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Effect of Cardiac Education on Coronary Artery Disease Knowledge and Knowledge Retention among University Nursing Students in Jordan

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Abstract: The purpose of this study was to test the effect of cardiac education programme on CAD knowledge and knowledge retention among university nursing students in the north of Jordan. Pre-test-post-test experimental randomized controlled design was used. Nursing students were randomly allocated either to the experimental group and attended cardiac educational program and or to control group who did not receive any intervention. Coronary Heart Disease awareness and knowledge questionnaire was used to measure students' knowledge about CAD. The first post-test was carried out one day after the programme application, while the second post-test was conducted three months after the application of cardiac education. The results showed that students in the experimental group have significantly ($p < 0.001$) higher knowledge in the first post-test ($M = 21.00$ $SD = 2.32$) and the second post-test ($M = 20.20$ $SD = 2.24$) compared with those in the control group. Implementing cardiac education programme improved nursing students CAD knowledge and knowledge retention. The cardiac education program should focus on university students to advance knowledge about CAD that may help enhance health outcomes by using effective healthy measures.

Key words: Cardiovascular diseases, coronary heart disease awareness, Jordan, nursing students

INTRODUCTION

Cardiovascular diseases (CVDs) are the primary cause of death responsible for approximately 35% of total deaths in 2007 in Jordan (Jordanian Ministry of Health, (JMOH), 2011). Coronary artery disease (CAD) was the main leading reason of death responsible for 4600 deaths (15%) of total death in Jordan in 2011 (JMOH). Cardiac education have a significant impact on health behaviors and cardiac physiologic risk parameters (Jiang *et al.*, 2007; Moony and Franks, 2011). Nursing students have a key role in providing health care information to meet the learning needs for patients with CAD. Lifestyle modification, medications, exercise and treatment of cardiac diseases are considered the major learning needs of patients with CAD (Galdeano *et al.*, 2010; Scott and Thompson, 2003).

Providing patient with adequate knowledge about their diseases is an important factor for improving adherence to healthy lifestyle (Lunelli, 2009, Tawalbeh and Ahmad, 2013). Eventually, enhancing knowledge about cardiac disease may assist in decreasing its complications (Mosca, 2006). On the other hand, the scarcity of cardiac education may lead to decrease adherence healthy lifestyle and unavoidable disease complications (Alm-Roijer *et al.*, 2006). However, there is a lack in the studies that focus on the effect of cardiac education on knowledge about CAD among university nursing students in Jordan as well as other countries. Therefore, it is crucial to assess the effect of cardiac education on knowledge about CAD among university nursing students.

Staff nurses in Jordanian hospitals play a key role in providing cardiac education since these hospitals do not have a staff nurse who is highly specialized in cardiac education. For that reason, enhancing nurse's knowledge about cardiac education is very essential. This nurse's knowledge is indication of what they learned about cardiac while they were nursing students. In addition, nursing students in their clinical training continue to care for people with cardiac problems. Improving nursing students' CAD knowledge to educate healthy and ill individuals, help promote healthy lifestyle and adherence to treatments. This education is considered as one of the core responsibilities of the health care professionals including nurses and nursing students (Turkmen *et al.*, 2012). For nursing students, to carry out those responsibilities, they have to be educated and aware about CAD during their education in the university. In the light of these facts, this study was planned to examine the effect of cardiac education on CAD knowledge and knowledge retention among university nursing students in the north of Jordan.

Literature review: Various studies were carried out to examine the effect of cardiac education on CAD knowledge among healthy adult (Eshah *et al.*, 2010; Moony and Franks, 2011) and among patients with CAD diseases in Jordan (Tawalbeh and Ahmad, 2013; McKinley, 2009). Moony and Franks (2011) conducted a descriptive, exploratory, non-experimental study to assess the effects of health education intervention on knowledge of CAD. The results indicated a significantly

improved level of knowledge about blood pressure, blood glucose, cholesterol and body mass index. Eshah *et al.* (2010), went further and conducted a quasi-experimental study and the result showed that there was a significant improvement in cardiac knowledge, attitude, health responsibility, nutritional behaviors and interpersonal relationship among the participant in the experimental group compared to the those in the control group. The more recent national pre-test-post-test study of Tawalbeh and Ahmad (2013) was to examine the effect of CAD education program on knowledge and adherence to healthy lifestyle among a convenient sample of 102 patients with CAD. The result should that the knowledge and the adherence to healthy lifestyle was significantly improved after the program application. McKinley and colleagues (2009) conducted a randomized controlled trial among a sample of patients with CAD. The result showed that the patients in the experimental group had a significant improvement in the level of knowledge after the cardiac education compared to the patients in the control group.

While there were few studies that measured the effect of cardiac education on knowledge about CAD among patients in Jordan (Tawalbeh and Ahmad, 2013), no studies examined the effect of cardiac education on knowledge among nursing students. However, there were few studies that examined the effect of simulation and cardiac education on knowledge of nursing students in Jordan. Tawalbeh and Tubaishat (2014) conducted a randomized controlled trial among 82 nursing students. The results showed that the students in the experimental group showed higher knowledge of advanced cardiac life support (ACLS) and higher confidence in applying ACLS, compared to the students in the control group. But, the sample, the education program, the variables studied, the teaching strategy and the tool were different from what were used in this study.

In summary, some international and national studies assessed the effect of cardiac education on CAD knowledge among patients with cardiac diseases, while, up to the author knowledge, there is no study that assessed the effect of cardiac education on CAD knowledge and knowledge retention among nursing students. Therefore, it is vital to assess the effect of cardiac education on the level of CAD knowledge that may help to improve students' knowledge. Ultimately the nurses knowledge may be enhanced, since the nurses knowledge is a reflection of what they learned when they were nursing students. And consequently, improving nurse knowledge may help advance patients' knowledge with CAD that improve the overall health aspects for cardiac patients.

MATERIALS AND METHODS

Design: An experimental, randomized controlled design was used. A pre-test-post-test experiment was applied

to examine the effect of cardiac education on CAD knowledge and knowledge retention among university nursing students. The students were randomly selected and then randomly assigned to either the experimental or control group. The experimental group provided with educational session about CAD while the control group did not receive any education.

Participants: A simple random sampling method was used to recruit the nursing students who were eligible and agreed to participate in this study. A record included all the nursing students in the first year at the Faculty of Nursing was taken from the admission and registration unit of the University and then a sample of nursing students was randomly selected using a simple random table. The chosen sample was then randomly assigned to either the experimental or control group. The inclusion criteria for the participants in the current study were (a) that the student did not attend any cardiac education course in the university, (b) that he or she provided the informed consent to participate and © that the student is in the first year in the faculty of nursing. Any student in the second, third and forth year was excluded because there are many courses taught in theses academic years and contained different topics about cardiac diseases included CAD.

The sample size was decided using the G* power software (Faul *et al.*, 2007). For the purpose of this study, a medium effect size (0.50) was utilized. The sample size was created based on the power level, which was 0.80 and the use of the conventional $\alpha = 0.05$ two tailed criterion of the significance. Accordingly, 64 nursing students were necessitated. To overcome the problem of students' attrition, an extra 40 students were hired, so that there were a total of 104 students in the final sample. The 104 nursing students were randomly allocated to either the experimental or control group and subsequently a 52 students were in each group.

Setting: This study was carried out in the Faculty of Nursing in one of government Jordanian Universities which provides bachelor and master degrees in various specialties. A bachelor degree in nursing is accomplished through a 4-year programme which requiring 132 credit hours. There are two major departments in the Faculty of Nursing: Adult Health and Community, Maternal and Child Health departments. The Faculty of Nursing contained many class-rooms which are provided with computers for Power Point presentations. In addition, there are nine laboratory supplied with important equipments that help advance the psychomotor skills of nursing students. Also, there are two simulation laboratory prepared with adult and pediatric manikins, computers, monitors and other important equipments. English is the language of teaching and all courses are taught in English in the Faculty of Nursing.

Research tool: A self-administered tool was used to collect the data in the current study. The tool begun with a short statement about the purpose of the study, informed consent and followed by two parts. The first part was the demographic and consisted of a checklist and gap filling questions type regarding all variables like age, family monthly income, gender and grade point average (GPA).

The second part of the tool was a coronary heart diseases awareness and knowledge questionnaire which was developed by Kayaniyil *et al.* (2009) to assess the knowledge about CAD. The first item of the tool assessed the students' understanding of CAD pathophysiology. The second two items determined the awareness of the leading cause of death for both men and women. The remaining twenty true or false items identified general knowledge of CAD, including its causes, risk factors, symptoms and treatment. Eleven of these items were based on items in the Cardiac Knowledge Questionnaire (Maeland and Havik, 1987) (Cronbach's alpha ranged from 0.69 to 0.86) and the Coronary Heart Disease Knowledge Test (Smith *et al.*, 1991) (Cronbach's alpha = 0.84). The rest nine true or false items were developed by the tool researcher (Kayaniyil *et al.*, 2009). The total knowledge score was computed by counting the number of right responses, with a possible range from 0 to 23 and higher scores showing better knowledge.

Coronary heart disease awareness and knowledge tool has four subscales. These subscales are pathophysiology, risk factors, symptom and treatment. The first three items with item number 8, 9 and 10 are related to pathophysiology of CAD. The items number 1, 2, 3, 4, 5, 11, 12, 13 and 14 are related to the risk factors of CAD. The items number 6 and 7 are related to the symptoms of CAD, while the items number 15, 16, 17, 18, 19 and 20 are related to the treatment of CAD.

Data collection procedure: The permission to carry out the study was obtained from the ethical research committee at the Faculty of Nursing. Then the researcher selected 104 nursing students randomly using a simple random table. The randomly selected students were randomly assigned to each of the experimental and control group to have 52 in each. The researcher provided a description of the study and asked the students to participate. The students who agreed to participate, were included in the study. A pre-test on CAD knowledge was applied for both groups on the first day. After that, the nursing students in the experimental group attended a 2 h Power Point presentation on CAD and a video. The education program was selected from the textbook of Smeltzer *et al.* (2012). The control group did not receive any education. The educational session included the pathophysiology, causes, risk factors, symptoms and treatment of CAD. Open discussion,

video and Power Point presentation were used as a teaching strategies in the education.

On the second day and three months after the cardiac education, the researcher invited the students in experimental and control group to complete a post-test regarding CAD using the same tool in the pre-test. The researcher instructed students to maintain the communications between them at the lowest level during filling the post-test.

The post-test for the two groups was performed in the class by the researcher. Students who accomplished the pre-test did not know in which they were included while, the researcher know their group assignments. Students knew of their groups just before the starting of the education implementation. To cover students involvement and to maintain their data confidential, a code number was given to each student in both groups. The study protocol and data collection points are clarified in Fig. 1.

Ethical issues: The ethical research committee at Faculty of Nursing reviewed and approved the study method and protocol. Written informed consent was obtained from all the students in the current study. To minimize the possibility of coercion and to avoid the influence during consent form, the first year nursing students who were not enrolled in one of the courses taught by the researcher were only recruited. The students received both verbal and written information about the purpose; content and extent of the study. A code number for each student at the stage of data collection and analysis was provided to keep the student information confidential. In addition, the collected questionnaires were kept in a private cabinet to maintain the students information private and confidential. Students were informed that their participation will be wholly voluntary. The researcher disposed off all questionnaires after study finished.

The informed consent contained that the students had the right to withdraw from the study at any point in time without any effect on their academic achievement. The procedure of data collection process was explored for all students. No risk or harm affected the students, since the data collection process mostly depended on a descriptive questionnaire. The students were informed that the demographical data and information regarding the CAD knowledge will be collected from them three times. The first time was before the application of the education program, while, the second and the third time were at the second day and at three months after the program application.

Data analysis: Statistical Package of Social Science (SPSS) Version 21 was applied to analyze the data. Descriptive statistics including mean (M), standard deviation (SD) and percent (%) were used to describe

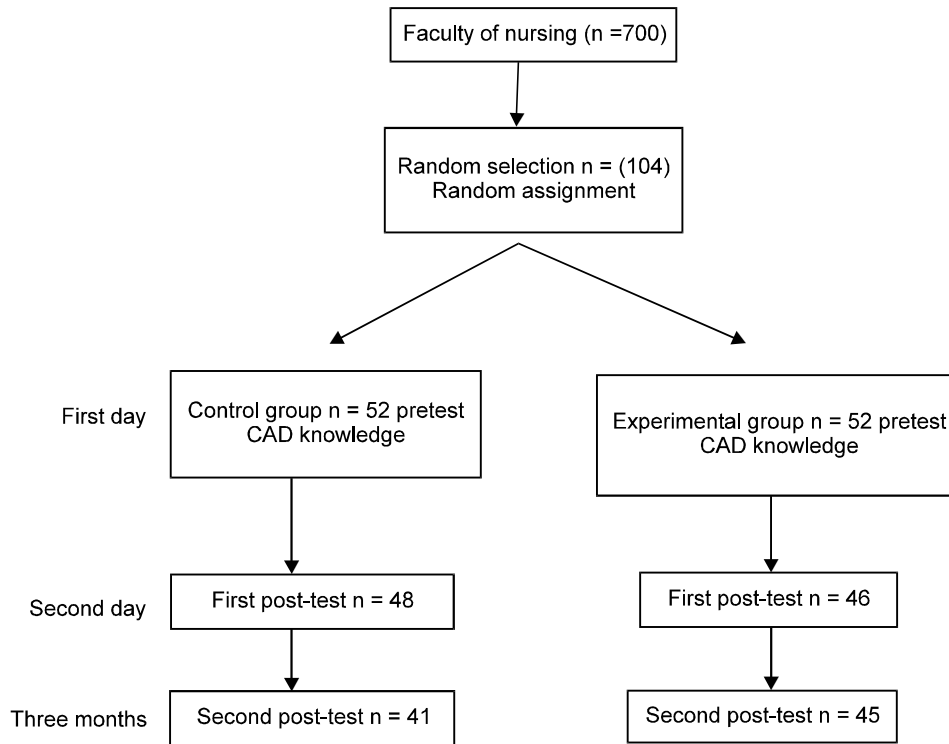


Fig. 1: Schematic diagram stand for the study protocol and data collection process

the nursing students characteristics and to evaluate the level of CAD related-knowledge among nursing students before and after the programme application. In addition, to assess if there were any statistically significant differences between the experimental and the control group at the pre-test level in terms of age, GPA, family monthly income and pretest knowledge and to examine the level of homogeneity between the study participants, an independent t-test was used. To test if there was any statistically significant difference between the two groups in terms of gender, Chi square was used. In addition, the independent t-test was used to examine whether or not there were statistically significant differences between the two groups in CAD knowledge. A paired t-test was used, to assess whether or not there were statistically significant differences between the mean pre-test and post-test scores of CAD related-knowledge for the experimental and control group.

RESULTS

Sample characteristics: One-hundred and four students were randomly selected and then allocated either to the experimental or control group, to have 52 students in each group at the baseline. The mean age for the participants was about 18.50 (Standard Deviation, SD = 0.70) and the mean GPA for the total sample was 79 (SD = 2.32). Family monthly income was (M = 510

Jordan Dinar, SD = 24.12). Fifty females and 54 males involved in the current study. An independent sample t-test indicated that there were no statistically significant differences between the groups in terms of age, family monthly income, GPA, pre-test knowledge, showing that the two groups were homogeneous. In addition, Chi-square indicated no statistically significant difference between the two groups in terms of gender $X^2 = 2.30$, $p = 0.34$ Table 1. Ninety-two percent (N = 94) of the total sample at the baseline completed the first post-test. Forty-six students (49%) were in the experimental group and 48 (51%) were in the control group. Also, 84% (N = 86) of the total sample at the baseline completed the second post-test. Forty-five students (52%) were in the experimental group and 41 (48%) were in the control group.

Results indicated that there was a statistically significant difference $t(92) = -53.88$, $p < 0.001$ between the experimental group (M = 21.00, SD = 2.32) and the control group (M = 6.93, SD = 1.15) regarding CAD knowledge in the first post-test one-day after the application of education intervention. Also, results demonstrated that there was a statistically significant difference $t(84) = -34.22$, $p < 0.001$ between the experimental group (M = 20.20, SD = 2.24) and the control group (M = 7.12, SD = 2.13) regarding CAD knowledge in the second post-test three months after the intervention (Table 2).

Table 1: Sample characteristics at baseline and the pre-test of CAD knowledge for the experimental and the control group (n = 104)

Variable	Experimental group n = 52	Control group n = 52	p-value
Age (years) M (SD)	18.70 (1.16)	18.30 (1.10)	0.30
Family monthly income	512.0 (22.14)	508.0 (24.11)	0.22
Gender			
Male (N)	28.00	26.00	0.34
Female	24.00	26.00	
Grade point average M (SD)	80.00 (2.41)	78.00 (2.10)	0.22
Pretest for knowledge M (SD)	08.30 (1.91)	06.90 (1.96)	0.35

*p<0.05 level (2-tailed)

Table 2: CAD knowledge mean difference in the first and second post-test between the experimental and control group

Variable	Experimental group M (SD)	Control group M (SD)	t	p-value
Knowledge	21.00 (2.32)	6.93 (1.15)	-53.88	0.001
Knowledge retention	20.20 (2.24)	7.12 (2.13)	-34.22	0.001

*p<0.001 level (2-tailed)

Table 3: CAD knowledge mean difference between the pre-test and the first and the second post-test for the experimental and control groups

Group	Pre-test M (SD)	1st. Post-test M (SD)	2nd Post-test M (SD)	t pretest and 1st post-test	t pretest and 2nd post-test
Experimental group	8.30 (1.91)	21.00 (2.32)	20.20 (2.24)	-6.95**	-6.88**
Pathophysiology	2.06 (0.84)	4.76 (1.10)	4.53 (1.00)	-3.99*	-3.65*
Risk Factors	3.23 (0.69)	7.96 (1.14)	7.44 (0.98)	-4.65*	-4.44*
Symptoms	1.02 (0.77)	1.79 (1.00)	1.85 (0.76)	-4.24*	-3.98*
Treatment	2.01 (1.12)	3.00 (1.32)	2.90 (1.11)	-3.54	-4.54
Control group	6.90 (1.96)	06.93 (1.15)	07.12 (2.13)	-2.22	-3.12

**p<0.001 level (2-tailed)

*p<0.01 level (2-tailed)

A paired t-test indicated that mean knowledge (M = 21.00, SD = 2.32) at the first post-test was significantly higher than that at the pre-test (M = 8.30, SD = 1.91) for the experimental group. In addition, results showed that mean knowledge (M = 20.20, SD = 2.24) at the second post-test was significantly higher than that at the pre-test (M = 8.30, SD = 1.91) for the experimental group. Conversely, that there were no statistically significant differences between the mean knowledge in the first and the second post-test compared to the mean knowledge in the pre-test for the control group.

The results of paired t test revealed that the mean pathophysiology scores differed significantly one day $t(92) = -3.99$, $p = 0.01$ and three months after the application of the programme $t(84) = -3.65$, $p = 0.02$. The results indicated that the mean risk factors scores differed significantly one day $t(92) = -4.65$, $p = 0.02$ and three months after the programme application $t(84) = -4.44$, $p = 0.04$. In addition, the results showed that the mean symptoms scores differed significantly one day $t(92) = -4.24$, $p = 0.04$ and three months after the application of the cardiac program $t(84) = -3.98$, $p = 0.03$. However, there were no significant improvement in the mean treatment scores either at one day nor at three months after the programme application.

DISCUSSION

The purpose of the current study was to test the effect of a cardiac education program on CAD related-knowledge

and knowledge retention among university nursing students. The results indicated that the level of the CAD knowledge among nursing students was limited before the program application. This is consistent with the result of other studies that showed a low level about CAD among patients with cardiac disease (Homko, 2008; Tawalbeh and Ahmad, 2013) and among healthy adults (Ammouri *et al.*, 2010; Eshah *et al.*, 2010).

Nurses knowledge is a reflection of what they learned when they were students. Therefore, nursing students should have adequate knowledge about CAD to provide an effective health education for patients in the health care settings. Deficient CAD knowledge among nursing students in the current study could be due to that the use a sample of first-year nursing student who did not attend any internal or external cardiac education course or workshop as indicated in the results part which may affect their level of knowledge. In addition, the limited role of media in Jordan in increasing the level of awareness about CAD among general population could be considered an important explanation for a low level about CAD among nursing students.

The results of the present study showed that the application of the educational program was significantly effective in improving knowledge among nursing students in the experimental group at the first and the second post-test compared to those in the control group. This result is consistent with the results of other studies (McKinley, 2009; Moony and Franks, 2011;

Tawalbeh and Ahmad, 2013; Williams *et al.*, 2007) which showed that cardiac education help to improve knowledge among patients with cardiac diseases. In addition, other studies were conducted among healthy adult (Eshah *et al.*, 2010) and among nursing students (Tawalbeh and Tubaishat, 2014) using different education strategies like simulation, the results indicated a significant improvement in knowledge after the application of the education program. However, the previous two studies used different educational program and strategies.

The considerable effect of the education on knowledge among nursing students in the experimental group could be related to different factors. The use of effective group discussion, video and Power Point presentation using different images for illustration help significantly improve the knowledge. Mullen *et al.* (1997) and Fletcher (1987) stressed that the previous teaching strategies are important and help to improve knowledge. In addition, the results indicated that the education program has a significant effect on CAD knowledge retention. In the second post-test, three months after the programme application, the nursing students in the experimental group were found to have a significantly high knowledge about CAD compare to those in the control group. This result is consistent with the result of other studies (Tawalbeh and Ahmad, 2013; Ackermann, 2009) which used different educational strategies and indicated a positive effect of education on knowledge retention. This finding could be due to the effective and efficient use of interactive, active group discussion and detailed explanation about CAD.

The result indicated a significant improvement in pathophysiology, risk factors and symptoms scores at one day and at three months after the program application. These findings could be due to the point that understanding pathophysiology, the risk factors and symptoms of CAD are seen as very important for students. This is supported by the studies conducted in this regard (Chan, 1990; Czar and Engler, 1997) which showed that learning about pathophysiology and risk factors were the most important areas but among patients with cardiac diseases.

Limitations, recommendations and implications: In spite of being randomly selected, the sample in the current study was drawn from only one Jordanian university which may limit the generalizability of the findings. It is worthy that this study could be replicated using larger and heterogeneous sample in multiple settings to examine the effect of cardiac education on students knowledge. Measuring CAD knowledge retention three months after the education intervention was another limitation. Further research work is recommended to measure knowledge retention over a long period of time to be sure that the same result could be maintained over time. In addition, this study was

conducted among baccalaureate nursing students, therefore the researcher suggested that it is essential to replicate this study among different medical and non-medical students in different Jordanian Universities. This will help clarify the overall public knowledge about CAD. Carrying out research examining the effect of cardiac educational program on knowledge and knowledge retention among university nursing students in Jordan may provide a foundation for conducting other studies which may help tackle the gap and the limitations of the present study.

The present study has a strong implications to nursing in which providing nursing students with effective cardiac education, may help to enhance their knowledge about CAD that may help to provide patients with the adequate CAD related-knowledge. Introducing the content of the current study in nursing curricula in Jordanian Universities may help to explain the significance of the cardiac education program application. Nursing programs in Jordanian universities should be adjusted to incorporate detailed CAD educational programs that advance CAD related-knowledge among university nursing students in Jordan. This study has a direct implication in practice since nursing students play a key role in assessing patients with CAD that may affect patients health outcomes.

Conclusion: The results indicated a low level about CAD among randomly selected sample of university nursing students. The application of cardiac education program help to enhance the knowledge acquisition and retention significantly among university nursing students in Jordan. The results give an evidence to support the integration of specific cardiac educational program that improves students knowledge about CAD. In addition, the results confirm the importance of considering a specific cardiac education program in nursing curriculum.

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