and control groups respectively had poor knowledge about healthy nutrition. While immediately, three and six months post the program the majority (90.7%, 94.4% and 96.3%) of nursing students in study group had good knowledge about healthy nutrition. Also, there were statistically significant improvement in overall nursing students' knowledge about healthy nutrition among both study and control groups immediately, three and six months post the program implementation p= (<0.001, <0.001 and <0.001respectively) in favor to the study group.

Table (4) illustrates comparison between study and control groups in relation to overall nursing students' nutritional behaviors assessment pre, immediately, three and six months post the program implementation, this table illustrates that, pre the program, it was found that more than three quarters (81.5%, 77.8%) of nursing students of both

study and control groups respectively, had poor nutritional behavior. However, immediately, three and six months post the program about 62.9%, 81.5%, and 79.2% of nursing students in study group respectively, had good nutritional behavior. There was statistically significant improvement in mean score of nutritional behaviors between study and control groups immediately, three and six months post the program $p < 0.001$, < 0.001 and < 0.001 respectively.

Table (5) illustrates comparison between both study and control groups in relation to overall nursing student's Self-Efficacy pre, immediately, three and six months post the program implementation. There was statistically significant improvement in mean score of self-efficacy between both study and control groups immediately, three and six months post implementing the program ($p < 0.001$, < 0.001 and < 0.001 respectively).

Discussion

Nursing students as university students are the future masters of the society. Also, they are as care providers and playing a vital role in healthcare. Therefore, it is significant for nursing students to take care of their health and should participate in health-promoting behaviors to increase their work performance, foster positive physical and mental health and preventing health problems such as overweight (Hwang & Oh, 2020). Therefore, the present study was conducted to examine the effect of implementing health education program in nutritional behavior and self-efficacy of overweight nursing students.

Regarding to studied students' knowledge about healthy nutrition The results of the current study showed that there was significant improvement in perceived benefits of healthy nutrition post the program. From the researcher's point of view, the significant improvement in the mean score of healthy nutrition's benefits could be due to positive effect of health education program in raising nursing

students' awareness about benefits of healthy nutrition. The study's results were consistent with study conducted by Mahmoud (2022) in his study entitled " Effect of Pender's model-based educational intervention program on promoting healthy lifestyle practices among university nursing students". The study revealed that there was significant increase in perceived benefits mean score post the intervention in the experimental group compared to the control group.

Furthermore, the current results revealed that there was significant decrease in the mean score of perceived barriers of healthy nutrition post the program in the study group. From the researchers' point of view, this significant decrease in perceived barriers of healthy nutrition mean score could be due to successful effect of the program in providing satisfactory knowledge about barriers of healthy nutrition and strategies to overcome these barriers such as providing knowledge about healthy nutrition, maintaining time & stress management, encouraging social support from family, friends, and peers, promoting nursing students' self-efficacy, and promoting engagement in social real-life relations. Additionally, significant decrease in perceived barriers of healthy nutrition mean score could be justified on the grounds that there is an inverse relationship between the scores of perceived benefits and barriers, also, relationship between knowledge and perceived barriers. As tendency to gain benefits and knowledge reduces or removes barriers.

These findings were supported by a study done Naserpoor et al (2018) in their study entitled " Effect of education based on Penders health promotion model on nutrition behavior of adolescent girls" reported that post the educational intervention, scores of perceived barriers to healthy eating in the experimental group had a significant decrease.

Regarding to overall nursing students' knowledge assessment about healthy nutrition.

The findings of the current study found a significant improvement in the knowledge of nursing students regarding healthy nutrition immediately, three and six months post the program implementation in favor to the study group. This improvement in nursing students' knowledge validated the effect of health education program based on Pender health promotion model and utilization of various sufficient reinforcement learned material and strategies such as power point slides, colored booklets, and group discussion,

The present study's results were consistent with Ishaq et al. (2020) in their study entitled "Assessment of eating habits and knowledge regarding daily nutritional requirements among university students" reported that students' dietary behaviors and nutritional knowledge were positively affected after receiving a nutrition education program. As well, these findings were in line with Hassanien et al. (2023) in their study entitled "Effect of Educational Program on lifestyle Pattern among Obese Students at Benha University" reported revealed that less than two third of the studied students had poor knowledge pre implementation of the program and more than half of the studied students had good knowledge post implementation of the program.

Conversely, Aly et al. (2018) in their study entitled "Prevalence of Overweight and Obesity among Mansoura University Students" reported that overall students' knowledge was low and showed that more than three quarters of students had poor level of knowledge regarding healthy diet, caloric content of food stuff, types of food elements, sources of nutrients, factors leading to obesity and diet related disease.

In relation to overall nursing students' nutritional behavior assessment.

The current study found a significant improvement in the nutritional behavior of nursing students post the program implementation based on Pender health promotion model in favor to the study group. These results indicate the agreement of the

first hypothesis "Nursing students who attend health education program using Pender's health promotion model exhibit higher mean scores in healthy nutritional behaviors than those who do not attend".

This significant improvement in nutritional behavior could be related to provided satisfactory information and knowledge during the program based on Pender health promotion model were very effective in changing nursing students' perception towards overweight as a serious health problem and importance of adopting healthy behavior which increase their intention to practice healthy nutritional behaviors. These study's results were congruent with Rabie et al. (2019) in their study entitled "Impact of Nutrition Education Program Based on Nutritional Assessment of Adolescent in Assiut -Egypt" revealed that there was a highly significant improvement of nutritional behaviors among intervention group than controlled group in the pre, immediate and post intervention.

In contrast, Rippin, et al. (2019), who conduct a study on 1026 students in Kolkata, India reported that there was no significant improvement of nutritional behaviors among adolescents. The findings of the study highlighted an urgent necessity to provide educational programs about healthy eating habits in early adolescence period.

According to nursing students' self-efficacy, the study revealed that, there was significant improvement in the mean score of self-efficacy of healthy nutrition post-program. This result indicates the agreement of the second hypothesis "nursing students who attend health education program using Pender's health promotion model exhibit higher mean scores in self-efficacy than those who do not attend".

This significant improvement could be explained by different strategies provided by the researcher during the program's sessions to improve nursing students' self-efficacy regarding diet-related behaviors. Such as, goal setting techniques, role modeling guided by the researcher, self-monitoring and self-

assessment to regulate goals and time, verbal persuasion, encouragement, and reinforcement by the researcher to follow healthy behavior, also, sharing the experiences of successful vicarious learning especially among peers and classmates.

These findings were in line with Khodaveisi et al. (2017) in their study entitled “Effect of Pender’s health promotion model in improving the nutritional behavior of overweight and obese women” they noted that there was significant improvement in the mean score of perceived self-efficacy of healthy diet in the experimental group post the intervention. Contrary to the results of the current study, Negm et al. (2022) in their study entitled " Effect of Educational Intervention Based on Health Belief Model among High-Risk undergraduate nursing students for Obesity" reported that there were no significant differences in self-efficacy among students post-application of the educational interventions

The previous results indicate a positive correlation between the mean score of **nutritional behaviors** and **self-efficacy** among study group. Therefore, the research hypothesis was accepted.

Conclusion

The results of the current study concluded that implementing health education program based on Pender health promotion model has a positive effect on improving nursing students' knowledge, self-efficacy level leading to improving nutritional behavior.

Recommendations

In line with the findings of the study, the following recommendations should be considered:

Recommendations for students:

- Conducting periodically routine screening by measuring body mass index for undergraduate nursing students who are at high-risk for obesity.
- Replicate the study on a large probability sample.

Table (1): Distribution of nursing students of study and control group according to their sociodemographic and academic data

Student's demographic data	Study (n = 54)		Control (n = 54)		χ^2	p
	No.	%	No.	%		
Age						
18-	37	68.5%	38	70.4%	0.044	0.835
19-	17	31.5%	16	29.6%		
Min. – Max.	18.0 – 19.0		18.0 – 19.0		t = 0.207	0.836
Mean \pm SD	18.31 \pm 0.47		18.30 \pm 0.46			
Sex					0.037	0.847
Male	24	44.4%	25	46.3%		
Female	30	55.6%	29	53.7%		
Residence					1.179	0.278
Rural	42	77.8%	37	68.5%		
Urban	12	22.2%	17	31.5%		
Family income					2.837	MC p= 0.251
Enough	52	96.3%	47	87.0%		
Not enough	1	1.9%	4	7.4%		
Enough and more	1	1.9%	3	5.6%		
Father's education					3.781	MC p= 0.294
Illiterate	0	0.0%	3	5.6%		
Primary school	10	18.5%	8	14.8%		
Secondary school	16	29.6%	20	37.0%		
University	28	51.9%	23	42.6%		
Mother's education					2.214	0.529
Illiterate	4	7.4%	7	13.0%		
Primary school	7	13.0%	10	18.5%		
Secondary school	31	57.4%	29	53.7%		
University	12	22.2%	8	14.8%		

χ^2 : Chi square test MC: Monte Carlo t: independent t- test

Table (2): Distribution of nursing students of study and control group according to their clinical data.

Student's Clinical Data	Study (n = 54)		Control (n = 54)		χ^2	p
	No.	%	No.	%		
Family history of overweight					1.967	0.161
Yes	16	29.6%	23	42.6%		
No	38	70.4%	31	57.4%		
Perceived reasons of overweight					1.462	0.227
Inactivity	16	29.6%	22	40.7%		
Increase calories (overeating)	31	57.4%	36	66.7%		
Psychological factors	17	31.5%	19	35.2%		
Others	1	1.9%	1	1.9%	0.167	0.683
Attendance of any sessions or programs about nutrition or weight reduction?					0.0	1.000
Yes	5	9.3%	5	9.3%		
No	49	90.7%	49	90.7%		

t: independent t- test χ^2 : Chi square test

Table (3): Comparison between study and control groups according to overall nursing students' knowledge assessment about healthy nutrition pre, immediately, three and six months post the program implementation.

Nursing student's knowledge assessment about healthy nutrition questionnaire	Study (n = 54)								Control (n = 54)								Study vs control			
	Pre		Immediately		Post 3 months		Post 6 months		Pre		Immediately		Post 3 months		Post 6 months		t(p)			
	Pre	Immediately	Post 3 months	Post 6 months	Pre	Immediately	Post 3 months	Post 6 months	Pre	Immediately	Post 3 months	Post 6 months	Pre	Immediately	Post 3 months	Post 6 months				
Part (1): Benefits of healthy nutrition																				
Min. – Max.	0.0- 10.0	6.0 – 10.0	2.0 – 10.0	7.0 – 10.0	0.0 – 8.0	0.0 – 8.0	0.0 – 10.0	0.0 – 10.0	1.054	16.953*	14.562*	13.512*								
Mean ± SD	3.63±3.12	9.57±0.90	9.13±1.44	9.44±0.88	3.06±2.51	3.30±2.57	2.81±2.84	3.70±2.99	(0.294)	(<0.001*)	(<0.001*)	(<0.001*)								
F (p)	138.83*(<0.001*)								1.245 (0.295)											
Part (2) Barriers of healthy nutrition.																				
Min. – Max.	4.0-15.0	0.0-7.0	0.0-10.0	0.0 -11.0	0.0 – 15.0	0.0 – 15.0	3.0-14.0	2.0-15.0	1.381	14.246*	16.086*	4.763*								
Mean ± SD	11.1±7	2.4±1.7	3.2±2.2	6.0 ±4.0	10.4±2.9	10.2±3.6	10.3±2.4	9.6±3.8	(0.170)	(<0.001*)	(<0.001*)	(<0.001*)								
F (p)	99.218*(<0.001*)								0.867 (0.459)											
Part (3): Interpersonal influences for healthy nutrition																				
Min. – Max.	0.0-4.0	0.0 – 5.0	0.0 – 5.0	0.0 – 5.0	0.0 – 5.0	0.0 – 5.0	0.0 – 5.0	0.0 – 5.0	1.102	6.601*	2.691*	6.995*								
Mean ± SD	0.93±0.95	3.39±1.34	3.22±1.42	3.67±1.26	1.22±1.73	1.41±1.75	2.41±1.71	1.65±1.71	(0.274)	(<0.001*)	(0.008*)	(<0.001*)								
F (p)	61.57*(<0.001*)								2.013(0.162)											
Overall Nursing student's knowledge	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	χ²(p)			
Poor	40	74.1%	0	0.0%	0	0.0%	0	0.0%	38	70.4%	44	81.5%	42	77.8%	41	75.9%	0.185	94.667*	87.667*	83.354*
Fair	14	25.9%	5	9.3%	3	5.6%	2	3.7%	16	29.6%	10	18.5%	9	16.7%	8	14.8%	(0.667)	(<0.001*)	(<0.001*)	(<0.001*)
Good	0	0.0%	49	90.7%	51	94.4%	52	96.3%	0	0.0%	0	0.0%	3	5.6%	5	9.3%				
Min. – Max.	1.0 – 17.0	19.0-30.0	17.0-30.0	16.0-30.0	1.0-16.0	1.0-17.0	3.0-23.0	1.0-20.0	0.542	25.583*	21.632*	19.029*								
Mean ± SD	8.4±4.1	25.3±2.7	24.1±2.8	24.3±3.2	8.8±4.1	8.5±4.0	8.3±4.6	8.9±5.0	(0.589)	(<0.001*)	(<0.001*)	(<0.001*)								
F (p)	402.158*(<0.001*)								0.254 (0.858)											

t: independent t- test χ²: Chi square test F: ANONA with repeated measures between different periods in each group * Statistically significant p-value at ≤0.05

Table (4): Comparison between study and control groups in relation to overall nursing students' nutritional behaviors assessment pre, immediately, three and six months post the program implementation.

Nursing student's nutritional behaviors assessment	Study (n = 54)								Control (n = 54)								Study vs control			
	Pre		Immediately		Post 3 months		Post 6 months		Pre		Immediately		Post 3 months		Post 6 months		t(p)/ χ^2 (p)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Pre	Immediately	Post 3 months	Post 6 months
Poor	44	81.5%	0	0.0%	2	3.7%	5	9.2%	42	77.8%	40	74.1%	41	75.9%	40	74.1%	0.228 (0.633)	75.059* ($<0.001^*$)	68.764* ($<0.001^*$)	66.578* ($<0.001^*$)
Neutral	10	18.5%	20	37.0%	8	14.8%	6	11.1%	12	22.2%	14	25.9%	9	16.7%	12	22.2%				
Good	0	0.0%	34	62.9%	44	81.5%	43	79.2%	0	0.0%	0	0.0%	4	7.4%	2	3.7%				
Min. – Max.	38.0-1.0		56.0-113.0		51.0-114.0		42.0-115.0		38.0-84.0		46.0-80.0		46.0-90.0		27.0-85.0		1.430	14.745*	11.375*	10.751*
Mean \pm SD	51.0 \pm 11.8		86.5 \pm 15.0		85.1 \pm 0.5		86.1 \pm 15.9		54.4 \pm 2.6		52.3 \pm 8.1		57.5 \pm 14.4		53.2 \pm 15.7		(0.156)	($<0.001^*$)	($<0.001^*$)	($<0.001^*$)
F (p)	100.116* ($<0.001^*$)								1.706 (0.197)											

t: independent t- test χ^2 : Chi square test F: ANONA with repeated measures between different periods in each group * Statistically significant p-value at ≤ 0.05

Table (5): Comparison between study and control groups in relation to overall nursing students' Self-Efficacy pre, immediately, three and six months post the program implementation.

Nursing Student's Self-Efficacy	Study (n = 54)								Control (n = 54)								Study vs control			
	Pre		Immediately		Post 3 months		Post 6 months		Pre		Immediately		Post 3 months		Post 6 months		t(p)/ χ^2 (p)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Pre	Immediately	Post 3 months	Post 6 months
Low	32	59.3%	5	9.3%	3	5.6%	3	5.6%	30	55.6%	35	64.8%	33	61.1%	34	63.0%	0.151 (0.697)	39.673* ($<0.001^*$)	39.400* ($<0.001^*$)	40.549* ($<0.001^*$)
Moderate	22	40.7%	34	63.0%	38	70.4%	40	74.1%	24	44.4%	18	33.3%	19	35.2%	18	33.3%				
High	0	0.0%	15	27.8%	13	24.0%	11	20.4%	0	0.0%	1	1.9%	2	3.7%	2	3.7%				
Min. – Max.	10.0-33.0		19.0-50.0		17.0-50.0		17.0-50.0		13.0-36.0		15.0-41.0		10.0-41.0		14.0-41.0		0.121	9.052*	10.689*	10.367*
Mean \pm SD	23.9 \pm 4.8		36.8 \pm 9.0		37.9 \pm 7.7		37.0 \pm 6.7		24.0 \pm 4.7		24.3 \pm 4.6		23.9 \pm 5.74		24.8 \pm 5.4		(0.904)	($<0.001^*$)	($<0.001^*$)	($<0.001^*$)
F (p)	44.114* ($<0.001^*$)								0.558 (0.644)											

t: independent t- test χ^2 : Chi square test F: ANONA with repeated measures between different periods in each group * Statistically significant p-value at ≤ 0.05

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