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Association between Sociodemographic Characteristics, Clinical Variables and Adherence Level on Lifestyle Modification among Patients with Coronary Artery Disease

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ABSTRACT

Background: Coronary artery disease (CAD) is one of the leading causes of death worldwide and contributes to large numbers of hospitalizations. Non-communicable diseases are Malaysia's leading cause of death, mainly due to cardiovascular disease, and the most significant contributor in terms of disability among Malaysians. Adherence to recommended healthy lifestyles is a secondary prevention strategy to reduce the risk of reinfarction and readmission among patients with CAD. Studies have shown that sociodemographic characteristics and clinical variables are associated with adherence to lifestyle modification. The study's objective is to assess the adherence level and association between sociodemographic data and adherence level to lifestyle modification among patients with coronary artery disease. **Methods:** A cross-sectional study was conducted among 113 patients diagnosed with coronary artery disease using a self-administered questionnaire in one of the government cardiac centres. **Results:** The study found that the adherence level to lifestyle modification was low 2.09 (±0.19). The adherence to recommended healthy lifestyle modifications was found to be significantly associated with race, $F(3,109)=17.14$, $p<0.05$. This study also indicated an association between adherence level to recommended lifestyle modification and the level of education $F(2,110)=8.71$, $F(2,110)=8.71$, $p<0.05$ and monthly income $F(2,110)=13.15$, $p<0.05$. There was a small but significant negative correlation between BMI and healthy diet intake, $r(113)=-0.207$, $p<0.05$. **Conclusion:** It was recommended that sociodemographic characteristics and clinical variables be crucial for nurses to understand and appreciate their patients' adherence to lifestyle modification behaviors. This will help nurses be more aware and sensitive to sociodemographic characteristics when planning their patients pre-discharge education and successful treatment.

Keywords: Adherence; Coronary Artery Disease; Coronary Care Nursing; Lifestyle Modification

INTRODUCTION

One of the leading causes of death worldwide and for large numbers of hospitalizations is coronary artery disease (CAD), which is increasing yearly (WHO, 2014). In Malaysia, non-communicable diseases (NCDs) are the leading cause of death, mainly due to cardiovascular diseases, including CAD, and the most significant contributors to disability among Malaysians (Ministry of Health Malaysia, 2017). From 2006 to 2015, the high occurrence of risk factors in Malaysia was identified, such as smoking, lack of physical activity, obesity, and hyperlipidemia, among adults over the age of 18 (Ministry of Health Malaysia, 2017).

Lifestyle modification is one of the interventions in the clinical guidelines for the prevention and treatment of CAD. The recommended lifestyle modification includes complete smoking cessation, blood pressure control, lipid management, physical activity, weight management, diabetes mellitus management, medication, and cardiac rehabilitation (Pereira & Franz, 2008). A healthy lifestyle is a secondary prevention strategy to reduce the risk of reinfarction and restenosis among patients with CAD. Hypno-pressure performed by trained personnel in patients with cardiovascular disorders is beneficial to reduce mean arterial pressure (Nugraha *et al.*, 2023). Adherence to a healthy lifestyle and medication is the most important secondary prevention to minimize the risk of complications

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among patients with CAD, such as death, congestive cardiac failure (CCF), and recurrent admission. The primary reason for the continued high incidence of coronary artery disease (CAD) as the leading cause of premature death in adults worldwide is that a significant portion of the risk of its recurrence cannot be accounted for or understood (Cho *et al.*, 2023). A study found that the risk of recurrent cardiovascular events is substantially reduced with adherence to behavioral advice, including diet, exercise, and smoking cessation (Chow *et al.*, 2010).

Adherence to a healthy lifestyle is one of the most significant challenges of secondary prevention among patients with CAD. Pandey and Choudhry (2014) found that medication adherence was a substantial challenge in secondary prevention among patients with myocardial infarction. A study by Sofi *et al.* (2011) demonstrated the difficulty of modifying lifestyle habits among 130 patients. There are numerous factors associated with non-adherence to a healthy lifestyle. Female gender, increasing age, poor knowledge, and a farther distance from the hospital were shown to lead to non-adherence to dietary advice; lower socioeconomic status was determined to lead to non-adherence to physical activity (Dhungana *et al.*, 2014). The dietary intake of patients is affected by race and economic status. A study highlighted that it is important to highlight that 51.2% of the respondents in the study had difficulties changing their diet intake due to financial issues (Gomez *et al.*, 2020). Primary prevention efforts should focus on identifying and addressing risk factors in order to reduce the likelihood of future occurrences of coronary artery disease (Kumar, Umashankar & Poddar, 2020). The study's objective is to assess the adherence level and association between sociodemographic data and adherence level to lifestyle modification among patients with coronary artery disease.

METHODOLOGY

Study Design and Population

A cross-sectional study was conducted among 113 CAD patients admitted to the cardiology department diagnosed with Unstable Angina (UA), Non-ST Elevation Myocardial Infarction (NSTEM) to ST-Elevation Myocardial Infarction (STEMI). Patients above 21 years old were presented with CAD events, defined and supported by electrocardiogram and cardiac enzyme blood test included in this study. Patients with chronic disease conditions (i.g.,cancer, Acquired Immune Deficiency Syndrome (AIDS) and Hypoxic Ischemic Encephalopathy (HIE)), and unstable mental conditions (e.g., depression, delirium and Alzheimer disease) were excluded from this study. Patients who identify with a barrier language were also excluded from the study.

Sample Size and Sampling Technique

G*Power 3.0 software was used to calculate the sample size. Using a power level of 0.80, an alpha level of 0.05, and an effect size of 0.50 for a two-tailed independence t-test, the estimated sample size was 103 based on a previous similar study (Eshah, 2013) that measured adherence to a healthy lifestyle. With an estimated attrition rate of 10%, the final sample size was 113 patients. The samples for this study were selected using a nonprobability, purposive sampling technique. The patients who fulfilled the inclusion and exclusion criteria as they fit the study were recruited.

Study Instruments

Data was collected using the questionnaire. The questionnaire was divided into two sections. Section A, namely sociodemographic data, is divided into two categories. The first category is (a) for sociodemographic items, which include sex, age, marital status, race, educational level, work status and monthly income. The other category (b) in Section A measures the clinical data from the patients, including smoking status, hypertension, diabetes mellitus, family history of CAD, previous cardiac events, treatment for the heart condition, weight, and height. In Section B, the adherence level to lifestyle modification was measured using the Health-Promoting Lifestyle Profile II (HPLP-II) developed by Walker, Sechrist, and Pender (1995). HPLP-II consists of 52 behavior statements related to six major components of a healthy lifestyle, including health responsibility, physical activity, nutrition, interpersonal relations, spiritual growth and stress management. All items are scored on a 4-point Likert scale (1- not at all; 2- sometimes; 3- often; 4- always). The score for each item in the six components could range from 1 to 4. A higher score indicates a greater level of health behaviours.

Data Collection and Measurement

Data were collected through individual face-to-face interviews using a structured questionnaire. The questionnaire was administered by a coronary care-trained nurse to patients after 72 hours of admission and prior to discharge. Patients have been explained the purposes and objectives of this study, and informed consent was

obtained from each patient. The sociodemographic, clinical background, and lifestyle modification status were collected via a self-administered questionnaire and patient assessment. Each patient took 20 to 30 minutes to complete the questionnaire.

Data Analysis

Data analysis was performed using IBM Statistical Package SPSS Version 24.0. Sociodemographic data and clinical characteristics analyzed with descriptive analysis were summarized using frequency and percentage. The level of adherence to lifestyle modification related to 6 healthy lifestyle components was calculated into means and standard deviations. The independent t-test, one-way ANOVA and Pearson correlation were used to analyse the association between sociodemographic information, clinical data, and adherence to lifestyle modification among patients with CAD.

Ethical Consideration

The study was approved by Ethics Committee of Universiti Teknologi Mara (UiTM), Malaysia on 11th June 2019 with reference number NMRR-19-433-45666(IIR) and Medical Research on 07th January 2019 with reference number 600-IRMI (5/1/6) .

RESULTS

Descriptive Analysis

Table 1: Descriptive Analysis for Sociodemographic Data (n = 113)

Criteria		Frequency	Percentage (%)	Mean (±SD)
Gender	**Male**	67	59.3	
	Female	46	40.7	
Age	21 – 30 years	3	2.7	51.03
	31 – 40 years	8	7.1	(±8.04)
	41 – 50 years	33	29.2	
	51 – 60 years	65	57.5	
	61 – 70 years	4	3.5	
Race	Malay	49	43.4	
	Chinese	36	31.9	
	Indian	25	22.1	
	Other	3	2.7	
Marital Status	Single	12	10.6	
	Married	95	84.1	
	Divorced	6	5.3	
Education Level	High school graduate	74	65.5	
	College	30	26.5	
	Bachelor's degree	9	8.0	
Monthly Income	<RM3000	66	58.4	
	RM3001 – 5000	39	34.5	
	RM5001 – 10000	8	7.1	
Smoking Status	Current	39	34.5	
	Past	26	23.0	
	Never	48	42.5	
Hypertension	Yes	81	71.7	
	No	32	28.3	
Dyslipidaemia	Yes	69	61.1	
	No	44	38.9	
Diabetes Mellitus	Yes	39	34.5	
	No	74	65.5	
Family History	Yes	57	50.4	
	No	56	49.6	
Previous Cardiac Event	Yes	20	17.7	
	No	93	82.3	

A total of 113 patients fulfilled the criteria and participated in the study. The statistics found that more than half of the patients were male (59.3%) and female (40.7%). The mean (±SD) age of patients enrolled in the study was 51.04 (±8.04), where 39% were below 50 years old. 49 (43.4%) patients were Malay, 36 (31.9%) were Chinese, 25 (22.1%) were Indian, and three others (2.7%). From 113 patients in the study, BMI (Body Mass Index) status of 82 (72.6%) patients was overweight. More than half, 81(71.7%) patients, have hypertension, and 69 (61.1%) have dyslipidemia. The sociodemographic and clinical characteristics of the patients enrolled in the study are depicted in Table 1.

Adherence to Lifestyle Modification

The level of adherence of the patients to practicing healthy lifestyle modification as recommended was sometimes mean of 2.09 (±0.19). Mean for physical activity was 1.78 (±0.37), indicating that the majority of the patients did not perform the recommended physical at all, the minimum mean score was 1.00 and the maximum was 2.75. Besides, for nutrition, the patients sometimes practiced a healthy diet as recommended. The minimum mean score for health responsibility was 1.00 (Not at all), and the maximum mean score was 2.78 (Sometimes). It is shown that the patients in this study were not accountable for their health, with a mean of 1.74 (±0.34). Adherence level to applied recommended stress management was 2.32 (±0.31), which showed 'practiced sometimes. The full summary of a six-item subscale for recommended lifestyle modification is described in Table 2.

Table 2: Adherence to Recommended Lifestyle Modification (n=113)

	Minimum	Maximum	Mean	Std. Deviation
Total HPLP-II	1.67	3.02	2.09	0.19
Value of HPLP-II subscale:				
Physical Activity	1.00	2.75	1.78	0.37
Nutrition	1.33	2.89	2.08	0.27
Stress Management	1.63	3.88	2.32	0.31
Spiritual Growth	1.78	3.89	2.25	0.33
Health Responsibility	1.00	2.78	1.74	0.34
Interpersonal Relationship	1.78	3.56	2.33	0.28

Association and Difference between Demographic and Clinical Variables on Adherence Level to Lifestyle Modification and Dual Antiplatelet Therapy

Table 3 shows a comparison and association between gender and clinical data on the adherence level to lifestyle modification. The independent samples *t*-test indicated no significant difference in adherence level to lifestyle modification as recommended between males and females, $t(111)=0.45$, $p>0.05$. The *t*-test analysis also found no significant difference between patients with a history of clinical data showing a risk for coronary artery disease with adherence to lifestyle modification ($p>0.05$).

Table 3: Comparison between Sociodemographic and Clinical Data on Adherence Level to Lifestyle Modification

Variables	Category	N	Mean (±SD)	*df* (*t*-value)	Significance (two-tailed)
Gender	Male Female	67 46	2.09(±0.20) 2.08 (±0.16)	111 (0.45)	0.67
Hypertension	Yes No	81 32	2.11 (±0.20) 2.03 (±0.15)	111 (1.87)	0.06
Hyperlipidaemia	Yes No	69 44	2.11 (±0.20) 2.11 (±0.20)	111 (1.86)	0.06
Diabetes Mellitus	Yes No	39 74	2.11 (±0.24) 2.07 (±0.15)	111 (1.07)	0.35
Family History	Yes No	57 56	2.11 (±0.21) 2.07 (±0.16)	111 (1.19)	0.23

The study's three groups of marital status measured are single, married, and divorced. There was no significant difference on adherence level to lifestyle modification, the one-way ANOVA p-value > 0.05.

Table 4: Comparison (ANOVA) between Sociodemographic Data on Adherence Level to Lifestyle Modfication

Variable	Category	N	Mean (±SD)	F(*df*)	*P*	Post hoc Tukey's test
Marital Status	Single Married Divorced	12 95 6	2.10 ±0.18 2.10 ±0.19 1.92 ±0.15	2.62(2,110)	0.078	
Race	Malay Chinese Indian Other	49 36 25 6	2.21 ±0.20 2.00±0.12 2.00±0.09 1.94±0.09	17.14(3,109)	*0.000	I vs II*** I vs III*** I vs IV**
Level of Education	School graduate College Bachelor's degree	74 30 9	2.05±0.19 2.10±0.13 2.31±0.20	8.71(2,110)	*0.000	I vs III*** II vs III**
Monthly Income	<RM3000 RM3001-5000 RM5001-10000	66 39 8	2.06±0.19 2.08±0.13 2.38±0.10	13.15(2,110)	*0.000	I vs III*** II vs III***

**Indicates p<0.05 (significant), **p<0.01 (moderately significant), ***p<0.001(highly significant)*

The study revealed a statistically significant difference in adherence level to recommended healthy lifestyle modification (total HPLP-II score) between the race of patients who participated in the study, p<0.05. The adherence to recommended healthy lifestyle modification (total HPLP-II score) was found to have a significant difference between race, F(3,109) = 17.14, p<0.05. The post hoc Tukey's test found there was highly significant differences (p < 0.001) between Malay (Mean=2.21; SD ±0.20) and Chinese (Mean = 2.00; SD ± 0.12), as well as between Malay (Mean = 2.21; SD ± 0.20) and Indian (Mean = 2.00; SD ± 0.09). Post hoc Tukey's test indicated there was a moderate significant difference (p < 0.01) on adherence level to recommended healthy lifestyle between Malay (Mean = 2.21; SD±0.20) and Others (Mean =1.94; SD±0.09).

In addition, there was a significant difference in adherence level to recommended lifestyle modification (total HPLP-II score) between the level of education, F(2,110) = 8.71, p<0.05. Post hoc Tukey's test indicated a highly significant difference (p<0.001) between school graduates (Mean=2.05; SD ± 0.19) and bachelor's degree graduates (Mean=2.31; SD ± 0.20). A moderate significant difference (p<0.01) was found by post hoc Tukey's test between college graduates (Mean=2.10; SD±0.13) and bachelor's degree graduates (Mean=2.31; SD±0.20).

There was a significant difference in total HPLP-II score between monthly income status proved by one-way ANOVA, F(2,110) = 13.15, p<0.05 and the post hoc Tukey's test found a highly significant difference between monthly income < RM3000 (Mean=2.06; SD ± 0.19) and monthly income RM3001 – 5000 (Mean=2.08; SD±0.13). A highly significant difference was also found between monthly income RM3001 – 5000 (Mean=2.08; SD±0.13) and RM5001 – 10 000 (Mean=2.38; SD±0.10). The findings are shown in Table 4.

The mean age of patients who participated in the study was 51.03 (±8.04). A Pearson correlation found a significant medium positive correlation between age and health responsibility r(113)=0.572, p<0.01, and also between age and nutrition r(113)=0.490, p< 0.01. This indicated that the older the patient, the higher the adherence to health responsibility and a healthy diet. However, the Pearson correlation analysis found a significant small negative correlation between age and spiritual growth r(113) = -0.384, p<0.01. A significant negative correlation was also found between age and physical activity, r(110)=-0.707, p<0.01. The results are shown in Table 5.

Table 5: Association between Age and BMI With Lifestyle Modification as Recommended

Association Variables	Mean (±SD)	HPLP II	HR	PA	NU	SG	IR	SM
Age	51.03 (±8.04)	-0.007	0.572**	-0.707**	0.490**	-0.384**	0.149	-0.071
BMI	27.59 (±2.51)	0.068	-0.064	0.181	-0.207*	0.186*	0.058	0.052

Note: HPLP II - health-promoting lifestyle profile II total, HR – health responsibility, PA – physical activity, NU – nutrition, SG – spiritual growth, IR – interpersonal relationship, SM – stress management,
*** indicates p<0.01, * indicates p<0.05.*

Table 5 also explained a significant negative correlation between BMI and healthy nutrition intake, $r(113) = -0.0207$, $p<0.05$. Other than that, there was a small positive correlation between BMI and spiritual growth, $r(113) = 0.186$, $p<0.05$.

DISCUSSION

The study found that the association between race and adherence level to lifestyle modification (total HPLP-II score) was significantly different. The study found a highly significant difference between Malay and Chinese and between Malay and Indian. This finding is probably due to Malaysia's different cultures and lifestyles. For example, the Malay culture, which is rich in customs such as feasts and festival celebrations, tends to cause them to adopt a poorly balanced diet during the festival seasons. In addition, easy-to-obtain food services such as 24-hour restaurants and the increasing number of various types of fast-food outlets led to this finding. Furthermore, there is an increase in food delivery companies, which may influence Malaysian food habits.

This finding is supported by one of the studies conducted in Malaysia, in which the researchers found that race is associated with different dietary habits among three ethnic groups. The study also found low physical activity among Malay and Chinese. Other than that, a study on lifestyle practices among Malaysian university students showed that race is associated with alcohol consumption among the participants in the study (Al-Naggar, Bobryshev, & Mohd Noor, 2013). In a study that investigated the dietary habits among adolescents in Malaysia, the researchers also found that healthy dietary patterns were significantly associated with ethnicity (Man *et al.*, 2020).

There was a significant difference in adherence level to recommended lifestyle modification (total HPLP-II score) between the levels of education. This finding indicated a significant difference between high school graduates and bachelor's degree graduates. A moderately significant difference was also found between college graduates (Mean and bachelor's degree graduates. The education level improves awareness of the importance of lifestyle modification as recommended, which can reduce the risk of complications and improve the quality of life among the patients in the study. A cross-sectional study that investigated lifestyle practices among rural communities in Kedah found that 79.9% of the respondents had good basic knowledge regarding lifestyle modification practices, and 96.6% of the respondents in the study received formal education (Afrose *et al*., 2018). It is important to consider early educational interventions that foster an increase in self-efficacy. These interventions can help guide patients in effectively managing their health at home and adopting a lifestyle that promotes wellness, reducing the risk of recurrence of Acute Coronary Syndrome (binti Abu, binti Sowtali & Ludin, 2020). The education level among the patients ostensibly helps them better understand the information provided to them to improve their lifestyle practices. A study finding show that teaching programme on risk factors and symptoms of Coronary Heart Disease is effective for increasing the knowledge of the higher secondary school teachers (Majumder, 2020).

Monthly income status was significantly different from the study's adherence level to lifestyle modification. In addition, this study found a highly significant difference between monthly income <RM3000 and monthly income RM3001–5000. A highly significant difference was also found between monthly incomes RM3001 –5000 and RM5001–10 000. This indicates the mean adherence level to recommended lifestyle modification was higher among patients with monthly income between RM5001–10 000.

These results imply that most Malaysians believe that practicing a healthy lifestyle requires high financial resources. Future researchers suggest investigating the effect of the pre-discharge intervention to improve this belief among the patients. Practicing a healthy lifestyle does not necessarily cost much money. As an example, physical activity is not necessarily just in the gym. Physical activity can also be practiced by walking around the house or gardening; however, the duration and intensity might differ from the other activities. This crucial information and belief must be delivered to each patient so everyone will understand how to practice a healthy lifestyle as recommended. This finding is similar to a study by Afrose *et al.* (2018), who found that respondents with a higher level of income practiced better physical activity than respondents with a lower income.

In addition, this study identified a significant negative correlation between age and physical activity. The older the patients, the less they performed physical activity as recommended and the lower their spiritual growth level. This condition might be due to low spiritual growth and less support from family members to practice physical activity among older people. Besides that, concern about accidents during activities also contributed to

the result. This result is similar to a study by Mumu *et al*. (2014), who found that older age was associated with non-adherence to physical activity; however, it contrasted with a healthy dietary intake that showed older people were more concerned about their healthy diet and health awareness (Govindaraju *et al.*, 2018). Elderly people are usually free from family and work responsibilities and may concentrate more on a healthy lifestyle. The other reasons for non-adherence to physical activity may be health problems, a lack of ability to perform physical activity, or dependency on other family members.

CONCLUSION

For patients with CAD to lower their risk of mortality and morbidity, adherence to lifestyle changes is essential. As recommended, this study suggested an association between sociodemographic characteristics and clinical data on adherence to lifestyle modification. Healthcare workers need to identify and understand the factors related to their patients that can contribute to improving awareness, education and adherence levels. The development of effective health education, health awareness and prevention can be implemented by understanding all the sociodemographic characteristics and clinical data associated with the adherence level.

To improve the quality of life among patients with CAD and reduce the risk of complications, cost and hospitalization, health education and awareness of primary and secondary prevention must be initiated among healthcare professionals and nurses. The healthcare professionals who are closest to the patients are nurses. The present study has important implications for future interventions. The study findings are intended to add critical knowledge that will help to improve nursing care services. It is targeted at promoting quality of life among patients with CAD. Future researchers and healthcare workers should investigate the effectiveness of information and education provided to their patients. The relationship and impact of the impart information to their adherence to lifestyle modification.

Conflict of Interest

The authors declare that they have no conflict of interests.

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REFERENCES

Afrose, Tahmina & Habib, Nasrin & Kharkwal, Kailash & Rashid, Mamunur. (2018). Original Article: Lifestyle modification practice in rural community at Kedah in Malaysia : A cross sectional study. *SBV Journal of Basic, Clinical and Applied Health Science, 2*(4), 169–176. https://doi.org/10.5005/jp-journals-10082-01146

Al-Naggar, R. A., Bobryshev, Y. V., & Mohd Noor, N. A. B. (2013, March 30). Lifestyle Practice among Malaysian University Students. Asian Pacific Journal of Cancer Prevention. *Asian Pacific Organization for Cancer Prevention, 14*(3), 1895-1903. https://doi.org/10.7314/apjcp.2013.14.3.1895

binti Abu, H., & binti Sowtali, S. N. (2020). The Effects of Early Educational Intervention On Patients with Acute Coronary Syndrome (Acs): A Review. *Malaysian Journal of Medical Research (MJMR), 4*(2), 32-41. https://doi.org/10.31674/mjmr.2020.v04i02.005

Chow, C. K., Jolly, S., Rao-Melacini, P., Fox, K. A. A., Anand, S. S., & Yusuf, S. (2010). Association of diet, exercise, and smoking modification with risk of early cardiovascular events after acute coronary syndromes. *Circulation, 121*(6), 750–758. https://doi.org/10.1161/CIRCULATIONAHA.109.891523

Cho, S. M. J., Koyama, S., Honigberg, M. C., Surakka, I., Haidermota, S., Ganesh, S., ... & Natarajan, P. (2023). Genetic, sociodemographic, lifestyle, and clinical risk factors of recurrent coronary artery disease events: a population-based cohort study. *European Heart Journal*, ehad380. https://doi.org/10.1093/eurheartj/ehad380

Dhungana, R. R., Devkota, S., Khanal, M. K., Gurung, Y., Giri, R. K., Parajuli, R. K., Adhikari, A., Joshi, S., Hada, B., &

Shayami, A. (2014). Prevalence of cardiovascular health risk behaviors in a remote rural community of Sindhuli district, Nepal. *BMC Cardiovascular Disorders, 14*, (92). https://doi.org/10.1186/1471-2261-14-92

Eshah, N. F. (2013). Predischarge education improves adherence to a healthy lifestyle among Jordanian patients with acute coronary syndrome. *Nursing and Health Sciences, 15*(3), 273–279. https://doi.org/10.1111/nhs.12018

Gómez, G., Kovalskys, I., Leme, A. C. B., Quesada, D., Rigotti, A., Cortés Sanabria, L. Y., Yépez García, M. C., Liria-Domínguez, M. R., Herrera-Cuenca, M., Fisberg, R. M., Nogueira Previdelli, A., Guajardo, V., Ferrari, G., Fisberg, M., Brenes, J. C., & On Behalf of The Elans Study Group (2021). Socioeconomic Status Impact on Diet Quality and Body Mass Index in Eight Latin American Countries: ELANS Study Results. *Nutrients, 13*(7), 2404. https://doi.org/10.3390/nu13072404

Govindaraju, T., Sahle, B. W., McCaffrey, T. A., McNeil, J. J., & Owen, A. J. (2018). Dietary Patterns and Quality of Life in Older Adults: A Systematic Review. *Nutrients, 10*(8), 971. https://doi.org/10.3390/nu10080971

Kumar, A. B., Umashankar, M. S., & Poddar, S. (2020). Assessment of Clinical, Risk Factors Profile and Clinical Pharmacist Care Services on Management and Prevention of Coronary Artery Disease Complications Among Diabetic Patients in a Tertiary Care Hospital Practice. *Malaysian Journal of Medicine & Health Sciences, 16*(3).

Man, C. S., Salleh, R., Ahmad, M. H., Baharudin, A., Koon, P. B., & Aris, T. (2020). Dietary Patterns and Associated Factors Among Adolescents in Malaysia: Findings from Adolescent Nutrition Survey 2017. *International Journal of Environmental Research and Public Health, 17*(10), 3431. https://doi.org/10.3390/ijerph17103431

Majumder, S. (2020). Effectiveness of A Planned Teaching Programme On Risk Factors and Symptoms of Coronary Heart Disease Among School Teachers. *Malaysian Journal of Medical Research (MJMR), 4*(4), 39-42. https://doi.org/10.31674/MJMR.2020.V04I04.009

Ministry of Health Malaysia (2017) Primary & Secondary Prevention of Cardiovascular Disease. Health Technology Assessment Unit Medical Development Division style modification and its factors among type 2 diabetic patients. *Indian Journal of Public Health, 58*(1), 40–44. https://doi.org/10.4103/0019-557X.128165

Mumu, S. J., Saleh, F., Ara, F., Afnan, F., & Ali, L. (2014). Non-Adherence to Life-Style Modification and its Factors among Type 2 Diabetic Patients. *Indian Journal of Public Health, 58*(1), 40–44. https://doi.org/10.4103/0019-557X.128165

Nugraha, D. A., Pujiastuti, S. E., Widiyanto, B., & Anwar, C. (2023). Effect of Hypno-Pressure on Mean Arterial Pressure in Patients with Cardiovascular Disorders. *The Malaysian Journal of Nursing (MJN), 14*(3), 86-93. https://doi.org/10.31674/mjn.2023.v14i03.010

Pandey, A. K., & Choudhry, N. (2014). Text message reminders to address medication non-adherence in post-mi patients: A one year intervention study. *Canadian Journal of Cardiology, 30*(10), S179. https://doi.org/10.1016/j.cjca.2014.07.280

Pereira, R. F., & Franz, M. J. (2008). Prevention and treatment of cardiovascular disease in people with diabetes through lifestyle modification: Current evidence-based recommendations. *Diabetes Spectrum, 21*(3), 189–193. https://doi.org/10.2337/diaspect.21.3.189

Sofi, F., Fabbri, A., Marcucci, R., Gori, A. M., Balzi, D., Barchielli, A., … Gensini, G. F. (2011). Lifestyle modifications after acute coronary syndromes in a subset of the AMI-Florence 2 Registry. *Acta Cardiologica, 66*(6), 791–796. https://doi.org/10.2143/AC.66.6.2136965

Walker, S.N., Sechrist, K.R., & Pender, N.J. (1995). Health Promotion Model - Instruments to Measure Health Promoting Lifestyle: Health-Promoting Lifestyle Profile [HPLP II] (Adult Version). https://deepblue.lib.umich.edu/handle/2027.42/85349 . Accessed on 23rd April, 2022.

World Health Organization (WHO) (2014). Global status report on noncommunicable diseases 2014. *World Health*, 176. https://doi.org/ISBN9789241564854. Accessed on 24th April, 2022