

Coenzyme Q10 supplements' knowledge among cardiac patients

Abstract:

Background: Most studies showed fair evidence on the benefits of Coenzyme Q10 supplements in improving cardiac functions and preventing cardiovascular diseases. This study aimed to assess knowledge of Coenzyme Q10 supplements among cardiac patients.

Methods: This was a cross-sectional study and 134 patients were conveniently enrolled based on inclusion and exclusion criteria. This study was conducted using a self-administered questionnaire, derived from extensive literature reviews.

Results: Study subjects were found to have not appropriate knowledge about Coenzyme Q10 supplements (mean knowledge score=1.8, SD=3.131). This study found strong positive correlation between the knowledge score and attitude score ($r=0.776$, $p<0.05$). Elderly and those earning higher incomes had statistically higher knowledge scores compared to others.

Conclusion: The obtained knowledge towards Coenzyme Q10 supplements reflected the low pattern of use among cardiac patients. It also emphasized the role of healthcare providers to increase awareness about the benefits of Coenzyme Q10 supplements among cardiac patients as well as to educate them about its interaction with some drugs.

Key words:

Coenzyme Q10, Knowledge, Attitude, Pattern of use, Cardiac patients

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Introduction

Cardiovascular diseases (CVDs) are amongst the most prevailed diseases affecting patients from all over the world. High death rates are associated with having one or more CVDs and are considered as one of the leading causes of death over the past 15 years. It was estimated that more than 54% of deaths were results of these diseases worldwide ^[1].

Over time conventional pharmacotherapies for CVDs such as beta blockers, angiotensin-converting-enzyme inhibitors, calcium channel blockers, and many other classes with proven efficacy in alleviation of cardiac disease states were established, but are associated with undesirable side effects, and adverse reactions ^[2]. Hence, the need for complementary and alternative medicine (CAM) is emerging due to their synergistic effects when used with evidence-based prescribed therapies ^[3].

One example of such complementary remedies is Coenzyme Q10 (CoQ10) ^[4]. CoQ10, which is a small lipophilic molecule, was discovered in 1957 and has been used in studies involving heart failure patients and general heart disease patients since the 1980s ^[5]. CoQ10 is present naturally inside of the human body. It is situated inside the mitochondria and is essential for the transfer of electrons for the ultimate production of the main energy source in the body which is adenosine triphosphate (ATP) ^[6].

Roles of CoQ10 in the body are to aid in energy production inside body cells, to act as an antioxidant to neutralize harmful free radicals, to protect smooth functioning of blood vessel's endothelium and lymph vessel, and to increase the supply of energy in heart's muscles. Some studies have shown that CoQ10 improves the symptoms of CVDs, and prolongs survival in cardiac patients. CoQ10 is recommended to be taken daily with a dose of 75- 360 mg ^[7]. This study aimed to assess knowledge of Coenzyme Q10 supplements among cardiac patients.

Materials and methods

This was a cross-sectional study done and a self-administered questionnaire was employed. The study subjects were screened for inclusion and exclusion criteria. At first, information sheet was handed to patients and informed consent was taken. The questionnaire was delivered personally to the patients by the researcher who also collected them back after they completed the study. The sampling method employed was convenient sampling.

Sample size was calculated according to $Z^2 \times (p) \times [(1-p) / C^2]$ where Z is the standard normal distribution = 1.96 at 95% confidence interval; p is the hypothesized proportion of outcome of interest and C is the acceptable allowable error of 0.05. Sample size was then corrected according to the estimated population of both the urbanized and rural settlements.

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The questionnaire was used as a research tool to evaluate patients' knowledge about the use of CoQ10 supplements. The questionnaire was adopted and adapted from a previous study^[8, 9]. The questionnaire had two parts assessing socio-demographic characteristics and knowledge of use of CoQ10. The first part assessed the socio-demographic characteristics of the participants such as age, gender, ethnicity, educational level, occupation, income, and main diagnosis. The second part has 10 multiple choice questions that assessed participants' knowledge on CoQ10 supplements. Each correct answer was given a score of 1 and each wrong answer was given a score of 0. The knowledge score was interpreted as poor, moderate, and good knowledge as tabulated in table 1. For scores of 3 correct answers or below, poor knowledge was assigned. For scores from 4 to 6, moderate knowledge was assigned. For correct scores of 7 or higher, good knowledge was assigned^[10].

Content validity of the questionnaire was checked before start of the study. During the pilot study, 20 patients were approached and the questionnaire was handed. Reliability of the questionnaire was assessed using Cronbach's alpha which is the most common tool to be used to measure internal consistency^[12]. Cronbach's alpha results were obtained: value for part II was 0.940.

All data were analyzed using Statistical Package for Social Sciences (SPSS) software (version 24) to interpret data. Relevant types of statistical analysis were conducted for interpretation of data. Normality of the data was checked (kurtosis of normally distributed data falls between +2 and -2)^[13]. Normally distributed continuous data was described in mean and standard deviation. Categorical data was described as frequency and percentage. For inferential statistics such as the correlation between knowledge scores, Pearson correlation test was used because it was found normally distributed. One-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of three or more independent groups.

Results

As shown in table 1, the mean (SD) age of the respondents for this study was 58.51 (8.53) years. Non elderly patients, considering elderly age to be over 60 years old^[14], are the majority of the study subjects. Majority of the patients were males and the major proportion of the study subjects received secondary education, had a monthly income of below than 700 USDs, and was diagnosed with acute coronary syndrome.

Table 1: Socio-demographic characteristics of the study subjects (n=134)

Characteristics	Frequency (%)	Mean (SD)
Age (years)		58.51 (8.53)
Non-elderly (<60 years)	63 (47%)	
Elderly (≥60 years)	71 (53%)	
Gender		
Male	120 (89.60%)	

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Female	14 (10.40%)
Education	
No formal education	13 (9.70%)
Primary education	12 (9.00%)
Secondary education	66 (49.30%)
Tertiary education	43 (32.1%)
Higher education: diploma	18 (13.40%)
Higher education: bachelor	19 (14.20%)
Post-graduate degree	6 (4.50%)
Occupation	
Professional	54 (40.30%)
Technical	28 (20.90%)
Clerical	11 (8.20%)
Self employed	10 (7.50%)
Unemployed	16 (11.90%)
Pensioner	15 (11.20%)
Gross Monthly Income (USDs)	
< 700	68 (50.70%)
700-1500	33 (24.60%)
1500-3000	23 (17.20%)
> 3000	10 (7.50%)
Diagnosis	
Acute coronary syndrome	71 (53.00%)
Hypertension	22 (16.40%)
Heart failure	26 (19.40%)
Atrial fibrillation	15 (11.20%)

As in table 2, the mean (SD) for knowledge score was very low at 1.8 (3.13) with the maximum score of 10, as shown in table 2. The majority of the study subjects (75.3%) had poor knowledge, and 11.1% had moderate knowledge. Only (13.4%) of the study subjects had good knowledge on Coenzyme Q10 supplements.

Table 2: Knowledge score among study subjects (n=134)

Characteristics	Frequency (%)	Mean (SD)
Knowledge score		1.8 (3.13)
Poor knowledge (3 or below)	101 (75.3%)	
Moderate knowledge (4-6)	16 (11.9%)	
Good knowledge (7 or more)	17 (12.7%)	

There was a significant difference ($p=0.008$) in knowledge scores between age groups and monthly income classes of the study subjects. Elderly patients showed better knowledge as compared to non-elderly ($p=0.41$). High-earning patients showed better knowledge about CoQ10 supplements. The actual difference in mean knowledge scores between two higher salaries groups was 3.048, as shown in table 3.

Table 3: Knowledge on CoQ10 supplements

	n	Mean (SD)	p-Value*
Age			
Male	120	2.17 (1.69)	0.003 ^a
Female	14	2.33 (2.71)	
Age			
Non-elderly	63	1.10 (2.45)	0.008 ^a
Elderly	71	2.56 (3.57)	
Gross Monthly Income (USDs)			
< 700	68	1.59 (2.92)	0.041 ^b
700-1500	33	1.15 (2.51)	
1500-3000	23	2.22 (3.28)	
> 3000	10	4.20 (4.59)	
Diagnosis			
Acute coronary syndrome	71	1.26 (2.32)	0.005 ^a
Hypertension	22	1.76 (2.48)	
Heart failure	26	1.48 (2.11)	
Atrial fibrillation	15	1.97 (2.30)	

a Independent-samples t-test

b One-Way ANOVA test

* $p < 0.05$ shows significance

As shown in table 4, this study revealed a statistically significant ($p=0.001$) strong positive correlation ($r=0.776$) between knowledge score and attitude score, implying that knowledge level increases with the increases in attitude.

Table 4: Correlation between knowledge score and attitude score

Characteristics	Attitude score
Knowledge score	0.776 ^c (0.001)*

c Pearson correlation test

* p value < 0.05 shows significant

Discussion

In this study, majority of the subjects did not take the supplements (88.8%) because they did not know about it or thought that the supplement was unnecessary. The majority of study subjects that used the supplement revealed that the reason for taking CoQ10 was for an existing heart condition. Most of the study subjects were recommended by their friends or family. All the study subjects did not experience any side effect while using CoQ10 supplements.

Elderly patients comprised of 47% of the study subjects, which is very probable and expected because age is known as one of the main risk factors of CVDs^[15]. By the onset of getting older, symptoms of cardiovascular disease often start to appear because as the body ages, the heart

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becomes weaker and the blood vessels become less flexible, making it harder for blood to move easily. In addition to that, poor nutrition, poor exercise habits, tobacco smoking, and diabetes mellitus can increase the risk of CVDs ^[16]. But for the non-elderly to be a majority in this study (53%) maybe due to sedentary lifestyles adopted by young adults with addition to consumption of unbalanced diet ^[17]. Men are three times more likely to have acute coronary syndrome (ACS) than women due to gender differences in psychosocial and behavioral coronary risk factors ^[18].

The majority of study subjects received only secondary education. Coronary risk factors increase with decrease in educational level of the patients, and education level is considered one of the factors associated with delay in seeking medical treatment ^[19,20]. Low financial status is a risk factor for the incidence of CVD, and hospitalization causes a financial burden to ACS patients, which can affect the outcome of therapeutic plan ^[21]. Most of the study subjects had ACS episodes because the study site is a cardiology referral center in the region thus it is not surprising that they handled more ACS cases than other institutions. In many countries coronary artery disease (CAD) is one of the leading causes of mortality, accounts for 20-25% of all deaths in public hospitals ^[22]. Add to that, more than 2.5 million hospitalizations are due to ACS worldwide. In Australia, the number of ACS hospitalizations has increased 79% from 1993 to 2008 for acute myocardial infarction (MI) and 33 % for unstable angina (UA), resulting in 95,000 hospitalizations in 2008 ^[21].

This study showed that the knowledge of patients about CoQ10 was very low because there is a substantial misconception about herbal products and dietary supplements in general, but most individuals are interested in receiving additional information about these products. Add to that, patients usually have poor knowledge regarding nutritional supplements especially regarding cost, adverse reactions and evidence-based health benefits ^[23]. Older patients tend to take more supplements than younger patients, thus resulting in a higher knowledge level. The use of dietary supplements is higher among elderly, and supplements users are shown to be well-educated about their supplements ^[24].

This study also showed that there is a significant difference in knowledge level according to monthly income which can be due to the affordability of CoQ10 supplements with high income subjects. In addition to that, women, the elderly, people with more education, more income, healthier diets and lifestyles, lower body weights, and people in the western United States use multivitamins and minerals supplements more often than others ^[23].

Most of the study subjects revealed negative attitude towards CoQ10 supplementation, because knowledge influences behavior through attitudes. The more knowledgeable patients are about the products, the higher their sense of safety and acceptability towards the products, leading to increase in their trend of consumption ^[25]. Elderly patients are shown to have more positive attitude values than the non-elderly patients because older patients tend to consume more supplements than younger patients, thus resulting in a more positive attitude ^[24].

As an understanding, usually knowledge level increases with the increase in attitude score. This can be interpreted that the more knowledgeable the patients are, the more positive their attitude towards CoQ10 supplementation and patients' knowledge about herbal products and dietary supplements was linked to increase in use. In this cohort of the patients, patients also didn't have good knowledge that's why their attitudes were also not positive. Patients with increased knowledge tend to consume more supplements ^[26]. Most of the study subjects stated that their

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friends or family that recommended them to consume CoQ10. This was to be expected as the prescribing trends were low thus this might link to the low recommendation and prescribing trends by doctors in this population ^[27].

Conclusion

This study discovered that most cardiac patients enrolled had a lower knowledge on CoQ10 supplements. However, there was a positive correlation found between patients' knowledge and their age. These findings indicate the necessity of a comprehensive education program targeting not only cardiac patients but also their healthcare providers to improve their awareness about the potential benefits and concerns from using supplements and complementary medicine.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

References

- 1 WHO. 2017. Cardiovascular diseases (CVDs). Geneva: World Health Organization.
- 2 Gutierrez-Mariscal, F.M., de la Cruz-Ares, S., Torres-Peña, J.D., Alcalá-Díaz, J.F., Yubero-Serrano, E.M. and López-Miranda, J., 2021. Coenzyme Q10 and Cardiovascular Diseases. *Antioxidants*, 10(6), p.906.
- 3 Barnes, P., Bloom, B., & Nahin, R. (2008). Complementary and Alternative Medicine Use Among Adults and Children: United States, 2007. *Natl Health Stat Report*. **10**(12):1-23.
- 4 Grant, Suzanne J., Bin, Yu Sun, Kiat, Hosen, & Chang, Dennis Hsu-Tung. (2012). The use of complementary and alternative medicine by people with cardiovascular disease: a systematic review. *BMC Public Health*, **12**(1), 299.
- 5 DiNicolantonio, James J., Bhutani, Jaikrit, McCarty, Mark F., & O'Keefe, James H. (2015). Coenzyme Q10 for the treatment of heart failure: a review of the literature. *Open Heart*, **2**(1), e000326.
- 6 Parkinson, Michael H., Schulz, Jörg B., & Giunti, Paola. (2013). Co-enzyme Q10 and idebenone use in Friedreich's ataxia. *Journal of Neurochemistry*, **126**, 125-141.
- 7 Qidwai, Waris, Samani, Zahra Aziz, Azam, Iqbal, & Lalani, Saima. (2012). Knowledge, Attitude and Practice of Vitamin Supplementation among Patients visiting Out-Patient Physicians in a Teaching Hospital in Karachi. *Oman Medical Journal*, **27**(2), 116-120.
- 8 Hilleman DE, Teply R, Packard KA. Knowledge, Perceptions, and Patterns of Fish Oil Use in Cardiac Patients. *J Pharm Pract*. 2020 Oct;33(5):580-585.
- 9 Oh RC, Beresford SA, Lafferty WE. The fish in secondary prevention of heart disease (FISH) survey--primary care physicians and omega3 fatty acid prescribing behaviors. *J Am Board Fam Med*. 2006 19(5):459-67.
- 10 Waller, Jo, Ostini, Remo, Marlow, Laura A. V., McCaffery, Kirsten, & Zimet, Gregory. (2013). Validation of a measure of knowledge about human papillomavirus (HPV) using item response theory & classical test theory. *Preventive Medicine* **56**(1):35-40
- 11 Sullivan, G. M., & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. *Journal of Graduate Medical Education*, **5**(4):541–542
- 12 Streiner, David L. (2003). Being Inconsistent About Consistency: When Coefficient Alpha Does and Doesn't Matter. *Journal of Personality Assessment*, **80**(3), 217-222.

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- 13 George, D. and Mallery, P. (2010). *SPSS for Windows Step by Step: A Simple Guide and Reference 17.0 Update*. 10th Edition, Pearson, Boston.
- 14 Karim. (1997). The Elderly in Malaysia, Demographic trends. *Medical Journal of Malaysia*, 52, 206-212.
- 15 Niccoli, T., & Partridge, L. (2012). Ageing as a risk factor for disease. *Current Biology* 22(17), R741–52.
- 16 Corella, D., & Ordovás, J. M. (2014). Aging and cardiovascular diseases: The role of gene-diet interactions. *Ageing Research Reviews*, 18:53–73.
- 17 Feigin V., Forouzanfar M., Krishnamurthi R., et al. (2014). Global and regional burden of stroke during 1990-2010: findings from the Global Burden of Disease Study 2010. *Lancet*. 2014;383(9913):245-254.
- 18 Chin, S. P., Jeyaindran, S., Azhari, R., Azman, W. A. W., Omar, I., Robaayah, Z., & Sim, K. H. (2008). Acute Coronary Syndrome (ACS) Registry - Leading the Charge for National Cardiovascular Disease (NCVD) Database. *Med J Malaysia* 63(126), 29–36.
- 19 Rosiek, A., & Leksowski, K. (2016). The risk factors and prevention of cardiovascular disease: the importance of electrocardiogram in the diagnosis and treatment of acute coronary syndrome. *Therapeutics and Clinical Risk Management*, 12, 1223–1229.
- 20 Salaries & Wages Survey Report. (2013). Retrieved on November 25, 2014, from http://www.statistics.gov.my/portal/download_Labour/files/BPTMS/2013/Laporan_Penyiasatan_Gaji_Upah_Malaysia.pdf.
- 21 Hyun, K. K., Essue, B. M., Woodward, M., Jan, S., Brieger, D., Chew, D. Redfern, J. (2016). The household economic burden for acute coronary syndrome survivors in Australia. *BMC Health Services Research*, 16, 636.
- 22 Hoo, F. K., Foo, Y. L., Lim, S. M. S., Ching, S. M., & Boo, Y. L. (2016). Acute coronary syndrome in young adults from a Malaysian tertiary care centre. *Pakistan Journal of Medical Sciences*, 32(4), 841–845.
- 23 Blumberg JB, Bailey RL, Sesso HD, Ulrich CM. The Evolving Role of Multivitamin/Multimineral Supplement Use among Adults in the Age of Personalized Nutrition. *Nutrients*. 2018;10(2):248.
- 24 Dickinson A., & MacKay D (2014). Health habits and other characteristics of dietary supplement users: a review. *Nutrition Journal*. 13:14.
- 25 Packman, I., Kirk, S. F. L. (2000). The relationship between nutritional knowledge, attitudes and dietary fat consumption in male students. *Journal of Human Nutrition and Dietetics*. 13, 389-395.

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- 26 Marinac JS, Buchinger CL, Godfrey LA, Wooten JM, Sun C, Willsie SK (2007). Herbal Products and Dietary Supplements: A Survey of Use, Attitudes, and Knowledge Among Older Adults. *J Am Osteopath Assoc* **107**(1):13–23.
- 27 Gowani, S. A., Shoukat, S., Taqui, A. M., Hanif, H. M., Rawasia, W. F., Qadri, Z., & Dhakam, S. H. (2009). Secondary prevention of heart disease – knowledge among cardiologists and Ω -3 (Omega-3) fatty acid prescribing behaviors in Karachi, Pakistan. *BMC Cardiovascular Disorders* **9**:4.

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