

Common Risk Factors of Myocardial Infarction and Some Socio Demographic Characteristics in Sulaimani City

Bayan Omar Sharif

Health Development and Training Center
Ministry of Health
Sulaimani, Iraq
omerbayan82@gmail.com

Samir Y. Lafi

Adult Nursing Department
College of Nursing
University of Raparin
Rania, Iraq
prof.dr.samir@uor.edu.krd

Article Info

Volume 6 – Issue 2 –
December 2021

DOI:
10.24017/science.2021.2.13

Article history:

Received 10/10/2021
Accepted 25/1/2022

Keywords:

Risk factors, myocardial infarction, socioeconomic status, coronary heart disease, Sulaimani City-Iraq

ABSTRACT

Coronary artery disease (CHD) is referred to as a pathologic process influencing the coronary arteries and leading to atherosclerosis. Myocardial infarction (MI) is one of the diagnostic conditions for CHD. Although CHD over the last decades in western countries coronary heart disease mortality has declined gradually but still is one of the vital causes of morbidity and death. Coronary heart disease is affected by Socioeconomic factors. These risk factors in Sulaimani city of Iraq remain uncertain. The current study's main aims were to explore the potential association between several predisposing factors of a heart attack in Sulaimani, Iraq, with some socio-demographic characteristics of the participants. 165 patients have been admitted to the Cardiac Specialty Hospital, (Coronary Care Unit), and they were definitely diagnosed as having MI participated in the current study between 2015 and 2016; in Sulaimani, Iraq. The study was attentive on exploring the socioeconomic status, lifestyle, family history of heart attack, and classical predisposing factors such as (Hypertension, Diabetes Mellitus, smoking cigarette, and dyslipidemia). The finding: ≥ 61 years was the most frequently affected by myocardial infarction. Sedentary lifestyle, Hypertension obesity, and overweight were accounted the subjects. (98.2%) of the selected patients no eating fish. (56.4%, 58.8%) of them were not eating daily fruit and vegetable respectively. Smoking was a significant correlation with age, gender, level of education, and marital status. Conclusions: In Sulaimani city of Iraq the strong predictors of heart attack were included: sedentary lifestyle, high body mass index, positive family history, unhealthy diet, smoking cigarettes, high blood pressure, dyslipidemia, and Diabetes Mellitus.

1. INTRODUCTION

Death rates from coronary heart disease have decreased in recent decades; morbidity and mortality are still due to coronary artery disease worldwide. Myocardial infarction (MI) or heart attack, which is one of the most coronary artery problems that lead to deaths could be referred back to different conditions of failing circulation of the heart [1]. The reason of nearly ninety percent of MI results from a thrombus that obstructs the atherosclerotic coronary artery, resulting in interruption of the blood supply and damage of the heart muscle [2,3]. Some factors or diseases that contribute as the predisposing risk factors for occurring heart attack include type one or two diabetes mellitus, hypertension, hypercholesterolemia, particularly high amount of low-density lipoprotein (LDL), low amount of high-density lipoprotein (HDL), high triglycerides (TG), stress and depression, overweight or obesity, smoking cigarette and sedentary lifestyle [4,6].

After the year 2020, the major source of death and disability will be due to coronary heart disease predominantly with MI in low middle-income countries, accounting for all deaths [7]. The maximum age-adjusted death from coronary heart disease is in Asian countries and had, followed by West Asian, Southeast Asian, and South Asian countries [8]. The most susceptible population to MI is Asian people [9]. A rapid transformation of the societies has occurred from nomadic or rural lifestyles to urban lifestyles over the last six or seven decades in classified countries of the middle east region which consists of mainly high, middle, and low-income countries [10]. Socioeconomic determinants of health are answerable for determining nearly half of the health of a population, and they also powerfully affect health behaviors, the second greatest contributor to health and permanency [11].

Non-communicable diseases have a multifactorial cause and account for more than fifty percent of the deaths internationally [12]. However, to date, no studies have been conducted on the risk factors of MI in Sulaimani of Iraq; therefore, the current study has intended to assess the common risk factors of a heart attack such as smoking, physical inactivity, hypertension, diabetes mellitus, unhealthy diets, and family history.

2. METHODS AND MATERIALS

Data were collected from those patients who were diagnosed with MI by the cardiologists and admitted to Cardiac Specialty Hospital in Sulaimani City/ Kurdistan Region of Iraq, which is the main health agency dealing with cardiac diseases in Sulaimani city, during the period of 25th November 2015 to 23rd October 2016. All patients expressed their consent before participation in the study. The excluded criterion for the current study was associated with hepatic and renal failure, human immunodeficiency virus (HIV), and cancer because they are far from our main topic and need to go deeper with them. The questionnaire was implemented for assessing smoking habits, heart attack, physical exercise, Type 2 diabetes, dietary and working conditions. The questionnaire was composed of 21 variables which were divided into two parts, the first one was socio and clinical demographic and lifestyle factors which include 17 items, while the second part was the common risk factors of MI which include 4 items. Identifying personal and family history of MI, the socioeconomic status such as (monthly income and level of education), lifestyle habits such as (cigarette smoking and daily physical activity), nutritional pattern, diabetes mellitus. Weight by kilograms, per standing height by meters squared is the measurement of body mass index which was calculated as with weight in kilograms divided by height in meters squared. The result of waist-hip ratio (WHR) was done by calculating waist measurement divided by the hip measurement. The panel of 29 experts from several specialists such as internists, cardiologists, nutrition, and specialist nurse inside and outside of Iraq such as (Iran, Jordan, Saudi Arabia, and Egypt) were included for the

validity of the questionnaire. The reliability of the questionnaire was checked and the pilot study was determined through the use of test-retest approach which was assessed as ($r= 0.98$), also, the data were collected via interview and discussion technique, and then the data were organized and coded into computer files, statistically analyzed.

Statistical analysis

All participants participated in the study except five of them who refused the participation. The normality of distribution such as Kolmogorov–Smirnov test was achieved for all variables in the pre-analysis or examination process. Pearson and Spearman’s correlation was used to examine relationships between variables. All data are expressed as means \pm SD. Data analysis was undertaken using the IBM SPSS (version 21), p-value less than 0.05 as a statistical significance was accepted.

Table 1: Socio–demographic and lifestyle factors distribution of myocardial infarction of 165 patients aged 31–90

Age Frequency (percentage %)						Gender n (%)	
31-40	41-50	51-60	61-70	71-80	81-90	Male	Female
6 (3.6%)	35 (21.2%)	41 (24.8%)	54 (32.7%)	23 (13.9%)	6 (3.6 %)	123 (74.5%)	42 (25.5%)

Education n (%)			Occupation n (%)		Marital status n (%)	
Primary School	High School	College or university	Employed	Unemployed	Married	Single/ widow/ divorced
133 (80.6%)	16 (9.7%)	16 (9.7%)	38 (23%)	127 (77%)	130 (78.7%)	35 (21.2%)

Residential Area n (%)		Smoking n (%)			Life style n (%)	
Urban	Rural	Never	EX & Passive smoker	Current smokers	Sedentary	Physical activity
120 (72.7%)	45 (27.3%)	50 (30.3%)	57 (34.5%)	58 (35.2%)	135 (81.8%)	30 (18.2%)

BMI n (%)		WHR n (%)		Dyslipidemia	Hypertension	Diabetes
Normal wt.	Over wt.& obesity	Average	At risk			
41 (24.8%)	124 (75.2%)	109 (66.4%)	56 (33.9%)	65 (39.4%)	101 (61.2%)	33 (20%)

Previous Heart attack	Visit Physician Regularly	Taking drugs regularly	Monthly income		
			Sufficient	B. Sufficient	Insufficient
28 (17%)	43 (26.1%)	96 (58.2%)	16 (9.7%)	58 (35.1%)	91 (55.2%)

3. RESULTS

The male participants included in this study were 123 patients (74.5%) while 42 (25.5%) were females. (27.3%) is the total number of the patients were from the rural areas while others (72.7%) were from the urban areas. The patients with MI in the present study were in the older age group [≥ 61 y: 83n (50.2%)] was higher than in middle-aged [41-60 y: 76n (46%)] and young [30-40 y: 6n (3.3%)] groups. Lifestyle factors and socio-demographic are summarized in table1. The occurrence of all predisposing factors was much more in a low level of occupation and education with sedentary married patients. Myocardial infarction was lower among the participants from the rural zones (27.3%) than among those from the urban areas (72.7%). Current, passive, and Ex- smoking was predominance in the MI patients (69.7%). The prevalence of BMI > 25 was 75.15% as compared to the normal weight class (24.8%). Sixty-one percent of the selected MI cases had hypertension. The prevalence of dyslipidemia and diabetes was (39.4%, 20%), respectively. A sedentary lifestyle (81.8%) was predominantly among MI patients. The prevalence of insufficient monthly income was (55.2%) as compared to sufficient (9.7%). As it is shown in Table 1, the patients who visited physicians regularly and took medication regularly were (26.1%,58.2%), respectively. The subjects with a positive family history of hypertension (54.5%), heart attack (39.2%), diabetes (28.4), and dyslipidemia (7.2%) are shown in table 2. Table 3 illustrates the dietary pattern of the patients. (98.2%) of the selected patients do not eat fish. Also, (56.4%, 58.8%) of patients do not eat daily fruit and vegetable, respectively.

Table 2: Participants' first and second degree of family history

Family History	Class	n (%)
Dyslipidemia	No	153 (92)
	First degree	11 (6.6)
	Second degree	1 (0.6)
Heart attack	No	101 (61.2)
	First degree	57 (35)
	Second degree	7 (4.2)
Hypertension	No	75 (45.4)
	First degree	83 (50.3)
	Second degree	7 (4.2)
Diabetes	No	118 (72)
	First degree	40 (24.2)
	Second degree	7 (4.2)

Table 3: Dietary pattern of the study sample

Variables	Class	n (%)
Daily intake of fruit	Never	93 (56.4)
	Sometime	72 (43.6)
	Always	0 (0.0)
Daily intake of vegetable	Never	97 (58.8)
	Sometime	38 (41.2)
	Always	0 (0.0)
Daily sweet foods like cakes, biscuits, and chocolate	Never	86 (52.1)
	Sometime	73 (44.2)
	Always	6 (3.7)
Daily sugar use with tea or with other hot drinks	Never	35 (21)
	Sometime	71 (43)
	Always	59 (36)
Eating fish	Never	162 (98.2)
	Sometime	3 (1.8)
	Always	0 (0.0)
Eating red meat	Never	100 (60.6)
	Sometime	61 (37)

Table 4: Correlation coefficient between risk factor of myocardial infarction and Socio-demographic data

Risk Factors	Age	Gender	Educational level	Marital status	Occupation	Monthly Income
Smoking Cigarette	0.343**	0.382**	-0.231*	0.172*	0.123	-0.133
Physical Exercise	-0.04	-0.203**	0.097	-0.158*	-0.115	-0.058
Daily fruit	0.086	0.019	-0.025	-0.073	-0.041	0.017
Daily vegetable	0.158*	0.076	-0.024	0.234*	0.078	-0.07
Daily sweet foods	-	-0.168*	0.114	-0.09	-0.058	0.056
Daily sugar use with hot drinks	0.259**	-0.159*	-0.183*	0.025	-0.137	-0.069
Eating fish	-0.159*	-0.183*	0.025	-0.137	-0.069	0.126
Eating red meat	-0.095	-0.08	0.127	-0.058	-0.141	0.119
	-0.177*	-0.164*	0.065	0.009	0.004	0.173*

** Correlation is significant at the 0.01 level (2- tailed). * Correlation is significant at the 0.05level (2-tailed).

4. DISCUSSION

The results of some studies reported that the incidence of myocardial infarction and mortality is differing among sets distinct in terms of educational level and profession and public station [13]. Myocardial infarction is considered as the main cause of death in Asia and each country in the Asia region and it has a different rate of death caused by it, which is correlated to the prevalence of risk factors among their people [14]. It seems to be due to the specific political and social conditions of Iraq, such as war and economic deprivation in recent years, few studies have been conducted on health and medicine. However, a combination of modifiable and non-modifiable predisposing factors that are related to a heart attack in the Iraqi residents is not well studied. The main objective of the present investigation, therefore, was to collect data on risk factors and modifiers of effect that contribute to the occurrence of MI in Sulaimani city. The current study found that the influencing factors such as high blood pressure (hypertension), sedentary lifestyle or physical inactivity, and overweight are increased in the region of study. Patients with MI from the rural and urban areas of Sulaimani city of Iraq, were fairly old (≥ 61 years). A higher prevalence of MI in male patients compared to females. The healthy dietary pattern of this study population was poor. Healthy living and lifestyle are believed as a very significant point for increasing knowledge and education in every society [15]. (80.6%) of the participants in the present study was graduated from primary school while only (19.4%) of them were graduated from secondary school and university. Patients with a lower educational level commonly have a higher risk of clinical outcome according to reports of several studies [16,17]. Providing a relevant prognostic factor in patients with MI could be provided by evaluating educational level according to recommendations of some studies [17, 18, 19]. This result is agreeing with outcomes from other studies [18, 20]. In a recent study level education and long-term mortality rate in clients with MI, investigators found an opposite and independent relationship between the level of education and long-term death in MI clients [18]. Furthermore, people in occupations with a high education level have low relation with MI risks [21]. On the other hand, the present data showed that employed patients with sufficient monthly income had a lower incidence of MI (23%, 9.7%) respectively. It seems that people with higher education tend to obtain jobs with a more satisfactory psychosocial situation [22]. Indeed, smoking, hypertension, and obesity have also been significantly associated with Psychosocial work factors [23]. In the present study, approximately (70%) of patients were current, passive, and Ex-smokers. A study conducted by (Elkhader, et al., 2016) in Sudan heart center Khartoum is agreeing with this result and showed a positive correlation between smoking and the development of MI [24].

Additionally, the level of education was negatively correlated with smoking (Table 4). therefore, it is possible that low-educated patients had little knowledge in this regard. The prevalence of BMI > 25 was (75.15%) as compared to the normal weight class (24.8%). Obese clients are much more expected to die from heart disease within ten years period following the index of heart attack [25]. The prevalence of hypertension, dyslipidemia, and diabetes was (61%, 39.4%, and 20%) respectively. Our finding for hypertension and dyslipidemia was higher than (Iqbal et al.,2015) in Pakistan, who documented that hypertension accounted for nearly (37%) and more than a quarter for hypercholesterolemia [9]. Nevertheless, the present outcome is similar to the result of their study for diabetes mellitus (19.4%) in the rural and urban focuses. The major modifiable risk factor for MI, heart failure, and stroke is hypertension. Smoking, overweight and obesity, and physical inactivity are those factors that increase the chance of developing high blood pressure [26]. Among modifiable risk factors of MI, the current study found that hypertension (61%) developed as the most significant one for the beginning of heart attack more than dyslipidemia and diabetes. This outcome is agreeing with the study done by (Mansour, 2012) in Basrah (Southern Iraq), (89.6%) which was done by (Abdel-Aal, et al.,2008) in Jordan and (Alwakeel, et al.,2008) among 1952 Saudi clients with type 2 diabetic (DM), hypertension and nearly majority of their male and female patients have hypertension (78.1%) [26-28].

We also found that sedentary lifestyles (81.8%) were predominantly among MI patients. Nearly a quarter of the global problem of heart attack is due to a sedentary lifestyle during well healthy aging [29] as well as 6% of mortality that occur worldwide [30]. Overall socioeconomic status may be related to physical activity [31]. The increasing migration rate of villagers to Sulaimani city may have had an effect on increasing the sedentary lifestyle because villagers due to rural lifestyle have to do daily physical activities while they have less daily activity in the city [32]. Fadheel and Hussein (2017) reported a 65.4% occurrence degree of physical inactivity among women clients with coronary heart disease in Al-Diwaniya city, Iraq [25]. More often lower socioeconomic position is realized in person with unhealthy foods, a period built on influences such as type of occupation, economic status, and level of education [33]. Intake of fruit, vegetables, and fish provide useful indicators of the risk of MI, and a lower intake of these food sources is positively associated with acute MI compared to those with a healthy eating pattern [34]. Given that most of the subjects in the current study had a low level of income, education, and occupation and, they were expected to have an unhealthy dietary pattern. As shown in Table 3, most subjects did not have the habit of consuming vegetables, fruits, and fish. Many patients also used sugar daily with a variety of beverages. Coronary heart disease as MI is known to aggregate in families [35]. This can largely be explained by the grouping of classical predisposing factors, such as heart attack, lipid disorders, DM, and patients with high blood pressure within families. In our study, we found a family history of hypertension, heart attack, and diabetic Mellitus in (54.5%, 39.2%, and 28.4%) of the patients (first- and second-degree relatives), respectively. Thus, the possibility of developing MI is high as suggested by the previous studies [36,37].

The protective effect of marital status on coronary heart disease has been well recognized in numerous studies among universal residents [37]. In the current study marital status was negatively correlated with exercise and was positively correlated with smoking and/or daily sweet foods (Table 4). The researchers return this to the risk of coronary heart disease over the lifetime is influenced by many personal, social, and behavioral factors, in our society the old person does not do regular exercise. Therefore, it seems that our patients have a low quality of marital status. Also, the present study found that male patients were more than females (74.5, 25.5%) respectively; which agrees with the previous study; these differences can be explained by the cardio-protective effect of endogenous estrogen [9]. The present study is not without limitations. One of the most important restrictions of the current research was the small example or sample size. Therefore, further experiments with a large sample size are needed.

5. CONCLUSION

In conclusion, our results show that low level of occupation, education and monthly income, sedentary lifestyle, hypertension, unhealthy dietary pattern, high BMI, were the strong interpreters of myocardial infarction in Sulaimani city, Iraq. Physical exercise is negatively correlated with age, gender, occupation, monthly income, and marital status; but it was positively correlated with educational level and daily consumption of fruit and vegetable are positively correlated with age and gender and negatively correlated with educational level. These results could have consequences for nurses' suggestions and plans to improve the life of patients with Myocardial infarction.

REFERENCE

- [1] C. Larsson, "Charlotte Common risk factors associated with acute myocardial infarction: Population-based studies with a focus on gender differences," Lund University, 2011.
- [2] J. Jeroen, H. Baumgartner, C. Ceconi, V. Dean, C. Deaton, S. Mendis, "Third universal definition of myocardial infarction," *Journal of the American College of Cardiology*, 60(16), pp.1581-1598, 2012.
- [3] AM. Domma, MA. Gamal, "Association between acute myocardial infarction, lipid profile and smoking habit," *Journal of Dental and Medical Sciences*, 14(6), pp. 47-51, 2015.
- [4] SS. Anand, S. Islam, A. Rosengren, MG. Franzosi, K. Steyn, AH. Yusufali, et al., "Risk factors for myocardial infarction in women and men: insights from the INTERHEART study," *European heart journal*, 29(7), pp. 932-40, 2008.
- [5] AE. Azab, AS. Elsayed, "Acute myocardial infarction risk factors and correlation of its markers with serum lipids," *J Appl Biotechnol Bioeng*, 3(4), pp. 00075, 2017.
- [6] CE. Ugwu, SE. Nwankwo, SC. Meludu, JK. Nnodim, "Assessment of the risk of myocardial infarction among undergraduate students in a Nigerian tertiary institution," *International Journal of Healthcare and Medical Sciences*, 2(11), pp. 60-5, 2016.
- [7] R. Pranavchand, BM. Reddy, "Current status of understanding of the genetic etiology of coronary heart disease," *Journal of postgraduate medicine*, 59(1), pp. 30, 2013.
- [8] T. Ohira, H. Iso, "Cardiovascular Disease Epidemiology in Asia—An Overview—," *Circulation Journal*, CJ, pp. 13, 2013.
- [9] R. Iqbal, N. Jahan, A. Hanif, "Epidemiology and management cost of myocardial infarction in North Punjab, Pakistan," *Iranian Red Crescent medical journal*, 17(7), 2015.
- [10] AA. Gehani, AT. Al-Hinai, M. Zubaid, W. Almahmeed, MM. Hasani, AH. Yusufali, et al., "Association of risk factors with acute myocardial infarction in Middle Eastern countries: the INTERHEART Middle East study," *European journal of preventive cardiology*, 21(4), 400-10, 2014.
- [11] EW. Odoi, N. Nagle, R. Zaretski, M. Jordan, C. DuClos, KW. Kintziger, "Sociodemographic determinants of acute myocardial infarction hospitalization risks in Florida," *Journal of the American Heart Association*, 9(11), pp. e012712, 2020.
- [12] U. Narang, A. Gupta, S. Gupta, N. Gupta, S. Joshi, S. Sharma, "Risk factors and demographic profile in acute myocardial infarction: a prospective study from tertiary care rural hospital in North India," *Journal of Contemporary Medical Research*, 5(6), F14-21, 2018.
- [13] WM. Schultz, HM. Kelli, JC. Lisko, T. Varghese, J. Shen, P. Sandesara, "Socioeconomic status and cardiovascular outcomes: challenges and interventions," *Circulation*, 137(20), pp. 2166-78, 2018.
- [14] MH. Halim, YS. Yusoff, MM. Yusuf, "A review on myocardial infarction and stroke risk factors in selected countries in Asia," *Advanced Science Letters*, 23(5), pp. 4429-33, 2017.
- [15] W. Carina, "Risks for cardiovascular disease in middle-aged women in different social environments," Diss. Linköping University Electronic Press, 2017.
- [16] RH. Mehta, JC. O'Shea, AL. Stebbins, CB. Granger, PW. Armstrong, HD. White, "Association of mortality with years of education in patients with ST-segment elevation myocardial infarction treated with fibrinolysis," *Journal of the American College of Cardiology*, 57(2), pp. 138-46, 2011.
- [17] G. González-Zobl, M. Grau, MA. Muñoz, R. Martí, H. Sanz, J. Sala, "Posición socioeconómica e infarto agudo de miocardio. Estudio caso-control de base poblacional," *Revista española de cardiología*, 63(9), pp. 1045-53, 2010.
- [18] L. Consuegra-Sánchez, A. Melgarejo-Moreno, J. Galcerá-Tomás, N. Alonso-Fernández, Á. Díaz-Pastor, G. Escudero-García, et al., "Educational level and long-term mortality in patients with acute myocardial infarction," *Revista Española de Cardiología (English Edition)*, 68(11), pp. 935-42, 2015.
- [19] I. Kirchberger, C. Meisinger, H. Goliike, M. Heier, B. Kuch, A. Peters, "Long-term survival among older patients with myocardial infarction differs by educational level: results from the MONICA/KORA myocardial infarction registry," *International journal for equity in health*, 13(1), pp. 19, 2014.
- [20] P. Tillgren, BJ. Haglund, M. Lundberg, A. Romelsjö, "The sociodemographic pattern of tobacco cessation in the 1980s: results from a panel study of living condition surveys in Sweden," *Journal of Epidemiology & Community Health*, 50(6), pp. 625-30, 1996.

- [21] A. Bortkiewicz, E. Gadzicka, J. Siedlecka, A. Szyjkowska, P. Viebig, J. Wranicz, et al., "Work-related risk factors of myocardial infarction," *International journal of occupational medicine and environmental health*, 23(3), pp. 255, 2010.
- [22] A. Netterström, FE. Nielsen, TS. Kristensen, E. Bach, L. Møller, "Relation between job strain and myocardial infarction: a case-control study," *Occupational and Environmental Medicine*, 56(5), 339-42, 1999.
- [23] AG. Cuevas, DR. Williams, MA. Albert, "Psychosocial factors and hypertension: a review of the literature," *Cardiology clinics*, 35(2), pp. 223-30, 2017.
- [24] BA. Elkhader, AA. Abdulla, MA. Omer, "Correlation of smoking and myocardial infarction among sudanese male patients above 40 years of age," *Polish journal of radiology*, 81, pp. 138, 2016.
- [25] QJ. Fadheel, AA. Hussein, "Prevalence and life style determinants of hypertension among women in Iraq," *J Pharm Res*, 1(3), pp. 000120, 2017.
- [26] AA. Mansour, "Prevalence and control of hypertension in Iraqi diabetic patients: a prospective cohort study," *The open cardiovascular medicine journal*, 6, pp. 68, 2012.
- [27] NM. Abdel-Aal, AT. Ahmad, ES. Froelicher, AM. Batiha, MM. Hamza, KM. Ajlouni, "Prevalence of dyslipidemia in patients with type 2 diabetes in Jordan," *Saudi Med J*, 29(10), pp. 1423-8, 2008.
- [28] JS. Alwakeel, R. Sulimani, H. Al-Asaad, A. Al-Harbi, N. Tarif, A. Al-Suwaida, "Diabetes complications in 1952 type 2 diabetes mellitus patients managed in a single institution," *Annals of Saudi medicine*, 28(4), pp. 260-6, 2008.
- [29] D. Mozaffarian, EJ. Benjamin, AS. Go, DK. Arnett, MJ. Blaha, M. Cushman, "Heart disease and stroke statistics—2016 update: a report from the American Heart Association," *circulation*, 133(4), pp. e38-60, 2016.
- [30] L. Goertzen, G. Halas, J. Rothney, AS. Schultz, P. Wener, JE. Enns, et al., "Mapping a decade of physical activity interventions for primary prevention: a protocol for a scoping review of reviews," *JMIR research protocols*, 4(3), pp. e91, 2015.
- [31] M. Talaei, K. Rabiei, Z. Talaei, N. Amiri, B. Zolfaghari, P. Kabiri, et al., "Physical activity, sex, and socioeconomic status: A population based study," *ARYA atherosclerosis*, 9(1), pp. 51, 2013.
- [32] N. Othman, T. Kane, K. Hawrami, "Environmental health assessment in Sulaymaniyah city and Vicinity. Kurdistan Institution for Strategic Studies and Scientific Research, William Joiner institute, University of Massachusetts Boston, 2017.
- [33] JD. Finger, T. Tylleskär, T. Lampert, GB. Mensink, "Dietary behaviour and socioeconomic position: the role of physical activity patterns," *PLoS One*, 8(11), pp. e78390, 2013.
- [34] A. Bellavia, F. Stilling, A. Wolk, "High red meat intake and all-cause cardiovascular and cancer mortality: is the risk modified by fruit and vegetable intake?," *The American journal of clinical nutrition*, 104(4), pp. 1137-43, 2016.
- [35] S. Pohjola-Sintonen, A. Rissanen, P. Liskola, K. Luomanmäki, "Family history as a risk factor of coronary heart disease in patients under 60 years of age," *European heart journal*, 19(2), pp. 235-9, 1998.
- [36] AS. Khan, M. Isik, T. Set, Z. Akturk, U. Avsar, "A 5-year trend of myocardial infarction, hypertension, stroke and diabetes mellitus in gender and different age groups in Erzurum, Turkey," *Journal of Taibah University Medical Sciences*, 9(3), pp. 198-205, 2014.
- [37] MS. Rendall, MM. Weden, MM. Favreault, H. Waldron, "The protective effect of marriage for survival: a review and update," *Demography*, 48(2), pp. 481-506, 2011.