Basic Life Support Training Program for University Nursing Students

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Abstract:

Background: Basic life support entails the recognition of sudden cardiac arrest and the immediate administration of cardiopulmonary-resuscitation and defibrillation with automated external defibrillator. These interventions can double or triple survival rates of victims with sudden cardiac arrests. **The aim of this study:** Was to evaluate the effect of a basic life support training program on university nursing students. **Research design:** A quasi-experimental design was used. **Setting:** This study was conducted at faculty of Nursing in Benha University. **Sample:** Simple random sample of 110 forth year students. **Tools:** Two tools were used; **Tool I:** Structured interviewing questionnaire included two parts A): Demographic characteristics of the studied students. B): Knowledge assessment of the studied students. **Tool II:** Observational checklist to measure the studied students' level of basic life support practice. **Results:** 77.3% of the studied students had good total knowledge post implementation compared by 15.5% pre implementation of the program and 80.0% of the studied students had a satisfactory level of total practices post implementation compared by 30.9% pre implementation of the program. **Conclusion:** The implemented training program succeeded to improve the studied students' levels of knowledge and practice about basic life support. **Recommendations:** Continuous training of basic life support throughout nursing education curriculum during the academic years and after graduation on regular basis and evaluation of application of automated external defibrillator devices in order for nursing students to be familiar with it.

Keywords: Automated External Defibrillator, Basic Life Support, Cardiac Arrest, Cardiopulmonary Resuscitation, University Nursing Students.

Introduction

Basic life support (BLS) entails the recognition of sudden cardiac arrest and the subsequent administration of cardiopulmonary-resuscitation (CPR) and defibrillation with an automated external defibrillator (AED). The administration of CPR and defibrillation within the first three to five minutes of collapse can yield survival rates ranging from 49% to as high as 75%. In fact, CPR has been demonstrated to double or triple survival from witnessed sudden cardiac arrest. Thus, successful implementation of BLS is critical in improving survival rates and outcomes. Furthermore, medical and paramedical students including nurse students' knowledge and practice about BLS is also essential. While the demand for BLS courses continues to rise in developed countries, BLS training in underdeveloped and developing countries is not practiced routinely. A recent survey in Upper Egypt demonstrated suboptimal and inadequate CPR knowledge among medical students and junior doctors **(Alkubati, et al., 2022).**

Sudden cardiac arrest is the sudden cessation of cardiac activity so that the victim becomes unresponsive, with no normal breathing and no signs of circulation. If corrective measures are not taken rapidly, this condition progresses to sudden death. Each year more than 400,000 Americans succumb to sudden cardiac death. Those suffering from cardiac arrest may or may not have previously been diagnosed with heart disease. The cause of cardiac arrest varies by population and age, most commonly occurring in those with a previous diagnosis of heart disease. Most cardiac deaths are sudden and usually unexpected, which has proven to be uniformly fatal in the past **(Patel & Hipskind, 2022).**

Nursing education is divided into two stages: the academic education stage and the professional education stage. At the academic stage students get theories and concepts in this stage divided into groups that are general in nature, supporting subjects such as medical courses that indirectly support nursing courses and expertise courses in nursing courses. While at the profession stage students apply the theories and concepts that have been gained during the academic stage. Professional education is sometimes referred to as a clinical learning process. This term appears related to the implementation of professions that are fully implemented in practice areas such as hospitals, health centers, maternity clinics, nursing homes, and families and communities. During clinical practice of BLS, nurse students can experiment by using concepts and theories to practice, increase motor skills, and develop professionalism **(Anggraini et al., 2020).**

Community health nurses may be the first to witness a cardiac arrest at out-hospital settings and call for emergency. Thus, community health nurses need to have updated technical knowledge and practical skills developed to contribute more efficiently to cardiac arrest management. Being important members of the healthcare team, community health nurses are deemed to possess the basic skills and expertise which are needed to perform CPR. It is documented that a timely performed CPR can largely prevent sudden death and it is hence considered to be an important medical procedure. To perform the procedure in a meticulous manner, community health nurses should be knowledgeable, and they should have expertise in the procedure **(Bajracharya & Nagarkoti, 2016).** The community health nursing students will become major healthcare supportive workforce for the general community including the cases of emergency which require prompt intervention. Therefore, adequate knowledge of BLS is necessary for all the university attending nursing students **(Ahmad et al., 2018).**

Significance of the Study

Cardiovascular diseases count for 46% of total deaths in Egypt. Cardiovascular diseases are a major public health concern with significant social and economic implications in terms of healthcare -needs, lost productivity, and premature death **(World Health Organization (WHO), 2018).** It is estimated that hypertension and coronary heart diseases, in Egypt, affect 25% and 8.5% of the population, respectively, increasing the liability to sudden cardiac arrest events requiring immediate and effective basic life support interventions **(Ghanem et al., 2018).**

In Egypt, in out of hospital cardiac arrest, only one third of cardiac arrests patients receive cardio-pulmonary resuscitation from a bystander, and only 2.0% receive automated external defibrillation, hence in success rate of resuscitation varies from 7.9-9.2%

(Egyptian College of Critical Care Physicians, 2020).

Provision of up-to-date information and skills training related to basic life support practices in nursing education programs is very important for nursing students' professional development and practitioner and education related roles. In addition, public health nurses have important roles and responsibilities in terms of informing society on current basic life support practices **(Kose et al., 2019).**

Aim of the Study

The study aimed to evaluate the effect of the basic life support training program for university nursing students.

Research hypothesis

The university nursing students' knowledge and practice about the basic life support will be improved after the implementation of the training program than before.

Subjects and Method

Study design:

Quasi-experimental research design was utilized to conduct this study.

Setting:

This study was conducted at Faculty of Nursing, Benha University.

Subjects:

A simple random sample was used, 25% (110) students of the total students' number of the fourth academic year 2021-2022 which included 450 students. The study at the fourth year in the faculty is divided into two departments: community health nursing department and psychiatric health nursing department. The students in this study were chosen randomly from both departments.

Tools of data collection:

Two tools were used for data collection:

Tool (I): Structured Interview Questionnaire which was consisted of two parts:

Part 1: Demographic characteristics: This tool included age, gender, residence, nursing department, additional study of BLS, and previous share in a real BLS.

Part 2: Students' knowledge: This part aimed to assess the students' knowledge about BLS, and it was divided into three partitions; the first one was about basic life support and cardiac arrest, such as definition of basic life support, definition of cardiac arrest, and causes of cardiac arrest. The second one was about chain of survival such as meaning of the chain of survival. The third one was about CPR and AED such as order of actions of CPR and pulse check sites for adults, children, and infants.

The scoring system of students' knowledge regarding basic life support was done as the following:

2 scores for the correct and complete answer, 1 score for the correct but incomplete answer, and 0 score for the incorrect answer or (do not know). The knowledge partition contained total 37 questions. The total knowledge score = 74 points. According to students' responses, good if the student got 75% or more (≥55.5 points), average if the student got 50- less than 75% (37-<55.5 points), and poor if the student got less than 50% (<37 points).

Tool (II): An observational checklist, adapted from American Heart Association, (2016): to assess the students' practices regarding the basic life support for adult, child, and infant.

The scoring system of this tool was done as the following: It contained 30 items; 13 for the adult basic life support part and 17 for child and infant basic life support part. The correct and complete response took score 2, the correct but incomplete response took score 1, and the wrong response took score zero. Total responses were 60 points equal to 100% and according to students' responses;

satisfactory for ≥ 60% (36 points) and unsatisfactory for < 60% (<36 points) of the total responses.

Content validity

Data collection tools (tool I and tool II) were tested for their content validity by a panel of five experts of Community Health Nursing Staff in the study field (Jury). They reviewed the tool for clarity, relevance, and applicability, and the necessary modifications were done in the editing of the questions.

Tool Reliability

The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the tools consisted of relatively homogenous items as indicated by the moderate to the high reliability of each tool. The reliability of knowledge = 0.749 and practices = 0.856.

Ethical considerations

All ethical issues were assured; official permission was obtained by submission of formal letter issued from the dean of the faculty of nursing at Benha University and an oral permission was obtained from the head of the community health nursing department to allow the researcher to meet the students after explanation of the study purpose. As regard to students, they had the right to refuse sharing or to withdraw from the study at any time without giving any reasons and the researcher provided strict concerns for privacy, confidentiality, and anonymity of the students.

Pilot Study

Before performing the study, a pilot study conducted on 10% from the sample size. According to the results of the pilot study, no modifications were made to the tools. Those who participated in the pilot study were included in the studied sample.

Fieldwork

The data collection process spanned about 6 months during the period from the start of November 2021 till the end of April 2022. The researcher met the students at the faculty lab of Benha University. The researcher divided the total sample students (110 students) into 4 groups; 3 groups consisted of 28 students and one group of 26 students. Each group took about 6 weeks to complete the developed BLS training program; one session per day per week of total 4 sessions, one session for theory and three sessions for practice, and 2 weeks for pre and post evaluation. The time needed for filling the tools was about 15-20 minutes.

Preparatory Phase: A review of the past and current information related to literature covering all of the aspects of BLS for adults and pediatrics and which was helpful in designing and processing data collection tools using the available books, scientific journals and articles, and nursing magazines. This was necessary for the researcher to be acquainted with and oriented about aspects of the research hypothesis as well as to assist in the development of data collection tools and prepared handout for the studied sample which included all items about basic life support, this took about 6 months.

Assessment phase: In this phase of BLS program development, knowledge and practice of the students through the collection and analysis of baseline data from the filled tools were assessed by the pre-test.

Designing phase: In this phase, the program booklet, handout, and methods of teaching were developed. The researcher identified the important needs for the target group; set needs priorities, objectives, and content were developed.

Implementation phase: Before the start of the BLS training program sessions, the pre-test evaluation was done for both knowledge and practice. The program consisted of four sessions; two sessions for theory and two sessions for practice. Discussion, motivation,

and reinforcement during sessions were used to enhance learning. Each session ended with a summary of its topics and the new session started with quick review of the last one and objectives of the new topics. Most of the participants were cooperative with the researcher. At the end of each session, students participated in discussion to correct any misunderstanding. Also they were informed about time and content of the next session.

Contents of BLS program: Anatomy and physiology of the heart, the electrical system of the heart, pathophysiology of cardiac arrest, definition of the basic life support, indication of basic life support, definition of chain of survival, concept of "Hands-only CPR", cardio-pulmonary resuscitation and AED for adults, cardio-pulmonary resuscitation and AED for children, cardio-pulmonary resuscitation and AED for infants, complications of CPR, and situations of terminating CPR.

Evaluation phase: After the implementation of the BLS training program, the researcher applied the post-test to evaluate the knowledge and practice acquired. The evaluation was done by using the post-test questionnaire and checklist which were the same format as the pre-test in order to compare the change of knowledge and practice.

Statistical Analysis

The collected data was organized, scored, tabulated and analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA) Qualitative data were expressed as frequency and percentage. Chi-Square test was used. Quantitative data were expressed as mean± standard deviation. Statistics analyzed by computer and proper statistics tests were used to determine whether results were significantly different or not. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as P-value <0.05 was considered significant, P-value <0.001 was considered as highly significant, and P-value >0.05 was considered insignificant.

Results

Table (1): Shows that 77.3% of the studied students aged 22 years old with mean 20.99±0.67 years. 58.2% of the studied students were females. 63.6% of them were from rural areas. 38.2% of the studied students had additional training of basic life support and finally, 35.5% of the studied students had a previous share in a real basic life support.

Figure (1): Illustrates that 15.5% of the studied students had good scores of total knowledge about basic life support pre implementation which increased to 77.3% post implementation of the program. While 57.2% of them had poor total scores of total knowledge about basic life support pre implementation and then this percentage decreased to 12.7% post implementation of the program.

Figure (2): Shows that 30.9% of the studied students had a satisfactory level of total practices about adult and child basic life support pre implementation of the program which was increased to 80.0% post implementation of the program. While 69.1% of them had an unsatisfactory level of total practices about adult and child basic life support pre implementation of the program and then this percentage was decreased to 20.0% post implementation of the program.

Table (3): Describes that there was a statistically positive correlation between the studied students' total knowledge about basic life support and their total practices post program (p ≤ 0.05).

Table (1): Frequency distribution of the studied students regarding their demographic characteristics (n=110).

| Demographic characteristics	No	%
Age/ years		
20 -	6	5.5
21 -	19	17.3
22 +	85	77.2
Min –Max	20-22	
Mean ±SD	20.99±0.67	
Gender		
Male	46	41.8
Female	64	58.2
Residence		
Urban	40	36.4
Rural	70	63.6
Nursing department		
Community health nursing	72	65.5
Psychiatric health nursing	38	34.5
Additional training or workshops about basic life support	42	38.2
Previous share in a real basic life support	39	35.5
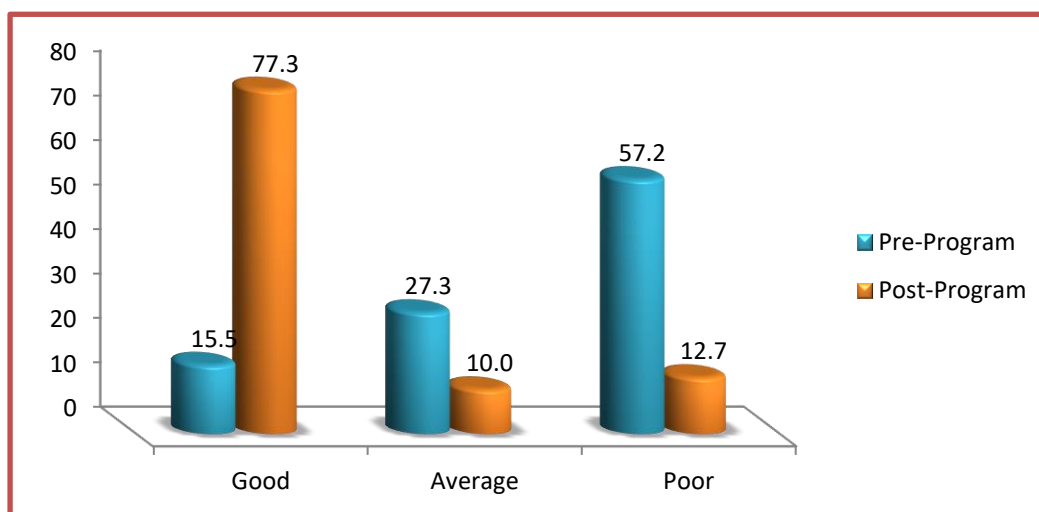
Figure (1): Percentage distribution of the studied students regarding their total knowledge level about basic life support pre-and post-program (n=110).
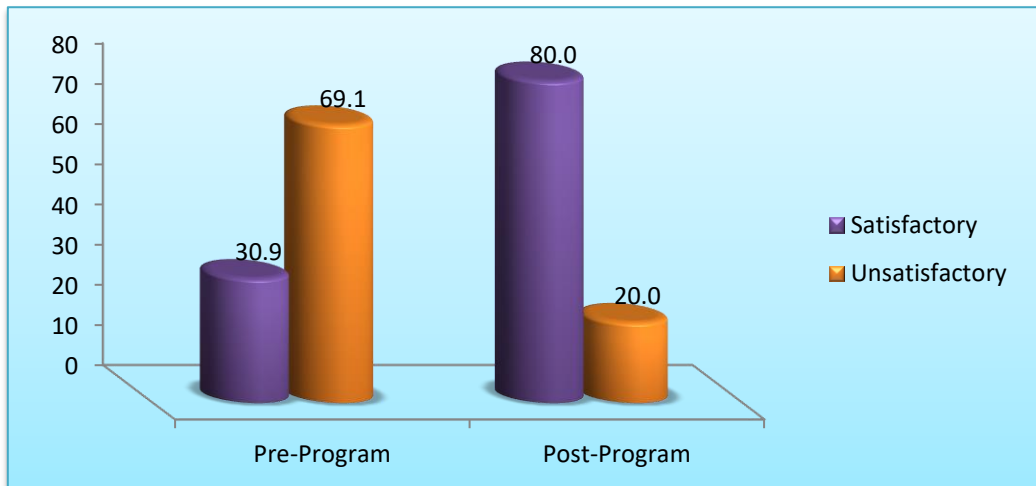
Figure (2): Percentage distribution of the studied students regarding their total practices level pre-and post-program (n=110).

Table (3) Correlation between total knowledge and total practices of the studied students about basic life support pre and post program (n=110).

	Total knowledge			
	Pre-program		**Post- program**	
	r	p-value	r	p-value
Total practices	0.154	0.109	0.757	0.030*

Discussion

Cardiac arrest is a life-threatening event that accounts for 15% of the global mortality and is more common in individuals with a preexisting cardiovascular condition. The emergency management of cardiac arrest involves a series of simple maneuvers, known as basic life support. These maneuvers include recognizing the signs of sudden cardiac arrest, CPR, and defibrillation with AED. Globally, about 92% out-of-hospital cardiac arrest subjects lose their lives due to limited availability of BLS and CPR facilities and without treatment the cardiac arrest survival rate declines by 5.5% per minute. If early basic life support and CPR is initiated; the survival rate can be substantially improved **(Salah et al., 2022).** Community health nursing students will become major healthcare supportive workforce for the general community including the cases of emergency.

which require prompt intervention. Therefore, adequate knowledge and practice of BLS is necessary for all the university attending nursing students **(Ahmad et al., 2018).**

Regarding the demographic characteristics of the studied students (table1), the present study revealed that more than half of the studied students aged 22 years old with mean 20.99±0.67 years, less than three quarters of them were from rural areas, and less than three fifths of the studied students were females. This findings agreed with **Requena-Mullor, et al., (2021)**, who studied "Effects of a Clinical Simulation Course about Basic Life Support on Undergraduate Nursing Students' Learning" "in Spain" and found that the students who participated in their study were mostly females and were approximately 20 years old and also agreed with **Rajaram et al., (2022)**, who studied "Impact of COVID-19 on

Basic Life Support Training Among Medical Students: An Experimental Study" "in India" and found that more than half (53.9%) of their study sample students were females, and agreed with **Tobase et al., (2017)**, who studied "The effects of an online basic life support course on undergraduate nursing students' learning" "in Brazil" and found that 87% of the sample students were females and the mean age was (±SD) was 21.47 (±2.39).

In this study less than two fifths of the studied students had additional previous training or workshops related to BLS. This finding came in the same line with **Awadalla et al., (2020)**, who studied "Experience of Basic Life Support among King Khalid University Health Profession Students, Southwestern Saudi Arabia" and found that about half of their study sample students had received additional basic life support practical and theoretical courses before implementation of their study program of BLS, and agreed **Srivilaithon et al., (2020)**, who studied "Retention of Basic-Life-Support Knowledge and Skills in Second-Year Medical Students" "in Thailand" and found that 32.21% of students had attended BLS training courses before their study. In addition, this finding agreed with **Tobase et al., (2017)** who found that 50% of their sample students had participated in a previous emergency training.

This finding was in contrast with **Alghamdi et al., (2021),** who studied "Awareness and attitude about basic life support among medical school students in Jeddah University, 2019: A cross-sectional study" "in Saudi Arabia" and found that only 23.1% of their students declared that they had previously received a BLS training courses .

The present study indicated that more than one third of the studied students had a previous share in a real BLS situation. This finding was supported by **Awadalla et al., (2020)** who found that more than one quarter of the students under their study told that they had encountered a real situation that required the use of BLS skills.

As for the total knowledge of the studied students about BLS pre and post program. This study clarified that less than three fifths of the studied students had poor total knowledge scores about BLS pre implementation and the minority of them had good scores at pre-program and this finding agreed with **Almesned et al., (2014),** who found that knowledge of BLS among their sample students was poor pre intervention and needed to be improved. This finding was supported by **Chandran & Abraham (2020),** who studied "Basic Life Support: Need of the Hour—A Study on the Knowledge of Basic Life Support among Young Doctors in India" and found that knowledge about the essential components of effective CPR was poor among the sample students pre-test, which improved to near 100% in post-test.

Furthermore, less than one fifth of the studied students had good scores of total knowledge about BLS pre implementation which increased to more than three quarters of them post implementation. However less than three fifths of the studied students had poor total scores of total knowledge about BLS pre implementation and then this percentage decreased to more than one tenth of them post implementation. This finding came in line with **Roel & Bjørk (2020),** who studied "Comparing Nursing Student Competence in CPR before and after a Pedagogical Intervention" "in Norway" and found that there were significant higher scores on knowledge of nursing students about CPR after intervention. This finding also supported by **Srivilaithon, et al., (2020),** who found that the sample students demonstrated an improvement of BLS knowledge after the training though it declined with time, a statistically significant improvement was

determined compared with the pre-test knowledge.

As for the total practices of the studied students about BLS pre and post program. This study ended to less than one third of the studied students had a satisfactory level of total practices about adult and child BLS pre-program implementation which was increased to more than three thirds of them at post program implementation. This finding came in the same line with **Requena-Mullor et al., (2021)** who found that there were statistically significant differences in the total score of the pre-test and after completing the BLS clinical simulation course [pre-test: 12.61 (2.30), post-test: 15.60 (2.06), p < 0.001] and **Tobase, et al., (2017)** who found that there was a significant increase in the average grade of their sample students about BLS after the practical course (p<0.001).

Eventually, this study confirmed that that there was a statistically positive correlation between the studied students' total knowledge about BLS and their total practices at post program (p ≤ 0.05), this finding was in accordance with **Kose, et al., (2019)**, who found that after basic life support implementation program, level of knowledge and practical skills of the studied sample students' scores were higher compared to pre-implementation scores (t= -12.442, p=0.000; t= -22.899, p=0.000).

Conclusion

More than three quarters of the studied students had good total knowledge post implementation and more than two thirds of the studied students had a satisfactory level of total practices post implementation. There was a statistically positive correlation between the studied students' total knowledge and previous share in a real BLS, and additional training at post program. There was a statistically positive correlation between the studied students' total practices and previous share in a

real BLS at post program. There was a statistically positive correlation between the studied students' total knowledge about BLS and their total practices at post program. The implemented training program could improve the studied students' levels of knowledge and practices about basic life support.

Recommendations

- Continuous training of basic life support throughout nursing education curriculum during the academic years and after graduation on regular basis in order to increase the effectiveness of basic life support practices during clinical training and real-life situations.

- There is a need for more studies that more comprehensively evaluate training in, handling, and application of automated external defibrillator devices in order for nursing students to be familiar with it within basic life support.

- Further researches are proposed to explore the effect of educational programs of basic life support intervention on improving knowledge and practice levels among nursing university students.

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برنامج تدريبي عن دعم الحياة المبدئي لطلاب التمريض الجامعي

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يستلزم إجراء دعم الحياة المبدئي التعرف على ماهية السكتات القلبية المفاجئة وكذلك كيفية عمل الإنعاش القلبي الرئوي وإزالة رجفان القلب باستخدام جهازمزيل الرجفان الخارجي الآلي. يؤدي إجراء الإنعاش القلبي الرئوي وإزالة الرجفان خلال أول ثلاث إلى خمس دقائق من حدوث السكتة القلبية المفاجئة إلى معدلات بقاء تتراوح بين 49٪ إلى 75٪ ولقد أثبت أن عمل الإنعاش القلبي الرئوي لمرضى السكتات القلبية المفاجئة قد زاد من فرص إنقاذهم من الموت المفاجئ ضعفين إلى ثلاثة أضعاف. وبالتالي، فإن دعم الحياة المبدئي أمر بالغ الأهمية في تحسين معدلات البقاء على قيد الحياة. علاوة على ذلك، فإن معرفة طلاب العلوم الصحية بما في ذلك طلاب الكليات التمريضية بكيفية تنفيذ إجراءات دعم الحياة المبدئي يعد أيضا أمرا أساسيا وضروريا. وقد أجريت الدراسة الحالية بكلية التمريض- جامهة بنها على عدد 110 طالب من طلاب الفرقة الرابعة بالكلية للعام الدراسي 2021-2022. وقد تبين إحصائيا بعد تنفيذ البرنامج التدريبي أنه هناك ارتباط إيجابي بين المعرفة الإجمالية للطلاب وبين كل من المشاركة السابقة في تطبيق دعم الحياة المبدئي بشكل فعلي والتدريب الإضافي. وجد أيضا ارتباط إحصائي إيجابي بين إجمالي ممارسات الطلاب والمشاركة السابقة في تطبيق دعم الحياة المبدئي بشكل فعلي بعد تنفيذ البرنامج. كذلك وجد ارتباط إحصائي إيجابي بين إجمالي مستوى معرفة الطلاب عن دعم الحياة المبدئي ومستوى ممارساتهم الإجمالية بعد تنفيذ البرنامج. وأوصت الدراسة على استمرار برنامج تدريبي عن دعم الحياة المبدئي لطلاب التمريض الجامعي